Final Environmental Impact Statement for the Bering Sea and Aleutian Islands Halibut Abundance-Based Management of Amendment 80 Prohibited Species Catch Limit.
Amendment 123 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area
December 2022[1]

This document analyzes a proposed management measure to link the Pacific halibut prohibited species catch (PSC) limit for the Amendment 80 commercial groundfish trawl fleet in the Bering Sea and Aleutian Islands (BSAI) groundfish fisheries to halibut abundance. The objectives of linking the PSC limit are to minimize halibut PSC to the extent practicable under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) National Standard 9 and to continue achieving optimum yield in the BSAI groundfish fisheries on a continuing basis under MSA National Standard 1. This would also be expected to provide incentive for the Amendment 80 fleet to minimize halibut mortality at all times. Achievement of these objectives could result in additional harvest opportunities in the commercial halibut fishery.

This document is a final Environmental Impact Statement (FEIS). An EIS provides assessments of the environmental impacts of an action and its reasonable alternatives as well as the economic benefits and costs of the action alternatives and their distribution. This FEIS addresses the statutory requirements of the MSA, the National Environmental Policy Act, and Presidential Executive Order 12866. An FEIS is a document produced by the North Pacific Fishery Management Council and the National Marine Fisheries Service Alaska Region to provide the analytical background for decision-making.

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List of Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
A80	Amendment 80 trawl fleet
ABM	Abundance-based management
ADF&G	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AKFIN	Alaska Fisheries Information Network
BSAI	Bering Sea and Aleutian Islands
CAS	Catch Accounting System
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COAR	Commercial Operators Annual Report
Council	North Pacific Fishery Management Council
CP	catcher/processor
CSIS	Community Subsistence Information System
CSP	Catch Share Program
CV	catcher vessel
DMR	Discard Mortality Rate
DPS	distinct population segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
E.O.	Executive Order
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FCEY	Fishery constant exploitation yield
FMP	fishery management plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRFA	Final Regulatory Flexibility Analysis
ft	foot or feet
GOA	Gulf of Alaska
IPHC	International Pacific Halibut Commission
lb(s)	pound(s)
LLP	license limitation program
LOA	length overall
m	meter or meters
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
MSE	Management Strategy Evaluation
mt	tonne, or metric ton
NEPA	National Environmental Policy Act
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
Observer Program	North Pacific Observer Program

Acronym or Abbreviation	Meaning
OMB	Office of Management and Budget
O26	Over 26" halibut
PA	Preferred Alternative
PBR	potential biological removal
PSC	prohibited species catch
PSEIS	Programmatic Supplemental Environmental Impact Statement
QS	Quota Share
RFA	Regulatory Flexibility Act
RFFA	reasonably foreseeable future action
RIR	Regulatory Impact Review
RPA	reasonable and prudent alternative
SAFE	Stock Assessment and Fishery Evaluation
SAR	stock assessment report
SBA	Small Business Act
SIA	Social Impact Assessment
SSB	Spawning Stock Biomass
SSC	Science and Statistical Committee
Secretary	Secretary of Commerce
SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpbacks
SPR	Spawning Potential Ratio
TAC	total allowable catch
TCEY	Total constant exploitation yield
U26	Under 26" halibut
U.S.	United States
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system

Table of Contents

List of Tables

List of Figures

1.1 Executive Summary

This document analyzes alternatives to proposed management measures to correlate or link the Amendment 80 commercial groundfish trawl fleet's (Amendment 80 sector) Pacific halibut prohibited species catch (PSC) limit in the Bering Sea and Aleutian Islands (BSAI) groundfish fisheries to halibut abundance. The Amendment 80 sector comprises trawl catcher/processor vessels in the BSAI that target groundfish species other than pollock. Through its final action, the North Pacific Fishery Management Council (Council) has recommended a program that links the Amendment 80 sector PSC limit to halibut abundance and provides incentive for the fleet to minimize halibut mortality at all times through reduced PSC limits at lower halibut abundance levels. Currently halibut PSC limits for groundfish fisheries are set in the BSAI Groundfish FMP at a fixed amount of halibut mortality, in metric tons (mt). When halibut abundance declines, halibut PSC becomes a larger proportion of total halibut removals and can result in lower catch limits for directed halibut fisheries. While other groundfish sectors are also subject to PSC limits, this action is limited to the Amendment 80 sector which responsible for the majority of BSAI halibut mortality in the groundfish fisheries.By reducing halibut bycatch, especially when abundance is low, this action promotes conservation of the halibut stock and may provide additional opportunities for the directed halibut fishery.

Roadmap for understanding EIS structure and RIR and MSA requirements

This document is a final Environmental Impact Statement (FEIS). An FEIS provides assessments of the environmental impacts of an action and its reasonable alternatives as well as the economic benefits and costs of the action alternatives and their distribution. This FEIS addresses the statutory requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Environmental Policy Act (NEPA), and Presidential Executive Order 12866. An FEIS is a document produced by the Council and the National Marine Fisheries Service (NMFS), Alaska Region to provide the analytical background for decision-making.

This FEIS is being prepared using the 1978 Council on Environmental Quality (CEQ) NEPA Regulations. NEPA reviews initiated before the effective date of the revised CEQ regulations may be conducted using the 1978 version of the regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020. A Notice of Intent to publish an Environmental Impact Statement (EIS) for the proposed management measures was published in the **Federal Register** on December 12, 2017 (82 FR 58374). This review began on that date, and the agency has decided to proceed under the 1978 regulations.

The document is structured to streamline information required in an FEIS and to organize it to be most easily understood by the reader. **Chapters 1 and 2** contain a description of the purpose and need for the action, followed by a description of the alternatives. **Chapters 3 and 4** of this FEIS contain background information on the BSAI Amendment 80 groundfish fishery and the Individual Fishing Quota (IFQ) and Community Development Quota (CDQ) commercial halibut fisheries in International Pacific Halibut Commission (IPHC) Regulatory Area 4 ("Area 4") that consists of five subareas (ABCDE) that together largely coincide with the BSAI management area. Those sections characterize the fisheries as they exist under status quo management and provide the context within which the alternative management measures should be considered. **Chapter 5** contains the impact analysis on the groundfish fishery and halibut fishery from these alternatives as well as the methodology for estimating these impacts, along with a summary of potential social/community impacts and environmental justice considerations. **Chapter 6** contains information and impacts to other affected resources. **Chapter 7** contains details on statutory requirements and other policies for relevant fisheries management. **Chapter 8** includes agency responses to public comments on the Draft EIS. Appended separately (**Appendix 1**) is a social impact assessment (SIA).

Relative Authorities of the Council, the National Marine Fisheries Service and the International Pacific Halibut Commission

The Council manages the groundfish fisheries of the BSAI under the authority of the MSA (16 U.S.C. 1801-1884), and through a Fishery Management Plan for the Groundfish of the BSAI Management Area (BSAI FMP). National Standard 9 of the MSA requires that fishery conservation and management measures shall, to the extent practicable: (1) minimize bycatch; and (2) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. Bycatch, as defined by the MSA, "means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards." 16 U.S.C. 1802(2). The term "regulatory discards" means "fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain but not sell." 16 U.S.C. 1802(38). In the BSAI FMP, the Council has designated Pacific halibut, along with several other fully utilized species such as salmon, herring, and crab, as "prohibited species" in the groundfish fisheries. Under this designation, their capture is required to be avoided, and their retention is prohibited except when retention is required or authorized by other applicable law, such as for the Prohibited Species Donation Program. Unintended removals of prohibited species are separately monitored and controlled under the BSAI FMP.

The Council and NMFS have established limits on removals of halibut, called halibut PSC limits, in the BSAI groundfish fisheries to minimize halibut bycatch and bycatch mortality. The BSAI FMP specifies that when a halibut PSC limit is reached in an area, further groundfish fishing with specific types of gear or modes of operation is prohibited by those who take their halibut PSC in that area. In other words, halibut PSC limits impose an upper limit on bycatch. In the context of the BSAI FMP, "halibut PSC" refers to the total mortality of halibut in the groundfish fisheries. This analysis primarily addresses halibut PSC, i.e., the subset of halibut bycatch that is assumed to be dead because of interactions with the groundfish fisheries. Mortality calculations are made for all halibut bycatch in the groundfish fisheries to estimate halibut PSC, using discard mortality rates adopted annually by the Council as part of the harvest specifications process. Halibut PSC limits, and halibut PSC estimates in the groundfish fisheries, are specified in terms of metric tons, round weight, of halibut mortality.

The International Pacific Halibut Commission (IPHC) is responsible for the overall biologic assessment and conservation of Pacific halibut off the coasts of Alaska, British Columbia, and the western United States. The IPHC refers to halibut "bycatch" to describe the mortality of all sizes of halibut caught in the commercial groundfish fisheries that are managed by the Council and NMFS (hook-and-line sablefish and Pacific cod; trawl Pacific cod, pollock, flatfish, and rockfish; and pot Pacific cod), and minor amounts in commercial shrimp trawl and crab pot fisheries. The IPHC uses the term "wastage" to describe halibut killed, but not landed by the commercial halibut fisheries. Causes can be due to lost and abandoned gear, and mortality of fish released due to the minimum commercial size limit of 32 inches in length. Wastage is not included in IPHC estimates of "bycatch" but is reported annually. The IPHC manages and reports on halibut removals in pounds, net weight, of halibut mortality, and assumes that net weights are 75 percent of round weights.

The Council and NMFS have the authority to set and adjust halibut PSC limits in the BSAI groundfish fisheries. However, only the IPHC can make determinations on annual catch limits for halibut in the directed fisheries. As such, though this action may result in changes to PSC usage by the BSAI groundfish fishery, there is no guarantee that this will translate to increased opportunities for halibut in the directed fishery, since the IPHC is not obligated to alter their harvest strategies based on the outcome of this action. This analysis uses the term "halibut PSC" in the context of the proposed action (e.g., halibut PSC limits and halibut PSC in the groundfish fisheries), except where appropriate to describe the IPHC catch limit process, or their research or stock assessment information.

The Council has set other PSC limits (crab, herring) based upon abundance of the stock in the BSAI. However, this action was complicated by consideration of how to index the BSAI portion of the coastwide halibut stock. In October 2017, the Science and Statistical Committee (SSC) recommended, and the Council selected two abundance indices to track Pacific halibut abundance and guide setting halibut PSC limits in the BSAI groundfish fisheries. These indices are derived from the NMFS Alaska Fisheries Science Center (AFSC) eastern Bering Sea (EBS) shelf bottom trawl survey (EBS shelf trawl survey) and from the IPHC setline survey covering IPHC Areas 4ABCDE. Both indices represent the best available scientific information on halibut abundance.

Purpose and Need

The Council's purpose and need statement for this action is taken from its motion of October 13, 2020 and set forth below:

> *Halibut is an important resource in the Bering Sea and Aleutian Islands (BSAI), supporting commercial halibut fisheries, recreational fisheries, subsistence fisheries, and groundfish fisheries. The International Pacific Halibut Commission (IPHC) is responsible for assessing the Pacific halibut stock and establishing total annual catch limits for directed fisheries and the North Pacific Fishery Management Council (Council) is responsible for managing prohibited species catch (PSC) in U.S. commercial groundfish fisheries managed by the Council. The Amendment 80 sector is accountable for the majority of the annual halibut PSC mortality in the BSAI groundfish fisheries. While the Amendment 80 fleet has reduced halibut mortality in recent years, continued decline in the halibut stock requires consideration of additional measures for management of halibut PSC in the Amendment 80 fisheries.*
>
> *When BSAI halibut abundance declines, PSC in Amendment 80 fisheries can become a larger proportion of total halibut removals in the BSAI, particularly in Area 4CDE, and can reduce the proportion of halibut available for harvest in directed halibut fisheries. The Council intends to establish an abundance-based halibut PSC management program in the BSAI for the Amendment 80 sector that meets the requirements of the Magnuson-Stevens Act, particularly to minimize halibut PSC to the extent practicable under National Standard 9 and to achieve optimum yield in the BSAI groundfish fisheries on a continuing basis under National Standard 1. The Council is considering a program that links the Amendment 80 sector PSC limit to halibut abundance and provides incentives for the fleet to minimize halibut mortality at all times. This action could also promote conservation of the halibut stock and may provide additional opportunities for the directed halibut fishery.*

Consistent with the MSA's National Standard 1 and National Standard 9, the Council and NMFS use halibut PSC limits to minimize halibut bycatch in the groundfish fisheries to the extent practicable, while achieving, on a continuing basis, optimum yield from the groundfish fisheries. The groundfish fisheries cannot be prosecuted without some level of halibut interception. Although fishermen are required by the BSAI FMP to avoid the capture of any prohibited species in groundfish fisheries, the use of halibut PSC limits in the groundfish fisheries provides an additional constraint on halibut bycatch and promotes conservation of the halibut resource. Halibut PSC limits provide a regulated upper limit to mortality resulting from halibut interceptions, as continued groundfish fishing is prohibited once a halibut PSC limit has been reached for a particular sector and/or season. This management tool is intended to balance the optimum benefit to fishermen, communities, and U.S. consumers that depend on both halibut and groundfish resources.

The halibut resource is fully allocated. The IPHC accounts for halibut mortality in the groundfish fisheries, recreational and subsistence fisheries, and other sources before setting commercial halibut catch limits each year. Specifically, the IPHC uses the use the three-year average of recent non-directed discard mortality to establish the following year's commercial halibut fishery catch limit. For several years, there have been concerns raised by stakeholders and the Council about the levels of halibut PSC in the commercial groundfish sectors. The spawning biomass of Pacific halibut in the 1990's was the highest seen in many decades, but has been declining since the 2000s. The declining biomass from those unusually high levels resulted in lower Pacific halibut catch limits set by the IPHC for the BSAI commercial halibut fisheries (Area 4), especially in 2013 and 2014 for the commercial halibut fishery in the northern and eastern Bering Sea (Area 4CDE). The Council addressed this initial concern by reducing trawl, non-trawl, and CDQ sectors' halibut PSC limits for the BSAI groundfish fisheries, implemented in 2016 by Amendment 111 to the FMP and continues to consider further management changes for the Amendment 80 sector PSC limit with this action.

Figure ES-1 Map of IPHC Regulatory Areas (outlined in dark blue) and BSAI FMP (shaded in light blue) and GOA FMP (shaded in yellow) areas.

Declines in the exploitable biomass of halibut since the late 1990s, and decreases in the Pacific halibut catch limits set by the IPHC for the BSAI commercial halibut fisheries (Area 4; Figure ES- 1), especially beginning in 2012 for the commercial halibut fishery in the northern and eastern Bering Sea (Area 4CDE), raised concerns about the levels of halibut PSC by the commercial groundfish trawl and hook-and-line (longline) sectors and led to the development and implementation of Amendment 111. Since then, the Council has been pursuing abundance-based measures to scale the halibut PSC limit for the Amendment 80 sector to the abundance of halibut (**Figure ES- 2**). Previous iterations of this analysis have considered modifying the halibut PSC limits for all sectors, but the Council in October 2020 chose to focus this action only on the Amendment 80 PSC limits since the Amendment 80 sector comprises the majority of halibut PSC mortality in the BSAI (52% average from 2015-2020). The intent of linking the Amendment 80 sector's PSC limit to levels of abundance is to minimize the impact from the Amendment 80 sector when, due to a decrease in BSAI halibut abundance, PSC in Amendment 80 fisheries becomes a larger proportion of total halibut removals in the BSAI, particularly in Area 4CDE, and can reduce the proportion of halibut available for harvest in directed halibut fisheries. Further, a program that links the Amendment 80 sector PSC limit to halibut abundance may provide incentives for the fleet to minimize halibut mortality at all times. Finally, this action promotes the conservation of the halibut stock, provides greater fairness among direct and indirect users of the halibut resource, and may provide additional opportunities for the directed halibut fishery.

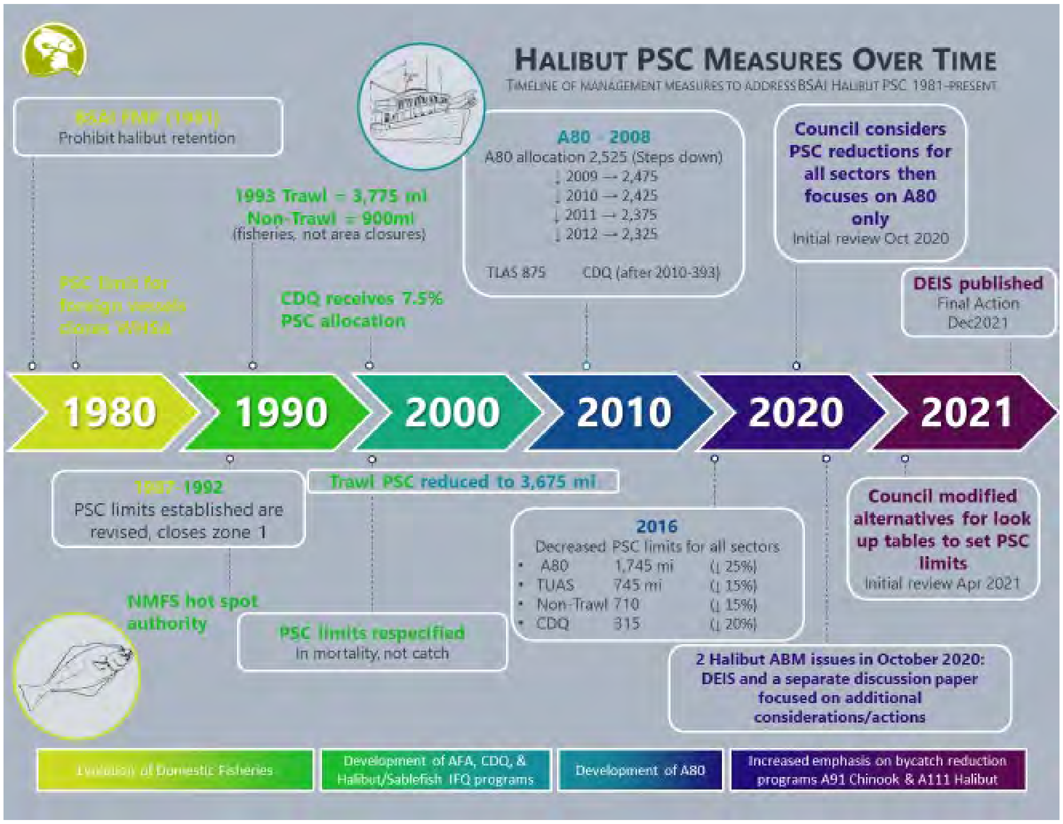


Figure ES-2 Historical overview of BSAI halibut PSC measures 1981-present.

The Council recognizes past and ongoing efforts by the Amendment 80 sector to reduce total halibut PSC in the BSAI. Concerns persist, however, about continuing low levels of halibut biomass that result in reduced directed fishery catch limits in Area 4 without any parallel reductions in PSC limits. Based on the IPHC management objectives as well as recent projections of halibut biomass and estimates of PSC mortality, directed fishery stakeholders remain concerned that catch limits will be insufficient to provide for a directed fishery in the BSAI at the PSC limits implemented under Amendment 111. The Amendment 80 sector fisheries account for the majority of halibut bycatch mortality in the BSAI. Therefore, the Council is considering the new approach described here to link the Amendment 80 PSC limit to halibut abundance.

The Council does not have authority to set catch limits for the commercial halibut fisheries, and halibut PSC in the groundfish fisheries is only one of the factors that affects harvest limits for the commercial halibut fisheries. Nonetheless, halibut PSC in the groundfish fisheries are a significant portion of total mortality in BSAI IPHC areas, currently remains static regardless of halibut abundance, and has the potential to affect catch limits for the commercial halibut fisheries in Area 4 under the current IPHC management procedures (harvest policy). Both the Council and the IPHC have expressed concern about impacts on directed halibut fisheries under the status quo in light of the continued decline in the halibut stock and identified abundance-based halibut PSC limits as a potential management approach to address these concerns. While the impact of halibut PSC reductions on catch limits for commercial halibut fisheries is dependent on IPHC policy and management decisions, reductions to current halibut PSC limits in the BSAI could provide additional harvest opportunities in the BSAI commercial halibut fishery.

Overall halibut PSC limits can be modified only through an amendment to the BSAI FMP and Federal regulations, although seasonal and some target fishery apportionments of those PSC limits would continue to be set annually through the BSAI groundfish harvest specifications process. The purpose of the proposed action is to establish an abundance-based halibut PSC management program in the BSAI for the Amendment 80 sector. The action is intended to meet the requirements of the Magnuson-Stevens Act, and is particularly designed to minimize halibut PSC to the extent practicable under National Standard 9 and section 303(a)(11), provide for the sustained participation of and minimize adverse economic impacts on fishing communities under National Standard 8, avoid discriminating between residents of different states and allocate fishing privileges fairly and equitably under National Standard 4, and maintain optimum yield in the BSAI groundfish fisheries on a continuing basis under National Standard 1.

The premise of abundance-based management of halibut is that the PSC limit would be set based on the surveyed abundance of halibut. Halibut PSC relative catch rates in the groundfish fisheries depend on a variety of factors and may correlate poorly with halibut abundance as indexed by surveys. A lack of correlation between surveyed abundance and Amendment 80 encounter does not discount the premise of abundance-based management; however, it may affect the potential impacts. The proposed action aims to minimize halibut PSC to the extent practicable in consideration of the regulatory and operational management measures currently available to the groundfish fleet, and the desire to ensure that catch in the trawl fisheries contributes to the achievement of optimum yield in the groundfish fisheries. Minimizing halibut PSC to the extent practicable is necessary to maintain a healthy marine ecosystem, ensure long-term conservation and abundance of the halibut stock, provide optimum benefit to fishermen, communities, and U.S. consumers that depend on both halibut and groundfish resources, and comply with the MSA and other applicable Federal law.

The proposed action may provide additional harvest opportunities in the commercial halibut fishery, especially in Area 4CDE for western Alaska and Pribilof Island coastal communities. Under the current IPHC harvest policy for establishing commercial fishery catch limits, reductions in halibut mortality from reducing halibut PSC below current levels may provide additional harvest opportunities to the commercial halibut fisheries in both the near term and long term. Additional near term harvest opportunities for the commercial halibut fisheries could result from mortality reductions of halibut that are over 26 inches in length (O26). Under current IPHC policy, these O26 halibut would likely be made available to the commercial halibut fishery in the area the PSC related mortality reductions occurred (historically in Area 4CDE), in the year following the PSC reductions, or when the fish reach the legal size limit for the commercial halibut fishery (greater than or equal to 32 inches in total length). Additional long-term harvest opportunities for the commercial halibut fisheries could accrue throughout the range of the halibut stock from a reduction of halibut PSC from fish that are less than 26 inches (U26). Benefits from reduced mortality of these smaller halibut could occur both in the Bering Sea and elsewhere as these halibut migrate and recruit into the commercial halibut fisheries.

Alternatives

Alternative 1: No Action (Status Quo). The Amendment 80 sector PSC limit is set at 1,745 mt.

Alternative 2: A 3X2 look up table with PSC limits that range from current PSC limit to 20% below current limit. PSC limit is determined annually based on the most recent survey values (Table ES-1).

Alternative 3: A 4X2 look up table with PSC limits that range from 15% above current PSC limit to 30% below current limit. PSC limit is determined annually based on the most recent survey values (Table ES-1).

Alternative 4: A 4X2 look up table with PSC limits that range from current PSC limit to 45% below current limit. PSC limit is determined annually based on the most recent survey values (Table ES-1).

Alternative 5 (Preferred Alternative): A 4X2 look up table with PSC limits that range from current PSC limit to 35% below current limit. PSC limit is determined annually based on the most recent survey values (Table ES-2).

Options (May apply to all action alternatives):
Option 1: PSC limit is determined using a 3-year rolling average of survey index values instead of the most recent survey value.
Option 2: In the first year of implementation, the PSC limit varies no more than (i: 10% or ii: 15%) from the status quo limit (1,745 mt).
Option 3: Establish an annual limit of (i: 80% or ii: 90%) of the PSC limit generated by the look up table. In 3 of 7 years, the Amendment 80 sector may exceed the annual limit up to the PSC limit generated by the look up table. If the Amendment 80 sector has exceeded the annual limit in 3 of the past 7 years, then the annual limit is a hard cap for the following year.

Figure ES-3 shows the survey states for the EBS shelf trawl survey and the IPHC setline survey from 1998 – 2019 to show how historical values have related to the breakpoints identified in Alternatives 2 through 5. To determine what the PSC limit would have been in a given year under the approach being considered by the Council, the reader should simply match the EBS shelf trawl and IPHC setline survey values from a given year and plot them on the individual Alternative look up tables.

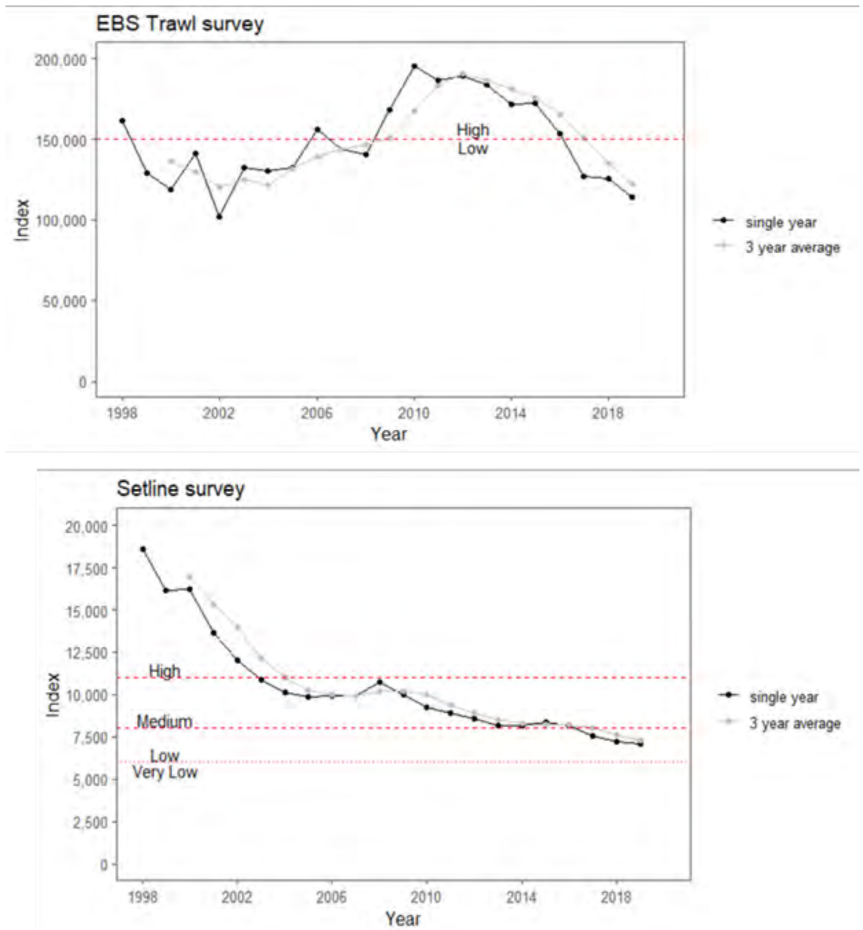


Figure ES-3 Survey states for Alternatives 2, 3, and 4. Top panel: EBS shelf trawl survey (1998-2019) with 'survey state' delineation (dotted line) between 'High' and 'Low" at 150,000 mt. Bottom panel: IPHC Setline survey 1998-2019 WPUE with 'survey' state delineations for 'High', 'Medium', 'Low' and 'Very low'. Both single within year data (black line) as well as the rolling three-year survey average (grey line) are shown.

Table ES-1-1 **Look up tables for use in setting PSC limits based upon PSC limits associated with the intersection of different states of the EBS shelf trawl survey and the IPHC setline survey. Alternatives 2, 3, and 4.**

Alternative 2		**EBS shelf trawl survey index (t)**	
		Low **< 150,000**	**High** **≥ 150,000**
IPHC setline survey index in Area 4ABCDE (WPUE)	**High** **≥ 11,000**	1,571 mt (10% below current)	1,745 mt (current limit)
	Medium **8,000 – 10,999**	1,483 mt (15% below current)	1,571 mt (10% below current)
	Low **< 8,000**	1,396 mt (20% below current)	1,483 mt (15% below current)

Alternative 3		**EBS shelf trawl survey index (t)**	
		Low **< 150,000**	**High** **≥ 150,000**
IPHC setline survey index in Area 4ABCDE (WPUE)	**High** **≥ 11,000**	1,745 mt (current limit)	2,007 mt (15% above current)
	Medium **8,000 – 10,999**	1,396 mt (20% below current)	1,745 mt (current limit)
	Low **6,000-7,999**	1,309 mt (25% below current)	1,396 mt (20% below current)
	Very Low **< 6,000**	1,222 mt (30% below current)	1,309 mt (25% below current)

Alternative 4		**EBS shelf trawl survey index (t)**	
		Low **< 150,000**	**High** **≥ 150,000**
IPHC setline survey index in Area 4ABCDE (WPUE)	**High** **≥ 11,000**	1,396 mt (20% below current)	1,745 mt (current limit)
	Medium **8,000 – 10,999**	1,222 mt (30% below current)	1,396 mt (20% below current)
	Low **6,000-7,999**	1,047 mt (40% below current)	1,222 mt (30% below current)
	Very Low **< 6,000**	960 mt (45% below current)	1,047 mt (40% below current)

Alternative 5 (Preferred Alternative)

The Council's recommended Preferred Alternative (Alternative 5, PA) bases the determination of the annual PSC limit on the most recent survey values for the IPHC setline survey and the EBS shelf trawl survey using the following look-up table. The two abundance indices (measures of the survey estimate of halibut either in metric tons (NMFS AFSC survey) or population-density as measures by weight per unit effort (IPHC survey)) will be used to track halibut abundance and to guide setting the PSC limit for the Amendment 80 sector. The selected indices are based on the NMFS AFSC EBS shelf trawl survey and the IPHC setline survey covering IPHC Areas 4ABCDE. Both indices represent the best available scientific information.

Table ES-1-2 Look up tables for use in setting PSC limits based upon PSC limits associated with the intersection of different states of the EBS shelf trawl survey and the IPHC setline survey for Alternative 5(Preferred Alternative)

		EBS shelf trawl survey index (mt)	
		Low <150,000	**High ≥ 150,000**
IPHC setline survey index in Area 4ABCDE (WPUE)	**High ≥ 11,000**	1,745 mt (current limit)	1,745 mt (current limit)
	Medium 8,000-10,999	1,396 mt (20% below current)	1,571 mt (10% below current)
	Low 6,000-7,999	1,309 mt (25% below current)	1,396 mt (20% below current)
	Very Low < 6,000	1,134 mt (35% below current)	1,134 mt (35% below current)

The Preferred Alternative reflects for the Council's effort to balance equitably several factors when establishing PSC limits, including the likely impacts on the halibut stock and affected participants in the Amendment 80 and directed halibut fisheries. The Preferred Alternative would specify halibut PSC limits that range from the current Amendment 80 halibut PSC limit to 35% below the current limit. This is within the range of halibut PSC limits considered for this action, which range from 15% above the current limit to 45% below the current limit. The Council acknowledges that halibut is fully utilized in the BSAI and at low and very low index states, mortality from PSC should decline in response to reduced amounts of halibut available for harvest by all users. Under those conditions, reducing mortality from PSC is likely to prevent halibut PSC from becoming a larger proportion of total removals in the BSAI, consistent with the Council's purpose and need statement.

In recommending the Preferred Alternative, the Council considered an appropriate balance among the Magnuson-Stevens Act requirements and national standards. The Preferred Alternative balances the interests of the two largest halibut user groups in the BSAI, the directed commercial halibut fishery and the Amendment 80 sector, by establishing abundance-based halibut PSC limits for the Amendment 80 sector. This abundance-based approach is more equitable and conceptually similar to the management approach for the directed commercial halibut fisheries off Alaska, which establishes annual catch limits that vary with established measures of halibut abundance.

The Council considered that halibut encounters in the Amendment 80 fishery may not always be positively correlated with these indices. The Amendment 80 sector has expressed concern about this potentially weak positive correlation and the potential impacts that may have on their ability to avoid halibut and reduce halibut mortality. The degree of this correlation, or lack thereof, is unknown. There is, however, an imbalance among users and greater conservation of the halibut resource is warranted and required. The Council and NMFS believe that linking Amendment 80 halibut PSC limits to halibut abundance levels as proposed in this rule will ensure that halibut PSC in Amendment 80 fisheries does not become a greater share of overall halibut removals in the BSAI, particularly in Area 4CDE, and may increase halibut harvest opportunities in directed halibut fisheries. In short, it would promote conservation of the halibut resource, improve its management, and create a more equitable distribution process between the directed and non-directed fisheries. In addition to supporting prosecution of groundfish fisheries, it is a highly valued fish species that supports directed subsistence, recreational, and commercial halibut fisheries coastwide.

In recommending the Preferred Alternative, the Council noted that at current halibut abundance index levels, a 1,309 metric ton PSC limit would apply as specified in the Low/Low states of the setline and EBS shelf trawl survey indices. This is a 25% reduction from the 1,745 metric ton limit currently in place and establishes the PSC limit 37 mt under the sector's average halibut PSC use from 2016 through 2019.

The Council considers the PSC limits proposed in the Preferred Alternative to be appropriate, because the range of survey index states in the table considers the interannual variability in the Amendment 80 sector's encounters of halibut and resulting halibut PSC mortality. This variability makes it clear that it is not sufficient to consider only average halibut PSC use over a series of years when making decisions about establishing PSC limits. From 2016 through 2020, halibut encounters ranged between 1,965 mt and 3,067 mt and PSC mortality ranged from 1,097 mt and 1,461 mt. The Council considered 2016 through 2020 to be the appropriate time period to evaluate halibut PSC use, because it reflects Amendment 80 sector operations under the Halibut Avoidance Plan and deck sorting along with other available tools to avoid halibut and reduce halibut mortality. The exclusion of 2021 acknowledges that Amendment 80 fishing operations, along with other fisheries in Alaska, were affected by COVID-19 mitigation measures and international supply chains and markets were negatively affected by disruptions in harvesting, processing and shipping.

At the Very Low/Low and Very Low/High index states, the Preferred Alternative would reduce the Amendment 80 halibut PSC limit 35% from the current limit. The Council acknowledges that, should the IPHC setline survey fall into the very low state, an additional halibut PSC limit reduction would be important to promote conservation of the halibut stock and for consistency with the abundance-based process to establish directed halibut fishery catch limits.

The Council considered the impacts of alternative ranges of halibut PSC limit reductions on 1) the halibut stock, 2) directed halibut fishery participants and communities that are engaged in directed halibut fisheries in the BSAI and in other Areas, and 3) BSAI groundfish fishery participants and communities that are engaged in the BSAI groundfish fisheries. The Council considered the detailed information provided in the analysis for the proposed action and public comments received on it. In recommending the Preferred Alternative, the Council acknowledged that the Preferred Alternative would impact all Amendment 80 companies differently and significant changes may be needed to be made to fishing plans and operations to adjust to the reduced halibut PSC limits under different survey index states. Reductions in halibut mortality by the Amendment 80 fleet will promote the conservation of the halibut stock in both the short and long terms. Further, anticipated benefits to the directed commercial halibut fishery from the Preferred Alternative PSC limits include longer term benefits from reductions in the U26 portion of the bycatch. Reduced mortality of smaller halibut could also provide benefits for the directed fishery in the Bering Sea and elsewhere as these halibut migrate and recruit to legal size.

Near-term benefits to the directed fishery in the Bering Sea may accrue from savings in O26 halibut. The analysis indicates that under the assumption of a 0.5 ratio for the PSC limit to the directed catch limit, which approximates the 2010-2019 average proportion of O26 halibut in PSC mortality, directed commercial halibut catch limits could increase by approximately 360,000 pounds under a 1,309 PSC limit that would be established under the Preferred Alternative at the low/low state, the current state of the halibut stock indices. While that amount could be available to those direct users, whether such amounts are in fact allocated to them will depend on actions from the IPHC.

In making its recommendation, the Council considered all ten National Standards in in Section 301(a) of the MSA and other requirements of the Act. In particular, Council members discussed the balance required between National Standard 1, and allowing for optimum yield, and National Standard 9, minimizing bycatch to the extent practicable. Steeper reductions were considered under Alternative 4, but the Council chose an alternative with less economic impact. Two other National Standards were particularly relevant to the Council in recommending the Preferred Alternative, National Standard 8 (provide for the sustained participation of fishing communities and to the extent practicable, minimize adverse economic impacts on such communities); and National Standard 4 (allocation of fishing privileges shall be fair and equitable).
Council members rationalized their recommendation of the PA based on all the National Standards and balancing their competing dictates.

Comparison of Alternatives

In recent years, the EBS shelf trawl survey has been in a 'Low' state (**Figure ES- 3**) under all Alternatives. The setline survey is in the 'Low' state currently under all four alternatives based on the 2019 survey estimates (and not including the Option 1 rolling three-year average). A comparison across alternatives grouped by the relative combination of survey states and their resulting PSC limits by alternatives is shown in Table ES-1-3.

Table ES-1-3 Combination of survey states and the PSC limits that result from those across alternatives

EBS		Setline		PSC limits			
State	**Index**	**State**	**Index**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
		very low	<6,000	NA	1222	960	1134
low	<150,000	low	6,000-7,999	1396	1309	1047	1309
low	<150,000	medium	8,000-10,999	1483	1396	1222	1396
low	<150,000			1571	1745	1396	1745
high	>150,000		<6,000	NA	1309	1047	1134
high	>150,000			1483	1396	1222	1396
high	>150,000		8,000-10,999	1571	1745	1396	1571
high	>150,000	high	≥11,000	1745	2007	1745	1745

Amendment 80 background information

The Council recommends annual catch limits, allocations, and PSC limits for the federally managed commercial groundfish fisheries in the BSAI. This document focuses on the Amendment 80 sector from among the several BSAI groundfish fisheries due to the narrowed scope of the proposed action alternatives. A brief overview of the Amendment 80 sector management and operational characteristics is included here.

Amendment 80 to the BSAI Groundfish FMP facilitated the formation of fishery cooperatives for trawl catcher/processors (CPs) that are ineligible under the American Fisheries Act (AFA) to participate in directed pollock fisheries. Amendment 80 originally allocated five BSAI non-pollock trawl groundfish species to permit holders that formed a cooperative within the non-AFA trawl CP sector. The Amendment 80 sector is allocated a portion of the total allowable catch (TAC) for Pacific ocean perch in the AI, Atka mackerel, yellowfin sole, rock sole, and flathead sole in the BSAI, as well as an allowance of PSC quota for halibut and crab.

Beginning in 2011, the Amendment 80 sector has been prosecuted solely by vessels operating in a cooperative. From 2011 to 2017 there were two cooperatives. Since 2017 all active Amendment 80 vessels are part of the Alaska Seafood Cooperative. Though the single-cooperative model creates an environment for highly organized fishing and shared investment in bycatch avoidance research, the cooperative is still made up of five independent for-profit companies. Industry reports indicate that intra-cooperative in-season transfers of quota for constraining species – i.e., halibut PSC or Pacific cod – occur very rarely, if ever.

Figure ES- 4 illustrates the contrast among the five Amendment 80 fishing companies that are operating in 2020 in terms of the species mix upon which they rely. The vertical axis expresses the percentage that a species or species group comprises of a company's total catch or gross wholesale revenue over the entire 2010 through 2019 time period. The figure defines companies by the historical catch of the vessels for which they claim current ownership in the most recent Amendment 80 Cooperative Report provided to NMFS and the Council. Data are obscured to preserve confidentiality; the purpose of the figure is to show that the Amendment 80 sector includes companies with different levels of dependence on flatfish and groundfish, and thus different degrees of exposure to expected PSC rates when bycatch is constraining. Those companies will also have a different set of options in terms of how they might continue their operation in the context of an effective halibut limit.

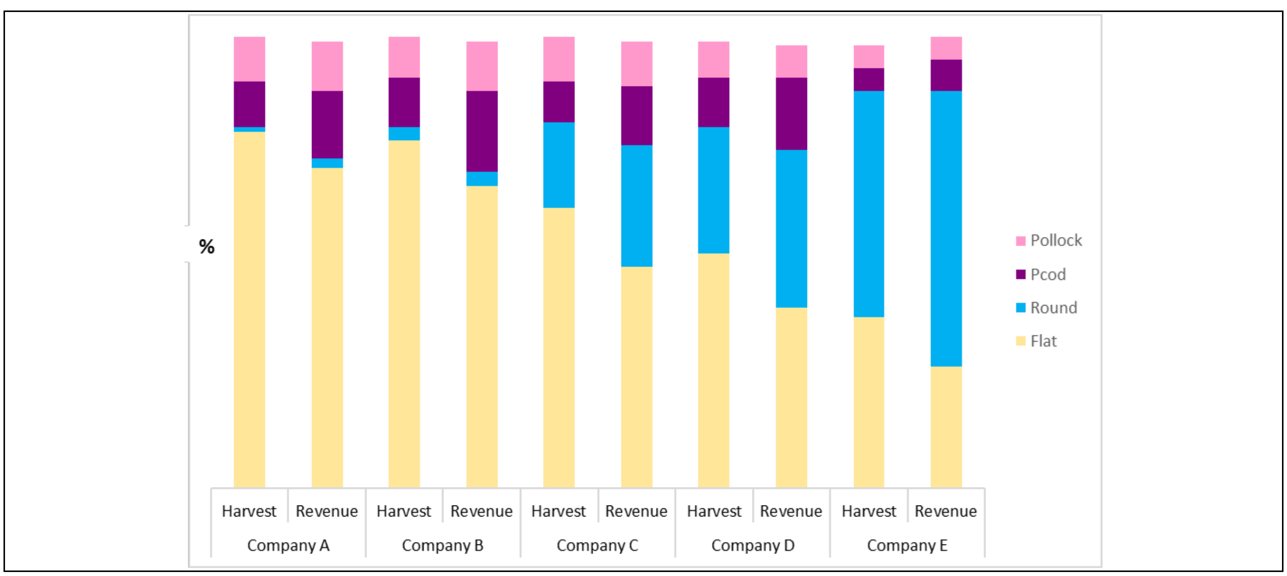


Figure ES-4 Aggregate 2010-2019 percentage of Amendment 80 harvest (mt) and gross wholesale revenue ($) by species group for fishing company fleets as comprised in 2020 (Sources: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA; Vessel company affiliations taken from Alaska Seafood Cooperative Reports). Round(fish) includes Atka mackerel, rockfish, Pacific Ocean perch, and sablefish. Flat(fish) includes

yellowfin sole, rock sole, flathead sole, Kamchatka flounder, Greenland turbot, arrowtooth flounder, and Alaska plaice

Table 3-13 reports the total gross revenues and catch by all Amendment 80 sector vessels during the 2010 through 2020 period; dollar values are standardized to 2018 values to better isolate productive value without the effect of inflation across the broader economy. Revenue data for the 2020 fishing year were not available at the time the analysis was completed. Typically, the highest grossing species for the sector in terms of cumulative gross value are yellowfin sole, Atka mackerel, and rock sole.

Table ES-1-4 Amendment 80 gross first wholesale revenue (2018 dollars) and catch (metric tons), 2010 through 2020. Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Year	Revenue (2018$)	Total Harvest (t)
2010	323,787,060	305,192
2011	385,153,549	302,157
2012	397,530,330	307,406
2013	307,582,132	306,775
2014	316,928,372	308,022
2015	290,450,269	289,169
2016	306,495,840	298,443
2017	359,357,539	278,771
2018	379,443,654	290,173
2019	335,260,125	288,302
2020		290,382

Halibut PSC is more prevalent in flatfish targets relative to other target species (**Figure ES- 6**), and fishing patterns among flatfish harvesters vary throughout the year. For example, northern rock sole tend to be targeted earlier in the year for valuable roe content.

The sector-wide reduction in halibut PSC beginning in 2016 which is generally attributed to the investment of time and resources in halibut avoidance and mortality rate mitigation (e.g. deck sorting) can be seen in **Figure ES- 6** and **Figure ES- 5**. Lower gross levels of halibut PSC in the later months of the year might also be attributable to the sector's Halibut Avoidance Plan that requires vessels to maintain a certain rate-performance standard regardless of where the sector stands in relation to the annual limit of 1,745 mt.

Examining trends in Amendment 80 halibut PSC catch and mortality is complicated by the fact that many variables that affect these metrics have changed in recent years.[2] PSC limits, discard mortality rate (DMR) estimation methods, and halibut handling procedures have all changed to varying degrees since 2010. PSC limits have decreased multiple times since 2010, most significantly in 2015 with the implementation of Amendment 111. **Figure ES- 5** illustrates that Amendment 80 sector annual halibut mortality has declined since 2014 and, more notably, has declined relative to total halibut catch since 2015. Halibut catch – sometimes referred to as encounter – is the weight of halibut caught before the DMR is applied. The ratio of estimated halibut PSC mortality to halibut catch is defined here as "effective

[2] In 2015, the first year of implementation of the deck sorting exempted fishing permit (EFP), deck sorted PSC was reported only on the final exempted fishing permit report and is not available in the usual specificity of observer data. As a result, PSC data in 2015 is available only as a total metric. Any tables and figures of the overall total annual PSC of Amendment 80 from 2015 are correct, however for tables and figures that include PSC in more discrete categories (i.e. target species, monthly totals), 234 mt of total PSC is not included. This does not apply to any year other than 2015.

mortality rate." Effective mortality in the Amendment 80 sector declined from 2015 to 2019, breaking from a consistent relationship between catch and mortality. The effective mortality rate increased slightly in 2020, but that is largely an artifact of the greatly reduced encounter rate.

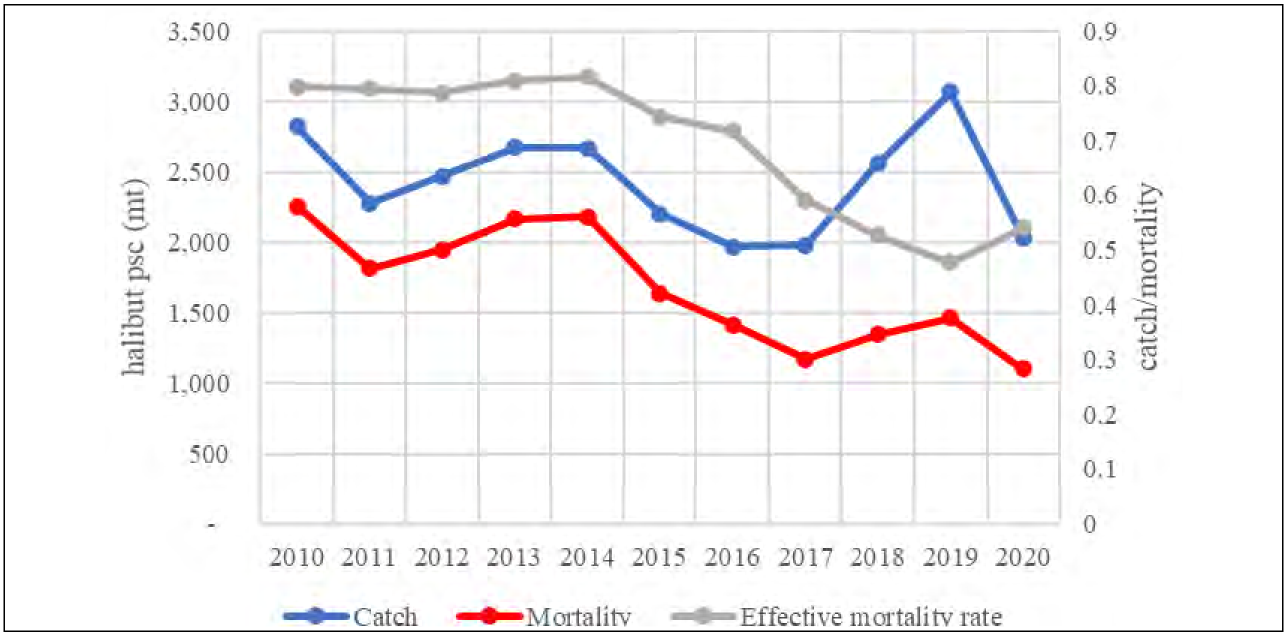


Figure ES-5 Amendment 80 sector effective mortality rate: function of halibut catch and mortality (2010 – 2020)

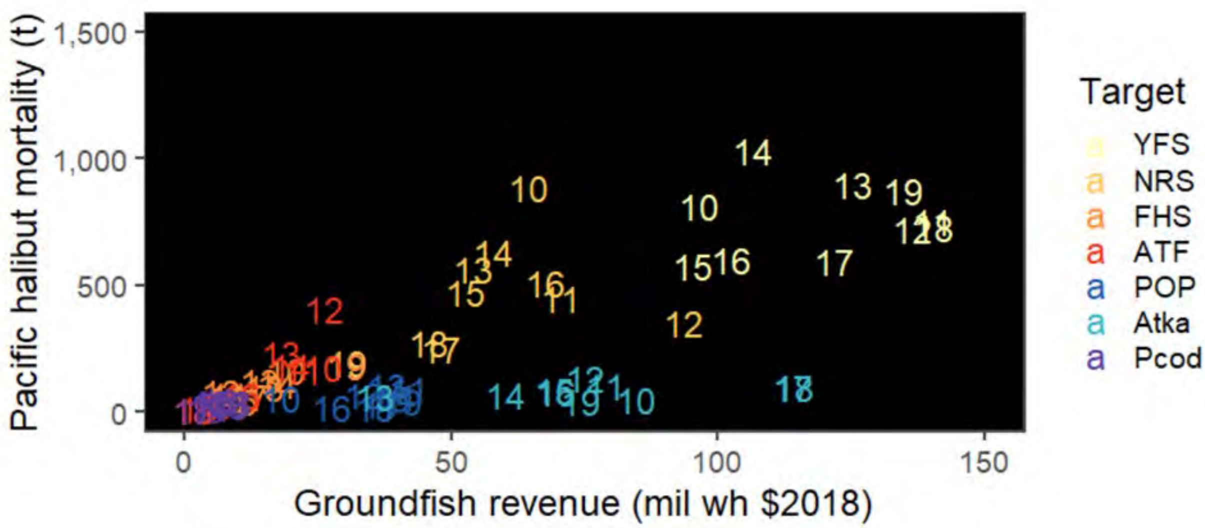


Figure ES-6 Amendment 80 Pacific halibut PSC mortality (mt) versus groundfish revenue (2018$ millions in wholesale) by target and year, 2010 through 2019.

Pacific halibut assessment, management and directed fishery background

The IPHC conducts an annual stock assessment for the coastwide halibut stock. Currently, the stock assessment for halibut uses four integrated age-structured models in an ensemble to account for parameter and structural uncertainty (Stewart & Martell 2015) resulting in a single value for the entire coast (U.S. and Canada). Migration between areas is not modeled.

The estimated spawning stock biomass has been stable since 2010 following a considerable decline since the late 1990s (**Figure ES- 7**). In recent years, the spawning biomass has been predicted to slightly decrease, even at low fishing levels, due to recent below average recruitment. Weight-at-age is also a contributing factor to this decline because the average weight-at-age of Pacific halibut has been declining over this same period.

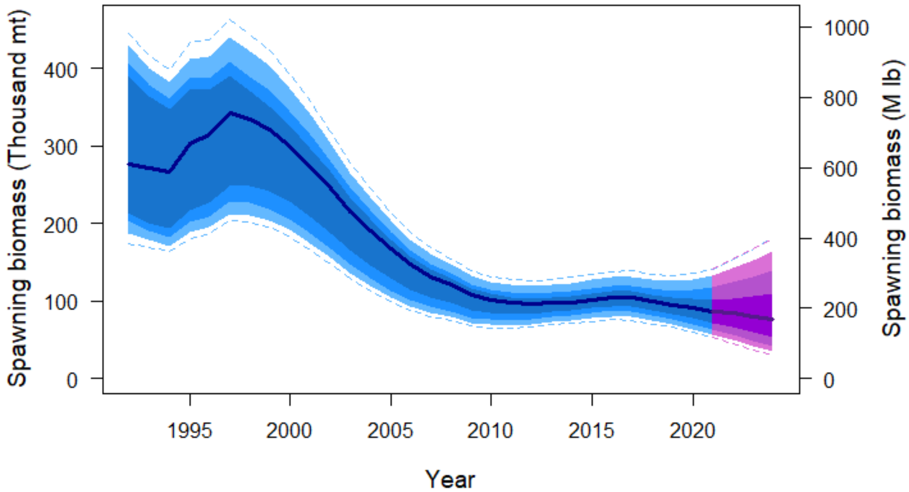


Figure ES-7 Estimated spawning biomass from the 2020 stock assessment ensemble (from Stewart & Hicks 2021) with a three-year projection (purple) based on a fishing intensity of FSPR=43% (TCEY=39.0 million pounds, ~17,690 mt).

The advice from the stock assessment ensemble is presented to the Commission as a risk-based decision table with different catch levels as columns and various performance metrics as rows. In 2017, the previous IPHC harvest policy paradigm was replaced with an interim Spawning Potential Ratio (SPR) based[3] harvest strategy policy while a management strategy evaluation (MSE) process is underway. This new paradigm sets a coastwide mortality limit and then distributes the mortality limits across IPHC Regulatory Areas (Hicks & Stewart 2017).

This new harvest strategy policy considers mortality from all sources and sizes when setting a coastwide mortality limit but still uses estimates of stock distribution from the IPHC fishery independent setline survey and relative harvest rates to distribute the mortality limits across IPHC Regulatory Areas.

[3] An SPR-based harvest policy defines a default or reference level of fishing intensity (**$F_{xx\%}$**, the level of fishing that would reduce the lifetime spawning output per recruit to xx% of the unfished level given current biology, fishery characteristics and demographics where lower values indicate higher fishing intensity) to determine mortality limits.

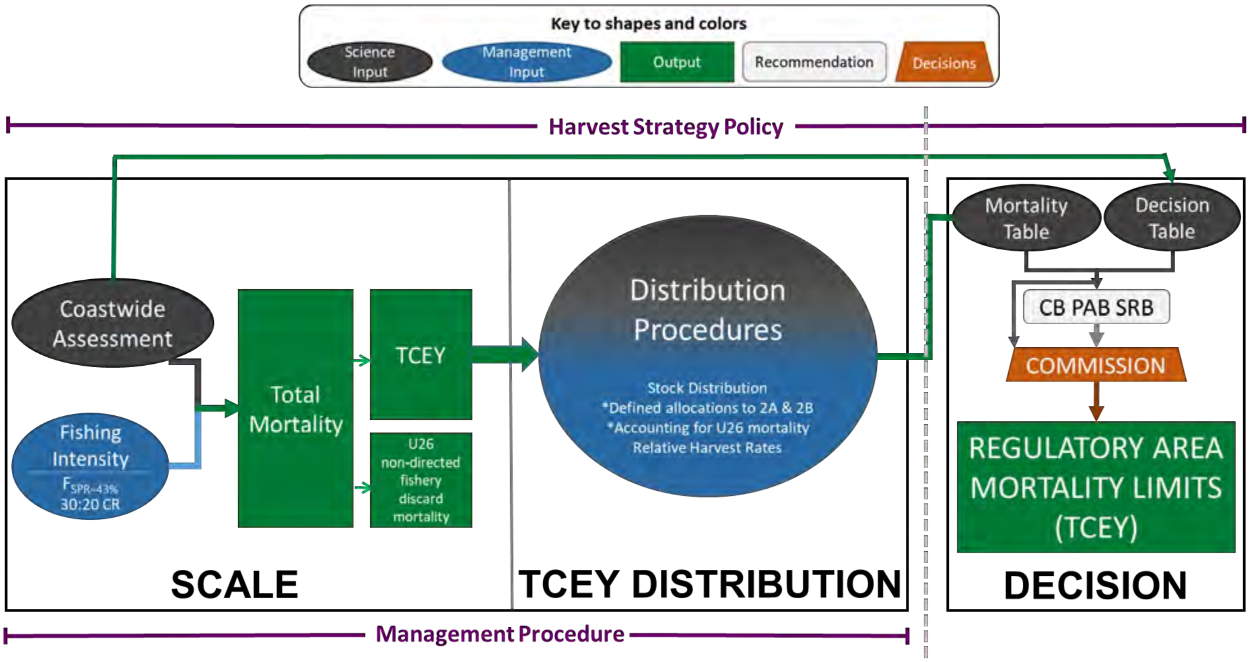


Figure ES-8 Illustration of the Commission interim IPHC harvest strategy policy (reflecting paragraph ID002 in IPHC CIRCULAR 2020-007) showing the coastwide scale and TCEY distribution components that comprise the management procedure. Items with an asterisk are three-year interim agreements to 2022. The decision component is the Commission decision-making procedure, which considers inputs from many sources.

The Total Mortality is split into two components: U26 non-directed commercial fishing (i.e., U26 bycatch) mortality and all other mortality which is called the Total Constant Exploitation Yield (TCEY) and consists of mostly O26 halibut. The IPHC delineates U26 and O26 differently because U26 Pacific halibut are highly mobile and much less likely to occur in the same IPHC Regulatory Area in the upcoming year in which mortality limits would apply, the setline survey captures almost exclusively O26 Pacific halibut, there is currently no reliable tool for describing the annual distribution of U26 across the entire convention area, and the mortality of U26 Pacific halibut has a different effect on the Spawning Potential Ratio than has the mortality of O26 fish (they are not entirely exchangeable).

U26 non-directed discards (including U26 Amendment 80 PSC) are accounted for in the stock assessment with respect to total mortality in the halibut stock but are not part of the TCEY, although it is accounted for in the calculation of the coastwide TCEY by subtracting it from the coastwide total mortality limit. O26 non-directed discards are subtracted from the TCEY within each IPHC area when calculating the Fishery Constant Exploitation Yield (FCEY). The default projection for non-directed discards is to use the three-year average of recent non-directed discard mortality to avoid some of the interannual variability of annual discard estimates.

The TCEY is distributed among IPHC Regulatory Areas based on estimates of biomass from the setline survey and relative harvest rates. Unlike the MSA, the Northern Pacific Halibut Act of 1982 (Halibut Act) (16 U.S.C. 773-773k) does not include specific provisions that require Commissioners to allocate quotas within, for example, an overfishing threshold; their broad mandate is the conservation of the halibut stock. Decisions for Area-specific TCEY’s are made considering all the input received; they may differ from the harvest policy output.

Due to a combination of changing harvest policies and Commission decisions that depart from harvest policy recommendations, the IPHC has adopted coastwide catch limits of varying fishing intensities in recent years. The Commission has adopted TCEYs above those recommended by the harvest policy in three of the last five years (Table ES-1-5). Estimates of fishing intensity are highly uncertain and change in subsequent years based on actual mortality and new runs of the stock assessment. The specific formula used by the IPHC Commissioners to distribute catch limits among Regulatory Areas has been different for each of the past three years.

Table ES-1-5 Comparison of reference TCEY and SPR based on the Interim harvest policy and those adopted by the IPHC commissioners

	Interim Harvest Policy (reference)		Adopted	
Year	TCEY	SPR	TCEY	SPR*
2021	39.00	43	39.00	43
2020	31.90	46	36.60	42
2019	40.00	46	38.61	47
2018	31.00	46	37.21	41
2017	39.10	46	40.74	45

*As estimated at the time of adoption (in the decision table presented at the IPHC annual meeting)

The FCEY is the Regulatory Area specific amount of yield for most directed Pacific halibut fisheries dependent upon allocation agreements for each IPHC Regulatory Area. The FCEY forms the basis of the directed fishery catch limits, although may not include all components of the directed fishery mortality for some Regulatory Areas. The FCEY includes commercial fishery landing limits in all areas, and other sectors in any area subject to Catch Sharing Plans (CSPs) for allocation of the halibut harvest. The CSPs are developed by the responsible fishery management organizations in each IPHC Regulatory Area. Non-FCEY removals include catches which either have no explicit limits on the amount of harvest (unguided sport harvest in Alaska, subsistence/personal use harvest in Canada and Alaska, and wastage from the commercial halibut fishery, except where this is explicitly included in catch-sharing plans) or catches which the IPHC has no authority to manage (bycatch mortality, such as halibut PSC in Alaska). The FCEY is determined by subtracting all other removals of O26 halibut from the TCEY.

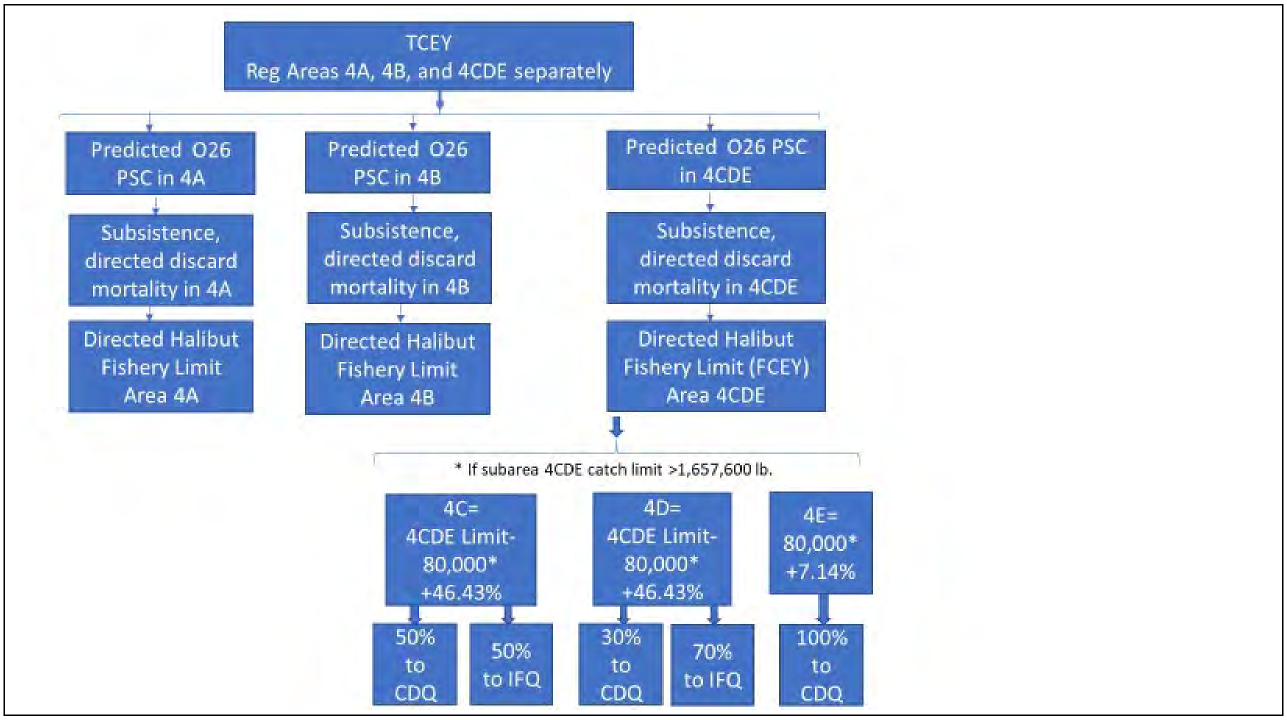


Figure ES-9 Distribution of TCEY to directed fishery users in IPHC Area 4 when the 4CDE catch limit is greater than 1,657,600 lbs.

Figure Notes: CSP: Area 4 Catch Sharing Plan; TCEY: Total Constant Exploitation Yield = Total mortality minus U26 bycatch mortality; FCEY in Area 4CDE = commercial catch limit (TCEY minus subsistence and O26 non-directed commercial discard mortality ("bycatch) and directed commercial discard mortality)

While Area 4 generally covers the BSAI groundfish FMP area, a portion of Area 4A overlaps the GOA FMP area. **Figure ES- 9** illustrates the distribution of TCEY to the Area 4 subareas and the Area 4 CSP that is described in the following subsection. Areas 4C, 4D, and 4E are considered as a unit by IPHC when harvest policy analyses are conducted. Note that the figure is incorporating a provision that is in place when the catch limit for that combined area is above a certain threshold. If that threshold is not met, the FCEY for those combined areas is distributed by the percentages shown with no adjustment applied.

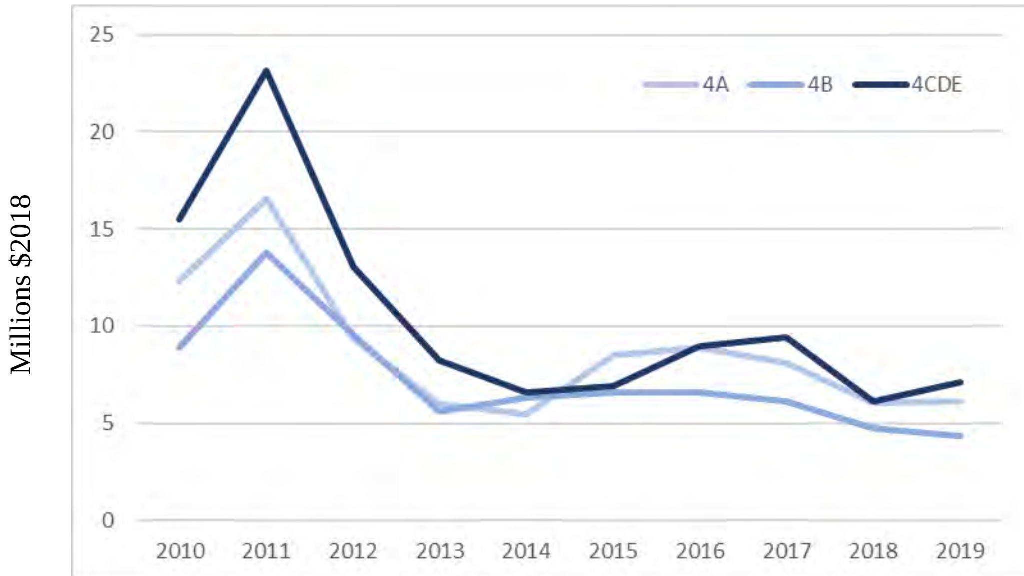
Catch and processing data for all halibut IFQ and CDQ harvest that occurred in Area 4 ABCDE are shown in Table ES-1-6. IPHC management of TCEY within area 4 is described are depicted in **Figure ES- 9**. To compare Area 4 to Alaska statewide commercial halibut catch, Table ES-1-6 shows IFQ landings in metric tons (round weight, or "CFEC whole pounds") for each area from 2010 through 2020. Values are shown in round weight tons to better put commercial harvest in the context of PSC limits for the groundfish fisheries. During that period, Area 4 accounted for 21 percent of statewide catch on average, ranging from 18 percent in 2010 to 24 percent in 2011. Area 4 accounted for 23 percent of catch in both 2019 and 2020.

Table ES-1-6 Alaska commercial IFQ and CDQ halibut catch (mt) by IPHC area, 2010 through 2020

IPHC Area	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2C	2,627	1,416	1,565	1,766	1,991	2,202	2,345	2,412	2,049	2,027	1,936
3	18,432	13,277	10,310	9,152	6,385	6,435	6,216	6,406	5,789	6,056	5,483
4	4,534	4,710	3,409	2,567	1,982	2,205	2,398	2,379	2,214	2,409	2,207
Total (t)	25,593	19,403	15,284	13,485	10,358	10,842	10,959	11,197	10,052	10,492	9,625
Total (M lbs.)	56.4	42.8	33.7	29.7	22.8	23.9	24.2	24.7	22.2	23.1	21.2

Source: CFEC Fish Ticket data provided by AKFIN Note: Conversion to mil of lbs. (M lbs.) provided for comparison to Section 4.5 Table 4-6.

As noted, the halibut resource has been fully utilized from 2010-2020. Overall, Area 4 accounted for 18 percent of state-wide ex-vessel value from commercial halibut catch. On an annual basis, Area 4 accounted for 16 percent (2010, 2013, 2014) to 23 percent (2011) of total value. Area 4 accounted for 19 percent of total ex-vessel value in 2019. **Figure ES- 10** shows the gross ex-vessel value (2018$) of commercial halibut catch in Area 4 by subarea.



Source: CFEC Fish Ticket data provided by AKFIN

Figure ES-10 Alaska commercial IFQ and CDQ halibut ex-vessel value (million 2018$) within Area 4, 2010 through 2019

Impacts of Alternatives 1-4 (note that Alternative 5, the PA, is summarized separately)

Impacts to the Amendment 80 sector

Under Alternative 1, there would be no changes to the regulated halibut PSC limits. Since 2010, halibut PSC in the Amendment 80 sector has been 63 percent to 93 percent of the current PSC limits (Table ES-1-7) with 2020 representing the lowest percentage usage over this time frame. At the Council's request, industry sectors have made voluntary efforts to reduce halibut PSC in the BSAI since 2014.

Table ES-1-7. Halibut PSC limit, encounters, and mortality by Amendment 80 sector, 2010 through 2020

A80 Sector	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PSC limit	2,425	2,375	2,325	2,325	2,325	2,325	1,745	1,745	1,745	1,745	1,745
Halibut encounters	2,823	2,277	2,469	2,677	2,667	2,200	1,965	1,976	2,555	3,067	2,031
Halibut mortality	2,254	1,810	1,944	2,166	2,178	1,638	1,412	1,167	1,343	1,461	1,097
% of PSC limit used	93%	76%	84%	93%	91%	94%	81%	67%	77%	84%	63%

Note: Halibut PSC that occurs on an Amendment 80 vessel due to harvest in the CDQ fishery is not included in this table.

Alternative 2 could reduce the amount of halibut PSC in the Amendment 80 sector in years of low halibut abundance. Changes from status quo range from a 10 percent reduction to a 20 percent reduction in halibut PSC limits (Table ES- 1-1). Halibut PSC limits would remain at status quo during years of high halibut abundance under this alternative. Alternative 3 could reduce the amount of halibut PSC in the Amendment 80 sector in years of low halibut abundance or increase the amount of halibut PSC in years of high abundance. Possible outcomes range from status quo to as much as a 30 percent reduction in halibut

PSC limits. Halibut PSC limits could increase by 15 percent during years of high halibut abundance under this alternative. Alternative 4 could reduce the amount of halibut PSC in the Amendment 80 sector in years of low halibut abundance. Possible outcomes range from status quo to as much as a 45 percent reduction in halibut PSC limits. A discussion of the impacts from Alternative 5 is found below.

For the action alternatives, a range of estimated catch and revenue outcomes for Amendment 80 were estimated relative to the range of the PSC limits associated with the alternatives. Alternative 2 has the narrowest range of PSC limits (1,396-1,745 mt) and thus the narrowest range of revenue estimates. Alternative 3 includes a wider range of PSC limits (1,222-2,007 mt) than Alternative 2 and is the only alternative that includes a limit that could be higher (up to 2,007 mt) than status quo (1,745 mt) . The range of PSC limits under Alternative 4 (960-1,745 mt) includes the lowest possible values and peaks at the status quo limit.

Data are drawn for separate simulation runs from five different time periods that select sets of years spanning the 2010 through 2019 period. Earlier years represent an era with higher Amendment 80 PSC while more recent years represent lower PSC use, better reflecting the present state of the fishery. Simulations were done either by drawing random hauls from the distribution or by stratifying haul-selection by month and maintaining historic monthly effort levels such that effort is constrained from the end of a fishing year backward rather than proportionally across the whole year.

Table ES-1-8 shows the results of these revenue estimates using different estimation methods. For each PSC limit and imposed groundfish catch limit – analogous to total Amendment 80 TAC – results shown by rows differ depending on the historical fishery data (haul-level catch, revenue, and PSC) that were used to simulate the fishery (Table ES-1-8). At higher PSC limits the sector is more likely to be constrained by their TAC than PSC, while PSC is more likely to be constraining at lower levels of PSC limits. This is particularly true for the datasets representing higher PSC use (2013-2014 and 2010-2014).

The choice of which dataset to use in the revenue analysis has the largest impact of any other variations between the scenarios. Changing the sampling method between random or stratified or changing the groundfish limit between 290,000 mt and 310,000 mt have smaller impacts on total revenue estimates. This is unsurprising since there is large variation in the rate of PSC use and revenue generated between years, and because the range of datasets were selected to demonstrate these differences. Datasets including more recent years generate higher revenues at all PSC limits. The differences in estimated revenues from higher PSC use and lower PSC use datasets are larger at lower PSC limits and become less substantial at higher PSC limits.

Table ES-1-8 Average estimated revenue (million wholesale $2018) by PSC limit and Alternative using different estimation methods. Green shading indicates the results were constrained by the PSC limit, blue shading indicates the results were constrained by the groundfish limit (290,000 or 3310,000 mt).

Estimation	PSC limit	960		1047		1222		1309		1396		1483		1571		1745		2007	
	Alternative(s)	4		4		3		3		2,3,4		2		2		1,2,3,4		3	
	GF limit (1,000 mt)	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	160.582	160.815	174.982	175.215	204.050	204.313	219.181	218.550	233.493	233.235	248.384	247.668	262.813	262.705	291.338	291.603	327.968	335.497
Random	2010-19	189.686	190.121	207.396	206.935	241.993	241.715	259.314	258.923	276.215	276.468	293.723	293.380	310.690	310.046	335.887	345.264	335.937	359.123
Random	2016-19	246.206	246.385	268.807	268.887	313.489	313.519	335.524	335.829	346.417	358.232	346.366	370.300	346.425	370.269	346.417	370.311	346.454	370.271
Random	2013-14	137.994	138.184	150.453	150.591	175.812	175.384	187.950	187.992	200.795	200.295	213.141	213.202	225.934	225.979	251.137	251.123	288.273	288.545
Random	2017-18	282.581	282.479	307.928	308.073	359.795	359.146	376.517	385.223	376.582	402.458	376.509	402.584	376.623	402.591	376.558	402.546	376.604	402.554
Stratified	2010-14	182.258	182.272	195.088	195.065	216.307	216.059	227.666	227.668	246.072	246.276	268.338	267.997	283.966	283.479	313.799	313.520	327.054	349.666
Stratified	2010-19	202.931	202.828	216.382	216.445	242.752	242.719	255.780	256.090	277.083	277.964	305.385	305.515	326.047	326.307	336.782	360.053	336.793	360.511
Stratified	2016-19	218.741	218.978	253.143	253.251	319.090	318.907	341.704	341.720	349.070	366.178	349.027	372.528	349.165	372.536	349.034	372.499	349.147	372.479

The likelihood of falling into one of the cells in Table ES-1-8 is based on multiple factors. The first, most direct, factor is determined by the survey indices and the applicable PSC limit as determined by the alternatives (look up tables). The second factor determining which cell represents the most likely outcome is which dataset was used to create the estimate. The lowest bound is represented by the 2013-14 dataset and the highest by the 2017-18 dataset. Given reductions in PSC limits and operational changes such as increased deck sorting, it is most likely that future PSC use will be similar to what has been seen in the years since 2015 – i.e., estimates using 2016-19 or 2017-18 data.

Currently, both the setline and the trawl surveys are in the low categories, which correspond to PSC limits that represent immediate reductions from the status quo PSC limit of 1,745 mt. Revenue estimates under the resulting PSC limits in the current low, low survey category using the 2016-19 dataset range from no change to a reduction of 3 percent under Alternative 2, reductions of 3 percent to 9 percent under Alternative 3, and reductions of 22 percent to 32 percent under Alternative 4.

The analysts also note that PSC use is a function of many factors, some of which are outside of the fleet's direct control. For example, changing environmental conditions could disperse groundfish or cause them to move out of well-known, fishable areas. This could cause the fleet to tow more hours for the same amount of catch, increasing gross costs as well as the possibility of high-bycatch events. A changing environment might also change the extent to which groundfish and halibut are comingled, also changing the probability of bycatch. The extent of these changes is presently unknown, meaning that at this time they can be thought of as risk factors that may affect the fleet's ability to maintain harvest levels under a lower PSC limit in a practicable manner.

The practicability of the Amendment 80 fleet to operate under reduced PSC limits relies on a number of different factors and behavioral modifications by the fleet in recent years. A fleet's last response to constraining halibut PSC limits is to reduce total groundfish harvest. This fishing strategy includes an assumption that fishermen will optimize their harvest in response to constraining limits. For example, prioritizing fishing operations to the best target fishery, area, and time to maximize net revenue, and reducing effort in the target fishery, area, and time that produce less net revenue. Multiple on-going actions by the fleet to address bycatch avoidance are described in this analysis, including cooperative fishing strategies, evaluating behaviors against standard fleet-wide bycatch rates, communication among captains, test tows, excluder use and deck sorting to reduce mortality when encounters cannot be avoided. Improvements are anticipated to continue to be realized, especially if halibut limits are further reduced and the fleet forgoes some profitability to reduce halibut mortality further. Reductions in halibut mortality are expected to result from the sector increasing costs, reducing efficiency, or improving the use of existing tools. The amount of mortality reductions cannot be quantified with any certainty. If substantial reductions in halibut mortality are realized, they are likely to be derived from the development and implementation of new technologies.

Impacts to Pacific halibut stock and directed fishery

Halibut spawning stock biomass

This analysis uses the best available information to determine the effects of the alternatives on the halibut stock. Given that the halibut resource is fully utilized, the effects of the alternatives on the halibut stock are dependent, in large part, on policy and management decisions made by the IPHC rather than by the Council and NMFS. Under its current harvest policy, the IPHC deducts halibut PSC in the groundfish fisheries, recreational, subsistence, and personal use halibut catches; and wastage in the commercial halibut fishery from the exploitable biomass before establishing commercial halibut catch limits each year. This analysis assumes the IPHC will continue to deduct all halibut removals when establishing commercial fishery catch limits to ensure the short- and long-term sustainability of the halibut stock, consistent with its mandate under the Convention between the United States and Canada for the Preservation of the Halibut Fishery of the Northern 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).

Impacts to the halibut biomass under all of the alternatives are expected to be similar and result in no impact to spawning stock biomass (SSB). The IPHC's SPR-based management approach is expected to conserve spawning biomass across differing patterns in fishery selectivity and/or allocation among different fisheries. Similarly, reductions in halibut PSC mortality conserve the resource. At the population level, however, there is likely to be little difference among the average future halibut spawning biomass under levels of PSC anticipated across all of the alternatives, including the no action alternative.

Directed Halibut fishery
PSC reductions could indirectly lead to increases in directed halibut catch through two means. First, reductions in the U26 portion of the PSC could lead to longer term benefits to the commercial halibut fisheries throughout the distribution of the halibut stock. Benefits from reduced mortality of these smaller halibut could occur both in the Bering Sea and elsewhere as these halibut migrate and recruit into the commercial halibut fisheries. Second, the current IPHC interim harvest policy subtracts the projected O26 portion of non-directed discard mortality (bycatch) from the TCEY by IPHC Regulatory Area when calculating fishing limits.

The magnitude of the relationship between PSC limits and directed catch limits depends on many variables. According to the IPHC interim management procedure, the non-directed discard mortality projection used when calculating catch limits is the three-year average non-directed discard mortality from the most recent year (specified during IPHC 2020 Annual Meeting https://iphc.int/uploads/pdf/am/2020am/iphc-2020-am096-r.pdf). Therefore, a change in the PSC use in a specific year will only begin to affect the trade-off with the directed halibut limit in the next year. Furthermore, the relationship between the PSC limit and PSC use varies; therefore, a reduction in the PSC limit may not always generate an increase in directed catch limits in the short-term and even when it does, the magnitude may vary based on the actual Amendment 80 O26 PSC mortality.
Assuming no change to IPHC harvest policy or implementation that conserves SSB levels, and a constant relationship between PSC use and limit, the relationship between PSC and directed catch limit will still vary with the relative proportions at age observed in the bycatch (which could be influenced by factors such as selectivity and recruitment allocation varying over time).

Given that Amendment 80 PSC accounts for ~60-82 percent of the overall groundfish trawl fleet's halibut discards, a larger percentage of Amendment 80 PSC that is O26, results in a lower directed halibut fishery catch limit. The three-year average of Amendment 80 PSC that are O26 has varied from 34 to 61 percent over the past 10 years. Because the relationship between PSC limits and directed halibut catch limits is uncertain and varies year to year, a range of potential changes in directed halibut catch resulting from the PSC limit changes that could occur under the alternatives is provided in Table ES-1-9. These changes are calculated using ratios of 0.25, 0.5, 0.75 and 1 to represent the relationship between PSC limits and directed catch limits. For example, using a ratio of 1, the entirety of the PSC limit change is transferred into the directed catch limit. This would mean 100 percent of the PSC limit is taken as O26 PSC for the previous three years given that the projected PSC removal is the three-year average of recent O26 PSC usage rather than the PSC limit. A ratio of 1 is the maximum because that implies all PSC usage is composed of O26 halibut and has a direct trade-off with the directed halibut limit. Ratios less than one indicate that PSC usage occurs wholly or partially on Pacific halibut less than 26 inches. Such fish would be subject to natural mortality and movement out of the region. Both of these processes, while uncertain, lower the impact of PSC usage on potential gains to the directed Pacific halibut fishery. Given recruitment variability, variable fishing patterns resulting in annual changes to selectivity, and variable population processes such as growth and movement, the ratio may occur anywhere in this range in a given year.

Table ES-1-9. Change from status quo (SQ) BSAI directed catch limits (million net pounds) resulting from proposed PSC limits (mt) given an assumed ratio between the PSC limit and the directed halibut limit. The bottom four rows display change from status quo directed BSAI catch limits resulting from the PSC listed at top, calculated using the quartiles of potential ratios.

		Alternative(s)	**4**	**4**	**3, 4**	**3**	**2, 3, 4**	**2**	**2**	**2, 3, 4**	**3**
		PSC Limit (mt)	**960**	**1047**	**1222**	**1309**	**1396**	**1483**	**1571**	**1745**	**2007**
difference from SQ PSC Limit		(mt)	-785	-698	-523	-436	-349	-262	-174	0	262
		(mil net pounds)	-1.298	-1.154	-0.865	-0.721	-0.577	-0.433	-0.288	0	0.433
ratio (PSC limit: directed catch limit)	1.00	change in directed catch limit (mil net pounds)	1.298	1.154	0.865	0.721	0.577	0.433	0.288	0	-0.433
	0.75		0.973	0.866	0.649	0.541	0.433	0.325	0.216	0	-0.325
	0.50		0.649	0.577	0.432	0.360	0.289	0.217	0.144	0	-0.217
	0.25		0.324	0.289	0.216	0.180	0.144	0.108	0.072	0	-0.108

A range of revenues associated with the potential changes in the net pounds of directed halibut catch limits (as calculated by the ratios in Table ES-1-9) are reported in chapter 5 (Table 5-3). The ex-vessel values are reported in 2018-dollar adjusted ex-vessel values for Area 4 as reported in Section 4. The ex-vessel value represents the amount paid to fishermen by a primary processor for raw fish. Ex-vessel prices are the most appropriate value to represent halibut fishery revenues given that this is the most common halibut supply chain in Alaska, particularly in the BSAI or Area 4 (see Section 4). In response to public comments, halibut revenues are also reported in wholesale values using estimates of first wholesale production values for head and gut fish as reported in the Economic SAFE Report. These calculations may overestimate potential changes in revenue as they assume 100 percent usage of the additional catch limit. The Area 4 TAC utilization rate was roughly 91 percent from 2011 through 2020 and was roughly 85 percent in 2020. The analysis also highlights the reasons why recently observed per-unit values for gross ex-vessel halibut revenues might not be a reliable predictor of future value in the near term due to significant market disruptions. These revenues are estimated using an entirely different approach and methodology than those used to analyze impacts in the groundfish sector and should not be used for cross-sector revenue comparisons.

Given that IPHC catch setting policy removes O26 bycatch by IPHC regulatory area, the spatial distribution of PSC may impact the distribution of directed fishery catch limits within Area 4. Total Amendment 80 PSC has decreased since 2015. However, the distribution within Area 4 has stayed fairly consistent with Area 4CDE accounting for between 83 percent and 90 percent of annual Amendment 80 PSC since 2015 (**Figure ES- 11**). If the spatial distribution of PSC within Area 4 remains consistent in the future, the directed halibut fishery in Area 4CDE would have the greatest potential for experiencing whatever incidental reallocative effects may occur under the proposed action alternatives.

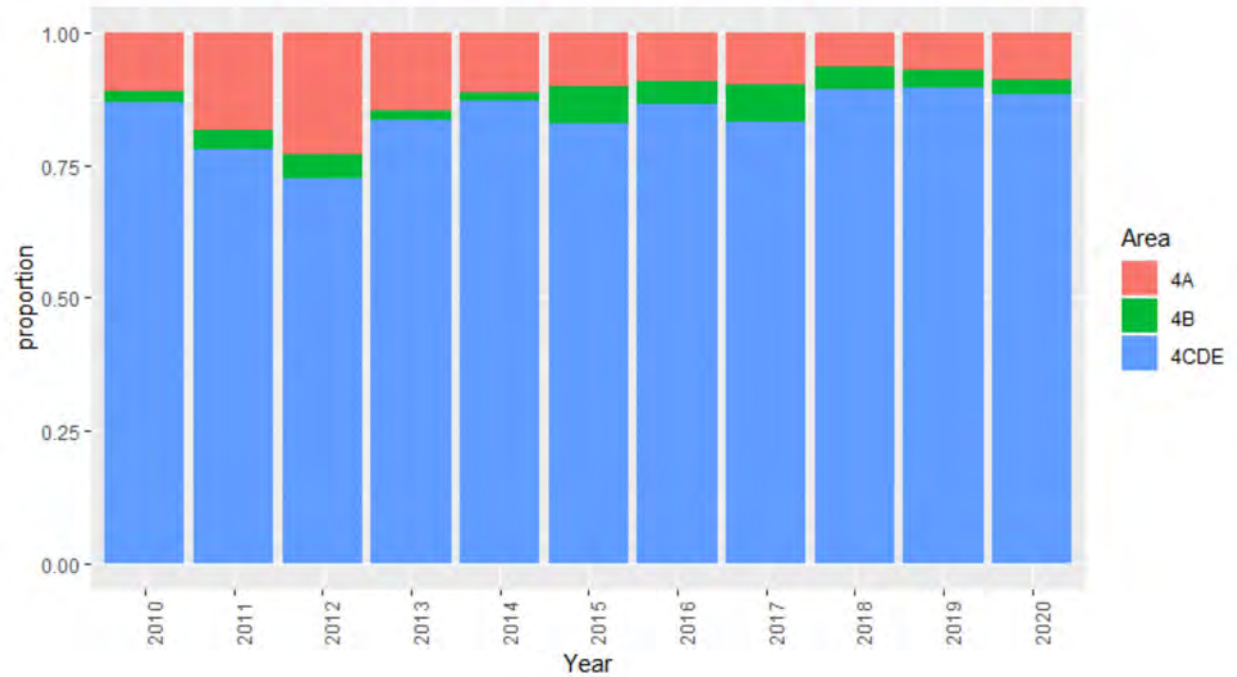


Figure ES- 11 Proportion of Amendment 80 halibut PSC by IPHC Regulatory Area from 2010 to 2020.

Impacts of Alternative 5 (PA)

The Council's preferred alternative (Alternative 5) uses a 4x2 look-up table to specify PSC limits annually. These limits range from the status quo limit of 1,745 mt to 35% below that (at 1,134). As shown in Table ES-1-10, the PSC limits specified under Alternative 5 fall within the range of limits analyzed under Alternatives 2 through 4 of this analysis. This section provides a guide for understanding how the impacts of Alternative 5 are best derived from the analysis of impacts previously described for Alternatives 1 through 4 above.

Table ES-1-10. Range of PSC limits specified under Alternatives 2 through 5 in this analysis. Note that yellow highlights provide comparison where limits are Alternative 5 are already analyzed in Alternatives 2 through 4. The lowest limit specified in Alterative 5 (1,134 mt) is best represented by interpolating between the 'High/very low and low low' and 'high low and low medium' limits within Alternative 4 of 1,047 mt and 1,222 mt respectively (values in grey highlights).

Trawl Survey	Low	High	Low	High	Low	High	Low	High
Setline survey	Very Low	Very Low	Low	Low	Medium	Medium	High	High
Alt 2	1396	1483	1396	1483	1483	1571	1571	1745
Alt 3	1222	1309	1309	1396	1396	1745	1745	2007
Alt 4	960	1047	1047	1222	1222	1396	1396	1745
Alt 5	1134	1134	1309	1396	1396	1571	1745	1745

Impacts on the halibut stock

As noted previously for Alternatives 1 through 4, impacts to the halibut biomass under all of the alternatives are expected to be similar and result in no impact to SSB. The IPHC's SPR-based management approach is expected to conserve spawning biomass across differing patterns in fishery selectivity and/or allocation among different fisheries. As such, there is likely to be little difference among the average future halibut spawning biomass under levels of PSC anticipated across all of the alternatives including the preferred alternative (Alternative 5).

Approach to understanding revenue impacts of preferred alternative

The preferred alternative (Alternative 5) includes five different PSC limits, four of which (1,309 mt, 1,396 mt, 1,571 mt and 1,745 mt) were previously analyzed under existing alternatives in the DEIS (Table ES-1-10). The PSC limit of 1,134 mt, associated with a very low setline survey state and a low or high trawl survey state is the only PSC limit included in the preferred alternative (Alternative 5) that was not specifically analyzed in the DEIS. This limit falls halfway between two previously analyzed PSC limits of 1,047 mt and 1,222 mt. Therefore, to understand the likely impacts of a PSC limit of 1,134 mt, one can interpolate between the impacts as estimated for PSC limits of 1,047 mt and 1,222 mt.

The following subsections use this approach to display potential impacts of the preferred alternative based on the PSC limits previously analyzed in the DEIS. Although the estimated impacts associated with PSC limits from only the preferred Alternative are displayed in this section it is important to remember that the revenues for the Amendment 80 (A80) fishery and the directed halibut fishery sectors are estimated separately, using different methodologies. They are meant to help compare impacts across alternatives *within* each sector and should *not* be used to compare impacts between the two sectors. The revenue estimates reported in this section do not represent the full scope of the economic impacts associated with the proposed action alternatives. All caveats and assumptions associated with these estimates and the interpretation of results as discussed in FEIS section 5.3 and section 5.4 apply to this section as well.

Impacts to Amendment 80 groundfish

Table ES-1-11 shows the average estimated status quo revenues (millions wholesale $2018) and percent difference from status quo by Alternative and PSC limit based on survey states. Percent differences are calculated across the rows (comparing estimates using same methods and datasets). This is modified from Table 5-6 in the document to include the PSC limits and survey states of the preferred alternative. Estimates associated with PSC limits of 1,047mt and 1,222mt are shaded grey as the impact of the actual PSC limit of 1,134mt will likely fall somewhere within this range. The same approach can be used to gauge the impacts of the preferred alternative with any of the figures or tables in section 5.3. All of the caveats and assumptions associated with these estimates and the interpretation of results as discussed in FEIS section 5.3 apply.

Presidential Executive Order (EO) 12866 (58 FR 51735, September 30, 1993) requires that the Office of Management and Budget review proposed regulatory programs that are considered to be “significant.” The EO lists multiple definitions of a “significant regulatory action,” including “any regulatory action that is likely to result in a rule that may: 1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities.”

Many of the scenarios in Table ES-1-11 represent a difference in average estimated revenue of $100 million or more. However, theses revenue estimates do not represent stand-alone predictions of future A80 revenues under each PSC limit. Rather, these estimates are provided to inform the potential difference in direction and magnitude of impacts when comparing among alternatives. The revenue estimates do not capture behavioral adjustments such as changes in targeting, fishing location, or other halibut avoidance strategies that might be employed, or estimate the costs associated with such avoidance strategies. Additionally, the revenue estimates reported in this section do not represent the full scope of the economic impacts associated with the proposed action alternatives. Given these caveats and the uncertainty surrounding these estimates it is possible that the preferred alternative has the potential to be considered a significant regulatory action as defined in EO 12866.

Impacts on BSAI halibut commercial catch

Table ES-1-12, below is modified from Table ES-1-8 to display a range of revenues associated with the potential changes in the net pounds of directed halibut catch limits associated with the PSC limits of the preferred alternative (Alternative 5). Estimates associated with PSC limits of 1,047mt and 1,222mt are shaded grey as the impact of the actual PSC limit of 1,134mt will likely fall somewhere within this range. The ex-vessel values are reported in 2018-dollar adjusted ex-vessel values for Area 4 as reported in Section 4 of the FEIS. The ex-vessel value represents the amount paid to fishermen by a primary processor for raw fish. Ex-vessel prices are the most appropriate value to represent halibut fishery revenues given that this is the most common halibut supply chain in Alaska, particularly in the BSAI or Area 4 (see Section 4). In response to requests from public comments, halibut revenues are also reported in wholesale values. The wholesale values in this table are estimates of first wholesale production values for head and gut fish as reported in the Economic SAFE report (NMFS, 2021). The ratios represent a broad descriptive range of potential relationships between PSC limits and directed catch limits as described in Section 5.4 of the FEIS. All of the caveats and assumptions associated with these estimates and the interpretation of results as discussed in Section 5.4 apply.

Table ES-1-11. Average estimated status quo revenues (millions wholesale $2018) and percent difference from status quo by Alternative and PSC limit based on survey states. Percent differences are calculated across the rows (comparing estimates using same methods and datasets).

Estimation method																				
					State		Limit		State	Limit	State	Limit	State	Limit	State	Limit	State	Limit	State	Limit
		EBS shelf trawl survey			Low/ High		1134		Low	1309	High	1396	Low	1396	High	1571	Low	1745	High	1745
		Setline survey			Very Low				Low		Low		Medium		Medium		High		High	
	PSC limit estimated		1745		1047		1222		1309		1396		1396		1571		1745		1745	
	GF limit (1,000 mt)	290	310		290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	291.338	291.603	Alternative 5	-40%	-40%	-30%	-30%	-25%	-25%	-20%	-20%	-20%	-20%	-10%	-10%	0%	0%	0%	0%
	2010-19	335.887	345.264		-38%	-40%	-28%	-30%	-23%	-25%	-18%	-20%	-18%	-20%	-8%	-10%	0%	0%	0%	0%
	2016-19	346.417	370.311		-22%	-27%	-10%	-15%	-3%	-9%	0%	-3%	0%	-3%	0%	0%	0%	0%	0%	0%
	2013-14	251.137	251.123		-40%	-40%	-30%	-30%	-25%	-25%	-20%	-20%	-20%	-20%	-10%	-10%	0%	0%	0%	0%
	2017-18	376.558	402.546		-18%	-23%	-4%	-11%	0%	-4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Strat.	2010-14	313.799	313.52		-38%	-38%	-31%	-31%	-27%	-27%	-22%	-21%	-22%	-21%	-10%	-10%	0%	0%	0%	0%
	2010-19	336.782	360.053		-36%	-40%	-28%	-33%	-24%	-29%	-18%	-23%	-18%	-23%	-3%	-9%	0%	0%	0%	0%
	2016-19	349.034	372.499		-27%	-32%	-9%	-14%	-2%	-8%	0%	-2%	0%	-2%	0%	0%	0%	0%	0%	0%

Table ES-1-12. Potential change in revenue from status quo based on PSC limit (2018$)

	EBS shelf trawl survey			**Low/ High**	**1134**	**Low**	**High** / **Low**	**High**	**Low/High**
	Setline survey			**Very Low**		**Low**	**Low** / **Medium**	**Medium**	**High**
			ratio	**1047**	**1222**	**1309**	**1396**	**1571**	**1745**
ex-vessel values	**2019**	**$4.33**	**1**	4,997,340	3,744,425	3,121,548	2,498,670	1,245,755	0
			0.75	3,748,005	2,808,319	2,341,161	1,874,003	934,316	0
			0.5	2,498,670	1,872,213	1,560,774	1,249,335	622,878	0
			0.25	1,249,335	936,106	780,387	624,668	311,439	0
	Average 2015-19	**$5.54**	**1**	6,393,826	4,790,789	3,993,851	3,196,913	1,593,876	0
			0.75	4,795,369	3,593,092	2,995,388	2,397,685	1,195,407	0
			0.5	3,196,913	2,395,395	1,996,925	1,598,456	796,938	0
			0.25	1,598,456	1,197,697	998,463	799,228	398,469	0
wholesale head and gut	**2019**	**$6.37**	**1**	7,351,745	5,508,543	4,592,208	3,675,873	1,832,670	0
			0.75	5,513,809	4,131,407	3,444,156	2,756,904	1,374,503	0
			0.5	3,675,873	2,754,271	2,296,104	1,837,936	916,335	0
			0.25	1,837,936	1,377,136	1,148,052	918,968	458,168	0
	Average 2015-19	**$7.04**	**1**	8,125,006	6,087,934	5,075,219	4,062,503	2,025,431	0
			0.75	6,093,754	4,565,951	3,806,414	3,046,877	1,519,073	0
			0.5	4,062,503	3,043,967	2,537,609	2,031,251	1,012,716	0
			0.25	2,031,251	1,521,984	1,268,805	1,015,626	506,358	0

Management and monitoring considerations

Management and enforcement considerations for this action are described in Section 5.8 of the FEIS, including the potential changes to cost recovery amounts for the Amendment 80 fishery, plus any increased issues with vessel safety. Potential enforcement issues include increased coercive behavior by vessel operatives and attempts to bias observer samples, plus any additional management issues that may need to be addressed in regulations as a result of this action.

Social and Environmental Justice

A social impact assessment (SIA) is appended separately (Appendix 1) and the findings are summarized in the Social and Environmental Justice section of this FEIS. The SIA evaluates community and regional patterns of engagement in and dependency on the BSAI Amendment 80 groundfish commercial fishery and the BSAI/Area 4 halibut commercial fishery as well as the potential for community level impacts under the no-action and action alternatives. Potential impacts to regional subsistence and sport halibut fisheries in Alaska are also evaluated. Myriad communities in Alaska and the Pacific Northwest participate directly and/or indirectly in one or both commercial fisheries. Within Alaska, more communities participate directly in the BSAI/Area 4 commercial halibut fishery than in the Amendment 80 fishery; however, the Amendment 80 fishery touches multiple Alaska communities directly or indirectly in several ways including: being the location of product transfers, which generate tax revenues realized at the state and local level; being ports of call, which may generate local support service sector economic activity; and/or being industry partners for the harvest of CDQ multispecies groundfish quota, among others. The BSAI/Area 4 halibut fishery, on the other hand, is fundamentally important to the local fleets of multiple Alaska communities and regions and, in some cases, provides one of the few options for private sector employment and income opportunities in those communities.

Economic Net Benefits Assessment

NEPA notes that economic effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment. This EIS also contains information relevant for conducting an economic impact analysis of a regulatory action as defined in Executive Order (E.O.) 12866 and reaffirmed in E.O. 13563. This section addresses economic net benefits only. Therefore, cost and benefit impacts discussed in this section are solely economic in nature, but that is not meant to imply that the social, cultural, and environmental impacts discussed elsewhere throughout this EIS are not relevant or can be excluded when considering overall costs and benefits.

Pursuant to E.O.'s 12866 and 13563, net benefits are calculated by summing all producer and consumer surplus that occurs in the US economy. Both costs and benefits are defined broadly to include all surpluses that accrue to direct and indirect participants in the fishery as well as to other members of society. Producer surplus is the difference between the minimum the producer would be willing to sell for and what the producer actually sells its goods for. Consumer surplus is a measure of consumer welfare and is defined as the additional economic benefit a consumer receives when the price that is paid for a good or service is less than the price the consumer is willing to pay. The groups considered include those persons who harvest or process fish effected by the action, those who provide support services to the harvesting and processing sectors of the fishing industry effected by the action, consumers of the halibut and Amendment 80 fishery products (and any other substitute species whose producer or consumer surplus changes as a direct result of the action), and members of society that are non-consumptive users of halibut that value the resource.

It is assumed that the Amendment 80 sector fisheries are constrained by halibut mortality limits during some years under the current PSC limit and could be further constrained if the halibut PSC limit is reduced further. However, it is also assumed that a reduced PSC limit will be less constraining on the Amendment 80 sector and will result in years when halibut mortality rates in the groundfish fishery are lower, depending on the size of the PSC limit, if the targeted groundfish species are more aggregated and avoiding halibut bycatch is easier. The reduction in the PSC limit may have some positive impact on the directed users of the halibut resource in future years.

Overall, given the constraints described in the analysis, the expected economic cost increases to the Amendment 80 sector, and the differing impacts and magnitude of impacts to producers and suppliers of both the Amendment 80 sector and the directed halibut fishery, producer surplus is expected to be negative. This would occur because the expected catch reductions in the Amendment 80 sector would not be offset by equivalent catch increases in the directed halibut fisheries. Consumer surplus will be little changed and will depend on the relative cost and availability of substitutes in the world whitefish market. Overall, for analytic purposes pursuant to E.O.'s 12866 and 13563, this means that net economic benefits are expected to be negative. The magnitude cannot be quantified, but can be expected to fluctuate along with changes in the PSC limits. For example, in years where the PSC limit is further reduced, resulting in a reduction in the amount of Amendment 80 species catch taken and increased costs associated with the harvest of those species, economic benefits are expected to be more negative.

Policy tradeoff and decision points

In selecting a preferred alternative, there were multiple alternatives and options to select from as well as policy tradeoffs considered. This section describes the decision-tree for the construction of a PA as well as policy-level considerations with respect to the MSA National Standards in doing so. Up to three steps are necessary to create a PA as shown in **Figure ES- 12**. As described previously, there are four action alternatives in this analysis, in addition to the No Action Alternative (Alternative 1). These action alternatives, would modify the Amendment 80 PSC limit to establish an annual regulatory process for PSC limit-setting based on look up tables framed by survey states. The Council was also able to consider additional options in addition to the specific action alternative to either smooth the inter-annual variability in the PSC limit (Option 1), limit the variability from Status Quo in the first year of implementation (Option 2) or add additional incentives regarding PSC usage (Option 3). Finally, Options 2 and 3, would require the Council to select a specific sub-option.

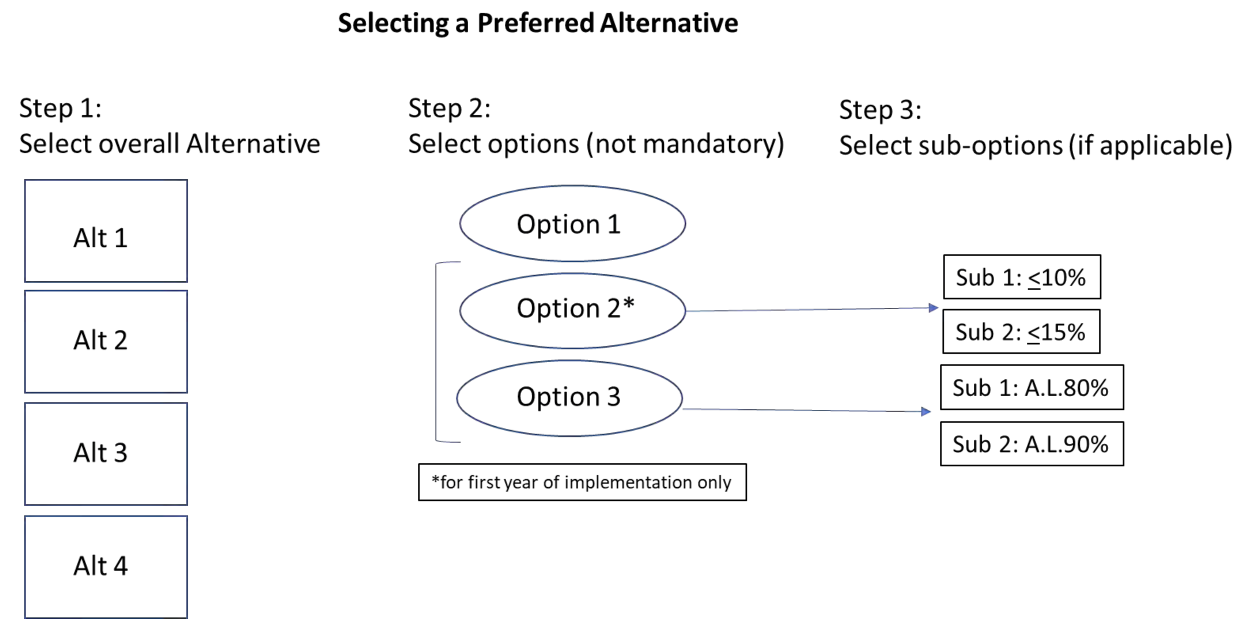


Figure ES- 12 Alternative steps in selecting among Alternatives and Options for creating a preferred alternative. Note that Option 1 does not have additional sub-options.

One of the policy considerations of this management action involves balancing competing interests among the National Standards, such as: minimizing bycatch to the extent practicable under National Standard 9, minimizing costs (where practicable) under National Standard 7, and factoring into account the importance of groundfish and halibut resources to fishing communities under National Standard 8. The practicability of operating under reduced PSC limits is extensively discussed in the analysis. Given their broader range of possible PSC limits and the indications that the Amendment 80 sector is more likely to be constrained by their TAC than PSC at high levels of PSC limits, Alternatives 2 and 3 provide the most flexibility for fishing operations to achieve their TAC both at lower halibut biomass levels and particularly at higher biomass survey states. Options 1 and 3 provide some mitigation of interannual variability in survey biomass estimates (Option 1) and further incentives to reduce bycatch below the regulatory PSC limit (Option 3). Policy decisions should address the ability of the fleet to catch its authorized harvest level while minimizing bycatch to the extent practicable.

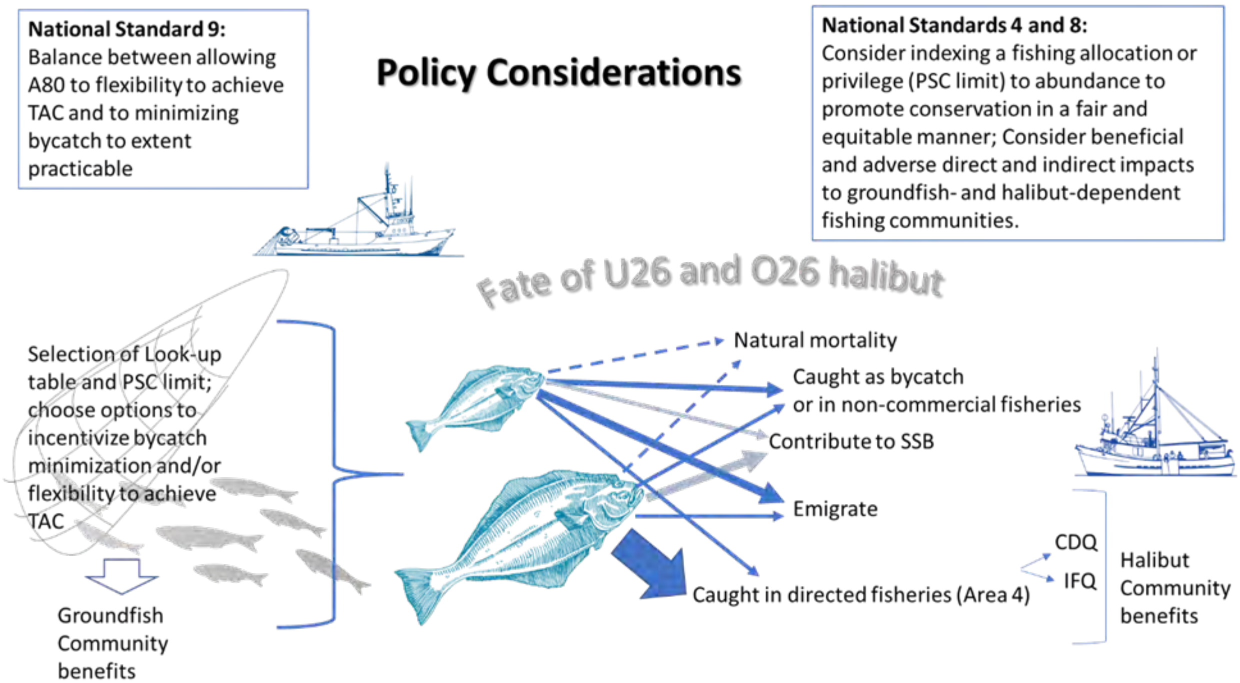


Figure ES- 13 **Schematic of trade-offs in considerations of some key National Standards based on the relative fate of O26 and U26 halibut. Here the width of the blue arrows represents relative magnitude of removals between O26 and U26 fish. Grey arrows show that contribution to SSB is from both sources but unknown magnitude while dotted lines for natural mortality indicate that it is considered equivalent between older and younger fish but is in fact an unknown quantity.**

Another potential policy trade-off stemming from the national standards includes consideration of National Standard 4 (allocate fishing privileges in a manner that is fair and equitable to all U.S. fishermen) (**Figure ES- 13**). Options are provided to incentivize bycatch reduction beyond what is provided by the PSC limit itself. Additional information on how all of the alternatives under consideration address each of the ten National Standards is contained in the analysis in Section 7.1.

Where are we in the process?

The Council has considered several discussion papers, a draft EIS, and public comment. Figure ES- 14 shows the schedule of previous iterative review and where final action on this EIS fits into the overall Council and NEPA process and with the NMFS process to publish the Record of Decision and implement the preferred alternative (PA) selected at final action. This document now represents the Final EIS (FEIS) and reflects the Council's selection of PA in December 2021.

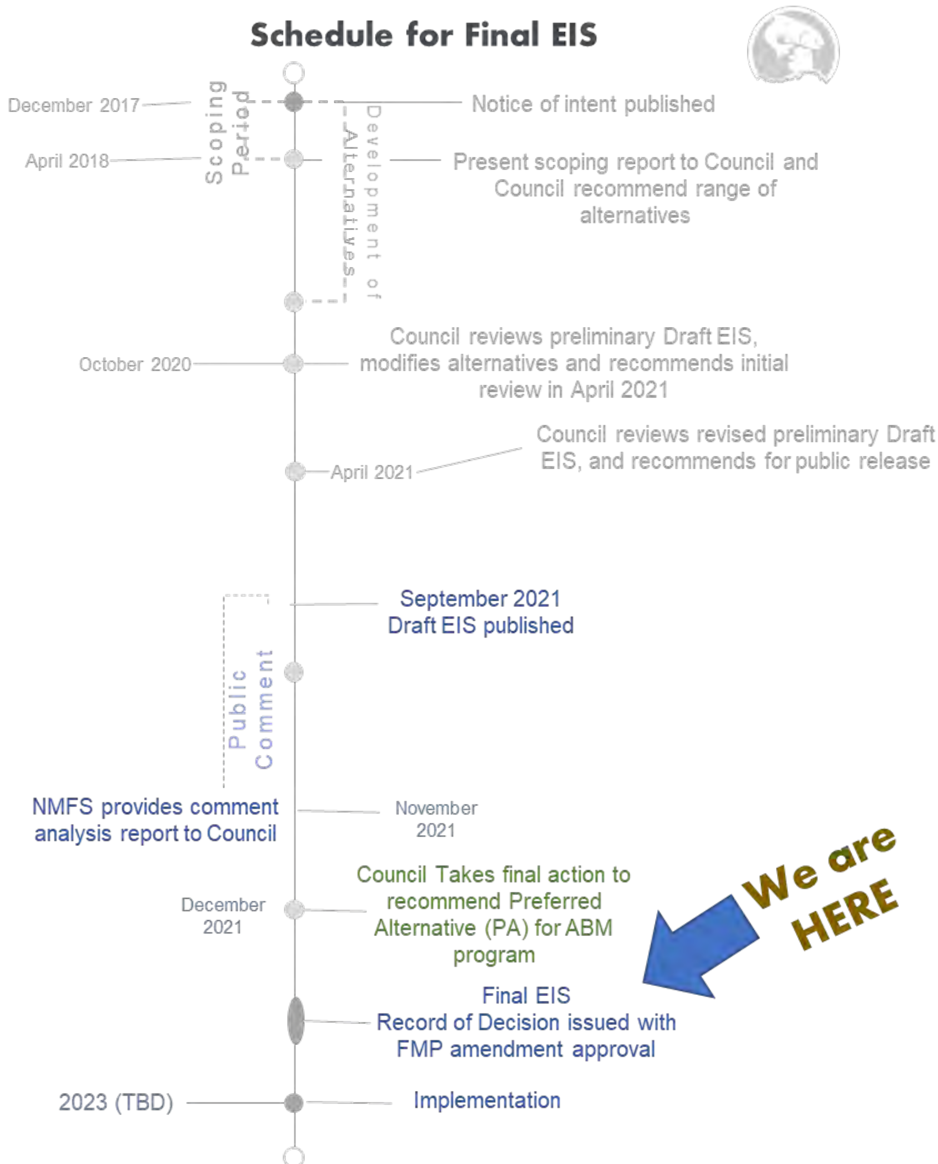


Figure ES- 14 Previous Council considerations (grey), recent Council considerations (green), proposed NEPA schedule and potential schedule for implementation

1 Introduction

This document analyzes a proposed management measure to link the Pacific halibut prohibited species catch (PSC) limit for the Amendment 80 commercial groundfish trawl fleet in the Bering Sea and Aleutian Islands (BSAI) groundfish fisheries to halibut abundance. The North Pacific Fishery Management Council (Council) is considering a program that provides incentives for the fleet to minimize halibut mortality at all times, that could promote conservation of the halibut stock, and may provide additional opportunities for the directed halibut fishery.

This document is a Final Environmental Impact Statement (FEIS). An Environmental Impact Statement (EIS) provides assessments of the environmental impacts of a proposed action and its reasonable alternatives as well as the economic benefits and costs of the action alternatives and their distribution. This FEIS addresses the statutory requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Environmental Policy Act (NEPA), and Presidential Executive Order 12866. An FEIS is a document produced by the Council and the National Marine Fisheries Service (NMFS) Alaska Region to provide the analytical background for decision-making. A Social Impact Assessment (SIA), appended, has also been prepared as a part of this analysis.

This FEIS is being prepared using the 1978 Council on Environmental Quality (CEQ) NEPA Regulations. NEPA reviews initiated before the effective date of the revised CEQ regulations may be conducted using the 1978 version of the regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020. A Notice of Intent to publish an EIS for the proposed management measures was published in the **Federal Register** on December 12, 2017 (82 FR 58374). This review began on that date, and the agency has decided to proceed under the 1978 regulations.

Pacific halibut (*Hippoglossus stenolepis*) is targeted in Alaska in commercial, personal use, recreational (sport), and subsistence halibut fisheries. Halibut has significant social, cultural, and economic importance to fishery participants and fishing communities throughout the geographic range of the resource. Halibut is also incidentally taken as bycatch in commercial groundfish fisheries.

The Council is examining abundance-based approaches to set the halibut PSC limit for the Amendment 80 sector in the BSAI. Currently halibut PSC limits for groundfish fishery sectors are set in the BSAI Groundfish Fishery Management Plan (FMP) at a fixed amount of halibut mortality in metric tons (mt). When halibut abundance declines, halibut PSC becomes a larger proportion of total halibut removals and can result in lower catch limits for directed halibut fisheries. That is, when halibut abundance declines, the directed fisheries carry much of the burden of conserving the resource by harvesting less. Through this action, the Council and NMFS will require implement measures so that the Amendment 80 sector shares in that burden. This action is limited to the Amendment 80 sector because that sector is responsible for the majority of BSAI halibut mortality in the groundfish fisheries. In light of the continued decline in the halibut stock, both the Council and the International Pacific Halibut Commission (IPHC) have expressed concern about impacts on directed halibut fisheries under the status quo and identified abundance-based halibut PSC limits as a potential management approach to address these concerns.

1.1 Halibut Management Authority

The IPHC and NMFS manage Pacific halibut fisheries through regulations established under the authority of the Northern Pacific Halibut Act of 1982 (Halibut Act) (16 U.S.C. 773-773k). The IPHC adopts regulations governing the target fishery for Pacific halibut under the Convention between the United States of America and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea (IPHC 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). For the United States, regulations governing the fishery for Pacific halibut developed by the IPHC are subject to acceptance by the Secretary of State with concurrence from the Secretary of Commerce. Then, NMFS publishes the IPHC regulations in the **Federal Register** as annual management measures pursuant to 50 CFR § 300.62. IPHC and NMFS regulations authorize the harvest of halibut in commercial, personal use, sport and subsistence fisheries by hook-and-line gear and pot gear. In the BSAI, (which largely coincides with IPHC Regulatory Area 4 (hereafter referred to as “Area 4”) and its five subareas (ABCDE)), halibut is harvested in all of these fisheries.

Section 5(c) of the Halibut Act also provides the Council with authority to develop regulations that are in addition to, and not in conflict with, approved IPHC regulations. The Council has exercised this authority in the development of Federal regulations for the halibut fishery such as (1) subsistence halibut fishery management measures, codified at 50 CFR § 300.65(g)-(k); (2) the limited access program for charter vessels in the guided sport fishery, codified at § 300.67; and (3) the Individual Fishing Quota (IFQ) Program for the commercial halibut and sablefish fisheries, codified at 50 CFR part 679, under the authority of Section 5 of the Halibut Act and Section 303(b) of the Magnuson-Stevens Act.

The Council manages the groundfish fisheries of the BSAI under the authority of the MSA and the BSAI FMP. Section 303(a)(11) of the MSA requires all fishery management plans to include conservation and management measures that, to the extent practicable: (1) minimize bycatch; and (2) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. Fishery management plans must also be consistent with the MSA’s ten national standards. Bycatch, as defined by the MSA, “means fish which are harvested in a fishery, but which are not sold or kept for personal use and includes economic discards[4] and regulatory discards.” 16 U.S.C. 1802(2). The term “regulatory discards” means “fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain, but not sell.” 16 U.S.C. 1802(38). In the BSAI FMP, the Council has designated Pacific halibut, along with several other fully utilized species such as salmon, herring, and crab, as “prohibited species” in the groundfish fisheries (Section 3.6.1 of the BSAI groundfish FMP). By regulation, the operator of any vessel fishing for groundfish in the BSAI must minimize the catch of prohibited species (50 C.F.R § 679.21(a)(2)(i)). The Council has also set catch limits for individual PSC species, which are defined in BSAI FMP Section 3.6.2.1. Under the designation as a PSC species, their capture is required to be avoided, and their retention is prohibited except when retention is required or authorized by other applicable law. Unintended removals of prohibited species are separately monitored and controlled under the groundfish FMPs.

The Council does not have authority to set catch limits for the commercial halibut fisheries, and halibut PSC in the groundfish fisheries is only one of the factors that affects harvest limits for the commercial halibut fisheries. Nonetheless, halibut PSC in the groundfish fisheries is a significant portion of total mortality in BSAI IPHC areas and has the potential to affect catch limits for the commercial halibut fisheries in Area 4 under the current IPHC harvest policy. While the impact of halibut PSC reductions on catch limits for commercial halibut fisheries is dependent on IPHC policy and management decisions, reductions to the current Amendment 80 halibut PSC limit in the BSAI could provide additional harvest opportunities in the BSAI commercial halibut fishery.

Although halibut is taken as bycatch in groundfish fisheries by vessels using all types of gear (trawl, hook-and-line, pot, and jig gear), halibut bycatch primarily occurs in the trawl and hook-and-line groundfish fisheries. The Council and NMFS manage halibut bycatch in the BSAI by (1) establishing halibut PSC limits for trawl, non-trawl, and Community Development Quota (CDQ) groundfish fisheries; (2) apportioning those halibut PSC limits to groundfish sectors, and in some cases, target fishery categories and seasons; and (3) managing groundfish fisheries to prevent PSC from exceeding the established limits. Consistent with National Standards 1, 4, 8, and 9 of the MSA, the Council and NMFS use halibut PSC limits in the BSAI groundfish fisheries to balance those sometimes competing requirements: the objective minimizing bycatch to the extent practicable, ensuring optimum yield from the groundfish fisheries on a continuing basis, allocating fishing privileges, and taking into account the importance of fishery resources to fishing communities. Halibut PSC limits in the groundfish fisheries

[4] “Economic discards” are defined as “fish which are the target of a fishery, but which are not retained because of an undesirable size, sex, or quality, or other economic reason.” 16 USC 1802 (9)

provide a constraint on halibut PSC mortality and promote conservation of the halibut resource. The halibut PSC limit established for the Amendment 80 sector is managed at the sector level in regulation, enforced at the sector level, and prohibits further groundfish fishing for the remainder of the year once the halibut PSC limit has been reached. Therefore, the Amendment 80 halibut PSC limit balances the needs of fishermen, fishing communities, and U.S. consumers that depend on both halibut and groundfish resources.

1.2 Purpose and Need

The Council amended its purpose and need statement for this action in October 2020 to be the following:

> *Halibut is an important resource in the Bering Sea and Aleutian Islands (BSAI), supporting commercial halibut fisheries, recreational fisheries, subsistence fisheries, and groundfish fisheries. The International Pacific Halibut Commission (IPHC) is responsible for assessing the Pacific halibut stock and establishing total annual catch limits for directed fisheries and the North Pacific Fishery Management Council (Council) is responsible for managing prohibited species catch (PSC) in U.S. commercial groundfish fisheries managed by the Council. The Amendment 80 sector is accountable for the majority of the annual halibut PSC mortality in the BSAI groundfish fisheries. While the Amendment 80 fleet has reduced halibut mortality in recent years, continued decline in the halibut stock requires consideration of additional measures for management of halibut PSC in the Amendment 80 fisheries.*
>
> *When BSAI halibut abundance declines, PSC in Amendment 80 fisheries can become a larger proportion of total halibut removals in the BSAI, particularly in Area 4CDE, and can reduce the proportion of halibut available for harvest in directed halibut fisheries. The Council intends to establish an abundance-based halibut PSC management program in the BSAI for the Amendment 80 sector that meets the requirements of the Magnuson-Stevens Act, particularly to minimize halibut PSC to the extent practicable under National Standard 9 and to achieve optimum yield in the BSAI groundfish fisheries on a continuing basis under National Standard 1. The Council is considering a program that links the Amendment 80 sector PSC limit to halibut abundance and provides incentives for the fleet to minimize halibut mortality at all times. This action could also promote conservation of the halibut stock and may provide additional opportunities for the directed halibut fishery.*

Fishermen are required by the BSAI groundfish FMP to avoid the capture of any prohibited species in groundfish fisheries, including halibut, and the use of halibut PSC limits in the groundfish fisheries provides a further constraint on halibut PSC and promotes conservation of the halibut resource. Halibut PSC limits provide a regulated upper limit to mortality resulting from halibut interceptions because continued groundfish fishing is prohibited once a halibut PSC limit has been reached for a particular sector and/or season. This management tool is intended to balance the optimum benefit to fishermen, communities, and U.S. consumers that depend on both halibut and groundfish resources.

1.2.1 Relative roles and responsibilities of the IPHC and NPFMC as they relate to halibut PSC

The IPHC accounts for all sources of halibut mortality, including halibut PSC in the groundfish fisheries, recreational catches, and subsistence catches before setting commercial halibut catch limits each year. Halibut fishery catch limits are the result of a multi-step process by the IPHC, with input from U.S. and Canadian fishery management organizations, to determine how much can be sustainably harvested by the commercial halibut fishery. The current harvest policy for Pacific halibut is based on two harvest targets: the distribution of harvest rates among regulatory areas, and scale of that harvest at the coastwide level. The IPHC refers to halibut “bycatch” to describe the mortality of all sizes of halibut caught in the commercial groundfish fisheries that are managed by the Council and NMFS (hook-and-line sablefish and Pacific cod; trawl Pacific cod, pollock, flatfish, and rockfish; and pot Pacific cod), and minor amounts in commercial shrimp trawl and crab pot fisheries. In the groundfish fisheries, Pacific halibut is a prohibited species, and bycatch mortality of halibut is referred to as halibut PSC.

In IPHC terms, “wastage” describes halibut killed, but not landed by the commercial (hook-and-line) halibut fisheries, due to lost and abandoned gear, and mortality of fish released due to the minimum commercial size limit of 32 inches in length. Wastage is not included in IPHC estimates of “bycatch” but is reported annually.

Specifically, the IPHC uses the current year’s projection of the PSC mortality to establish the following year’s commercial halibut fishery catch limit. For several years, there have been concerns raised by stakeholders and the Council about the levels of halibut PSC in the commercial groundfish sectors. The spawning biomass of Pacific halibut in the 1990s was the highest seen in many decades but has been declining since the 2000s. The declining biomass from those high levels resulted in lower Pacific halibut catch limits set by the IPHC for the BSAI commercial halibut fisheries (Area 4), especially in 2013 and 2014 for the commercial halibut fishery in the northern and eastern Bering Sea (Area 4CDE) (Figure 1-1). The Council addressed this initial concern by reducing trawl, non-trawl, and CDQ sectors’ halibut PSC limits for the BSAI groundfish fisheries, implemented in 2016 by Amendment 111 to the FMP. The Council continues to consider further management changes for the Amendment 80 sector PSC limit with this action.

Figure 1-1 Map of IPHC Regulatory Areas (outlined in dark blue) and BSAI FMP (shaded in light blue) and GOA FMP (shaded in yellow) areas.

The Council recognizes efforts by the Amendment 80 sector to reduce total halibut PSC in the BSAI. Concerns persist, however, about continuing low levels of halibut biomass, constant halibut PSC limits, and diminishing directed fishery catch limits. Based on the IPHC management objectives, as well as recent projections of halibut biomass and estimates of PSC mortality, directed fishery stakeholders remain concerned that halibut catch limits will not be sufficient to provide for a directed fishery in the BSAI at the current PSC limits implemented under Amendment 111. The Amendment 80 sector fisheries account for the majority of halibut bycatch mortality in the BSAI. Therefore, the Council is considering the approach described here to link the Amendment 80 PSC limit to halibut abundance.

Under MSA National Standard 8, conservation and management measures must take into account the importance of fishery resources to fishing communities in order to provide for the sustained participation of and minimize adverse economic impacts on fishing communities that depend on both halibut and groundfish resources. BSAI coastal communities are affected by reduced catch limits for the directed halibut fishery, especially in Area 4CDE. In considering changes to the management of the Amendment 80 halibut PSC limit in the BSAI, the Council must balance these communities' engagement in and dependence on halibut fisheries with community engagement in and dependence on the groundfish fisheries. The Council must also consider MSA National Standard 4 which states that management measures shall not discriminate between residents of different states. National Standard 4 also requires allocations of fishing privileges to be fair and equitable to all fishery participants. To be consistent with the National Standards 1, 4, 8, and 9 of the MSA, a Council action to implement an abundance-based halibut PSC limit must minimize halibut PSC in the Amendment 80 groundfish fisheries to the extent practicable while preserving the potential for the optimum harvest of the groundfish total allowable catch (TAC). Some considerations for an effective and pragmatic abundance-based halibut PSC limit system include consideration of the existing regulatory and operational management measures and the need to conserve the halibut resource, maintain a healthy marine ecosystem, ensure long-term conservation and abundance of the halibut stock, provide optimum benefit to fishermen, communities, and U.S. consumers that depend on both halibut and groundfish resources, and comply with the MSA and other applicable Federal law.

Consistent with the Council's purpose and need statement, an abundance-based halibut PSC limit for Amendment 80 may provide improved harvest opportunities in the Area 4 commercial halibut fishery that meet IPHC and Council management objectives, particularly at low levels of halibut abundance. Distinguishing between the fish that are over 26 inches in length (O26) and those that are under 26 inches in length (U26) is important for the IPHC harvest policy. Under that policy, the O26 component taken as PSC has approximately the same effect on the halibut stock as O26 catch in the commercial halibut fishery and is treated the same: it is directly deducted from the total constant exploitable yield (TCEY) (See Section 4.4.1 for description of the IPHC harvest policy and TCEY). If halibut PSC is reduced relative to the status quo, additional harvest opportunities for the BSAI directed halibut fisheries could result in the near term from PSC related mortality reductions of O26 halibut. Under current IPHC harvest policy, these O26 halibut could be available to the commercial halibut fishery in the area the PSC reductions occurred in the year following the PSC reductions or when the fish are likely to reach the legal-size limit for the directed halibut fishery (greater than or equal to 32 inches in total length).

Longer term benefits to the directed halibut fisheries could also accrue throughout the distribution of the halibut stock from a reduction of PSC mortality to U26 halibut. Removals of U26 halibut are included in the stock assessment, and therefore in the estimated productivity and current status of the stock. Because the stock assessment is conducted at the coastwide level, the U26 component of PSC is implicitly assumed to have an equal effect on the productivity of all IPHC areas. The reason for this has to do with the small size and future potential of these fish. Benefits from reduced mortality of these smaller halibut could occur both in the Bering Sea and elsewhere as these halibut migrate and recruit into the directed halibut fisheries over the full range of the halibut stock. At higher levels of halibut abundance, an abundance-based halibut PSC limit may provide the Amendment 80 groundfish fisheries with a higher PSC limit.

1.3 History of this Action

The Council and NMFS have enacted a range of management measures and regulations to address halibut bycatch since the origin of the BSAI Groundfish FMP in 1981 (Figure 1-2). A synopsis of historical management measures in the BSAI FMP and regulations from 1981 through 2012 was provided to the Council in June 2012 (Northern Economics, Inc. 2012). Amendment 80 was implemented in 2008. Table 1-1 shows the changes in the PSC limits by sector from 1981 to present. Step-down provisions reduced the Amendment 80 limit by about 8 percent between 2008 through 2012. Note that in conjunction with step-down provisions in Amendment 80, the Community Development Quota (CDQ) limit was increased by 50 metric tons in 2010 before a subsequent reduction in 2016 as part of Amendment 111. Non-trawl and Trawl Limited Access sector PSC limits were also reduced as a result of Amendment 111.

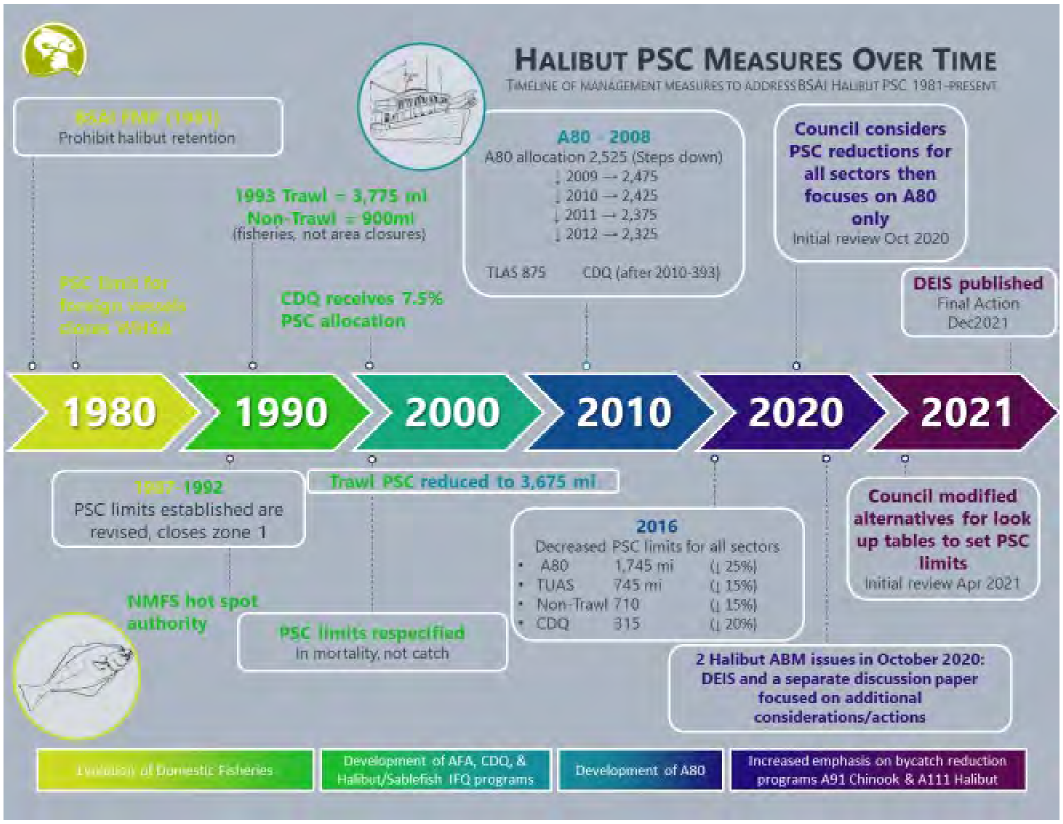


Figure 1-2 Historical overview of BSAI halibut PSC measures 1981-present.

Table 1-1 Evolution of Pacific halibut PSC limits in metric tons (mt) of mortality, by main sectors in the BSAI region, 1999-2021 (see Fig. 1-1 for additional information on halibut limits and actions 1981-2016). Here PSC limits for trawl and non-trawl from 2008 to 2015 reflect the reduction for the CDQ limit. Limits for 1999-2007 were also reduced 7.5% for the CDQ but this is not shown in the table.

	Trawl	Am80	BSAI Trawl Limited Access*	Non-trawl	CDQ	Total PSC limit
1999-2007	3,675	NA	NA	900	**	4,575
2008		2,525	875	833	343	4,576
2009		2,475	875	833	343	4,526
2010		2,425	875	833	393	4,526
2011		2,375	875	833	393	4,476
2012		2,325	875	833	393	4,426
2013-2015		2,325	875	833	393	4,426
2016-2021		1,745	745	710	315	3,515

* The BSAI Trawl Limited Access fisheries encompass all trawl fisheries in the BSAI except Amendment 80 catcher processors (i.e., all trawl catcher vessels in any target fishery, and American Fisheries Act catcher processors).

** Limits for 1999-2007 were reduced by 7.5% for PSC usage by the CDQ sector.

In February 2015, in conjunction with initial review of the analysis prepared for Amendment 111 to the BSAI FMP that considered reductions of BSAI Pacific halibut PSC limits, the Council also requested that Council and IPHC staff evaluate possible approaches to link BSAI halibut PSC limits to data or model-based abundance estimates of halibut. IPHC staff took the lead on drafting a paper examining several aspects of potential abundance-based halibut PSC limits in the BSAI, including a review of harvest policies by both Council and IPHC staff, fishery trends, a range of potential candidate abundance indices, a discussion of basing allocation on yield (biomass) versus spawning capital (relative fishing impact), and a review of research recommendations (Martell et al., 2016).

The Council then initiated subsequent discussion papers and requested that analysts from within the different agencies (IPHC, NMFS Alaska Fisheries Science Center [AFSC], NMFS Alaska Regional Office [RO], and Council staff) collaborate to provide additional information on appropriate abundance indices for use in scaling PSC to halibut abundance (referred to in this document as 'indexing PSC to abundance') indexing halibut abundance to PSC in the Bering Sea, how to establish control rules, and the development of performance metrics.[5] In 2017, NMFS published a Notice of Intent to publish an EIS for the proposed management measures. In addition to the formal scoping period, the Council provided considerable opportunities for stakeholder input, including formation of a stakeholder committee in 2018 tasked with providing the analysts with specific scenarios from the broad suite of alternatives, elements, and options for analysis and to provide feedback on recommended performance metrics. These scenarios were included in the alternatives, and staff provided drafts of the analysis that included performance metrics to address competing objectives in October 2019 and February 2020. Staff developed a model-based analysis of the alternatives to assess the use of chosen indices on halibut abundance and resulting PSC limits. At the February 2020 meeting, the Council modified the scope of this analysis to focus exclusively on the Amendment 80 sector, due to that sector comprising the majority of the halibut mortality annually. The analysis was reworked, and in October 2020, the Council reviewed another preliminary DEIS. At the October 2020 meeting, the Council revised the purpose and need statement to more directly address the action before the Council and embedded its objectives directly into the purpose and need statement. The Council also revised its alternative set to three action alternatives that all used a look up table approach to set PSC limits based on the status of halibut as indexed in both the IPHC setline and eastern Bering Sea (EBS) trawl surveys. The Council requested that version of the preliminary DEIS shift the analytical focus from a management strategy evaluation (MSE) approach centered on evaluating objectives with respect to performance metrics, to a more traditional impacts analysis on the affected fishing sectors and other affected resource components. Following initial review of a preliminary DEIS in April 2021, the Council modified the options applied to the alternatives and requested the document be revised in response to Scientific and Statistical Committee (SSC) requests to the extent feasible before publishing the DEIS for the public review and comment.

[5] A summary of the papers reviewed by the Council and the focus of those papers from 2016 through 2019 is included in Chapter 1 of the October 2020 DEIS, accessible at: https://meetings.npfmc.org/CommentReview/DownloadFile?p=64175697-f114-4386-943f-3a864ac24361.pdf&fileName=C6%20ABM%20Draft%20DEIS%20Analysis.pdf

Table 1-2 Information contained in previous materials provided April 2016-October 2020

Topic	Information	Link
Initial Review DEIS Initial Review DEIS	April 2021 initial review DEIS Preliminary DEIS on previous alternative set Revised Alternative set from October 2020 motion	April 2021 initial review DEIS October initial review preliminary ABM DEIS October 2020 Council motion
Preliminary DEIS	Previous initial review draft which contained alternatives that applied to all sectors	October 2019
Indices	Data sources from which to derive indices including strengths and weaknesses of each	April 2016
	Description of potential abundance indices IPHC assessment; EBS shelf trawl survey; combined and applied in a control rule	April 2016
Fishery characteristics	Halibut PSC by target; observed trawl and longline effort, CPUE, PSC rates	Supplement April 2016
Control rules	Control rule background	April 2016 October 2016 April 2017 April 2018
	Control rule features	April 2016 October 2016 April 2017 April 2018
	Control rule examples already in use	April 2016 April 2017
Quantifying objectives	Performance metrics	February 2017 April 2017
		June 2017
Incentives	Incentives	April 2017
Alternatives and scenarios	Example ABM alternatives	April 2016 October 2016 April 2017 Supplement Apr 17 April 2018
	Management issues and methods	October 2016
	Analytical considerations and example scenarios	April 2016 Supplement ppt October2016 April2017 Supplement Apr 17
	Methodology for analysis	June 2018(a)
Performance standard	Proposed O26 performance standard	June 2018 (b)

Throughout the Council process and associated Council meetings addressing this issue, as the analysis for this action developed and evolved over the last 6 years, numerous opportunities for public input, written and oral, have been available to the public. In September 2021, a Draft Environmental Impact Statement for the BSAI Halibut ABM of Amendment 80 PSC Limit was published for public review and comment (86 FR 50331, September 8, 2021). The DEIS was developed under requirements of the National Environmental Policy Act (NEPA) (40 CFR Parts 1500–1508). Public comments on the DEIS were received during the public comment period, which closed on October 25, 2021. NEPA requires federal agencies to involve tribal governments, together with the public, state and local governments, relevant agencies, and any applicants, in development of EISs. The U.S. Environmental Protection Agency submitted a comment letter on the DEIS that advised NMFS that the Bering Intergovernmental Tribal Advisory Council may be able to provide helpful information on this action. At the December 2021 Council meeting NMFS presented a summary report of public comments received on the DEIS. The Council took final action at that December 2021 meeting and selected a Preferred Alternative to recommend to NMFS.

1.3.1 Tribal Consultation and opportunities for input from Tribal members, Alaska Native organizations, and representatives.

NMFS has special obligations to consult and coordinate with tribal governments on a government-to-government basis pursuant to Executive Order (E.O.) 13175 on "Consultation and Coordination with Indian Tribal Governments" and the Executive Memorandum of April 29, 1994, on "Government-to-Government Relations with Native American Tribal Governments." NMFS is also required to consult with Alaska Native Claims Settlement Act (ANCSA) corporations on the same basis as tribal governments under E.O. 13175 (Pub. L. 108-199). A recent Presidential memorandum affirms the Federal government's commitment to including Tribal voices in policy deliberations that affect Tribal communities and recognizes that strong communication is fundamental to a constructive relationship.

NMFS sent letters sent to tribal governments on this action to notify them of the action and to invite them to consult on it under E.O. 13175 on a government-to-government basis. NMFS received feedback stating the letters were not sufficient invitations.

To date, NMFS solicited input on this agenda item through the following actions:

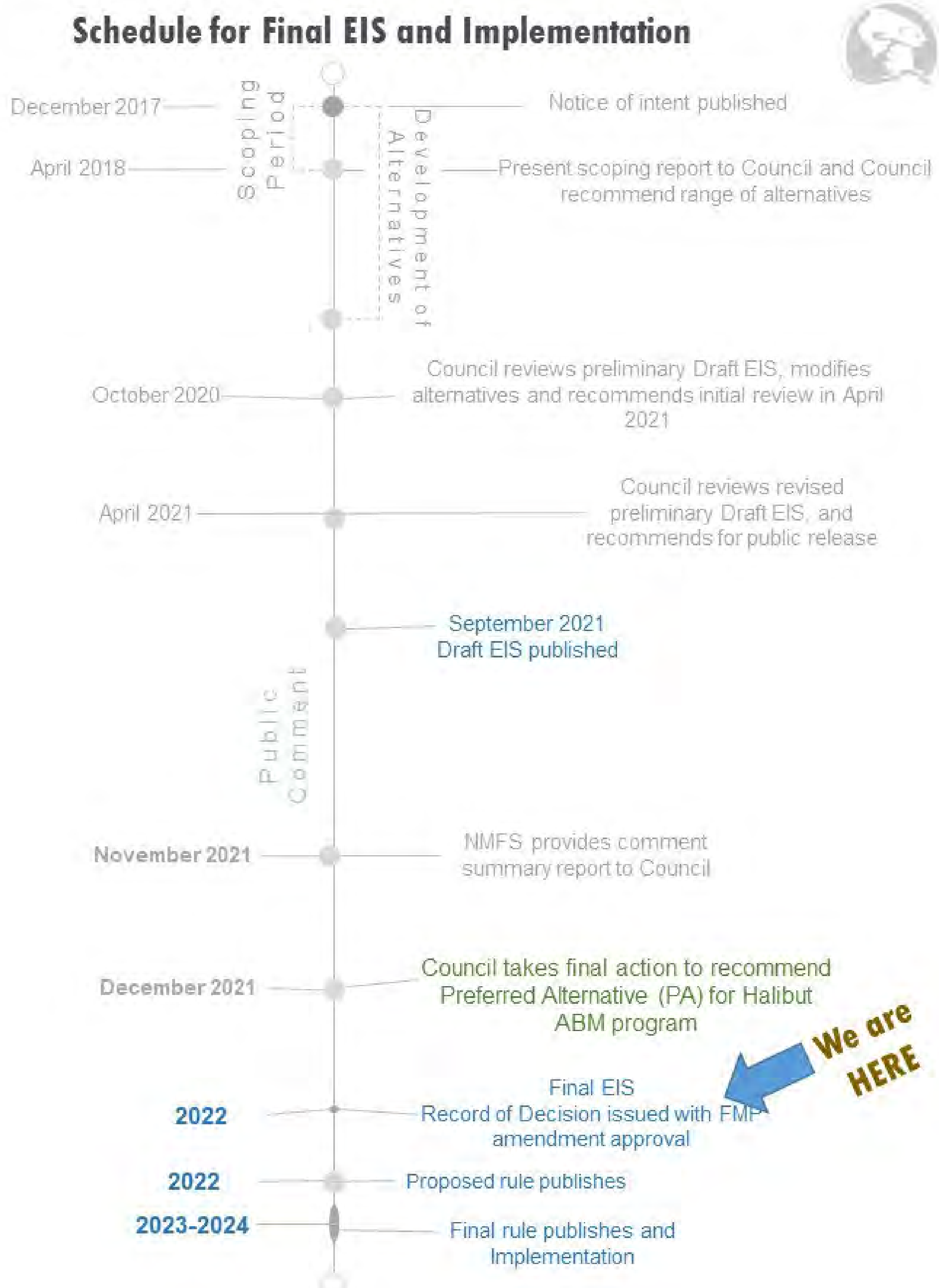
- Letter sent August 2020 to Alaska Tribal governments and entities and ANCSA Corporations.
  - https://media.fisheries.noaa.gov/2021-07/tribe-halibut-abundance-eis-intial-rev-08-18-20.pdf?null
- Letter sent April 2021 to Alaska Tribal governments and entities and ANCSA Corporations.
  - https://media.fisheries.noaa.gov/2021-07/tribe-halibut-abundance-eis-4-26-21.pdf?null
- Summary of Tribal Consultation Teleconference to Discuss Halibut ABM with Aleut Community of St. Paul Island, November 2021
  - https://media.fisheries.noaa.gov/2022-01/consultation-with-aleut-comm-st-paul-2021.pdf
- Summary of Tribal Consultation Teleconference to Discuss Halibut ABM Concerns with Aleutian Pribilof Islands Association, July 2021
  - https://media.fisheries.noaa.gov/2021-09/tribal-consultation-halibut-abm-apia-summary.pdf
- Letter sent November 10, 2021 inviting tribal governments and organizations to participate in a halibut bycatch listening session on November 29, 2021, which included the halibut ABM action.
  - https://www.fisheries.noaa.gov/alaska/consultations/halibut-and-salmon-engagement-sessions-noaa-fisheries-alaska-region
  - Notes from that November 29, 2021, listening session are available here: https://media.fisheries.noaa.gov/2022-01/halibut-listening-session-summary-nov-2021.pdf
- Letter sent February 9, 2022 requesting tribal consultations with 19 tribes the DEIS identified as affected entities.

- https://www.fisheries.noaa.gov/alaska/consultations/alaska-fisheries-tribal-consultation-documents-and-workgroup

1.4 Where are we in the process?

Figure 1-3 shows the schedule of the overall Council and NMFS NEPA processes, including previous analysis reviews, the Council's selection of the Preferred Alternative at final action on the DEIS, and NMFS's anticipated publication of the Record of Decision and implementation of the management action through proposed and final rulemaking. This document is now considered the Final EIS (FEIS) and reflects the Council's Preferred Alternative.

The next steps in this process are publication of proposed implementing regulations for this action and a notice of availability of the Amendment 123 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area. As part of the regulatory rulemaking process, NMFS will solicit public comment on the proposed regulations to implement this action and the notice of availability of the BSAI FMP Amendment 123. Through these two public comment periods and through tribal consultation under E.O. 13175, NMFS continues to solicit input on this action. If approved by the Secretary of Commerce, final implementation of this action would occur prior to the beginning of the 2024 fishing year.



Schedule for Final EIS and Implementation
December 2017
Scoping Period
Notice of intent published
April 2018
Development of Alternatives
Present scoping report to Council and Council recommend range of alternatives
October 2020
Council reviews preliminary Draft EIS, modifies alternatives and recommends initial review in April 2021
April 2021
Council reviews revised preliminary Draft EIS, and recommends for public release
September 2021
Draft EIS published
Public Comment
November 2021
NMFS provides comment summary report to Council
December 2021
Council takes final action to recommend Preferred Alternative (PA) for Halibut ABM program
We are HERE
2022
Final EIS
Record of Decision issued with FMP amendment approval
2022
Proposed rule publishes
2023-2024
Final rule publishes and Implementation

Figure 1-3 Previous Council considerations (grey), recent Council considerations (green), NEPA documents and anticipated schedule for implementation (blue)

1.5 Description of Management Area

The proposed action would be implemented in the BSAI groundfish management areas, which overlap IPHC regulatory areas 4A, 4B, 4C, 4D, and 4E (Figure 1-4).

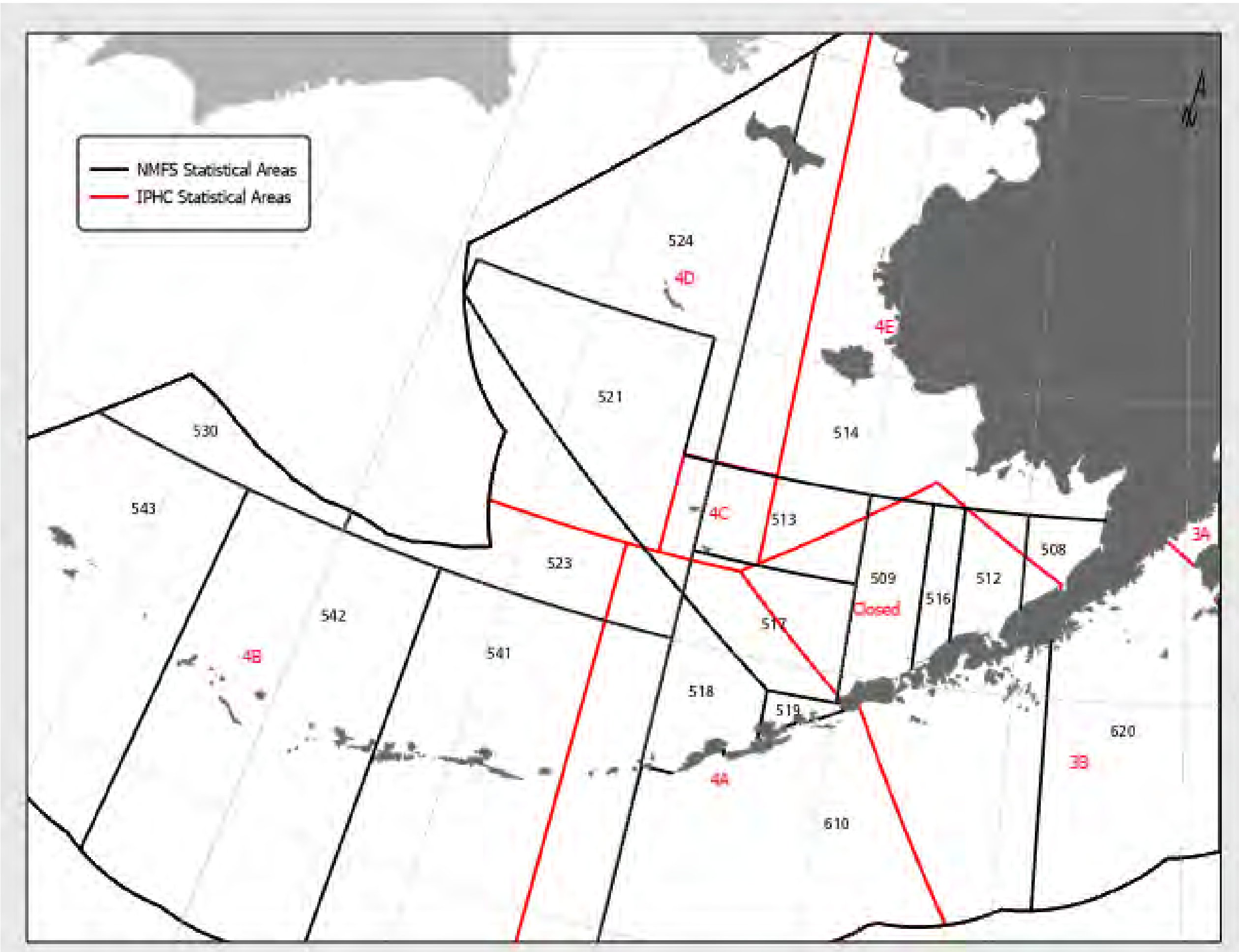


Figure 1-4 Alaska groundfish reporting areas and IPHC regulatory areas for Pacific halibut. Source: Adapted from NMFS Alaska Region map by Northern Economics Inc.

NMFS management areas do not match exactly to IPHC regulatory areas (Figure 1-4). To show the relative overlap, the groundfish BSAI reporting areas are equated with IPHC areas as shown in Table 1-3. Note that IHPC Area 4A includes part of NMFS Area 610, which is part of the Gulf of Alaska (GOA) FMP area.[6] Further information on how NMFS apportions halibut PSC mortality by regulatory area to provide to the IPHC is contained in Section 5.4.1.

[6] The treatment of directed halibut fishery information for IPHC Area 4 as it regards the overlap of BSAI and GOA FMP areas is addressed in Section 4.4.1 of this DEIS.

Table 1-3 Alaska groundfish reporting areas and IPHC regulatory areas for Pacific halibut. NMFS management area reassignments used to aggregate groundfish and halibut statistics to IPHC regulatory areas

IPHC Area	NMFS Areas	Region
4A	517, 518, 519, 521, 523, 541	BSAI
4B	523, 541, 542, 543	
4CDE and Closed area	508, 509, 512, 513, 514, 516, 517, 521, 523, 524	

1.6 Abundance indices

The Council selected two abundance indices (measures of the survey estimate of halibut either in metric tons (NMFS AFSC survey) or population-density as measures by weight per unit effort (IPHC survey)) that could be used to track halibut abundance and to guide setting the PSC limit for the Amendment 80 sector[7]. The selected indices are based on the NMFS Alaska Fisheries Science Center (AFSC) EBS shelf bottom trawl survey and the IPHC setline survey covering IPHC Areas 4ABCDE. Both indices represent the best available scientific information. A short description of the development of each index is provided below for context in understanding the alternatives that index halibut PSC to abundance.

1.6.1 AFSC EBS shelf bottom trawl surveys

The NMFS AFSC has conducted the EBS shelf trawl survey annually since 1982 ***with the exception of 2020***[8] using standardized protocols.

1.6.1.1 Survey Objectives

The AFSC designed the EBS shelf survey to describe the composition, distribution, and abundance of demersal fish, shellfish, and principle epibenthic invertebrate resources of the EBS. The continental shelf area of the EBS has proven to be one of the most productive fishing areas in the world in terms of both species' abundance and commercial value.

Results of the EBS shelf survey provide up-to-date estimates of biomass, abundance, and population structure of groundfish populations in support of stock assessment and ecosystem forecast models that form the basis for groundfish and crab harvest advice. Relative abundance (catch per unit effort) and size and/or age composition data are key results from this survey. The survey covers Pacific halibut in addition to target species such as walleye pollock, Pacific cod, yellowfin sole, northern rock sole, red king crab, and snow and tanner crabs. Additional data collected on the survey are used to improve understanding of life history of the fish and invertebrate species as well as the ecological and physical factors affecting their distribution and abundance. The EBS shelf survey is generally described in a NOAA Technical Memo (Stauffer, 2004).

The main objective of AFSC groundfish trawl surveys is to collect fishery-independent data for multiple species which describe the:

- temporal distribution and abundance of the commercially and ecologically important groundfish halibut and crab species,
- changes in the species composition and size and age compositions of species over time and space,
- reproductive biology and food habits of the groundfish community,

[7] Additional indices were considered and not carried forward as candidate indices see Table 1-2 for more information on those indices.

[8] See Section 2.6 for information on the cancellation of 2020 surveys due to COVID-19 outbreak and further discussion of future planning for PSC limit determination in the event that future surveys are not able to be conducted or conducted at a reduced effort.

- the physical environment of the groundfish habitat.

1.6.1.2 Technical Design

The stratified random design of the EBS shelf survey consists of a grid with stations placed at the center of each 20 × 20 nautical square miles (Figure 1-4). Beginning in 1982, the same 356 stations were sampled annually. The AFSC added 20 stations to the northwest sector in 1987, resulting in a total of 376 stations.

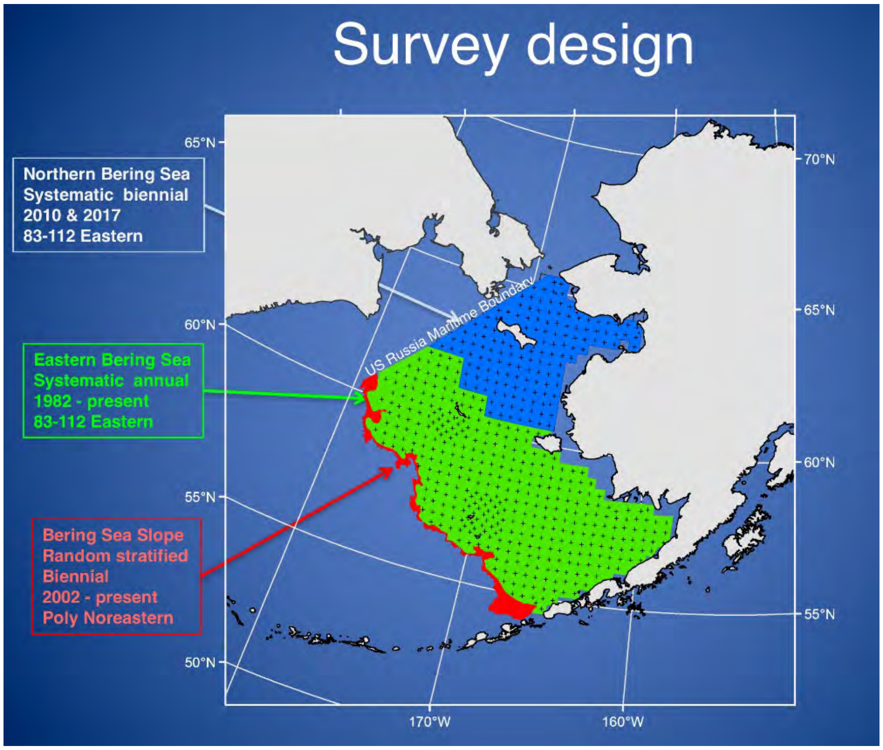


Figure 1-5 Layout of NMFS trawl survey designs (Source: Bob Lauth, AFSC).

The bottom trawl gear and trawling protocols used in AFSC surveys are described in Stauffer (2004). Samples obtained from the survey's standard 30-min tow range in weight from 30 to 17,800 kg (median = 1,167 kg). The time available to process this volume of catch is approximately equal to the time required for the vessel to traverse the 20 nautical miles to the next towing site (approx. 2 hours). Catches weighing 1,200 kg or less by visual estimate are lifted by crane from the trawl deck to a sorting table, where the catch is sorted and enumerated in its entirety. Catches from these tows are processed completely. However, roughly half of all EBS tows exceed the limits of the sorting table and must be subsampled. This is accomplished by lifting the whole catch off the deck, obtaining its weight with a load cell, and emptying it into a large bin containing a brailing net. The catch is subsampled by lifting the contents of the brailing net to a sorting table. The catch from the sorting table is weighed and enumerated by species, and weights and numbers are extrapolated to the total catch based on weight. The remaining catch on deck is sifted or "whole-hauled" for Pacific halibut (*Hippoglossus stenolepis*) and commercial crabs (*Lithodes* spp., *Paralithodes* spp., *Chionoecetes* spp.) and, in more recent years, other large-bodied species including Greenland turbot (*Reinhardtius hippoglossoides*), Pacific cod (*Gadus macrocephalus*), skates (*Raja* spp., *Bathyraja* spp.) and some species of sculpins (*Hemitripterus bolini*, *Hemilepidotus* spp., *Myoxocephalus* spp.).

Catches larger than the lifting capacity of the crane (approx. 5 mt) are emptied on deck and measured volumetrically using a density coefficient applied to calculate total catch weight. Once the weight of these very large catches (approx. 1.5% of all catches) is estimated, a sample is brought to the table for sorting and enumeration, and then extrapolated to the total catch. Whole-hauling occurs for the species mentioned above even on these large catches.

1.6.1.3 Survey Estimate of Halibut

The AFSC developed trawl efficiency and enumeration confidence matrices for both fishes and invertebrates collected during the EBS shelf survey from 1982 through 2014. The trawl efficiency index scores describe how accurate and consistent the survey is as an indicator of relative animal density and are provided for each taxon code appearing in the survey database. These efficiency index scores are subjective but were influenced by the results from several catch efficiency field experiments using NMFS trawl gear (e.g., Weinberg and Munro 1999; Munro and Somerton, 2001; Somerton and Munro, 2001; Weinberg et al. 2002; Kotwicki and Weinberg 2005; Somerton et al. 2007; Weinberg et al. 2016). The efficiency index for Pacific halibut received the highest score, indicating that the AFSC believes the Pacific halibut catch-per-unit-effort (CPUE) calculated from the EBS shelf survey is an accurate and consistent indicator of relative animal density. Pacific halibut also received the highest score for confidence in the enumeration of weight and counts from the EBS shelf survey. A detailed description of the efficiency and enumeration confidence indices is provided in a 2016 NOAA Technical Memo (Stevenson et al., 2016).

The IPHC has deployed a biologist on the EBS shelf survey every year since 1998 to collect halibut samples. The IPHC participates in the EBS shelf survey to augment information collected in its coastwide setline survey. The setline survey is the primary fishery-independent source of data for the halibut stock assessment (Henry et al. 2015). However, Pacific halibut occupy a vast area of the Bering Sea shelf for which the IPHC lacks the financial resources to sample in its entirety. Moreover, the fishing gear used in the coastwide setline survey data generally catches O26 halibut, which is available for harvest in the directed commercial fishery. Therefore, in most years, the EBS shelf survey is the only measure of relative abundance for U26 halibut for much of this area. The halibut data collection (including ages) and treatment of information collected by the IPHC during the EBS shelf survey is described and the results are reported in the IPHC Report of Assessment and Research Activities 2016 (IPHC-2016-RARA-26-R).

The EBS shelf survey has different size-selectivity than setline gear. To address this, the EBS shelf trawl survey is calibrated to the setline survey selectivity before it is incorporated into the calculation of the setline survey indices. Therefore, the setline survey does not index smaller halibut (mostly U26). In 2006, the IPHC added shelf stations to its setline survey in the Bering Sea region to compare information from setline stations in that area with data collected on the EBS shelf survey. After the study, the IPHC concluded that the EBS shelf survey, along with periodic IPHC survey calibrations, provided an adequate accounting of Pacific halibut biomass on the EBS shelf (Clark and Hare 2007) and is a useful tool for constructing a population-density index for the IPHC stock assessment (Webster 2014). The 2006 study was repeated in 2015 and confirmed the earlier finding (IPHC-2016-RARA-26-R). Based on this information, the EBS shelf survey would be an appropriate index of halibut abundance in the Bering Sea.

1.6.1.4 Availability of halibut data

Annual survey data are available each year in the fall with the exception of 2020 and are used to prepare groundfish stock assessments. Therefore, the most recent EBS shelf survey data would be available each fall for use as an index for the informing the Amendment 80 PSC limit in regulation.[9]

1.6.1.5 Halibut Abundance data from survey

The IPHC used the shelf survey to estimate total Pacific halibut abundance in the EBS at 66 million fish in 2016, slightly higher than in 2015. As shown in Figure 1-5 and Table 1-4, estimated abundance declined between 4% and 22% annually beginning in 2006 from a high of 133.4 million halibut down to

[9] EBS surveys were cancelled in 2020 due to the Covid-19 pandemic crisis. See Section 2.6 for further discussion of future planning for PSC limit determination in the event that future surveys are not able to be conducted or conducted at a reduced effort.

around 70 million halibut in 2019. The biomass estimates have steadily declined since the 2010 peak of over 195 thousand mt down to just under 114 thousand mt in 2019.

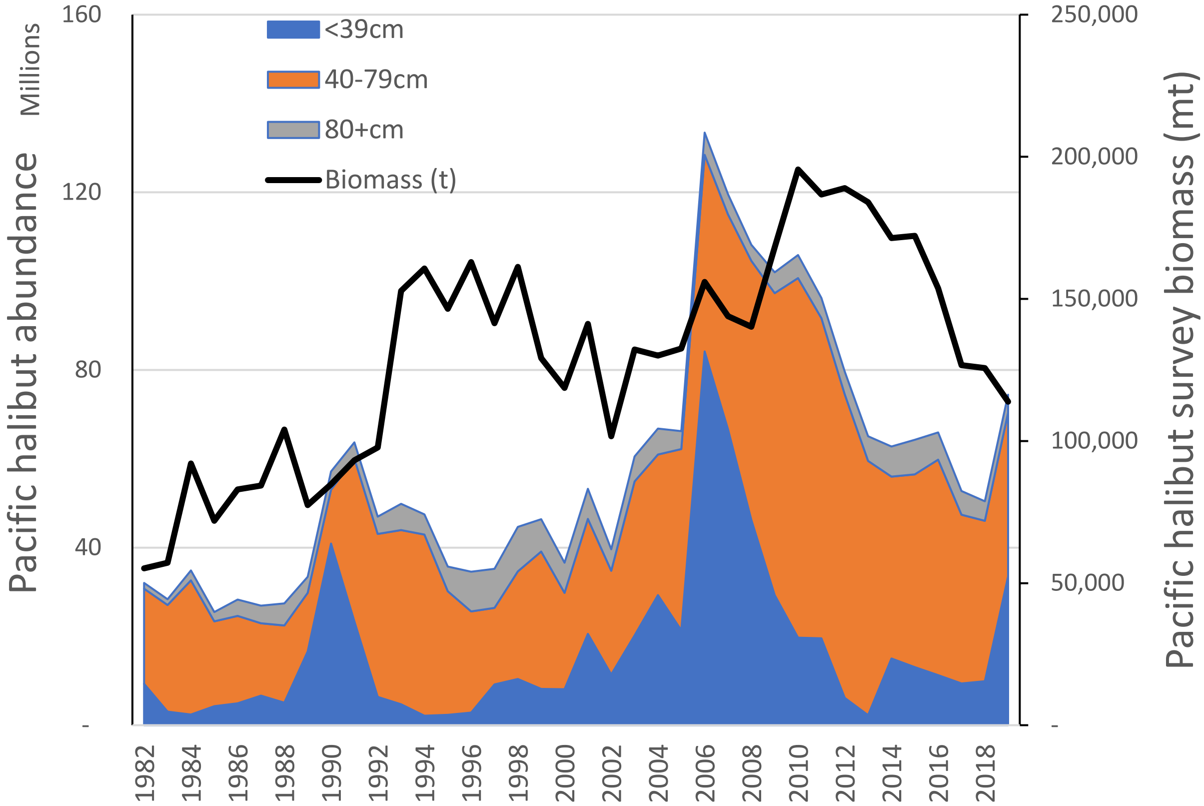


Figure 1-5 Estimated abundance (numbers of Pacific halibut) by length category, total biomass (mt) as estimated by the EBS bottom trawl survey data, 1982-2019. The trawl survey index was the area-swept biomass (catch-per-unit-effort multiplied by stratum area) estimated for the EBS by the annual NMFS EBS shelf trawl survey during 1998–2019. These include all the standard core area strata (Table 1-4), but not the northwest area strata.

Table 1-4 Estimated trawl survey index (mt) for the year 1998–2021 (note no survey was conducted in 2020)

Year	Trawl Index	Year	Trawl Index
1998	161,256	2010	195,535
1999	129,116	2011	186,666
2000	118,677	2012	189,000
2001	141,219	2013	183,989
2002	101,706	2014	171,427
2003	132,151	2015	172,237
2004	130,075	2016	153,704
2005	132,518	2017	126,684
2006	155,964	2018	125,957
2007	143,903	2019	113,855
2008	140,247	2020	---------
2009	168,102	2021	131,416

1.6.2 IPHC Standardized Coastwide fishery independent setline survey (FISS)

The IPHC's annual fishery independent setline survey (FISS) survey, referred to as the setline survey in this document, is the most important and comprehensive data input to the annual Pacific halibut stock assessment.

1.6.2.1 Survey Objective

The primary objective of the IPHC setline survey is to sample Pacific halibut for stock assessment and stock distribution estimation. Other objectives include tagging of halibut, collection of environmental data, collecting data from other species, and recording observations of seabirds.

1.6.2.2 Technical design

In the past, the survey typically chartered 12 to 14 fishing vessels during the summer months to survey more than 1,300 stations on a 10 nautical mile (nm) by 10 nm grid in nearshore and offshore waters of southern Oregon, Washington, British Columbia, southeast Alaska, the central and western Gulf of Alaska, Aleutian Islands, and northern Bering Sea (Henry et al 2017). Depths surveyed typically ranged from 20–275 fathoms (37–503 meters [m]) but shallower stations from 10–20 fathoms (18–37 m) and deeper stations up to 400 fathoms (732 m) were surveyed in recent years as part of expansion studies. Now that those expansion studies are complete, the entire depth range from 10–400 fathoms (18–732 m) and IPHC convention area is part of the survey design and includes 1,890 stations on a 10-nm grid from California to the Bering Sea shelf edge. IPHC is currently considering sampling design options that include: 1) a full sampling of the 1,890 station design; 2) complete randomized sampling of stations within each IPHC Regulatory Area; 3) randomized cluster sampling in which clusters of stations are selected to make an operationally efficient fishing day; and 4) subarea sampling in which IPHC Regulatory Areas are divided into non-overlapping subareas and all stations within a selection of the subareas are sampled. The latter two options are examples that will meet the primary sampling objectives while also considering logistics and cost. Webster (2020) provides further details of the IPHC setline survey.

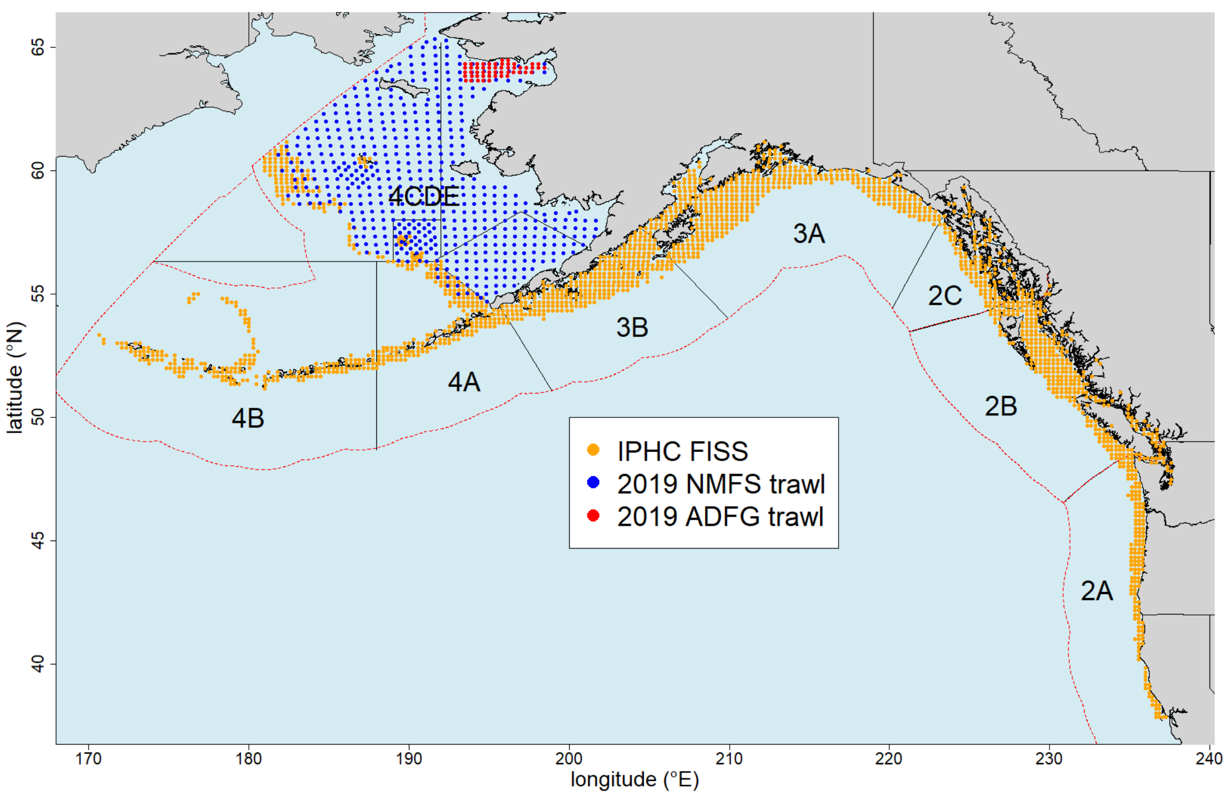


Figure 1-6 Map of the full 1890 station FISS design, with orange circles representing stations available for inclusion in annual sampling designs, and other colors representing trawl stations from 2019 NMFS and ADFG surveys used to provide complementary data for Bering Sea modelling. From Webster (2020).

The IPHC setline survey has evolved since 1993 with the addition of stations and the calibration with other surveys to utilize as much information as possible to estimate the abundance of Pacific halibut within the IPHC Convention Area. Prior to 1997, the survey had less coverage, but data are available for many Regulatory Areas (Stewart & Monahan 2016). The expansions from 2014–2019 added a considerable amount of information for the edges of the stock distribution, including calibrations with other surveys in the Bering Sea (e.g., the EBS shelf trawl survey). In 2020, the IPHC setline survey sampled all stations in the core areas of the Pacific halibut stock (Areas 3A and 2C as well as the northern portion of area 2B). However, reduced survey effort was completed in the eastern half of Area 3B and other regulatory areas were omitted, including the EBS/AI areas (Figure 1-7).

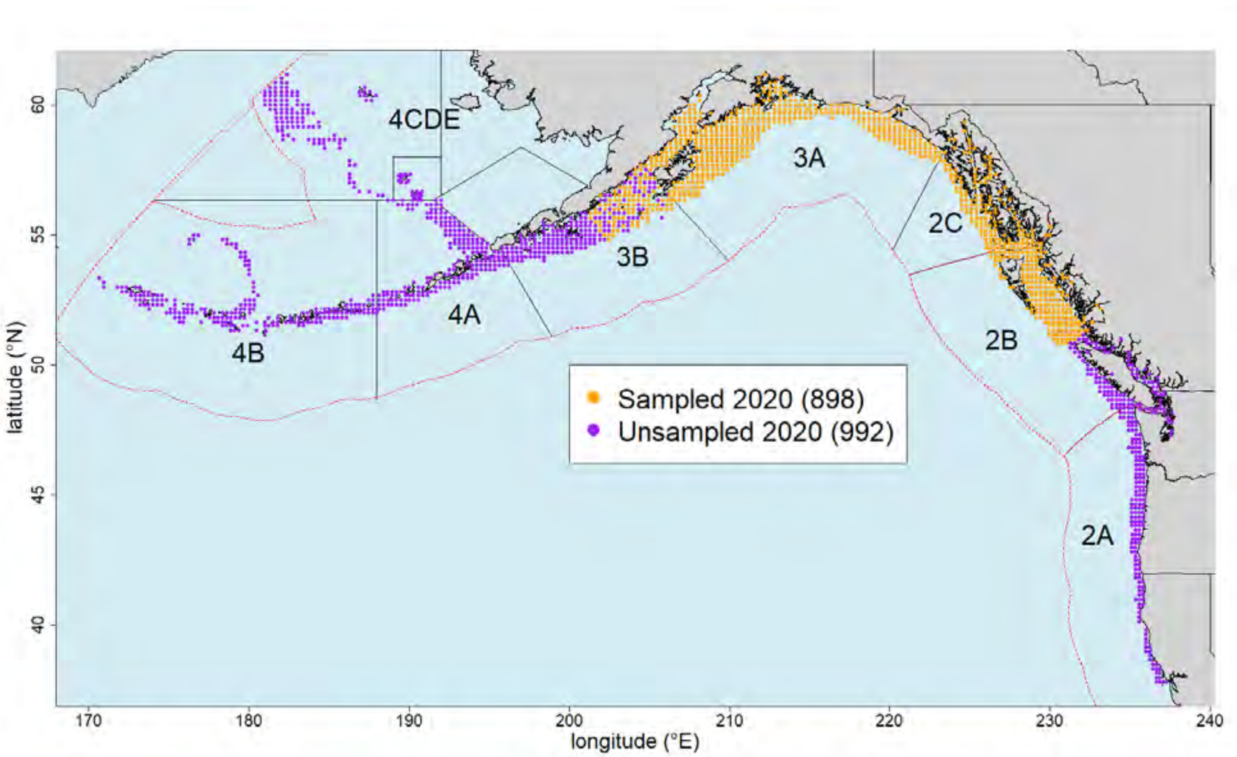


Figure 1-7 Map of the implemented 2020 FISS design, with orange circles representing those stations to be fished in 2020, and purple circles representing stations from the survey design that were not fished in 2020. From Webster (2020).

1.6.2.3 Sampling and analysis of IPHC setline survey (FISS) data

The fishing gear used in the setline survey generally catches halibut that are O26, similar to what is encountered in the directed fishery. Typically, five to seven skates (where each skate is typically 100 fathoms units of leaded groundline) of baited 16/0 hooks are fished where the number of skates may increase or decrease in each year depending on the expected encounter rate with Pacific halibut. The other specifications for gear, setting schedule, and soak time have remained consistent since 1998 (Henry et al 2017). A set is considered ineffective for stock assessment if predetermined limits for lost gear, depredation, or displacement from station coordinates are exceeded.

Pacific halibut observations are recorded by IPHC sea samplers on the vessel. The fork lengths of all Pacific halibut are recorded to the nearest centimeter. Each length is converted to an estimated weight using a standard formula (Clark 1992), and these weights were then used to generate the weight per unit effort (WPUE) data. However, starting in 2019, weights are directly observed during the sampling process. Average O32 WPUE, expressed as net pounds per skate, is calculated by dividing the estimated catch in pounds (net weight) of Pacific halibut equal to or over 32 inches (81.3 cm; O32 Pacific halibut) in length by the number of skates hauled for each station. The sex, state of maturity, prior hook injuries, and depredation are also recorded. Otoliths are collected from a subsample of O32 and U32 halibut.

The setline survey data are analyzed to estimate the coastwide numbers-per-unit-effort (NPUE) and WPUE of O32 halibut and all halibut caught (Total). In 2016, an improved approach (spatio-temporal modeling) was used to estimate density indices (Webster 2017). This space-time model improves estimation by fitting models to the data that account for spatial and temporal dependence, making use of the degree to which the halibut distribution is patchy (has regions of high and low density), and that those patches tend to persist with time. For example, if WPUE is high at a particular location it is more likely to be high at nearby locations, and at the same location in previous and subsequent years. Therefore, information about density at a location and time from a direct observation is also informed by information recorded nearby in space and time. Similarly, such an approach also allows estimation of a density index at a location with no data (e.g., a location between stations, a station with an ineffective set, or a region not surveyed annually). Additionally, auxiliary information collected on the survey (such as station depth) can provide further improvements.

The IPHC annual setline survey does not directly sample stations on the EBS flats (Figure 1-7), except for those around St. Matthew Island and the Pribilof Islands. Instead, data from annual NMFS trawl surveys, calibrated to the 2006 and 2015 IPHC setline surveys in the EBS (Webster et al. 2016), are integrated into the space-time analysis. The annual NMFS EBS shelf trawl survey is used in conjunction with the NMFS/ADFG surveys of Norton Sound (Soong and Hamazaki 2012) to develop an estimate of the density of Pacific halibut in the Bering Sea (see Webster 2014 for details). The EBS shelf trawl survey is calibrated to the setline survey selectivity before it is incorporated into the calculation of the setline survey indices. Therefore, the setline survey does not index smaller halibut (mostly U26). Additionally, data from the NMFS sablefish longline survey have been used to index deep water (>275 fathoms, 503 m) on the Area 4D edge, but are no longer needed with the expanded survey design.

The WPUE and NPUE are standardized to account for hook competition (competition for baits among Pacific halibut and other species) and timing of the survey relative to the total harvest of Pacific halibut. The hook competition adjustment will increase the raw WPUE or NPUE at an individual station slightly with more competition (fewer baits returned) and is applied before the space-time model to account for variability in the standardization among stations. The standardization to account for the amount of harvest taken before the setline survey uses target harvest rates for each IPHC Regulatory Area (See Section 5.4.1) and is done for each IPHC Regulatory Area instead of individual stations.

1.6.2.4 Availability of halibut data

The IPHC setline survey is typically completed in late summer and preliminary results are presented at the IPHC interim meeting in late November, although results may be available before then. It is possible that some minor changes due to data quality control and data checking may occur before the IPHC Annual Meeting in January, but these are not likely to be substantial. WPUE for all years 1993 to current are available for O32 and Total WPUE. Therefore, Total WPUE is used throughout this report since it is most congruent with the IPHC's concept of TCEY (O26 halibut) (See Section 4.4.1) and contains all of the information collected from the IPHC setline survey.

1.6.2.5 IPHC setline survey Pacific halibut abundance in the BSAI

The space-time model provides WPUE and NPUE for each IPHC Regulatory Area, with Area 4CDE combined into a single area. The IPHC Regulatory Areas can be summed together after weighting by bottom area of suitable habitat for Pacific halibut. Space-time model results of Total WPUE for IPHC Regulatory Areas 4A, 4B, and 4CDE are shown in Table 1-5 and Figure 1-8 along with an appropriately combined Total WPUE for all three areas (4ABCDE). The correlation between all of these index time-series is high.

The space-time model uses all years of data to inform the estimated WPUE in each year by estimating spatial and temporal correlations. This has two important outcomes. First, an additional year of observations will result in changes to the entire time-series, with the greatest change occurring to nearby years. For example, the addition of 2019 data slightly changed the index in 2018 as estimated from the previous year when 2019 data were not yet sampled (note this resulted in a 1.21% change from the previous calculated 2018 value). Second, the estimation of spatial and temporal correlation allows for the estimation of stations that were not sampled in a specific year (i.e., uses information from nearby stations that have observations in nearby years). This optimized use of the information from the sampled data reduces uncertainty and allows for the estimation of a consistent time-series over all years. Additionally, estimates of the WPUE can still be produced for areas that were not sampled in a particular year, with appropriate estimated uncertainty. This is particularly important for 2020 with the reduced survey in response to the COVID-19 pandemic crisis. The BSAI region was not surveyed by the IPHC or NMFS surveys (Figure 1-7), but the space-time approach is still able to produce an estimate for the area, with an increased uncertainty, using the observations from previous years and the stations outside of the BSAI that are sampled in 2020. Therefore, even though the BSAI was not sampled in 2020, an estimate from the setline survey for use as an abundance-based management (ABM) index is available, but additional years without data will further increase uncertainty and reduce precision in the predictions.

Table 1-5 IPHC fishery independent setline survey for Area 4 (all regions) 1998-2021. The index value represents the calculated weight-per-unit-effort index (WPUE) for all sizes of Pacific halibut[10].

Year	Index 4ABCDE WPUE
1998	18,254
1999	16,069
2000	15,859
2001	13,538
2002	12,025
2003	10,988
2004	10,366
2005	10,182
2006	10,472
2007	10,481
2008	11,081
2009	10,338
2010	9,725
2011	9,340
2012	8,858
2013	8,514
2014	8,457
2015	8,638
2016	8,469
2017	7,819
2018	7,550
2019	7,227
2020	7,134
2021	6,955

[10] For more information on calculation and units see https://iphc.int/uploads/pdf/im/im097/iphc-2021-im097-inf05.pdf)

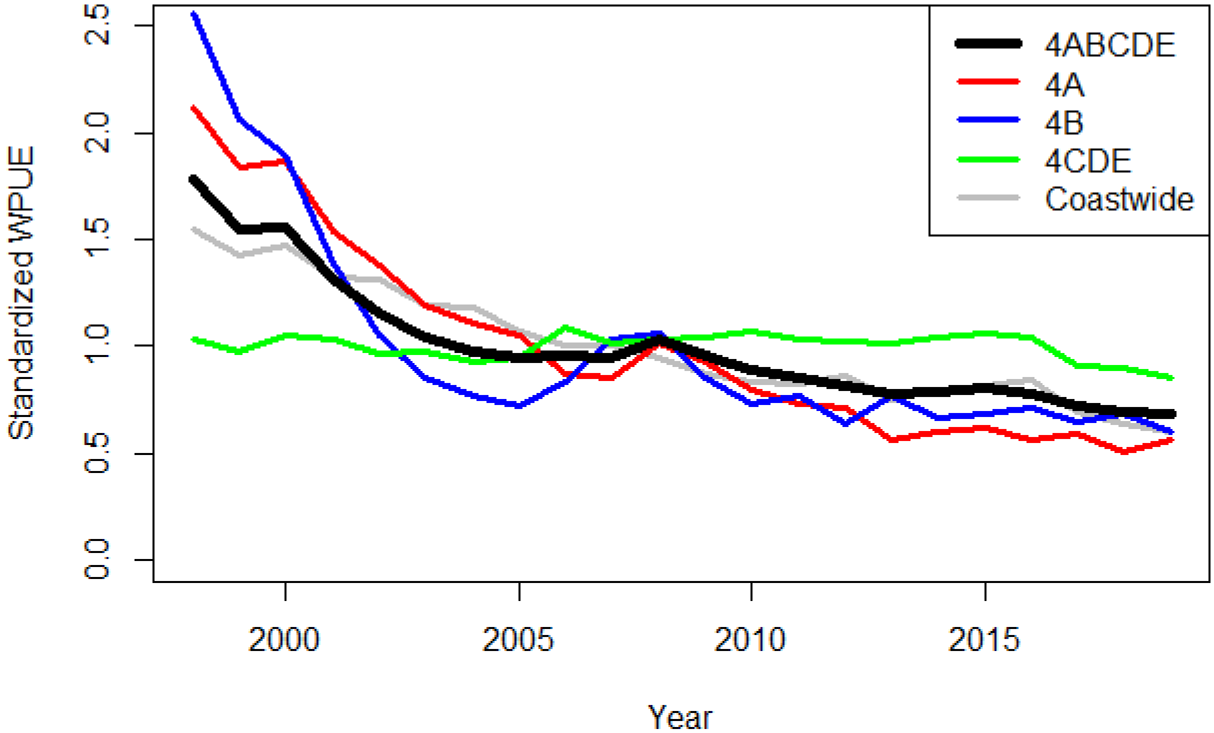


Figure 1-8 WPUE all Pacific halibut (Total) for IPHC Regulatory Areas in Area 4 standardized to the mean of the time series (1998-2019) for each Area. Area 4ABCDE is the sum of Areas 4A, 4B, and 4CDE, and Coastwide is all IPHC Regulatory Areas summed. Summed indices are appropriately weighted by bottom area. These estimates do not include 2020 data.

2 Description of Alternatives

NEPA requires that an EIS analyze a reasonable range of alternatives consistent with the purpose and need for the proposed action. The action alternatives (Alternatives 2-5) in this chapter were designed to accomplish the stated purpose and need for the action. All of the action alternatives were designed to link the PSC limit to halibut abundance for the Amendment 80 (also referred to A80 throughout) sector;[11] other sector PSC limits for BSAI halibut are unaffected. The current halibut PSC limit for the Amendment 80 sector is established in the BSAI Groundfish FMP. Changing the PSC limit for the Amendment 80 sector (under Alternatives 2, 3 4, and 5) requires amendments to both the FMP and federal regulations.

There are five alternatives that were under consideration by the Council. While the Council has considered a variety of options and approaches during the scoping and development of this issue (2016-2020; see further discussion in Section 2.8), in October 2020, the Council identified three action alternatives that variously index the halibut PSC limit for the Amendment 80 sector to BSAI halibut abundance using "look up" tables (Table 2-1 though Table 2-3). **The fifth alternative, which falls within the range of the other three action alternatives, is the Council's Preferred Alternative (PA) identified at final action in December 2021.**

For Alternatives 2 through 5, PSC limits would be determined annually by referencing the most recent survey abundance values to a "look up" table. Each "look up" table is a matrix containing a selection of unique PSC limit values that each correspond to an EBS shelf trawl survey state (high or low) and to an IPHC setline survey state (high, medium, and low for Alternative 2 and high, medium, low, and very low for Alternatives 3, 4, and 5). The Alternatives differ from each other with different PSC limit values associated with each pair of EBS shelf trawl survey and IPHC setline survey states.

The Council also adopted three options, applicable under any of Alternatives 2 through 5, which could affect how the PSC limits would be calculated. Option 1 would use the three-year rolling average of the survey estimate instead of the most recent year available for the "look up" table. Option 2 would be applied in the first year of implementation only to reduce the variability of the initial PSC limit change. Option 3 provides an additional threshold level below the PSC limit to increase the incentive to reduce bycatch to the extent practicable. **The Council did not select any of the options to be included in the PA.** The alternatives and options are discussed in more detail in the subsections that follow.

Alternative 1: No action. BSAI halibut PSC limit for the Amendment 80 sector remains at 1,745 mt.
Alternative 2: A 3X2 look up table with PSC limits that range from the current PSC limit to 20% below that limit. The PSC limit is determined annually based on the most recent survey values.

Table 2-1 Alternative 2: 3x2 look up table to determine PSC limits based on survey states, with PSC limits that range from current PSC limit to 20% below current limit.

		EBS shelf trawl survey index (mt)	
		Low < 150,000	High ≥ 150,000
IPHC setline survey index in Area 4ABCDE (WPUE)	High ≥ 11,000	1,571 mt (10% below current)	1,745 mt (current limit)
	Medium 8,000 – 10,999	1,483 mt (15% below current)	1,571 mt (10% below current)
	Low < 8,000	1,396 mt (20% below current)	1,483 mt (15% below current)

[11] See Section 3.3 for a description of the Amendment 80 sector.

Alternative 3: A 4X2 look up table with PSC limits that range from 15% above the current PSC limit to 30% below that limit. The PSC limit is determined annually based on the most recent survey values.

Table 2-2 Alternative 3: 4x2 look up table to determine PSC limits based on survey states, with PSC limits that range from 15% above current PSC limit to 30% below current limit.

		EBS shelf trawl survey index (mt)	
		Low < 150,000	High ≥ 150,000
IPHC setline survey index in Area 4ABCDE (WPUE)	High ≥ 11,000	1,745 mt (current limit)	2,007 mt (15% above current)
	Medium 8,000 – 10,999	1,396 mt (20% below current)	1,745 mt (current limit)
	Low 6,000-7,999	1,309 mt (25% below current)	1,396 mt (20% below current)
	Very Low < 6,000	1,222 mt (30% below current)	1,309 mt (25% below current)

Alternative 4: A 4X2 look up table to determine PSC limits based on survey states, with PSC limits that range from the current PSC limit to 45% below that limit.

Table 2-3 Alternative 4: 4x2 Look up table to determine PSC limits based on survey states, with PSC limits that range from current PSC limit to 45% below current limit.

		EBS shelf trawl survey index (mt)	
		Low **< 150,000**	**High** **≥ 150,000**
IPHC setline survey index in Area 4ABCDE (WPUE)	**High** **≥ 11,000**	1,396 mt (20% below current)	1,745 mt (current limit)
	Medium **8,000 – 10,999**	1,222 mt (30% below current)	1,396 mt (20% below current)
	Low **6,000-7,999**	1,047 mt (40% below current)	1,222 mt (30% below current)
	Very Low **< 6,000**	960 mt (45% below current)	1,047 mt (40% below current)

Alternative 5 (Preferred Alternative): A 4X2 look up table to determine PSC limits based on survey states, with PSC limits that range from the current PSC limit to 35% below that limit.

Table 2-4 Alternative 5: 4x2 Look up table to determine PSC limits based on survey states, with PSC limits that range from current PSC limit to 35% below current limit.

		EBS shelf trawl survey index (t)	
		Low **< 150,000**	**High** **≥ 150,000**
IPHC setline survey index in Area 4ABCDE (WPUE)	**High** **≥ 11,000**	1,745 mt (current limit)	1,745 mt (current limit)
	Medium **8,000 – 10,999**	1,396 mt (20% below current)	1,571 mt (10% below current)
	Low **6,000-7,999**	1,309 mt (25% below current)	1,396 mt (20% below current)
	Very Low **< 6,000**	1,134 mt (35% below current)	1,134 mt (35% below current)

2.1 Alternative 1, No Action

Under the No Action alternative, the BSAI PSC limits that are set in the FMP and in regulation as an amount of halibut equivalent to 3,515 mt of halibut mortality would remain unchanged. Within that total, the BSAI PSC limit for the Amendment 80 sector is set in the FMP and in regulation as an amount of halibut mortality equivalent to 1,745 mt (implemented at that level in 2016). The Amendment 80 trawl PSC limit is specifically allocated among the Amendment 80 cooperative(s) and the Amendment 80 limited access sector; however the Amendment 80 sector is currently comprised of a single cooperative, the Alaska Seafood Cooperative (AKSC), and there is currently no limited access participation. All vessels fishing in the sector must stop fishing for the remainder of the year when the annual PSC limit is reached. Table 2-5 provides data on halibut PSC mortality usage in the Amendment 80 sector from 2010 through 2020.

Table 2-5 Halibut PSC limit, encounters, and mortality by Amendment 80 sector, 2010 through 2020

A80 Sector	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PSC limit	2,425	2,375	2,325	2,325	2,325	2,325	1,745	1,745	1,745	1,745	1,745
Halibut encounters	2,823	2,277	2,469	2,677	2,667	2,200	1,965	1,976	2,555	3,067	2,031
Halibut mortality	2,254	1,810	1,944	2,166	2,178	1,638	1,412	1,167	1,343	1,461	1,097

Note: Halibut PSC that occurs on an A80 vessel due to harvest in the CDQ fishery is not included in this table.

2.2 Alternatives 2 through 4: Set PSC Limit for Amendment 80 based on Abundance of BSAI halibut according to tables employing levels of both the EBS trawl and the IPHC Setline Survey

Under Alternatives 2 through 4[12], the Amendment 80 sector halibut PSC limit would be prescribed annually based on look up tables. The PSC limit (mt of halibut mortality) would be based on the independent values of two survey abundance indices: the EBS shelf trawl survey index (mt) and the IPHC setline survey index in Area 4ABCDE (WPUE).

[12] See Section 2.4 for the Description of and Rationale for Alternative 5 (Preferred Alternative) which is encompassed within the range of the Look up table construction, breakpoints and values within Alternatives 2 through 4.

The look up tables, which are different for each alternative, determine the Amendment 80 sector PSC limit based on the intercept of the two survey index values. Each alternative defines the same two states for the EBS shelf trawl survey (“low” or “high”) but differ by defining either three (“low/medium/high”) or four (plus “very low”) states for the IPHC survey. Figure 2-1 shows the historical EBS shelf trawl survey biomass estimates with the delineation of low and high (below or above 150,000 mt) as indicated in Alternatives 2-4.[13] Figure 2-2 shows the biomass estimates for the IPHC Setline Survey historically with delineations for the ranges of states as indicated in Alternatives 2-4 (Very Low: <6,000, Low: 6,000-7,999, Medium: 8,000-10,999 and High: ≥11,000, note the Very Low state does not apply to Alternative 2, in which the Low state includes the range other alternatives call Very Low). The breakpoints employed in these look up tables were determined by visual inspection of relative trends in the survey indices. Under all three of these Alternatives, the survey data for determining the appropriate ‘state’ under any of the look up tables would occur in the Fall of the preceding year (see Figure 2-3), to determine the appropriate PSC limit in the subsequent year.

[13] Note this and the following figure also illustrate survey values using the three-year rolling average as proposed under Option 1.

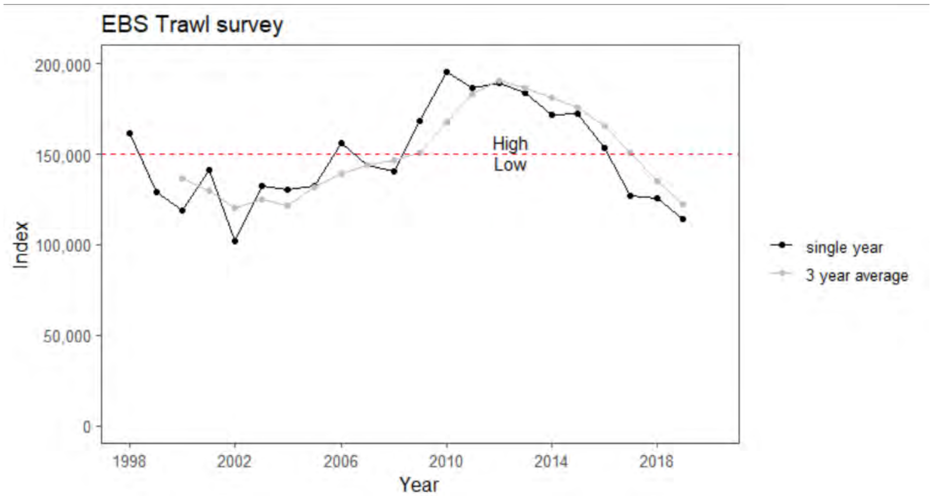


Figure 2-1 **Historical values of the EBS shelf trawl survey (mt) 1998 – 2019 for single point value in that year (black line and points) or Option 1's rolling three year average (grey).**

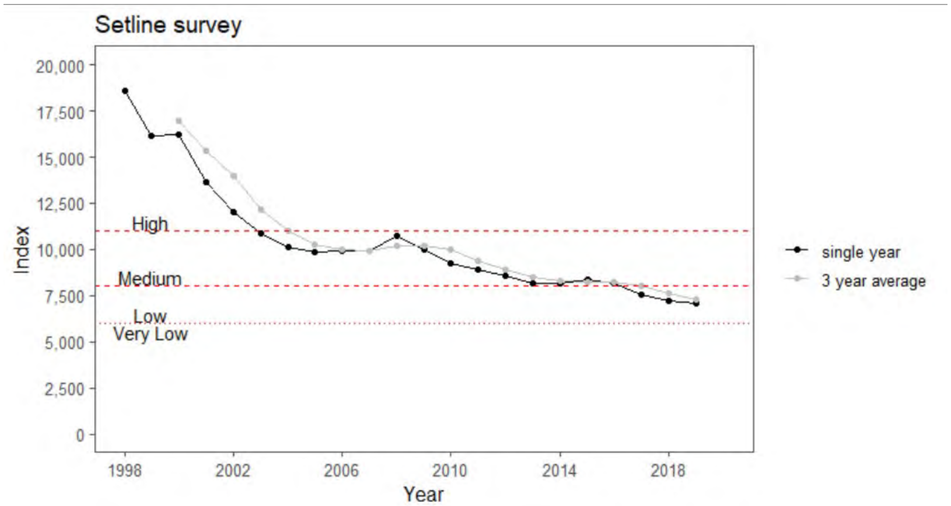


Figure 2-2 **Historical values of the IPHC setline survey (WPUE) 1998 – 2019 for single point value in that year (black line and points) or Option 1's rolling three year average (grey).**

Year of survey	Setline Index	State	Trawl Index	State	Year PSC limit set	Lookup tables		
Alternative		2,3,4		2, 3, 4	Alternative	2	3	4
2015	8,385	Medium	172,237	High	2016	1571	1745	1396
2016	8,134	Medium	153,704	High	2017	1571	1745	1396
2017	7,583	Low	126,684	Low	2018	1396	1309	1047
2018	7,228	Low	125,957	Low	2019	1396	1309	1047
2019	7,104	Low	113,855	Low	2020	1396	1309	1047

Figure 2-3 **Schematic for understanding the timing of survey availability and resulting PSC limit setting as shown in Table 2-5**

Table 2-6 contains the historical values for both surveys (1998 through 2019), their resulting state in that year as defined under the alternatives, and what the Amendment 80 PSC limit would have been in each historical year had the PSC limits been calculated under those survey states.

Table 2-6 Historical survey values for IPHC Setline index (WPUE), EBS Trawl (mt) and resulting PSC limit 'States" for each based on Alternatives 2 – 4 (left panel) (High/Medium/Low/Very Low). Note that current survey values for setline have not reached the established 'very low' level as specified under Alternatives 3 and 4. Back-calculated PSC limits based on Alternatives 2-4 are shown (right panel). Note that the year of PSC limit is lagged one year from the survey year as the determination of survey value is made in the year prior to implementation of the PSC limit.

	Setline		Trawl			PSC Limits from Look up tables		
Survey year	Index	State	Index	State	PSC Limit year	Alt 2	Alt 3	Alt 4
1998	18,577	High	161,256	High	1999	1745	2007	1745
1999	16,155	High	129,116	Low	2000	1571	1745	1396
2000	16,207	High	118,677	Low	2001	1571	1745	1396
2001	13,681	High	141,219	Low	2002	1571	1745	1396
2002	12,037	High	101,706	Low	2003	1571	1745	1396
2003	10,862	Medium	132,151	Low	2004	1483	1396	1222
2004	10,128	Medium	130,075	Low	2005	1483	1396	1222
2005	9,856	Medium	132,518	Low	2006	1483	1396	1222
2006	9,932	Medium	155,964	High	2007	1571	1745	1396
2007	9,922	Medium	143,903	Low	2008	1483	1396	1222
2008	10,714	Medium	140,247	Low	2009	1483	1396	1222
2009	9,989	Medium	168,102	High	2010	1571	1745	1396
2010	9,271	Medium	195,535	High	2011	1571	1745	1396
2011	8,896	Medium	186,666	High	2012	1571	1745	1396
2012	8,539	Medium	189,000	High	2013	1571	1745	1396
2013	8,133	Medium	183,989	High	2014	1571	1745	1396
2014	8,173	Medium	171,427	High	2015	1571	1745	1396
2015	8,385	Medium	172,237	High	2016	1571	1745	1396
2016	8,134	Medium	153,704	High	2017	1571	1745	1396
2017	7,583	Low	126,684	Low	2018	1396	1309	1047
2018	7,228	Low	125,957	Low	2019	1396	1309	1047
2019	7,104	Low	113,855	Low	2020	1396	1309	1047

2.3 Options that could apply to Alternatives

There were three options considered. Selection of these options is not mandatory. The options are not mutually exclusive. However, the Council did not select any of these Options for its Preferred Alternative.

2.3.1 Option 1: Rolling survey average to determine PSC limits

PSC limit is determined using a 3-year rolling average of survey index values instead of the most recent survey value.

This option would be used to smooth inter-annual variability in the PSC limit based on changes in the survey index from one year to the next using the most recent three years of survey data available. Without this option, the most recent survey year value would determine the survey state for PSC setting in the subsequent year.

2.3.2 Option 2: PSC variability

In the first year of implementation, the PSC limit varies no more than (i: 10% or ii: 15%) from the status quo limit (1,745 mt)

Under Option 2, the Sub-option, or percentage of PSC limit, selected constrains the determination of the new PSC limit in the first year of implementation after it is calculated using the Alternative's look up table. The purpose of this option is to reduce the initial inter-annual variability in the PSC limit in the first year of implementation. Regardless of the PSC limit determined from the look up table, the PSC limit in the first year of implementation must fall within the range 1,483 to 2,006 (representing a variability of +/- maximum 15% change from status quo 1,745 mt).

2.3.3 Option 3: Annual limit

Establish an annual limit of (i: 80% or ii: 90%) of the PSC limit generated by the look up table. In 3 of 7 years, the A80 sector may exceed the annual limit up to the PSC limit generated by the look up table. If the A80 sector has exceeded the annual limit in 3 of the past 7 years, then the annual limit is a hard cap for the following year.

The purpose of the annual limit (80-90% of the PSC limit generated from the action Alternatives look up tables) is to incentivize the Amendment 80 sector to achieve halibut bycatch mortality levels that are lower than the look up table PSC limit at all times. As such, the Amendment 80 sector would be permitted to incur an amount of halibut PSC mortality that is above the annual limit but below the PSC limit generated by the look up table in 3 of any 7 consecutive years, as assessed on a rolling 7-year timeline. If the Amendment 80 sector exceeds the annual limit in 3 of 7 years, then the annual limit proportion of the PSC limit generated by the look up table is a hard cap the following year.

In any given year, the Amendment 80 sector's PSC mortality would be assessed against the annual limit to determine whether it has been exceeded. Next, the result from that year plus the results for the six preceding years would be assessed in total to determine whether the annual limit was exceeded in 3 of 7 years. If so, the annual limit would become a hard limit in the following year. This process is triggered only following a year where PSC mortality exceeds the annual limit. Therefore, in years where the annual limit was not exceeded, the mortality in the previous 6 years is irrelevant. The sector does not remain under a hard cap each subsequent year until the sector is out of the 3 in 7 trigger, however if the next time it is exceeded is within that trigger time frame, the subsequent year would again trigger a hard cap set at the level of the annual limit. It is therefore possible historically to have more than 3 times in a 7-year period in which the annual limit is exceeded. The intent of this option, although not selected by the Council at final action, would have been to not retain the annual limit as a hard cap in subsequent years and would only have been triggered again if, in the following year, an annual limit[14] was exceeded. It would have been therefore impossible to have the annual limit imposed as a hard cap two years in a row.

Table 2-7 provides a hypothetical series of incidences whereby the annual limit is exceeded in a number of years and a hard cap is imposed for the following year. The annual limit is imposed as a hard cap (shown in red text) only in a year where: 1) the previous year exceeded the annual limit and 2) the years over the limit is 3 or more in the last 7 (shown by grey shaded cells). In this example the annual limit is exceeded for the third time within 7 years in 2025 (after the annual limit was exceeded in 2021 and 2024). Thus, in 2026 annual limit level is imposed as a PSC limit. Because the sector will be shut down if it reaches the hard cap, 2026 is automatically a year in which the annual limit is not exceeded. Therefore, in 2027 operations resume under both an annual limit and a PSC limit. However, in 2028 the annual limit is again exceeded, imposing a hard cap (at the annual limit level) in 2029. This occurs because 2028 is the third time within the rolling 7-year period (2022 through 2028) in which the annual limit was exceeded. Operations would return in 2030 to being prosecuted under an annual limit that is not binding.

[14] For consistency with regulations at § 679.21(f)(6) if this option had been selected as part of the Preferred Alternative (PA) the Council would have likely to redefined the term "annual limit" as "annual threshold."

Table 2-7 Hypothetical synopsis of application of annual limit under Option 3 and the interplay between when it is imposed as a hard cap and for how long. A year specified as bold is prosecuted under a hard cap in that year.

Year	Annual Limit exceeded	Annual Limit imposed as a Hard cap	Years Over Limit
2021	Y	N	1 of 1
2022	N	N	1 of 2
2023	N	N	1 of 3
2024	Y	N	2 of 4
2025	Y	N	3 of 5
2026	NA	Y	3 of 6
2027	N	N	3 of 7
2028	Y	N	3 of 7
2029	NA	Y	3 of 7
2030	N	N	3 of 7

There may be unintended negative incentives to avoid bycatch in situations where the annual limit is close to or likely to be exceeded under this option. Additional mechanisms could be considered to incentivize continuing to reduce bycatch even if the annual limit is being approached or exceeded. As currently structured, once the annual limit is exceeded in a given year, the incentive to continue to reduce bycatch within that year is negligible until the PSC limit itself is being approached. Similarly, bycatch that remains below the annual limit is acceptable even if the annual limit is narrowly approached (e.g. 1 mt below is still counted as a 'below' year therefore the incentive to remain substantially below the annual limit may be weak). Some additional mechanisms to provide for continued PSC mortality reduction under these circumstances could be considered in conjunction with the structure of Option 3, such as evaluating whether or not an overage occurs on a rolling multi-year basis rather than only within a single year to determine a closure. Under that circumstance, PSC mortality would be assessed based on a rolling number of years to determine if the annual limit is exceeded rather than only based upon the within year PSC mortality. In that case, the overall PSC mortality in any one year remains relevant to bycatch avoidance actions that could impact the following year and provide incentive to continue to reduce bycatch to the extent practicable under any situation of single year overage.

2.4 Preferred Alternative 5 and Council Rationale for Recommending the Preferred Alternative

The Council's recommended Preferred Alternative (Alternative 5) bases the determination of the annual PSC limit on the most recent survey values for the IPHC setline survey and the EBS shelf trawl survey using the look-up table. The two abundance indices (measures of the survey estimate of halibut either in metric tons (NMFS AFSC survey) or population-density as measures by weight per unit effort (IPHC survey)) will be used to track halibut abundance and to guide setting the PSC limit for the Amendment 80 sector. The selected indices are based on the NMFS Alaska Fisheries Science Center (AFSC) EBS shelf bottom trawl survey and the IPHC setline survey covering IPHC Areas 4ABCDE. Both indices represent the best available scientific information.

Table 2-8 Alternative 5: 4x2 Look up table to determine PSC limits based on survey states, with PSC limits that range from current PSC limit to 35% below current limit.

		EBS shelf trawl survey index (t)	
		Low < 150,000	High ≥ 150,000
IPHC setline survey index in Area 4ABCDE (WPUE)	High ≥ 11,000	1,745 mt (current limit)	1,745 mt (current limit)
	Medium 8,000 – 10,999	1,396 mt (20% below current)	1,571 mt (10% below current)
	Low 6,000-7,999	1,309 mt (25% below current)	1,396 mt (20% below current)
	Very Low < 6,000	1,134 mt (35% below current)	1,134 mt (35% below current)

The Preferred Alternative reflects the Council's efforts to balance several factors when establishing PSC limits, including the likely impacts on the halibut stock and affected participants in the Amendment 80 and directed halibut fisheries. The Preferred Alternative would specify halibut PSC limits that range from 10% above the current Amendment 80 halibut PSC limit to 35% below the current limit. This is within the range of halibut PSC limits considered for this action, which range from 15% above the current limit to 45% below the current limit. The Council has acknowledged that halibut is fully utilized in the BSAI and at low and very low index states, mortality from PSC should be reduced in response to lower amounts of halibut available among harvest for all users. Under those low and very low conditions, reduction in mortality from PSC is likely to prevent halibut PSC from becoming a larger proportion of total removals in the BSAI, consistent with the Council's purpose and need statement.

The Preferred Alternative balances the interests of the two largest halibut user groups in the BSAI, the directed commercial halibut fishery and the Amendment 80 sector, by establishing abundance-based halibut PSC limits for the Amendment 80 sector. This abundance-based approach is like the management approach for the directed commercial halibut fisheries off Alaska, which establishes annual catch limits that vary with established measures of halibut abundance.

The Council considered that halibut encounters in the Amendment 80 fishery may not always be positively correlated with these indices. The Amendment 80 sector has expressed concern about this potentially weak positive correlation and the potential impacts that may have on their ability to avoid halibut and reduce halibut mortality. The degree of this correlation, or lack thereof, is unknown. There is, however, an imbalance among users and greater conservation of the halibut resource is warranted and required. The Council and NMFS believe that linking Amendment 80 halibut PSC limits to halibut abundance levels as proposed in this rule will ensure that halibut PSC in Amendment 80 fisheries does not become a greater share of overall halibut removals in the BSAI, particularly in Area 4CDE, and may increase halibut harvest opportunities in directed halibut fisheries. In short, it would promote conservation of the halibut resource, improve its management, and create a more equitable distribution process between the directed and non-directed fisheries. And the Council recognized that, in addition to supporting prosecution of groundfish fisheries, halibut is a highly valued fish species that supports directed subsistence, recreational, and commercial halibut fisheries coastwide. Managing PSC limits according to abundance promotes conservation of the halibut resource and equality and fairness among competing users.

In recommending the Preferred Alternative, the Council noted that at current halibut abundance index levels, if the Preferred Alternative were implemented today, a 1,309 metric ton PSC limit would be established for the Amendment 80 sector, as specified in the Low/Low states of the setline and EBS shelf trawl survey indices. This is a 25% reduction from the 1,745 metric ton limit currently in place and establishes the PSC limit 37 mt under the sector's average halibut PSC use from 2016 through 2019.

The Council considered the PSC limits in the Preferred Alternative, including a 1,309 metric ton PSC limit, to be appropriate, because the limits established in the look-up table account for the interannual variability in the Amendment 80 sector's encounters of halibut and resulting halibut PSC mortality. This variability makes it clear that it is not sufficient to consider only average halibut PSC use over a series of years when making decisions about establishing PSC limits. From 2016 through 2020, halibut encounters ranged between 1,965 mt and 3,067 mt and PSC mortality ranged from 1,097 mt and 1,461 mt. The Council considered 2016 through 2020 to be the appropriate time period to evaluate halibut PSC use, because it reflects Amendment 80 sector operations under their Halibut Avoidance Plan and deck sorting along with other available tools to avoid halibut and reduce halibut mortality. The exclusion of 2021 acknowledges that Amendment 80 fishing operations, along with other fisheries in Alaska, were affected by COVID-19 mitigation measures, and international supply chains and markets were negatively affected by disruptions in harvesting, processing, and shipping.

At the Very Low/Low and Very Low/High index states, the Preferred Alternative would reduce the Amendment 80 halibut PSC limit 35% from the current limit. The Council acknowledges that should the IPHC setline survey fall into the very low state, an additional halibut PSC limit reduction would be important to promote conservation of the halibut stock and for consistency with the abundance-based process for setting directed halibut fishery catch limits.

The Council considered the impacts of alternative ranges of halibut PSC limit reductions on 1) the halibut stock, 2) directed halibut fishery participants and communities that are engaged in directed halibut fisheries in the BSAI and in other Areas, and 3) BSAI groundfish fishery participants and communities that are engaged in the BSAI groundfish fisheries. The Council considered the detailed information provided in the analysis for the proposed action and public comments received on it. In recommending the Preferred Alternative, the Council acknowledged that the Preferred Alternative would impact all Amendment 80 companies differently and significant changes would be needed to fishing plans and operations to adjust to the reduced halibut PSC limits under different survey index states. Reductions in halibut mortality by the Amendment 80 fleet will promote the conservation of the halibut stock in both the short and long terms. Further, anticipated benefits to the directed commercial halibut fishery from the Preferred Alternative PSC limits include longer term benefits from reductions in the U26 portion of the bycatch. Reduced mortality of smaller halibut could also provide benefits for the directed fishery in the Bering Sea and elsewhere as these halibut migrate and recruit to legal size.

Near-term benefits to the directed fishery in the Bering Sea accrue from savings in O26 halibut. The analysis indicates that under the assumption of a 0.5 ratio for the PSC limit to the directed catch limit, which approximates the 2010-2019 average proportion of O26 halibut in PSC mortality, directed commercial halibut catch limits could increase by approximately 360,000 pounds under the 1,309 PSC limit that would be established under the Preferred Alternative at the low/low state, the current state of the halibut stock indices. While that amount could be available to those direct users, whether such amounts are in fact allocated to them will depend on actions from the IPHC.

In making its recommendation, the Council considered all National Standards in in Section 301(a) of the MSA and other requirements of the Act. Council members discussed the tension between National Standard 1, and allowing for optimum yield, and National Standard 9, minimizing bycatch to the extent practicable. Steeper reductions were considered under Alternative 4, but the Council chose an alternative with less economic impact. Two other National Standards were particularly relevant to the Council in recommending the Preferred Alternative, National Standard 8 (provide for the sustained participation of fishing communities and to the extent practicable, minimize adverse economic impacts on such communities); and National Standard 4 (allocation of fishing privileges shall be fair and equitable). Council members rationalized their recommendation of the PA based on all the National Standards and balancing their conflicting dictates.

2.5 Historical Comparison of Alternatives

Figures and tables in this section are designed to provide an overall comparison of PSC limits from 2009 through 2019 with the potential PSC limits under Alternatives 2-4. Figure 2-1 and Figure 2-2 (Section 2.2), as well as Figure 2-4 provide the historical context of the observed values from these surveys and how they are applied to the identified states (1998-2019). Figure 2-5 shows that PSC limits since 2016 have fallen to the level of the upper PSC limits included in the look up tables of the proposed alternatives, but not the lower PSC limits.

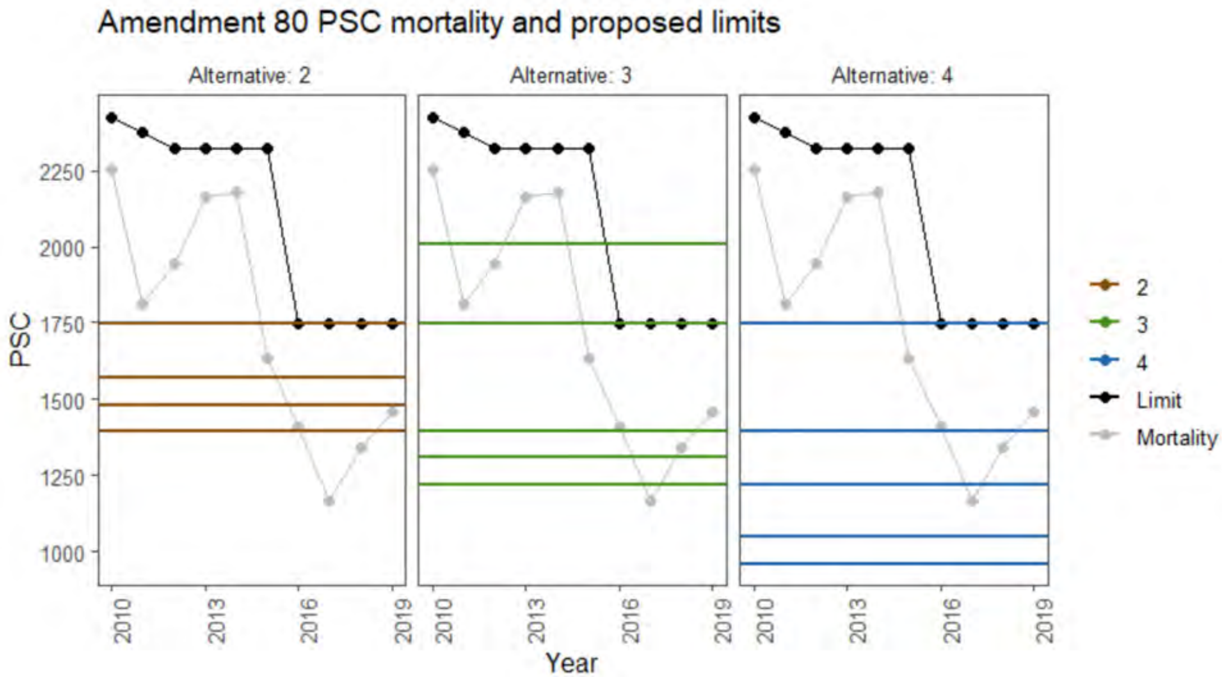


Figure 2-4 **Historical comparison of the status quo PSC limits compared with the proposed PSC limits under each alternative, as indicated by solid bands (brown Alt2; green Alt 3; blue Alt 4). Black line is the actual historical PSC limit while grey indicates the actual PSC mortality. The status quo PSC limit from 2016-present is 1,745 mt.**

Table 2-9 provides a comparison across Alternatives 2-4 by indicating the PSC limits that apply to each alternative, as derived from various combinations of the EBS shelf trawl and IPHC setline survey states.

Table 2-9 Comparison of PSC limits across all alternatives 2-4 with the survey states necessary to achieve that limit.

	Alt 2				Alt 3				Alt 4			
	EBS		Setline		EBS		Setline		EBS		Setline	
PSC limit	State	Index	State	Index	State	Index	State	Index	State	Index	State	Index
960									low	<150,000	very low	<6,000
1047									low	<150,000	low	6,000-7,999
									high	>150,000	very low	<6,000
1222					low	<150,000	very low	<6,000	low	<150,000	medium	8,000-10,999
									high	>150,000	low	6,000-7,999
1309					low	<150,000	low	6,000-7,999				
					high	>150,000	very low	<6,000				
1396	low	<150,000	low	<8,000	low	<150,000	medium	8,000-10,999	low	<150,000	high	>=11,000
					high	>150,000	low	6,000-7,999	high	>150,000	medium	8,000-10,999
1483	low	<150,000	medium	8,000-10,999								
	high	>150,000	low	<8,000								
1571	low	<150,000	high	>=11,000								
	high	>150,000	medium	8,000-10,999								
1745	high	>150,000	high	>=11,000	low	<150,000	high	>=11,000	high	>150,000	high	>=11,000
					high	>150,000	medium	8,000-10,999				
2007					high	>150,000	high	>=11,000				

Table 2-10 provides a comparison of the PSC limits across the alternatives (including the PA Alternative 5 for context) resulting from identical survey states. Alternatives 2, 4, and 5 set the maximum PSC limit equal to the status quo limit (1,745 mt). The maximum PSC limit in Alternative 3 is set at 2,007 mt. Minimum PSC limits across the action alternatives range from 20%-45% below the status quo. For comparison, Table 2-11 shows the minimum and maximum PSC limits by alternative for Amendment 80 with the current fixed regulatory limits for the other sectors (see Section 2.7 alternatives considered, but not carried forward for the rationale in not addressing PSC limits across other sectors within the scope of this current analysis).

Table 2-10 Survey states, and the PSC limits that result from those combinations across alternatives

EBS		Setline		PSC limits			
State	**Index**	**State**	**Index**	**Alt 2**	**Alt 3**	**Alt 4**	**Alt 5**
low	<150,000	very low	<6,000	NA	1222	960	1134
low	<150,000	low	6,000-7,999	1396	1309	1047	1309
low	<150,000		8,000-10,999	1483	1396	1222	1396
low	<150,000			1571	1745	1396	1745
high	>150,000		<6,000	NA	1309	1047	1134
high	>150,000			1483	1396	1222	1396
high	>150,000		8,000-10,999	1571	1745	1396	1571
high	>150,000		≥11,000	1745	2007	1745	1745

Table 2-11 Minimum and maximum PSC limits by alternative for Amendment 80 as compared with fixed limits for others sectors not impacted by this action

Groundfish Sector	A80	A80	A80	A80	A80	BSAI TLAS	Non-Trawl	CDQ
Alternative	1	2	3	4	5	All	All	All
Minimum PSC Limit	1745	1396	1222	960	1134	745	710	315
Maximum PSC Limit	1745	1745	2007	1745	1745	745	710	315

2.6 Process for specifying PSC limits under Alternative 2 - 5

Alternatives 2 through 5 would necessitate changing PSC limits annually for the Amendment 80 sector based on the look up table associated with the selected alternative. The look up table would be included in regulation, and each fall the survey state for the two indices will establish the PSC limit for the following year. This is similar to the Bering Sea Chinook PSC limits where the regulations establish that either lower or higher PSC limits will be specified for the upcoming year depending on an assessment of Chinook abundance levels (see regulations at 50 CFR § 679.21(f)(6)). For this proposed halibut abundance-based management action, if the Council had selected any of the options would also have been included in regulation. Thus, while information on the PSC limit (and annual limit or threshold, had Option 3 been selected) would be available to the Council in conjunction with the specifications process, there would be no action required of the Council in October or December to specify the PSC limit for the following year. As shown in Figure 2-5, while information may be insufficient in October of a given year to determine the subsequent year’s PSC limit (and annual limit or threshold if Option 3 had been selected), that information would be available for December and may help inform TAC-setting.

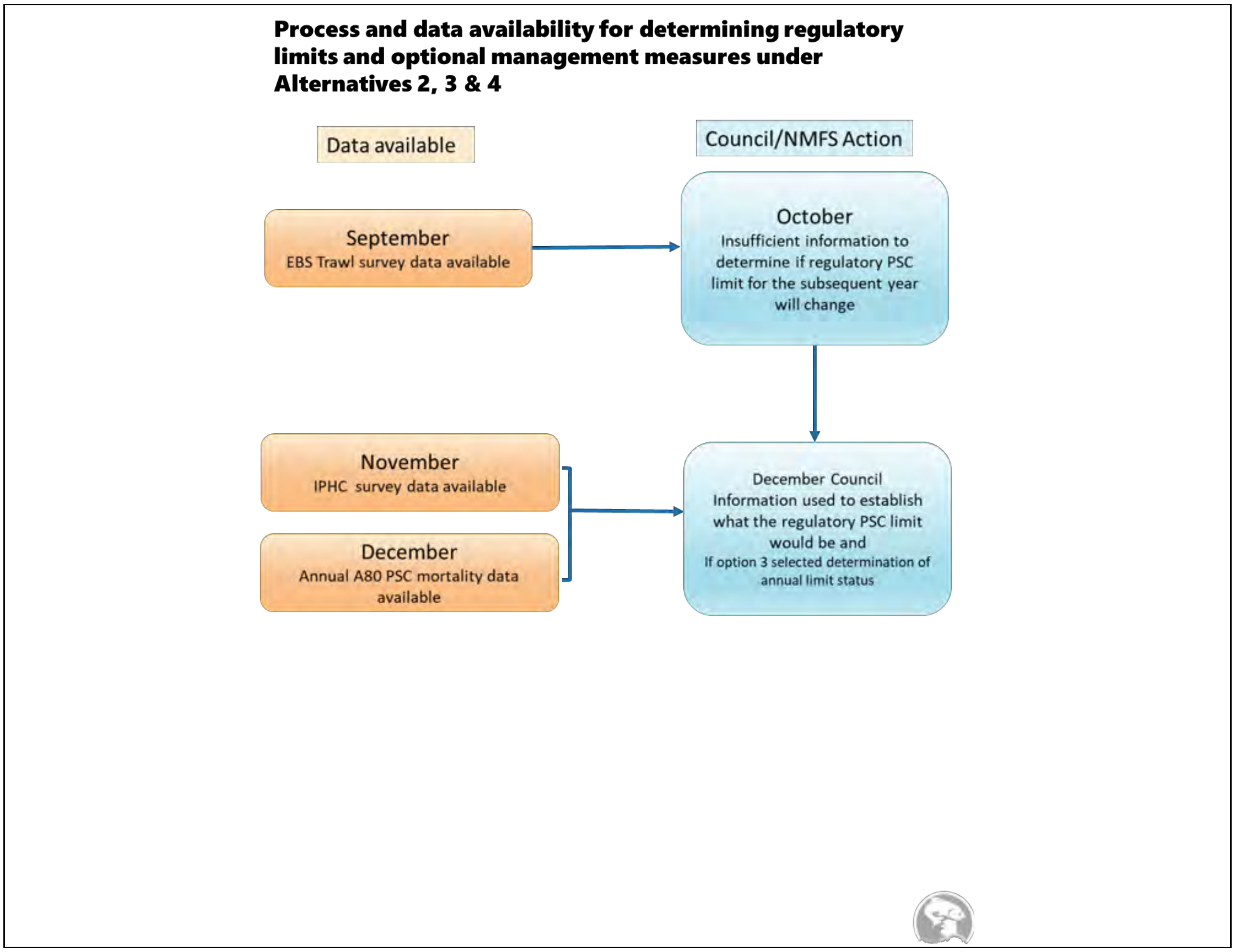


Figure 2-5 Information available for annual changing regulatory halibut PSC limits under Alternatives 2, 3, 4.

As discussed in Section 1.6.1, **with the exception of 2020,** EBS shelf trawl survey biomass estimates are available annually for the September Groundfish Plan Team meetings. Information to assign the trawl survey state for use in the look up table would be available at that time,[15] which may provide the public some idea of whether or not the PSC limit is likely to change for the following year (i.e. if the EBS shelf trawl survey has increased or decreased sufficiently from the previous year to shift from a low or high threshold at 150,000 mt). However, IPHC setline survey estimates may not be available until late October or possibly late November, because the survey is typically not completed until early September and time is needed to verify and model the data.

If the revised PSC limit in December is considerably lower than the one previously approved for opening the fishery in January (from the previous year), it may be adjusted in-season as needed by NMFS. See Section 3.2.1 on NMFS's authority for in season adjustments to start the fishing year prior to final specifications being approved in March. This is of particular importance in the event of PSC or annual limits that decrease from one year to the next.

Had the Council chosen to apply Option 3 to any of the Alternatives 2, 3, or 4, a determination of Amendment 80 PSC usage would be necessary before establishing whether an annual limit was exceeded. This information is generally available immediately following the close of the fishery and should be

[15] See section 2.7 for considerations of no new survey data.

available in time for final specifications in December. Regardless, NMFS will provide a notice to the public to designate the upcoming year's PSC limit prior to the start of fishing.

Had the Council selected Option 2, it would have only been employed in the first year of implementation of this proposed action.

2.7 Considerations in the circumstance of no new survey data

In 2020, the annual EBS shelf trawl survey and the IPHC EBS setline survey component were cancelled due to the COVID-19 pandemic crisis, and a reduced survey effort was completed in the GOA and other regions. In the absence of new data in any given year under any of the alternatives, the Council may wish to set the limits at the PSC limit from the previous year. Should there be multiple years without additional survey data, the Council could consider an adjustment to the limit (higher or lower) depending upon the trend in survey data from previous years. The Council clarified in its PA that the most recent survey data available should be used to set annual PSC limits in the absence of one or more years of survey data.

2.8 Alternatives considered but not carried forward for analysis

Complex multi-dimensional control rules: A preliminary review DEIS was presented to the Council in October 2020. At that time a more complex formulation of 2 and 3-dimensional control rules were considered for establishing halibut PSC limits. A two-dimensional control rule sets the control rule based on two variables (e.g., biomass and PSC limit) while a three-dimensional control rule adds an additional variable (e.g., two different estimates of biomass for both survey indices and a PSC limit as the third). Each alternative contained a range of starting points (e.g., the value of the PSC limit at the time of implementation) and slopes (e.g., the rate of change of the PSC limit with changes in the biomass estimate). At that time a discussion paper was also presented which provided, among other considerations, a more simplified approach to setting PSC limits indexed to halibut abundance using look up tables. Following Council review of both the discussion paper and preliminary review DEIS in October 2020, the Council chose to pursue further analysis of only the more simplified approach to setting PSC limits as being more transparent to the public. Therefore, the previous more complex set of Alternatives, Elements, and Options which had been under development for several Council meetings (see Table 1-2) was replaced by the current alternative set presented in the subsequent DEIS and this FEIS.

Closed loop simulation modeling: Additionally, during review of the October 2020 analysis and based on SSC recommendations regarding the use of the model results for context only, the Council requested the analysts pursue a more simplified analysis that did not involve projecting alternative impacts based on the halibut operating model (described in Section 4.3).

Roll-over provisions for PSC: An option to roll over a percentage of unused PSC from one year to the next was considered for the April 2021 initial review DEIS but was eliminated from consideration at that time due to difficulties in incorporating such a provision with annually varying PSC limits.

Alternatives that apply to all groundfish fishing sectors: Additional alternatives had been considered previous to the October 2020 alternative set, including alternatives that linked PSC limits to abundance for all fishing sectors in the BSAI: the fixed gear sector, BSAI trawl limited access sector, and the CDQ groups. Those alternatives ranged from status quo with fixed halibut PSC limits by sector to a range of complex gear-specific PSC limits linked to BSAI halibut abundance for all sectors. Under that set of alternatives PSC limits would have been established for all sectors by gear type (aggregate trawl PSC limit and an aggregate non-trawl PSC limit) using the two- and three-dimensional control rules under consideration at that time (which are superseded by the current alternative set as noted above). In February 2020, the Council narrowed the focus of the action and accompanying analysis to only the Amendment 80 sector, eliminating the other sectors from the action and analysis, because Amendment 80 sector comprises the majority of halibut PSC mortality.

Standardized survey indices: Previous discussions summarized the potential benefits of standardized survey indices versus absolute values of biomass. The implications of using a standardized estimate of survey abundance as it relates to the IPHC setline survey is discussed under Section 1.6.1.5 of this analysis and more generally in the SSC minutes from April 2021.

From the SSC minutes (April 2021):

> *The SSC notes that the Council has framed the look up tables for each alternative for evaluation in terms of absolute levels for the two indices of halibut abundance, the IPHC modelled setline survey index and the Bering Sea trawl survey. The SSC strongly cautions against using indices of abundance couched in absolute units for look up tables. The IPHC's survey index is based on a spatio-temporal model, meaning the scale of the entire time series can change during any update to the data or modelling methods. This could lead to unintended and changing relationships between the scale of recent years, the status quo and the specified absolute levels in the table. Specifically, the state of the PSC lookup value could change location in the tables due to methodological changes rather than actual changes in the survey observations. Similarly, model-based estimators are now used for both Pacific cod and pollock in order to include the northern Bering Sea as the distributions of these species shift northward; a similar approach for halibut would lead to model-based estimators on both axes of the look up tables. The SSC notes that the analysts have cautioned against using absolute indices from the beginning of halibut ABM and used primarily relative indices in their earlier alternatives. The SSC recommends treating the indices of abundance as relative values compared to a specific year (or years) in order to eliminate this potential scaling problem and ensure that future use of the tables remains consistent with their intent at the outset.*

The estimates from the EBS shelf trawl survey and the IPHC setline survey are relative indices and are not considered absolute estimates. The relative difference between estimates in each year (i.e., the trend) is the important outcome of the survey estimates. As with the IPHC space-time model, any future use of a spatiotemporal approach to estimate trawl survey trends or improved survey methods would likely result in changes to annual estimates for the entire survey time-series. The Council considered the SSC's recommendation of standardizing the indices of abundance as relative values compared to a specific year (or years). However, analysts acknowledged that basing a look up table on such standardized values makes it more difficult for stakeholders to read reported survey indices in a given year and map those onto a table to anticipate the resulting Amendment 80 PSC limit. In summary, the absolute values for the survey index are dependent on the assumptions of the survey design and data analysis, whereas a standardized index could show less year-on-year variability. However, in the interest of greater transparency to the public and in regulation, the Council chose to use absolute values from the surveys recognizing that these historical values could change in the future. This is similar to how other PSC limits are set in the BSAI.

Additional alternatives and concepts that have been considered in previous iterations of this ABM action are listed below:

Indices of abundance: A wide range of different abundance indices were considered in the development of alternatives for linking halibut abundance to halibut PSC limits before selecting the EBS shelf trawl survey and the IPHC setline survey for the alternatives. Additional indices considered include the EBS slope survey, the GOA bottom trawl survey, the AFSC longline survey, and the IPHC coastwise assessment results. Different size categories of halibut from these surveys were also considered to develop a 'juvenile index' of abundance. In addition, several fishery catch-per-unit-effort indices were also considered. The Council also considered indices in numbers instead of biomass. Additional information and correlation amongst these various indices are contained in Appendix 2 of the October 2019 DEIS. The SSC determined that the most appropriate indices for indexing PSC limits to abundance are the EBS shelf trawl survey and the IPHC Setline survey.

Simplified bycatch control rules: In April 2016, an appendix to a discussion paper proposed some simplified bycatch control rules (referred to as BCRs). These proposed BCRs included a ratio of historical bycatch to indices of abundance from the IPHC setline survey and the EBS trawl survey, as well as consideration of target spawning biomass and weighted based upon the previous year's PSC limit. These concepts were not carried forward by the Council at that time.

Extension to the GOA: The Council briefly considered extending the ABM analysis to include the Gulf of Alaska but deferred further consideration of this to after the Bering Sea ABM PSC action was completed.

3 Groundfish Stock Status and Amendment 80 Fishery Description

3.1 Description of Groundfish resources

The Council recommends annual catch limits, allocations, and PSC limits for the federally managed commercial groundfish fisheries in the BSAI. Target species managed in the BSAI FMP include: walleye pollock, Pacific cod, sablefish, various flatfishes (yellowfin sole, Greenland turbot, arrowtooth and Kamchatka flounders, northern rock sole, flathead sole, Alaska plaice, and others), various rockfish species (Pacific ocean perch, northern rockfish, rougheye and blackspotted rockfish, shortraker rockfish, and others), Atka mackerel, skates, sculpins, sharks, squids, and octopuses. The sector that would be directly regulated by the action alternatives under consideration is among the BSAI groundfish fisheries managed under the FMP: the BSAI non-pollock trawl CP sector, commonly referred to as Amendment 80 (A80) sector or fleet. This section of the FEIS describes how BSAI groundfish are assessed and managed, as well as the manner in which the A80 sector has operated since its implementation in 2008.

This document focuses on the A80 sector from among the several BSAI groundfish fisheries due to the narrowed scope of the proposed action alternatives. The preliminary analysis that was reviewed by the Council in October 2019 provided background on the other BSAI groundfish fisheries for which halibut PSC limits are established (NPFMC 2019a; Section 3). That information is incorporated here by reference. Those fisheries include the trawl limited access sector (TLAS), the hook-and-line CP sector (HALCP; often referred to as the Freezer Longline Coalition cooperative or FLC), the hook-and-line CV sector (HALCV), and the groundfish and PSC allocations made to Community Development Quota (CDQ) groups, which are fished using a variety of gear types (trawl, hook and line (HAL), pot) on vessels owned by the groups or in partnership with other groundfish harvest companies.

Annual Stock Assessment Fishery Evaluation (SAFE) report and Ecosystem Status Report (ESR) for 2020

The annual BSAI Groundfish SAFE Report (NPFMC 2020b), which is considered by the Council during its annual December meeting when determining the biennial final harvest specifications, provides a detailed discussion of the status of individual groundfish stocks, and is incorporated here by reference. The Council also receives an Ecosystem Status Report (ESR) on an annual basis in conjunction with setting harvest specifications. Given the lack or surveys in 2020, a brief summary of environmental conditions in 2019 is summarized below (excerpted from the ESR portion of the 2019 SAFE Report Introduction; NPFMC 2019b).

2019 represented the warmest bottom temperatures on record for the EBS, including unpreceded warm conditions in the inner domain, and it is also the second winter in a row of low sea ice in NBS, with impacts that range from impacts on the cold pool through fish distributions (juveniles and adults). Sea ice extent was anomalously low in the winter of 2018/2019 (despite an early near-normal ice extent through January that rapidly retreated in February 2019). As a result, there was a small cold pool in the NBS (only slightly larger than 2018). The zooplankton prey base in 2019 was dominated by small, lipid poor copepods and there was a low abundance of lipid rich large copepods and euphausiids. This shift in prey base has potential impacts on the carrying capacity of the system, especially for newly recruited juvenile fish. In contrast to previous years, there were below average coccolithophore blooms in 2019. The spring bloom was ~9 days earlier than normal, and jellyfish abundance continued to increase.

Upper trophic level responses were mixed. There was declaration by NOAA of an Unusual Mortality Event (UME) due to 200+ emaciation-caused deaths of gray whales migrating back to the EBS. This reflects the poor 2018 foraging conditions; in the EBS, gray whales feed on amphipods, mysids,and crab larvae, and they potentially compete with groundfish for prey in the NBS. Similarly, short-tailed shearwater die-offs were observed in 2019, reflective of 2018 foraging conditions (e.g., euphausiids) in the EBS before making migrations. Like previous years, ice seals continued to be impacted by lack of sea ice. A NOAA UME was also declared for ice seals in 2019. Like gray whales, many carcasses were young animals that were in poor condition or emaciated, and pups exhibited a decline in condition (blubber thickness), possibly reflecting competition with fish in the NBS and lack of ice.

In contrast, conditions likely improved in 2019 for other upper-trophic consumers like seabirds (except short-tailed shearwaters). Seabirds may have been successful at finding lipid rich copepods and euphausiids, even though abundances were low, competition for available prey may have been reduced as a result of shearwater mortality and/or poor recruitment events for fish species. Colonies at the Pribilof Islands may have benefited from northward shifts in fish populations. There remains a high level of concern regarding food security for local communities in Alaska that rely on subsistence resources including seabirds.

Similarly, fish condition in the Southeastern Bering Sea (SEBS) survey in 2019 was above average. Multiple groundfish stocks like pollock appear to be persisting through warm conditions and/or are utilizing cold water refugia in the Northern Bering Sea. For example, the pollock 2018-year class appears strong, Pacific cod biomass continue to increase in the NBS, and groundfish condition across multiple species increased from 2018. Groundfish biomass in the NBS continued to increase (30% since 2017) as did abundance (52% increase relative to the 2017 survey). Abundance in the SEBS increased 112% from 2018 while biomass increased slightly (2% relative to 2018). There was indication of recruitment of some key fish species in both areas (e.g., Pacific cod). Juvenile Walleye pollock (age 0) were captured in the NBS, and the SEBS saw a 75% increase in juvenile pollock biomass. Other species show mixed responses. Bristol Bay sockeye had the 4th largest return since 1963. Crab biomass was down, likely reflecting multiple years of benthic productivity, difference in larval recruitment, and changes (increase) in predation. The Ocean Surface Current Simulator (OSCURS) model based index of on-shore transport (key for flatfish recruitment) showed high on-shore transport, which is in contrast to previous years of offshore or little-onshore transport. For pollock, below average recruitment is projected from age 0 energy density, diet energy density, and surface silicic acid, while the temperature change index indicates increased recruitment. The combination of reduced predation and increased productivity may have led to increased survival (based on the multispecies stock assessment model for the Bering Sea known as 'CEATTLE' for Climate-enhanced, Age-based model with Temperature-specific Trophic Linkages).

Overall, despite anomalous environmental conditions, the present status of the BSAI stocks continues to appear mostly favorable. Nearly all stocks are above their target levels (Figure 3-1). The abundances of EBS pollock, EBS Pacific cod, all rockfishes managed under Tier 3[16], and all flatfishes managed under Tiers 1 or 3 are projected to be above their target biomass levels in 2020 (B_{MSY} or the B_{MSY} proxy of $B_{35\%}$), while sablefish and blackspotted/rougheye rockfish remain below this target level.

[16] Amendment 56 to the BSAI FMP (64 FR 10952, March 8, 1999) introduced a six-tiered system accommodating different levels of reliable information available to fishery scientists for determining Over Fishing Levels.

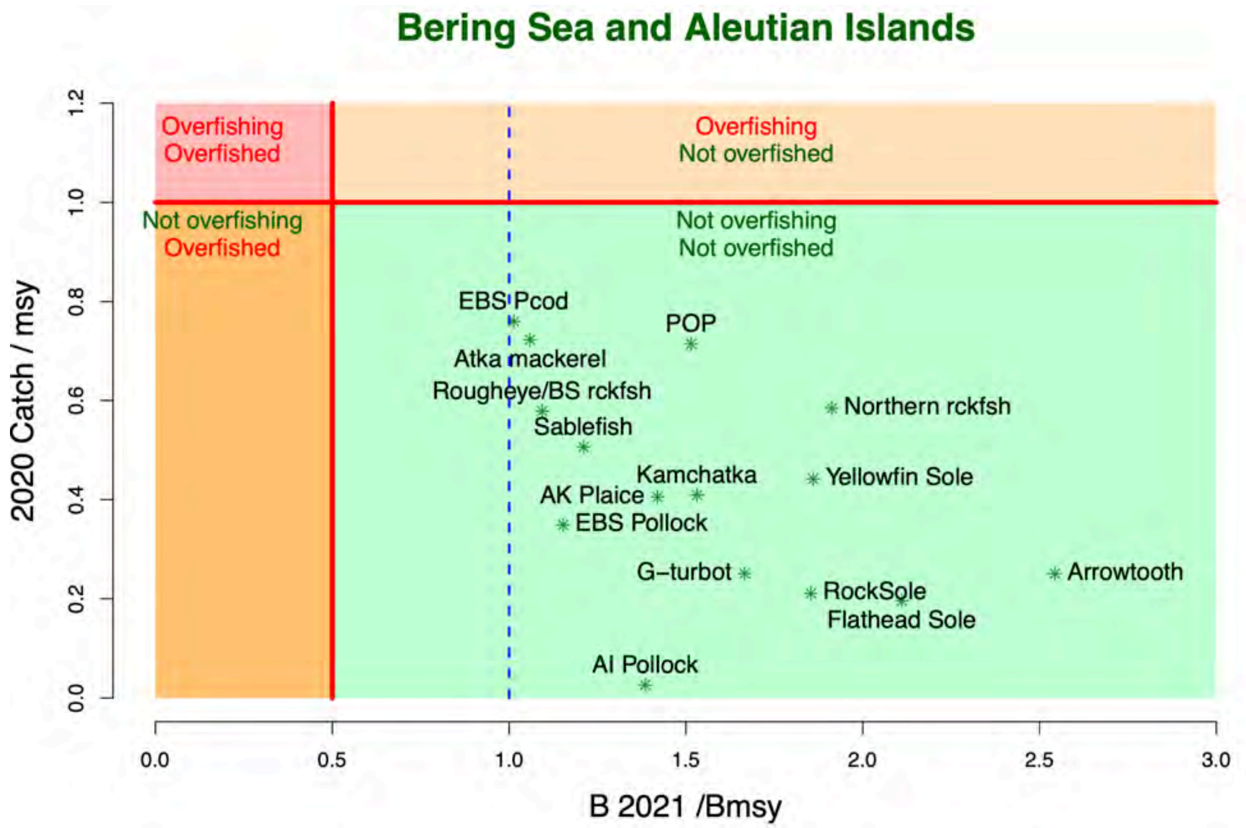


Figure 3-1 **Summary of Bering Sea stock status 2021 (spawning biomass relative to Bmsy; horizontal axis) and 2020 year catch relative to fishing at Fmsy (vertical axis) where F_{OFL} is taken to equal F_{MSY}.**

Across all gear types and sectors, total commercial groundfish catch levels (TACs) in the BSAI are capped at 2 million mt each year; the cap corresponds to the upper limit on the optimum yield in the BSAI FMP and in Pub. L. No. 108-199. The 2 million mt constraint is well below the sum of ABCs for the FMP groundfish species. For example, the sum of 2020 groundfish FMP species' ABCs is 3,272,581 mt. In 2019 the sum of ABCs was 3,367,578 mt; the TAC was set at 2,000,000 mt and total catch was 1,957,943 mt. Figure 3-2 and Table 3-1 show total BSAI groundfish harvest (mt) by species or species group from 2004 through 2019.[17] Figure 3-3 shows the relative percentage of harvest for each species or species group. Total catch has consistently been on the upper end of the optimum yield spectrum near the 2-million-ton cap, except from 2008 through 2010 when TACs were set lower and may have been suppressed by lower demand associated with the broad economic recession in addition to lower pollock TAC.[18] Pollock has always accounted for the largest share of groundfish catch (roughly 70% since 2015, up from 60% to 65% from 2008 through 2012). The figures break out yellowfin sole from other flatfish. Yellowfin sole has accounted for roughly 7% to 10% of total groundfish catch during the analyzed period, while all other flatfish combine to account for roughly 4% to 7%. Within the BSAI flatfish category, yellowfin sole accounted for an average of 55% of catch from 2004 through 2019, and that proportion has been above 60% since 2016.[19] Other notable trends in the most recent years include an increase in the harvest of rockfish species and sablefish. Rockfish catch reached 54,657 mt in 2019 while the period's

[17] "Other species" include sculpins, skates, sharks, squid, and octopus.
[18] Total TAC was 1.84 million t in 2008, 1.68 million t in 2009, and 1.68 million t in in 2010 before increasing to 2.0 million t in 2011.
[19] Other flatfish include arrowtooth flounder, Bering flounder, Alaska plaice, Kamchatka flounder, starry flounder, rock sole, rex sole, flathead sole, petrale sole, dover sole, English sole, butter sole, and Greenland turbot.

annual average before that year was 28,000 mt. Sablefish catch volume remains small compared to the entire BSAI cap but increased from 85 mt in 2015 to 3,070 mt in 2019.

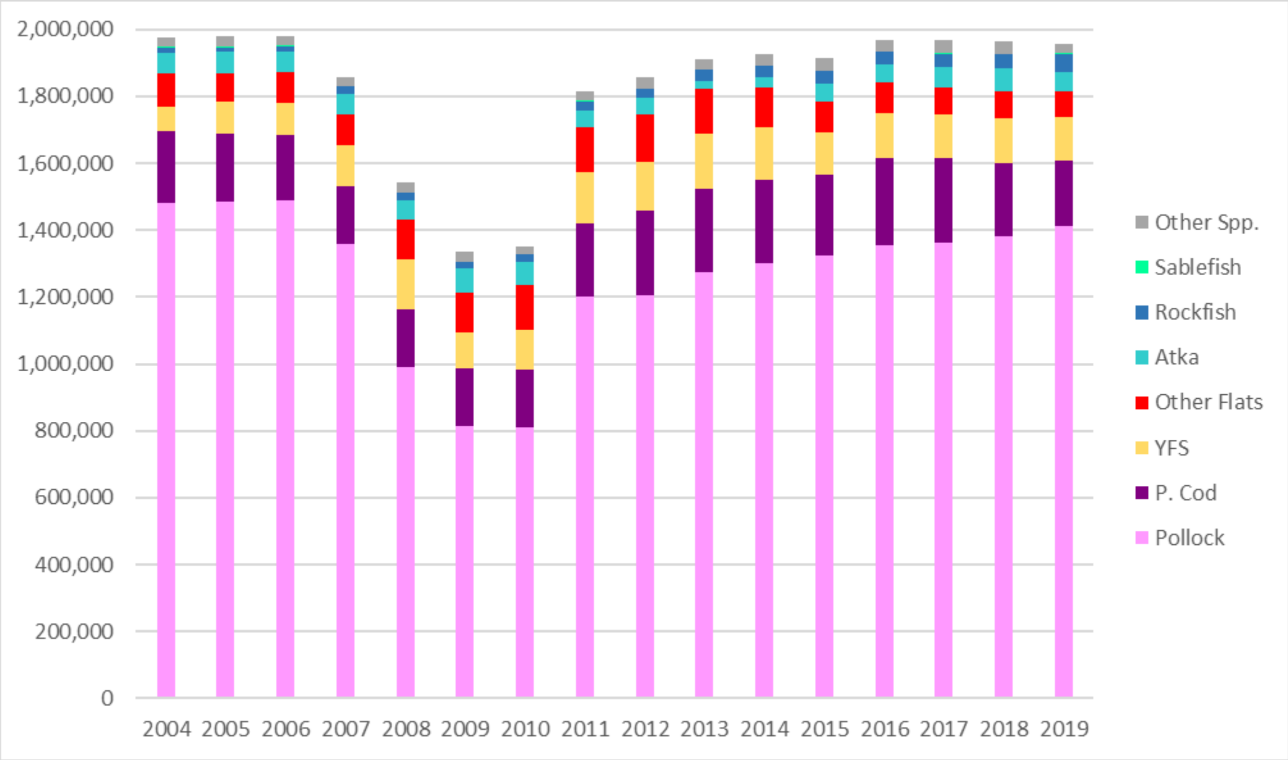


Figure 3-2 BSAI catch (mt) by species or species group across all gear types and sectors, 2004 through 2019

Table 3-1 BSAI catch (1,000 mt) by species or species group across all gear types and sectors, 2004 through 2019

Year	Pollock	P. Cod	YFS	Other Flats	Atka	Rockfish	Sablefish	Other Spp.	Total
2004	1,482	213	76	99	61	18	0.9	30	1,977
2005	1,485	205	94	85	62	15	1.3	30	1,979
2006	1,490	193	99	89	62	17	1.0	28	1,979
2007	1,357	174	121	94	59	23	1.0	28	1,857
2008	992	171	149	121	58	22	0.7	30	1,542
2009	813	176	108	118	73	19	0.6	28	1,334
2010	812	172	119	134	69	23	0.7	23	1,352
2011	1,200	220	151	134	52	28	0.5	29	1,815
2012	1,206	251	147	143	48	28	0.6	31	1,855
2013	1,274	250	165	132	23	35	0.6	33	1,912
2014	1,300	249	157	119	31	36	0.4	34	1,927
2015	1,323	242	127	92	53	40	0.1	36	1,913
2016	1,355	261	135	90	54	37	0.4	36	1,968
2017	1,361	253	132	79	64	38	1.1	39	1,968
2018	1,381	220	132	81	70	42	1.7	38	1,965
2019	1,411	198	128	79	57	55	3.1	26	1,956
Average	1,265	215	127	105	56	30	1	31	1,831

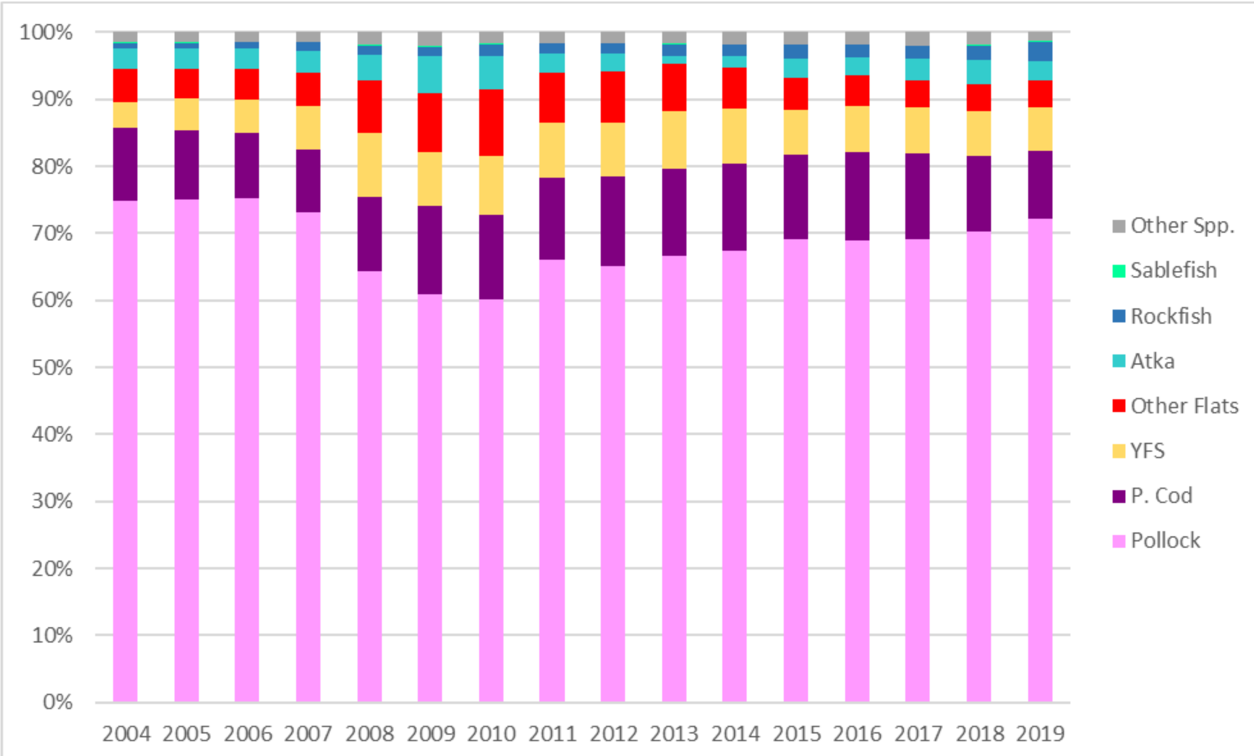


Figure 3-3 **Percentage share of total BSAI groundfish catch by species or species group (all gear types and sectors), 2004 through 2019.**

Additional information on Pacific cod and flatfish stocks is provided below to augment the information available in SAFE reports for consideration in the impacts of alternatives based upon the combination of stock trends, TAC-setting, and alternative halibut PSC limits for the A80 sector, which is sometimes operationally constrained by its allocation of the BSAI Pacific cod TAC.

3.1.1 Pacific cod

Pacific cod is distributed widely over the EBS as well as in the Aleutian Islands (AI) area. Tagging studies (e.g., Shimada and Kimura 1994) have demonstrated significant migration both within and between the EBS, AI, and GOA. However, recent research indicates the existence of discrete stocks in the EBS and AI (Canino et al. 2005, Cunningham et al. 2009, Canino et al. 2010, Spies 2012). Research conducted in 2018 indicates that the genetic samples from the NBS survey in 2017 are very similar to those from the EBS survey area, and quite distinct from samples collected in the Aleutian Islands and the Gulf of Alaska (Spies et al. 2019).

Cod was managed as a single BSAI stock from 1977 through 2013 with an increasing population trend through 2012. Beginning in 2014 separate catch specifications have been set for the AI cod population and the Bering Sea (BS) cod population. Catch specifications and population estimates for AI cod are based on survey biomass trends in the AI which have increased slightly in recent years. Nevertheless, the OFL and ABC have remained constant since 2019 at 27,400 and 20,600 respectively (Thompson et al. 2019b).

Catch specifications for EBS Pacific cod – OFL, ABC, and TAC – have declined for the last several years due to overall estimated population declines (Table 3-2). In setting TACs for both the AI and BS, the Council takes into consideration the State GHL fishery (See Section 3.1.1.2 for additional information on cod allocations and reductions for State GHL fisheries).

Table 3-2 **Catch specifications for BS cod 2017-2020**

Year	Age 0+ biomass	OFL	ABC	TAC
2017	1,260,000	284,000	239,000	223,704
2018	918,000	238,000	201,000	188,136
2019	824,000	216,000	181,000	166,475
2020	751,708	185,650	155,873	141,799

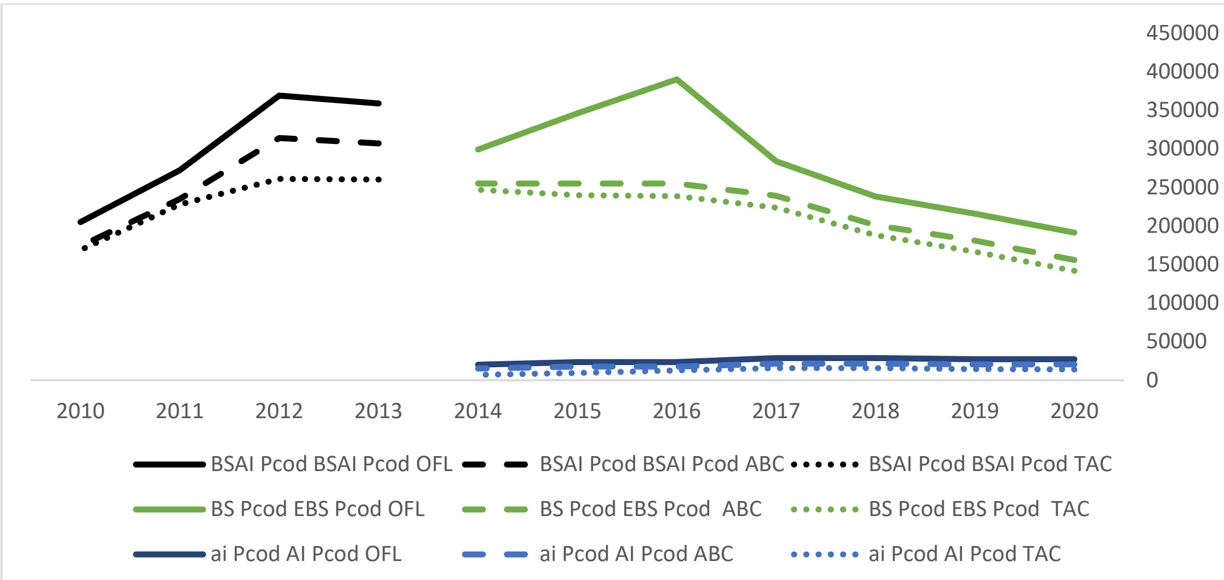


Figure 3-4 **BSAI, Eastern Bering Sea (EBS) and Aleutian Island (AI) Pacific cod OFL, ABC and TAC 2010-2020 (break between 2013 and 2014 reflects the switch to specifying harvest by BS and AI separately).**

3.1.2 Flatfish stocks

Key harvested flatfish species in the BSAI include yellowfin sole, northern rock sole, flathead sole and Alaska Plaice. These stocks are currently well above their target Bmsy stock size (Figure 3-1). TACs for flatfish stocks have been set well below their ABC levels due to a variety of harvesting constraints including market and halibut bycatch considerations. Yellowfin sole continues to comprise the majority of flatfish harvested in the BSAI; northern rock sole the second is the second most harvested BSAI flatfish.

OFL, ABC and TACs in recent years for yellowfin sole and northern rock sole are shown in Figure 3-5 and listed in Table 3-3 and Table 3-4. Biomass for each year corresponds to the projection given in the SAFE report issued in the preceding year. With the exception of Greenland turbot, all flatfish stocks have specifications managed at the BSAI-wide level (Table 3-5).

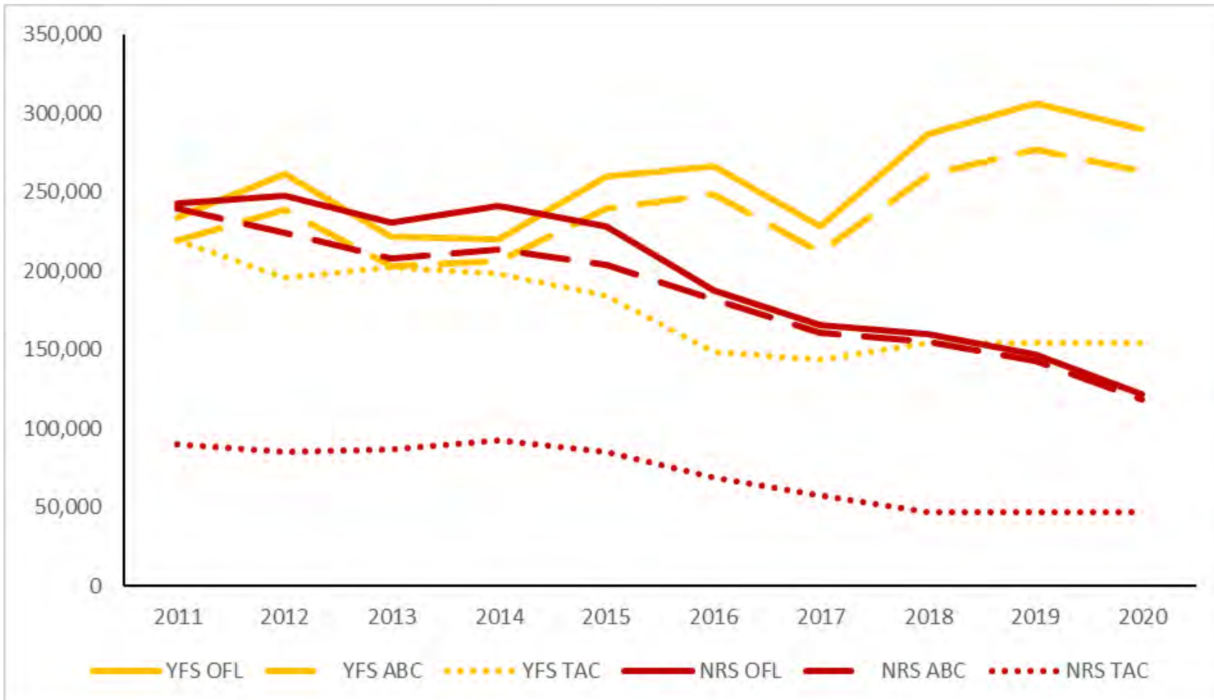


Figure 3-5 OFL, ABC and TAC levels for yellowfin sole and northern rock sole

Table 3-3 Catch specifications for yellowfin sole 2017-2020

Year	Age 6+ Biomass	OFL	ABC	TAC
2017	2,290,000	287,000	260,800	154,000
2018	2,553,100	306,700	277,500	154,000
2019	2,462,400	290,000	263,200	154,000
2020	2,461,850	287,943	260,918	150,700

Table 3-4 Catch specifications for northern rock sole 2017-2020

Year	Age 6+ Biomass	OFL	ABC	TAC
2017	1,000,600	159,700	155,100	47,100
2018	923,200	147,300	143,100	47,100
2019	828,000	122,000	118,900	47,100
2020	1,068,000	157,300	153,300	47,100

3.2 Management of the NMFS groundfish fisheries

3.2.1 Groundfish harvest specification process

This section provides an overview of the BSAI groundfish specifications and management process for all managed stocks as they are set during the December Council specifications process. This considers all groundfish sectors including pollock. Details on the A80 sector allocations and management are contained in a follow up section (Section 3.3).

The groundfish fisheries in Federal waters off Alaska are managed under the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP) and the Fishery Management Plan for Groundfish of the Gulf of Alaska (GOA FMP). In the BSAI and GOA, groundfish harvests are managed subject to annual limits on the amounts of each groundfish species or species group that may be taken. The annual harvest specifications also set or apportion the PSC limits. The annual limits are referred to as "harvest specifications," and the process of establishing them is referred to as the "harvest specifications process." The intended effect of these actions is to conserve and manage the groundfish resources in the BSAI in accordance with the MSA. The U.S. Secretary of Commerce approves the harvest specifications based on the recommendations of the Council. The goals of the harvest specifications process are to (1) manage fisheries based on the best scientific information available, (2) provide for adequate prior public review and comment on Council recommendations, (3) provide for additional opportunity for Secretarial review, (4) minimize unnecessary disruption to fisheries and public confusion, and (5) promote administrative efficiency.

Groundfish harvest specifications establish an over-fishing level (OFL), acceptable biological catch (ABC), and TAC by species and area in the BSAI. As shown in Table 3-5 some species are allocated TAC for the entire BSAI when the population structure indicates a single stock. Others, such as Pacific cod and sablefish have separate allocations by the BS subarea of the BSAI, and the AI subarea of the BSAI. Additionally, for some rockfish and Atka mackerel, allocations are further specified within regions to avoid localized depletion.

**Table 3-5	2020-2021 OFLs, ABCs and TACs for BSAI Groundfish**

Species	Area	2020 OFL	2020 ABC	2020 TAC	Catch as of 11/7/2020	Final 2021 OFL	Final 2021 ABC	Final 2021 TAC
Pollock	EBS	4,085,000	2,043,000	1,425,000	1,364,949	2,594,000	1,626,000	1,375,000
	AI	66,973	55,120	19,000	2,971	61,856	51,241	19,000
	Bogoslof	183,080	137,310	75	8	113,479	85,109	250
Pacific cod	BS	191,386	155,873	141,799	136,185	147,949	123,805	111,380
	AI	27,400	20,600	13,796	5,321	27,400	20,600	13,796
Sablefish	AK	50,481				60,426	29,588	
	BSAI		n/a	n/a	n/a	n/a	n/a	8,113
	BS	n/a	2,174	1,861	5,184	n/a	3,396	3,396
	AI	n/a	2,952	2,039	1,123	n/a	4,717	4,717
Yellowfin sole	BSAI	287,307	260,918	150,700	128,320	341,571	313,477	200,000
Greenland turbot	BSAI	11,319	9,625	5,300	2,312	8,568	7,326	6,025
	BS	n/a	8,403	5,125	1,639		6,176	5,125
	AI	n/a	1,222	175	673		1,150	900
Arrowtooth flounder	BSAI	84,057	71,618	10,000	10,265	90,873	77,349	15,000
Kamchatka flounder	BSAI	11,495	9,708	6,800	7,279	10,630	8,982	8,982
Northern rock sole	BSAI	157,300	153,300	47,100	25,762	145,180	140,306	54,500
Flathead sole	BSAI	82,810	68,134	19,500	9,001	75,863	62,567	25,000
Alaska plaice	BSAI	37,600	31,600	17,000	19,954	37,924	31,657	24,500
Other flatfish	BSAI	21,824	16,368	4,000	4,113	22,919	17,189	6,500
Pacific ocean perch	BSAI	58,956	48,846	42,875	36,303	44,376	37,173	35,899
	BS	n/a	14,168	14,168	8,895		10,782	10,782
	EAI	n/a	11,063	10,613	9,557		8,419	8,419
	CAI	n/a	8,144	8,094	7,966		6,198	6,198
	WAI	n/a	15,471	10,000	9,885		11,774	10,500
Northern rockfish	BSAI	19,751	16,243	10,000	8,362	18,917	15,557	13,000
Blackspotted/Rougheye Rockfish	BSAI	861	708	349	458	576	482	482
	EBS/EAI	n/a	444	85	125	n/a	313	313
	CAI/WAI	n/a	264	264	333	n/a	169	169
Shortraker rockfish	BSAI	722	541	375	214	722	541	500
Other rockfish	BSAI	1,793	1,344	1,088	996	1,751	1,313	916
	BS	n/a	956	700	293		919	522
	AI	n/a	388	388	703		394	394
Atka mackerel	BSAI	81,200	70,100	59,305	57,506	85,580	73,590	62,257
	EAI/BS	n/a	24,535	24,535	22,926		25,760	25,760
	CAI	n/a	14,721	14,721	14,588		15,450	15,450
	WAI	n/a	30,844	20,049	19,992		32,380	21,047
Skates	BSAI	49,792	41,543	16,313	17,221	49,297	41,257	18,000
Sculpins	BSAI	67,817	50,863	5,300	4,805	N/A	N/A	
Sharks	BSAI	689	517	150	179	689	517	200
Octopuses	BSAI	4,769	3,576	275	682	4,769	3,576	700
Total	BSAI	5,584,382	3,272,581	2,000,000	1,849,473	3,945,315	2,747,727	2,008,113

BSAI TAC setting is generally driven by tradeoffs among the availability of pollock, BS Pacific cod, key flatfish species and the 2 million mt optimum yield cap. High value, low volume species such as sablefish and rockfish have TACs set equal to ABC while lower value flatfish stocks such as arrowtooth flounder have TACs set well below ABC for both market reasons and expected halibut bycatch rates. Trends in ABCs and TACs between three key stocks (EBS pollock, BS Pacific cod and yellowfin sole) are shown in Figure 3-6. At lower levels of pollock ABC (e.g., 2010-2012) the pollock TAC is set equal to the ABC. Since 2012, as the pollock ABC increased, the pollock TAC remained relatively stable thus allowing for higher TACs to be set for other BSAI groundfish species. BS Pacific cod ABC is reduced by the state guideline harvest level (GHL) prior to TAC being established (see Section 3.1.1.2 for more information on TAC setting and allocation for cod). As noted previously the Pacific cod ABC has been declining in recent years, so BS cod TAC levels have also been declining (Figure 3-6). TAC levels for yellowfin sole have been stable since 2015 following a decline between 2010 and 2015.

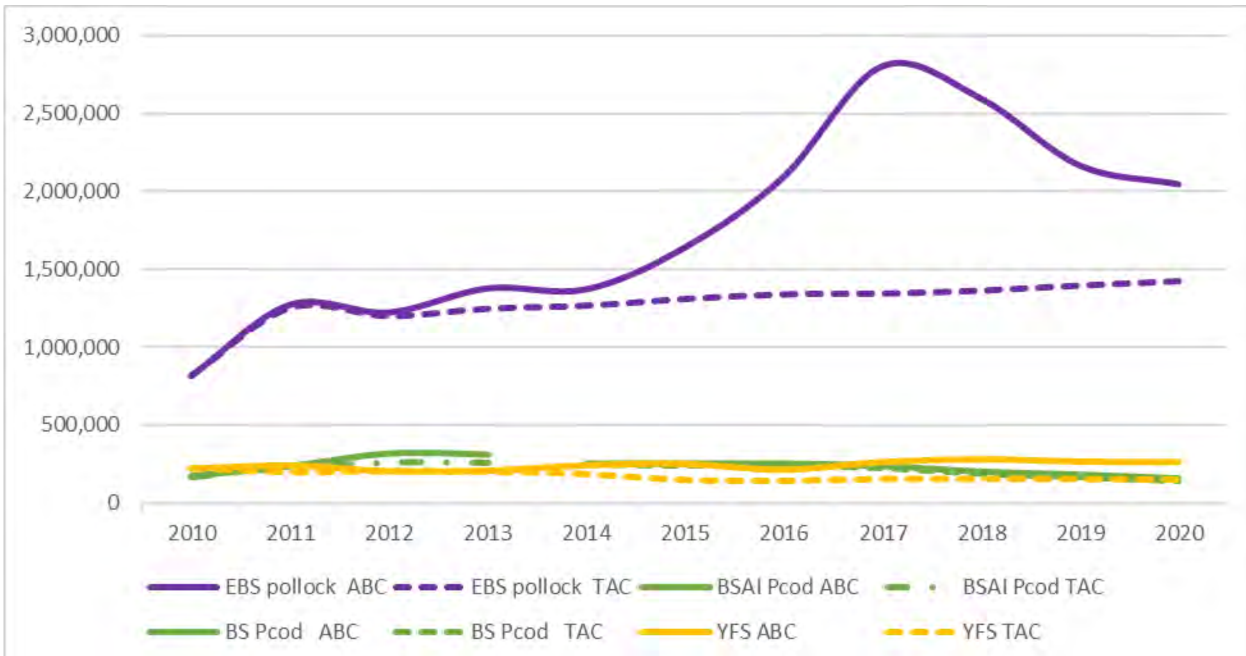


Figure 3-6 ABC and TAC for EBS pollock, BS cod and yellowfin sole (mt)

Pacific ocean perch (POP) TACs have generally been set close to or equal to the ABC (Figure 3-7). Atka mackerel TACs have fluctuated due to a range of regulations limiting total catch in areas because the species is a Steller sea lion prey item.[20]

[20] NMFS Final Rule implementing Steller sea lion mitigation measures (79 FR 70285, Nov. 25, 2014)

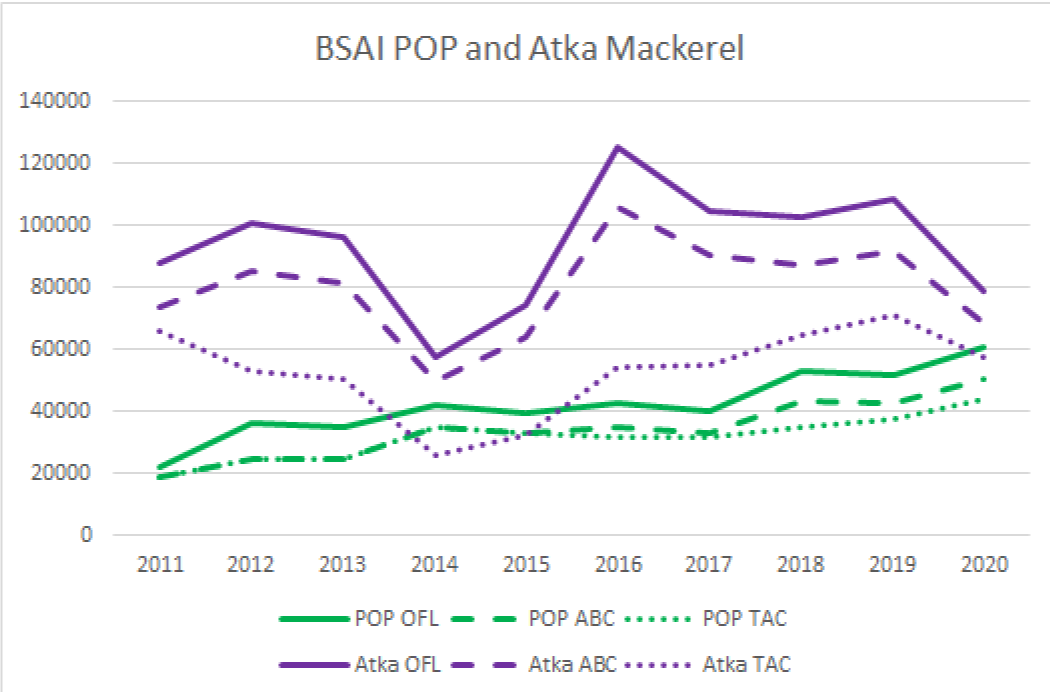


Figure 3-7 OFL, ABC and TAC levels for BSAI Pacific ocean perch (POP) and Atka mackerel

3.1.1.1 Flatfish flexibility exchange program

Beginning in the 2015 fishing year, an ABC reserve has been annually specified for the flatfish species that are allocated to CDQ groups and A80 cooperatives – flathead sole, rock sole, and yellowfin sole. The ABC reserve is divided among CDQ groups and A80 cooperatives using the same formulas as in the annual harvest specifications process, ensuring that an entity exchanging one flatfish quota for another cannot result in exceeding an ABC or the 2-million-ton OY upper limit. The reserve for each species is specified by the Council's evaluation of the ABC surplus for each species (i.e., the difference between the ABC and TAC). The Council considers whether the reserve needs to be reduced by a discretionary buffer amount based on social, economic, or ecological considerations. The Council then designates some, all, or none of the ABC surplus as the ABC reserve. Figure 3-8 shows the ABC and TAC for the three stocks subject to the Flatfish Flexibility Exchange Program.

The purpose of the Flatfish Flexibility Exchange Program is to allow cooperatives or CDQ groups to increase their harvest opportunity and/or reduce halibut PSC through flexibility in their choice to target a certain flatfish species. Decisions to utilize the flexibility program might reflect halibut PSC rates in a certain target fishery or catchability and market conditions. Within the species subject to the program, a vessel is only required to hold quota for any of the three species.

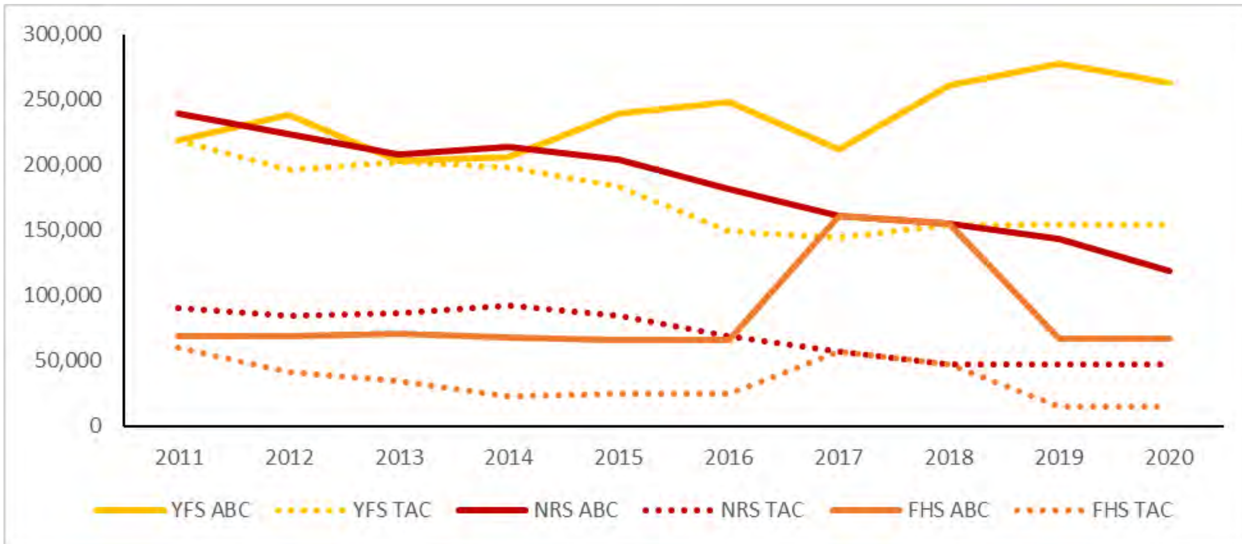


Figure 3-8 **ABC and TAC levels for the three flatfish species managed under flatfish specifications: yellowfin sole (YFS), northern rock sole (NRS) and flathead sole (FHS).**

NMFS annually provides the Council with a report on the flatfish exchanges made by the A80 cooperatives and CDQ groups. That report is made during the NMFS Sustainable Fisheries (SF) Inseason Management Annual Report at each December Council meeting, and an annually updated PDF of all flatfish exchanges is available on the NMFS Alaska Groundfish Harvest Specifications page.[21] These reports provide the Council with information to consider when deciding whether to establish a buffer by reducing the amount of the ABC reserve available to be exchanged by eligible entities in a future year.

In 2015 and 2016, there were net exchanges of flathead sole and rock sole for yellowfin sole. These exchanges resulted in roughly 11,000 mt and 9,500 mt of additional yellowfin sole TAC in each respective year. In 2017, net exchanges resulted in roughly 2,700 mt of TAC shifting from rock sole to yellowfin sole, with a negligible net change to the initial flathead sole TAC. Net exchanges in 2018 flowed from rock sole to both yellowfin sole and flathead sole, resulting in roughly 2,600 additional tons of flathead sole TAC and 1,950 additional tons of yellowfin sole TAC. The same pattern occurred in 2019, with rock sole being exchanged for the other species, resulting in 5,650 additional tons of flathead sole and 2,450 additional tons of yellowfin sole.

The bulk of exchanges are executed in September and October when TACs are more likely to be constraining or as entities adjust targets to meet business targets or to keep bycatch rates down to meet internal cooperative performance standards. As of August 2020, there had been no flatfish exchanges. Fewer exchanges in 2020 were likely due to lower overall flatfish harvest, and thus less need to exchange one eligible species to afford an opportunity to target another.

3.1.1.2 Pacific cod allocation

Pacific cod is allocated across state and federal fisheries and to various gear and operational type sectors within each management realm. Stock assessment and harvest specifications are made separately for the BS and AI areas due to population distinctions. Figure 3-9 provides a schematic of how BS and AI ABCs are first apportioned to the state-managed GHL fisheries in each area's state waters. After that, the TAC recommended by the Council is allocated to CDQ groups and finally the remainder is allocated to the federal non-CDQ groundfish sectors. The TAC that the Council recommends accounts for the BS and AI GHL allocations such that ABC is not exceeded, but the Council's TAC is not necessarily set at a level

[21] See, for example, "Further Allocations" at https://www.fisheries.noaa.gov/alaska/commercial-fishing/2020-2021-alaska-groundfish-harvest-specifications.

where TAC plus the GHL is equal to the ABC. TAC may be set lower based on policy decisions accounting for the state of all the BSAI groundfish stocks and the need to remain within the 2 million mt optimum yield cap. The allocation to the non-CDQ sectors is based on the summed BS and AI TACs. Those federal groundfish sectors include – in order of allocation percentage – the combined hook-and-line and pot sector, trawl CVs, A80, AFA trawl CPs, and jig gear. The allocation to the hook-and-line and pot sectors is subdivided between HAL CPs, HAL CVs ≥ 60’ length overall (LOA), HAL and pot CVs less than 60’ LOA, pot CPs, and pot CVs ≥ 60’ LOA.

The following subsections provide additional detail on the management of federal and state Pacific cod fisheries in the BSAI.

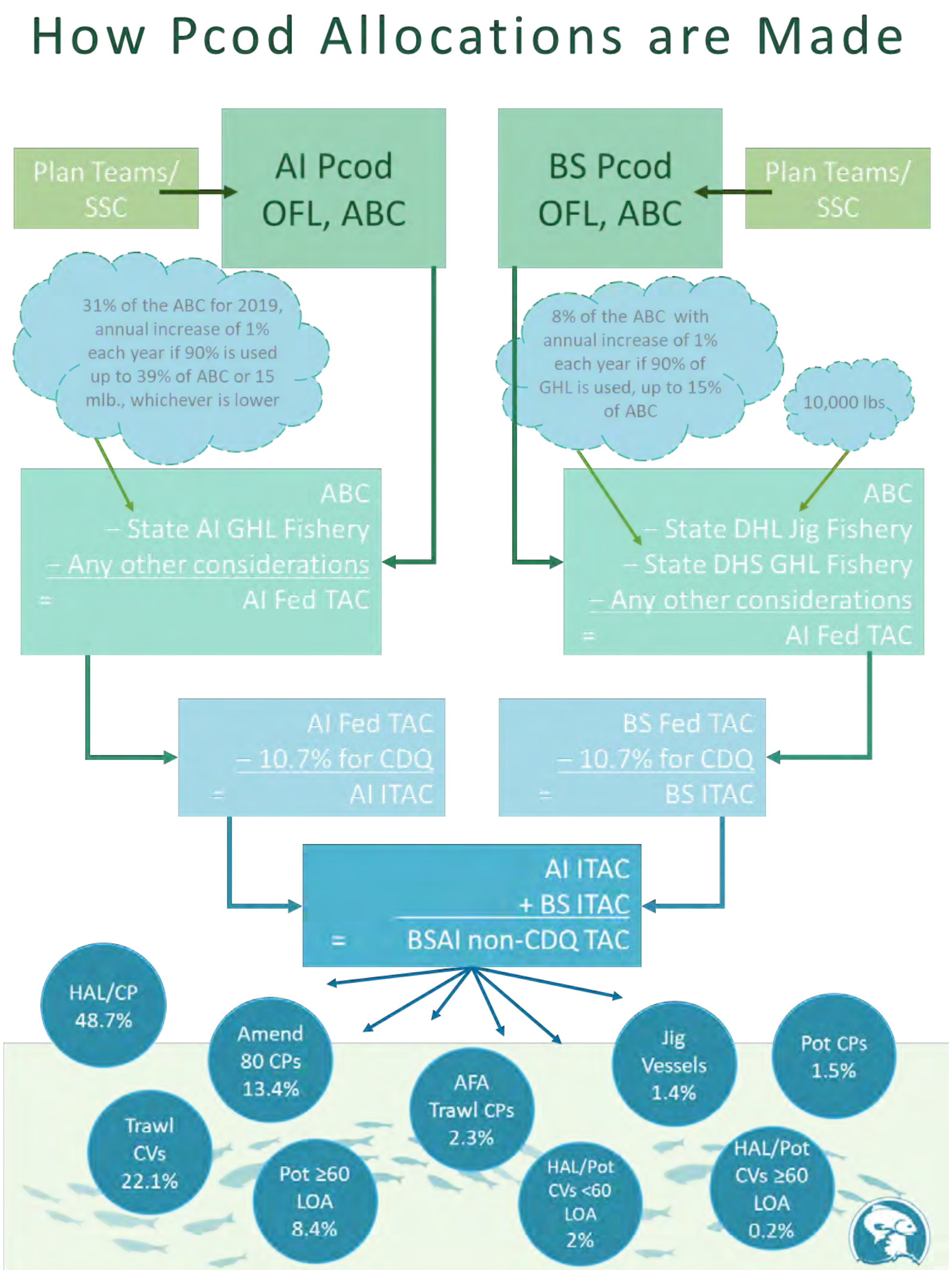


Figure 3-9 **BSAI cod allocation beginning with area-specific ABCs in BS and AI, deduction of the state GHL, CDQ allocations and recombined BSAI TAC for sector and seasonal allocations. Total of 34 separate allocations to sectors and seasons (seasons not depicted).**

State fisheries (guideline harvest level)

The State manages three GHL fisheries for Pacific cod. Two occur within state waters in the BS (pot and jig gear) and one occurs within state waters in the AI (pot and trawl gear).

In October 2018, the Alaska Board of Fisheries (BOF) made changes to the BS and AI GHLs that determine the available harvest in the state waters Pacific cod fisheries under its jurisdiction. Because the GHL is deducted from the BSAI Pacific cod ABC before any allocation to federal fisheries, increasing the GHL *may* reduce available harvest for groundfish harvesters, including the A80 sector and CDQ groundfish allocations. A higher GHL directly affects the TAC available to all federal sectors when TAC is set equal to the ABC minus the GHL; that has been the case in recent years, as Pacific cod ABCs are low. In some instances, the Council could recommend Pacific cod TACs that are less than "ABC minus GHL" to create capacity within the 2 million mt OY cap for the harvest of other groundfish species. This occurred in 2015.[22] In years when the difference (gap) between TAC and "ABC minus GHL" is greater than zero, the effect of an increased GHL percentage depends on the amount of that percentage and the size of the gap.

After deducting the GHL from ABC, the Council recommends TAC levels such that ABC is not exceeded; 10.7% of that TAC is allocated to CDQ groups before the remainder is allocated to gear and operational type harvest sectors. From that remainder, 13.4% is allocated to the A80 sector. Under current regulations when TAC is set equal to "ABC minus GHL," shifting an additional pound of Pacific cod from the federal TAC to the GHL fisheries reduces the allocation to the A80 sector by 0.12 pounds. The same shift of one pound would reduce the CDQ allocation by 0.107 pounds.

The Dutch Harbor subarea (DHS) of the Bering Sea GHL fishery for Pacific cod was first opened in 2014. State regulations provided for a GHL of 3% of the BSAI Pacific cod ABC, which was subtracted from the BS ABC and accounted for when the Council recommended the federal BS TAC. Starting in 2016, the BOF changed the DHS GHL calculation to align with the split of the federal BSAI Pacific cod stock into separate BS and AI stocks. As part of those modifications, the DHS GHL was changed to 6.4% of the BS ABC. The DHS GHL was changed again at the October 2018 BOF meeting. The DHS GHL was increased to 8.0% of the BS ABC starting in 2019 and increased to 9.0% in 2020. If the GHL is fully harvested (90% considered fully harvested) then the BOF will increase the limit again by 1% of the BS ABC each year until it reaches 15%.[23] The 15% GHL would continue unless changed by the BOF. Until 2019, the DHS fishery occurred in state waters between 164 degrees and 167 degrees west longitude. At its October 2018 meeting the BOF expanded the area to include waters between 162.30 degrees and 167.00 degrees west longitude.

The DHS fishery is open to vessels 58' or less using pot gear with a limit of 60 pots per vessel. The season opens seven days after the federal BSAI <60' pot/longline sector's season closure and may close and re-open as needed to coordinate with federal fishery openings. The 2020 season opened on January 26 and was closed on March 12 (47 days) because the GHL was projected to be taken. Since 2014, the season has opened between January 19 and February 12. Season length has ranged from 31 days in 2018 to 71 days in 2016 – setting aside the exceptional year of 2014 when the fishery remained open until September 1. The DHS pot gear fleet reached 40 vessels in 2020, which was the largest fleet size during the 2014 through 2020 period. Participation has increased steadily from 16 vessels in 2014 and 14 vessels in 2015. All of the catch is delivered to shoreside plants since it is harvested by pot vessels that are 58' or less.

When the DHS GHL for pot gear reaches 15% of the BS ABC, it will equate to a 134% increase from the 2018 GHL allocation. The 2018 GHL (6.4%) was 28.36 million lbs. (12,864 mt); however, the poundages associated with a 15% DHS GHL – or any percentage in any future year – will depend on the level of the BS ABC.

[22] BS ABC = 255,000 mt; BS GHL = 8,178 mt; BS TAC = 240,000 mt. In this case, the Council set the TAC 6,822 mt lower than it conceivably could have without exceeding the ABC after accounting for the GHL.
[23] From 2014 through 2020, the DHS GHL fishery was harvested at 97% of the GHL or greater.

The BOF also created a 100,000 lbs. (~45 mt) GHL jig gear fishery for Pacific cod in the DHS. That fishery began in May 2019.

The State of Alaska has managed a GHL fishery for Pacific cod in state waters in the AI subarea since 2006. The AI GHL was 3% of the federal BSAI Pacific cod ABC from 2006 through 2015. Beginning in 2016, the AI GHL changed to 27% of the AI ABC, with an annual 4% step-up provision that could bring the GHL to 39% of the AI ABC if the AI GHL is fully harvested on a continuing basis. The GHL is considered fully harvested if 90% is taken by November 15. The BOF capped the AI GHL at a maximum of 15 million lbs. (6,804 mt). At the BOF October 2018 meeting, the BOF included a four percent step-down provision if the AI GHL is not fully harvested (90% harvest) during two consecutive calendar years. The GHL may not be reduced below 15% of the AI Pacific cod ABC. The majority of the AI GHL state waters fishery has been harvested by vessels using trawl and pot gear (harvest information for this fishery is confidential during recent years due to the number of processor participants). In 2019, the AI GHL stepped up to 31% of the AI ABC and in 2020 the AI GHL capped out at 15 million lbs. or 6,804 mt, which was 33% of the AI ABC. The BOF had established the 2020 AI GHL at 35% of the AI ABC, which would have equaled 7,210 mt had the cap not been in place. In 2021 the AI GHL was established at 39% of the AI ABC unless that amount is constrained by the 15 million lbs. GHL limit, which depends on where the ABC is set.

Federal fisheries (TAC)

Once the BS and AI TACs are established, regulations at 50 CFR § 679.20(a)(7)(i) allocate 10.7% of the Bering Sea Pacific cod TAC and 10.7% of the Aleutian Islands Pacific cod TAC to the CDQ Program for the exclusive harvest by Western Alaska CDQ groups. The remaining portion of TAC is the initial total allowable catch (ITAC). An incidental catch allowance (ICA) is set for the HAL and pot gear sectors to cover catch while targeting non-cod species. The ICA is set based on NMFS's estimate of need and that amount is deducted from the aggregate allocation to HAL and pot sectors before suballocations are made to gear and size-based sectors. For the 2020 BSAI Pacific cod fishery, the ICA was 400 mt.

After subtracting the CDQ allocation from the BS and AI TACs, NMFS combines the remaining BS and AI TACs into one BSAI non-CDQ TAC, which is available for harvest by nine non-CDQ fishery sectors. Regulations at 50 CFR § 679.20(a)(7)(ii)(A) define the nine Pacific cod non-CDQ fishery sectors in the BSAI and specify the percentage allocated to each. Allocations for 2020 can be seen in Table 9 of the annual harvest specifications published in the **Federal Register**.[24] The non-CDQ fishery sectors are defined by a combination of gear type (trawl, HAL, pot), operation type (CV or CP), and vessel size categories (i.e., vessels greater than or equal to 60 ft in length overall, or less than 60 ft in length overall).

NMFS manages each of the non-CDQ fishery sectors to ensure that harvest of Pacific cod does not exceed their overall annual allocations. NMFS monitors harvests that occur while vessels are directed fishing for Pacific cod (specifically targeting and retaining Pacific cod above specific threshold levels) and harvests that occur while vessels are directed fishing in other fisheries and incidentally catching Pacific cod (e.g., the incidental catch of Pacific cod while directed fishing for pollock in the AFA fishery). For the non-AFA trawl CP sector (A80), NMFS allocates exclusive harvest privileges to vessels participating in an A80 cooperative and prohibits them from exceeding their cooperative allocation. For other non-CDQ fishery sectors, NMFS carefully tracks both directed and incidental catch of Pacific cod. NMFS takes appropriate management measures, such as closing directed fishing for a non-CDQ fishery sector, to ensure that total directed fishing and incidental catch do not exceed that sector's allocation.

An allocation to a non-CDQ fishery sector may be harvested in either the BS or the AI, subject to the non-CDQ Pacific cod TAC specified for the BS or the AI. If the non-CDQ Pacific cod TAC is reached in

[24] https://www.federalregister.gov/documents/2019/03/13/2019-04539/fisheries-of-the-exclusive-economic-zone-off-alaska-bering-sea-and-aleutian-islands-final-2019-and#p-45

either the BS or AI, NMFS will prohibit directed fishing for Pacific cod in that subarea for all non-CDQ fishery sectors, even if there is a positive remaining amount in the overall BSAI area.

Allocations of Pacific cod to the CDQ Program and to the non-CDQ fishery sectors are also apportioned by seasons. In general, regulations apportion CDQ and non-CDQ fishery sector allocations among three seasons that correspond to the early (A-season), middle (B-season), and late (C-season) portions of the year. Depending on the specific CDQ or non-CDQ fishery sector allocation, between 40 percent and 70 percent of the Pacific cod allocation is apportioned to the A-season, which is historically the most lucrative fishing season due to the presence of valuable roe in the fish and the good quality of the flesh during that time of year. The allocation of Pacific cod among the CDQ Program and the nine non-CDQ fishery sectors, as well as the seasonal apportionment of those allocations, create a large number of separate sectoral-seasonal allocations. To help ensure the efficient management of these allocations, regulations allow NMFS to reallocate (rollover) any unused portion of a seasonal apportionment from a non-CDQ fishery sector to that sector's next season during the current fishing year unless the Regional Administrator determines a non-CDQ fishery sector will not be able to harvest its allocation. The one exception where seasonal rollovers are not allowed is the jig gear sector.

3.2.2 Halibut PSC limit and discard mortality

The halibut PSC limits for BSAI groundfish sectors are described in Section 2.1. Under status quo regulations, the A80 sector is managed under a halibut PSC hard cap of 1,745 mt of mortality. NMFS has the ability to make a within-year reallocation of halibut PSC from the TLAS sector to the A80 sector as the Regional Administrator deems appropriate (50 CFR § 679.91(f)(4)). Any amount of halibut PSC that would be reallocated under this rule is first reduced by 5% to ensure some amount of PSC savings if the reallocated PSC is maximally used. This regulatory flexibility tool has been used only three times, in the late-year portions of 2010, 2013, and 2014 when the TLAS sector was largely winding down and the A80 sector was still prosecuting yellowfin sole. The historical use cases for this tool align with the highest A80 PSC use rates since 2010; however, the use of this in-season management tool was primarily an artifact of the two-cooperative A80 environment that existed at that time. Reallocated PSC is issued at the A80 cooperative level. In the cases when one of the cooperatives could benefit from a buffer to ensure their late-season fishing opportunity, it was more expedient to reallocate from a sector that was not utilizing its limit than to negotiate an intra-sector transfer of PSC. None of the years when this rule was utilized resulted in total A80 PSC mortality exceeding the limit at the time. The rule has not been utilized in recent years because the sector has reduced its PSC use relative to the limit and because the sector has consolidated into a single cooperative, thus eliminating operational barriers to intra-sector PSC transfers. The analysts note that the Council is not changing this existing regulation under the ABM action.

The two subsections that follow describe how the estimated catch of Pacific halibut is translated to a mortality estimate that is then debited against a fishery or sector's PSC limit. The first subsection notes recent modifications to the discard mortality rate (DMR) estimation methodology and lists the resulting DMRs that have been applied to the A80 sector (BSAI non-pelagic trawl CPs, in this context) and other fisheries. The second subsection describes the methodology for estimating discard mortality when deck sorting is occurring. A80 deck sorting was developed under a series of Exempted Fishing Permits (EFPs) that were intermittent beginning in 2009 but ramped up to more robust sampling and greater vessel participation from 2015 to the present. As of 2020, deck sorting of halibut is implemented in regulation[25] and integrated into the Observer Program; data from deck sorted hauls is used in the Catch Accounting System (CAS). Section 3.4.5 provides additional information on the development of halibut deck sorting under the EFP and ties that into the broader context of the active halibut mortality mitigation measures that A80 has enacted since 2015.

[25] 50 CFR § 679.120

Discard mortality rate estimation process

To monitor halibut bycatch mortality allowances and apportionments, NMFS uses observed halibut incidental catch rates, halibut DMRs, and estimates of groundfish catch to project when a fishery's halibut bycatch mortality allowance or seasonal apportionment is reached. Halibut incidental catch rates are based on observers' estimates of halibut incidental catch in the groundfish fishery. DMRs are estimates of the proportion of incidentally caught halibut that do not survive after being returned to the sea. The cumulative halibut mortality that accrues to a particular halibut PSC limit is the product of a DMR multiplied by the estimated halibut PSC. DMRs are estimated using the best scientific information available in conjunction with the annual BSAI stock assessment process. The DMR methodology and findings are included as an appendix to the annual groundfish SAFE reports.

The approach to establishing DMRs has changed in recent years. At the Council's request, a new methodology was presented to and approved by the Plan Teams, SSC, and Council in December 2016. The most recent revisions to DMR estimation were presented to the Groundfish Plan Teams in September 2019.[26] Beginning in 2016, the fishery definitions for DMR estimates and application transitioned from species composition to vessel/gear operational characteristics causatively linked to halibut mortality. While the previous approach used a 10-year reference period for DMR estimates, the current process uses a reduced reference period (2-3 years) to better incentivize improvement in halibut handling practices. The shorter reference period provides fishery participants an opportunity to see a lower DMR estimate result from their efforts, which may come at a financial or operational cost (see Section 3.4.5).

The estimation process uses weighted averages of sampled halibut bycatch viability and mortality ("condition data" – sampled halibut are rated excellent, poor, or dead) to expand estimated DMRs from a sample to the haul, trip, and fishery following the sampling hierarchy. All computations are completed within each sampling stratum (full coverage, gear-specific partial coverage, and EM) before estimates are combined across the strata to produce final DMR estimates. Annual DMRs are presented to the Plan Teams, SSC and Council in conjunction with the annual specifications process.

Table 3-6 shows the halibut DMRs for all gear and operational type sectors that are specified across the BSAI and GOA for 2018 through 2020. The A80 sector falls under the "BSAI non-pelagic trawl (NPT)" CP sector. DMRs are specified for a two-year period (with the 2020 DMRs applying to 2021) however, as with the harvest specifications, DMRs are annually updated and published in the **Federal Register**.[27] Note that for some sectors where the number of viabilities collected (N_viabilities) or the number of vessels observed (not shown) was small the applied DMR is a proxy taken from a more robustly sampled sector. The A80 sector is subject to a DMR estimate based on viabilities sampled on A80 vessels. The A80 DMR has decreased from 84% to 75% from 2018 to 2020. Halibut catch and mortality rate estimates are discussed in greater detail in Section 3.4.

[26] See Halibut DMR Working Group Recommendations for 2020 (presented at September 2019 Groundfish Plan Team Meeting), provided by the inter-agency Halibut DMR Working Group.
[27] For 2020/2021 BSAI groundfish harvest specifications, see BSAI Table 18 at https://www.fisheries.noaa.gov/alaska/commercial-fishing/2020-2021-alaska-groundfish-harvest-specifications.

Table 3-6 Halibut DMRs in harvest specifications for groundfish fisheries by gear and sector, and the number of animal viabilities assessed in order to estimate DMR, 2018 through 2020

			2018		2019		2020	
Area	**Gear**	**Sector**	**DMR**	**N_viabilities**	**DMR**	**N_viabilities**	**DMR**	**N_viabilities**
BSAI	**NPT**	CP	84%	2,025	78%	2,844	75%	1,100
		CV	60%	2,456	59%	2,736	58%	2,353
	HAL	CP	8%	9,459	8%	6,756	9%	4,990
		CV	17%	14	4%	2	9%[a]	43
	POT	All	9%	548	19%	380	27%	266
GOA	**NPT**	CP	84%	132	79%	1,300	75%[b]	1,524
		CV	67%	755	67%	1,106	68%	710
		CV (RP)	62%	176	49%	388	52%	323
	HAL	CP	10%	1,608	11%	1,637	11%	1,010
		CV	17%	456	21%	416	13%	362
	POT	All	7%	602	4%	450	0%	119
All	**PTR**	All	*Specified at 100% (not estimated)*					

a Based on BSAI HAL CP; b Based on BSAI NPT CP
Note: NPT = non-pelagic trawl; PTR = pelagic trawl; CV (RP) = Central GOA Rockfish Program Catcher Vessels

Table 3-7 shows the actual DMRs that have been applied to the A80 sector dating back to 2010, illustrating the shift from species composition to operational type.

Table 3-7 Halibut DMRs that have been applied to the A80 sector, 2010 through 2020

Gear	Fishery/Sector	2010-13	2013-16	2016-17	2017-18	2018-19	2019-20	2020-21
Non-CDQ trawl	Alaska plaice		71	66				
	Arrowtooth flounder [1]	76	76	84				
	Atka mackerel	76	77	82				
	Flathead sole	74	73	72				
	Greenland turbot	67	64	82				
	Kamchatka flounder			84				
	Non-pelagic pollock	73	77	81				
	Pelagic pollock	89	88	88				
	Other flatfish [2]	72	71	63				
	Other species [3]	71	71	66				
	Pacific cod	71	71	66				
	Rockfish	81	79	83				
	Rock sole	82	85	86				
	Sablefish	75	75	66				
	Yellowfin sole	81	83	84				
Non-pelagic trawl	Mothership and catcher/processor				85	84	78	75

[1] Arrowtooth flounder includes Kamchatka flounder 2010-14
[2] "Other flatfish" includes all flatfish species, except for halibut, Alaska plaice, flathead sole, Greenland turbot, rock sole, yellowfin sole, Kamchatka flounder, and arrowtooth flounder.
[3] "Other species" includes skates, sculpins, sharks, squids, and octopuses.
Source: Alaska Groundfish Harvest Specifications https://www.fisheries.noaa.gov/alaska/sustainable-fisheries/alaska-groundfish-harvest-specifications

NMFS Catch Accounting System methodology for halibut PSC estimation when deck sorting is occurring on an A80 vessel

When halibut deck sorting occurs on a non-pollock trawl CP or mothership, there are two components of the total halibut PSC in the CAS: (1) the weight and mortality of halibut sorted on deck; and (2) the weight and mortality of halibut in the factory.

Halibut sorted on deck: The current sampling protocols have been in place since 2019. When deck sorting occurs, the observer will determine which sampling design to implement based on the abundance of halibut. When halibut numbers are relatively low, observers employ a 1-in-5 (20%) simple random design to collect length and viability data. For hauls with high halibut numbers, the observer uses a 1 in 10 (10%) simple random design to collect length and viability data. If the observer feels that minimal halibut will be encountered, the observer collects length data for every halibut up to the first randomly selected assessment fish to ensure haul specific weight data is available. If they reach their randomly selected halibut, the extra lengths are deleted and are be factored in the halibut weight calculation. Occasionally, an observer is not able to recognize a high halibut bycatch event. In these situations, the observer may switch from a 1 in 5 design to a 1 in 10 design after halibut deck sort data collection has begun. When this occurs, data collected using the 1 in 5 design is corrected during debriefing to match the 1 in 10 rate. The lengths of all the sampled halibut are converted to a weight using the IPHC's length weight table. The average weight of the sampled halibut is calculated and multiplied by the number of unsampled halibut to estimate the total weight of unsampled halibut. The weight of the sampled and unsampled halibut comprise the total weight of deck sorted halibut. The total weight of deck sorted halibut reported by the observer is posted in CAS as discarded halibut.

Next a halibut DMR is applied to the halibut PSC. The observer identifies the viability, or health, of the halibut in the simple random sample. The qualitative viabilities assessed by the observer correspond to a quantitative post-capture mortality rate. For each deck sorted haul, a weighted average DMR based on the weight of halibut at each viability level is calculated. That average DMR is applied to the total weight of deck sorted halibut in the haul, calculating a halibut PSC weight, which is posted in CAS. In the rare event there are no viabilities collected for a deck sorted haul, an annual average DMR from the vessel's other deck sorted hauls is used. If it is the vessel's first deck sorted haul for the year, and there are no other hauls from which to generate an average, then an annual average DMR from the deck sorted hauls of all vessels in the year is used. As other deck sorted hauls are sampled throughout the year and additional viability data become available, the annual average DMRs will be recalculated and reapplied to the vessel's deck sorted haul that is missing viability data.

The conditional mortality probabilities for halibut sorted on deck are 20% for "Excellent," 55% for "Poor," and 90% for "Dead."

Halibut recovered in the factory: The second component follows the CAS PSC estimation process described in Cahalan et al (2014), and the weight of halibut in an observer's species composition samples in the factory are extrapolated to the entire haul. In 2015 through 2017, a standard DMR of 90% was applied to the halibut recovered in the factory. Beginning in 2018, a DMR is applied to the halibut recovered in the factory based on DMRs published in harvest specification tables in the **Federal Register** (see Table 3-6). The appropriate DMR is applied based on gear, sector, and year to calculate a halibut PSC mortality weight.

The sum of the two estimates – halibut mortality from the deck sorted fish plus the halibut mortality of fish from the factory – is posted in CAS.

3.2.3 Groundfish fishery closures for crab in Bristol Bay

Several closure areas for trawl gear are in place and may afford protection to halibut spawning and nursery grounds (Figure 3-10). Many of these overlap the IPHC Closed Area. The nearshore Bristol Bay Trawl Closure Area (Federal reporting areas 508 and 512) prohibits trawl fishing at all times, except seasonally in the Northern Bristol Bay Trawl Area. The Red King Crab Savings Area, which straddles reporting areas 509 and 516, is closed to non-pelagic trawling year-round (except for the subarea in certain years). There are also seasonal closures in the area. Federal reporting area 516 is closed to fishing with trawl gear from March 15 through June 15, and the subarea of the Red King Crab Savings Area is closed to non-pelagic trawling under certain conditions.

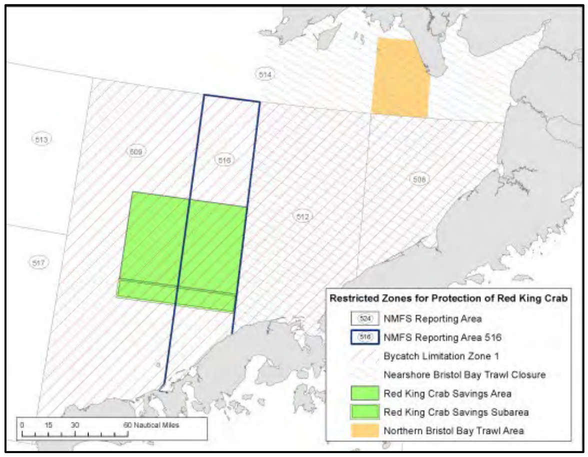


Figure 3-10 Bering Sea fishery closures for the protection of red king crab

3.2.4 Crab PSC limits and area closures

There are additional triggered time and area closures for Bristol Bay red king crab (BBRKC), Snow crab and Tanner crab in the Bering Sea. These measures are summarized below and affect trawl fisheries only. Zones 1 and 2 are closed to directed fishing when the crab PSC limits (red king crab and EBS Tanner crab) are attained in specified trawl fisheries (Figure 3-11). Zones 1 and 2 were established by Amendment 10 to the BSAI groundfish FMP, after being implemented by emergency rule by NMFS in 1986 (NPFMC 1986). These areas were initially based upon the trawl survey distribution of red king crab and Tanner crab stocks at that time. The stair step procedure for determining PSC limits for red king crab taken in Zone 1 trawl fisheries is based on modeled abundance of mature female BBRKC and effective spawning biomass (ESB) from the stock assessment (Table 3-8).

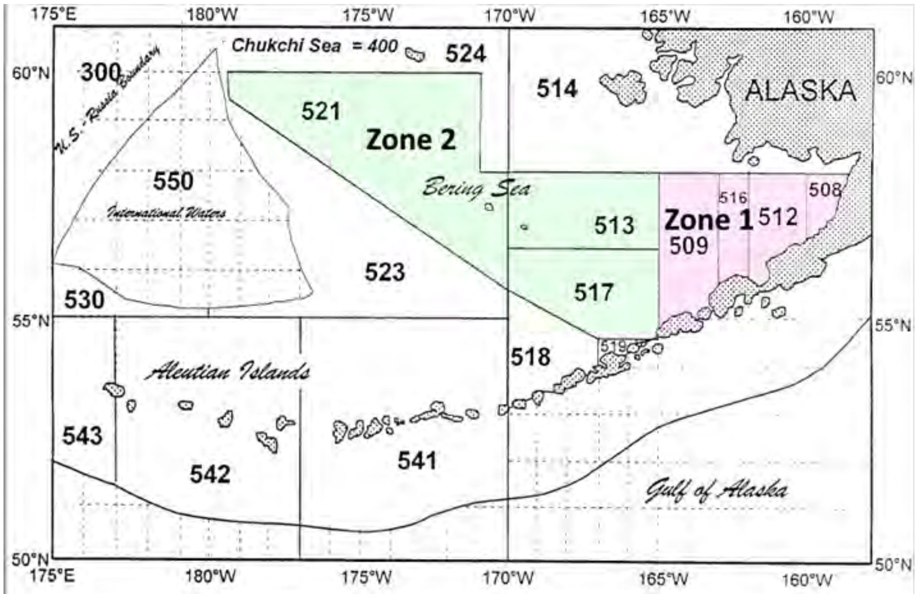


Figure 1 to Part 679. Bering Sea and Aleutian Islands statistical and reporting areas
a. Map

Figure 3-11 Zones 1 and 2 area for closures (Bristol Bay red king crab and EBS Tanner crab)

Table 3-8 PSC limits for Zone 1 red king crab (no Zone 2 red king crab)

When the number of mature female red king crab is …	**The zone 1 PSC limit will be …**
(A) At or below the threshold of 8.4 million mature crab or the effective spawning biomass is less than or equal to 14.5 million lb (6,577 mt)	32,000 red king crab
(B) Above the threshold of 8.4 million mature crab and the effective spawning biomass is greater than 14.5 but less than 55 million lb (24,948 mt)	97,000 red king crab
(C) Above the threshold of 8.4 million mature crab and the effective spawning biomass is equal to or greater than 55 million lb	197,000 red king crab

Source: 50 CFR 679.21(e)(1)(i)

A summary of all red king crab trawl closure measures in shown in Table 3-9.

Table 3-9 Red king crab trawl closures by NMFS reporting area

Area	Effective date	Closure
508	1997	• Closed to all trawl as part of Nearshore Bristol Bay Trawl Closure • Longline and pot vessels required to carry 100% observer coverage
509	--	• Open to trawling, except RKCSA (see below) • Closes, as part of Zone 1, to select target trawl fisheries when applicable red king crab PSC limits are reached by those fisheries
512	March 1987	• Closed to all trawl, first as the Crab and Halibut Protection Zone, and subsequently as part of Nearshore Bristol Bay Trawl Closure • Domestic Pacific cod trawl fishery allowed out to 25 fathoms, with 100% observer coverage, from 1987 to 1997
Eastern part of 514 *(east of 162º W)*	1997	• Closed to all trawl as part of Nearshore Bristol Bay Trawl Closure • Seasonal exemption for the Northern Bristol Bay Trawl Area, which is open to trawling from April 1 to June 15, annually[1]
516	1989	• Closes to all trawl from March 15 to June 15, annually, originally as a seasonal extension of the Crab and Halibut Protection Zone • Closes, as part of Zone 1, to select target trawl fisheries when applicable red king crab PSC limits are reached by those fisheries
Red King Crab Savings Area (RKCSA) *(straddles 509 & 516)*	1995	• Closed by emergency rule from Jan 20-April 19, 1995, to non-pelagic trawl (note, 516 portion of RKCSA also closed March 15-June 15) • Closed by inseason action to all trawl from Jan 20-June 15, 1996 • Closed by amendment to non-pelagic trawl beginning 1997 • Exemption for trawling allowed in the Red King Crab Savings Subarea, when a commercial fishery for Bristol Bay red king crab was allowed the previous year • 100% observer coverage required for all pot and longline vessels fishing in the RKCSA, and all trawl vessels fishing in the subarea

[1] Under a voluntary agreement between industry and members of the Togiak community, in place since 2009, the trawl fleet has agreed to cease fishing in the exempted Northern Bristol Bay Trawl Area by June 1, to avoid potential interactions with halibut.

There are two triggered closures in the trawl fishery to address trawl bycatch of Tanner crab. These are triggered time/area closures to trawl gear as shown in Figure 3-11. Trawl PSC trigger limits for EBS Tanner crab in Zones 1 and 2 are based on a percentage of the total abundance minus an additional reduction implemented in 1999 of Tanner crab as indicated by the NMFS trawl survey (Table 3-10).

Table 3-10 PSC limits for EBS Tanner crab

PSC limits for bairdi Tanner crab: Zone 1 and 2		
Zone	Abundance	PSC Limit
Zone 1	0-150 million crabs	0.5% of the total abundance minus 20,000 animals
	150-270 million crabs	730,000
	270-400 million crabs	830,000
	over 400 million crabs	980,000
Zone 2	0-175 million crabs	1.2% of the total abundance minus 30,000 animals
	175-290 million crabs	2,070,000
	290-400 million crabs	2,520,000
	over 400 million crabs	2,970,000

Source: 50 CFR 679.21(e)(1)(ii)(A)

There is an additional separate triggered time/area closure for trawl fisheries to protect snow crab stocks and their habitat. This closure is triggered if the PSC limit is reached in specified fisheries. The limit accrues for bycatch taken within the *C. opilio* Bycatch Limitation Zone (COBLZ). That area then closes for the fishery that reaches its specified limit. (**Figure 3-12**). The COBLZ area was specified under amendment 40 the FMP and was established in 1997.

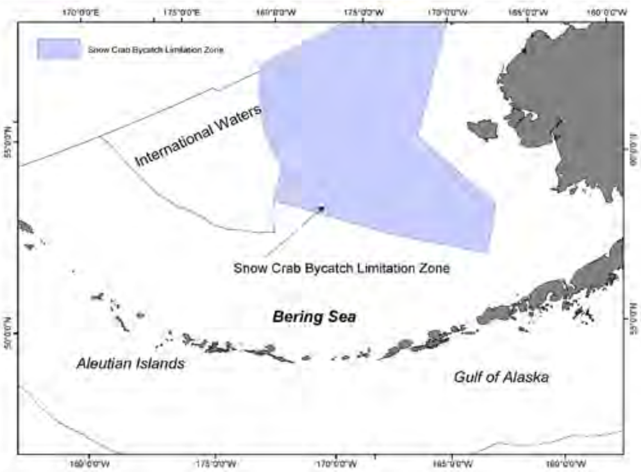


Figure 3-12 C. opilio Bycatch Limitation Zone (COBLZ)

EBS snow crab trawl PSC limits are based on total abundance of snow crab as indicated by the NMFS standard trawl survey. The cap is set at 0.1133% of the snow crab abundance index minus 150,000 crab, unless a minimum or maximum abundance threshold is reached. If 0.1133% multiplied by the total abundance is less than 4.5 million then the minimum PSC limit will be 4.350 million animals. If 0.1133% multiplied by the total abundance is greater than 13 million then the maximum PSC limit will be 12.850 million animals.[28] Snow crab bycatch that occurs outside of COBLZ does not accrue to the COBLZ limit.

A summary of all trawl closures, 2020 PSC limits, as well as other fixed closures to groundfish sectors and gears in the BSAI for crab bycatch management are shown in Table 3-11.

[28] 50 CFR 679.21(e)(1)(iii)

Table 3-11 Summary of groundfish fishery closures for crab PSC and habitat

Stock	Area	Gear type	Timing	For trigger closures		
				Allocation by sector or target fishery in 2020	How catch accrues	2020 PSC limit
Bristol Bay red king crab	Red King Crab Savings Area	nonpelagic trawl	closed year-round, except subarea	Up to 25% of Zone 1 PSC limit		
	Nearshore Bristol Bay Trawl Closure	nonpelagic trawl	closed year-round, except Togiak subarea open 4/15-6/15			
	Zone 1	all trawl	when limit is reached, area closes to target fishery	A80 sector yellowfin sole Pacific cod pollock/mackerel/ other species	RKC bycatch in Zone 1, by fishery	97,000 allocated among target fisheries
EBS Tanner crab	Zone 1	all trawl	when limit is reached, area closes to target fishery	A80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Tanner crab bycatch in Zone 1, by fishery	980,000 allocated among target fisheries
	Zone 2	all trawl	when limit is reached, area closes to target fishery	A80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Tanner crab bycatch in Zone 2, by fishery	2,970,000 allocated among target fisheries
Pribilof Islands blue king crab	Pribilof Islands Habitat Conservation Area	all trawl Pot fishing for Pacific cod	year-round			
EBS snow crab	*C. opilio* Bycatch Limitation Zone (COBLZ)	all trawl	when limit is reached, area closes to target fishery	A80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Snow crab bycatch in the COBLZ, by fishery	8,580,898 allocated among target fisheries
	Northern Bering Sea Research Area	nonpelagic trawl	currently year-round; fishing may resume in future under a research plan			
St Matthew blue king crab	St Matthew Island Habitat Conservation Area	nonpelagic trawl	year-round			

3.3 Amendment 80 fishery description

Note to the reader: CFEC/ADF&G Fish Ticket information and Commercial Operators Annual Reports (COAR) data were not yet available for 2020 at the time of preparation. As a result, tables and figures that report revenue terminate in 2019.

Amendment 80 to the BSAI Groundfish FMP, implemented in 2008, facilitated the formation of fishery cooperatives for trawl CPs that are not eligible under the American Fisheries Act (AFA) to participate in directed pollock fisheries. A80 originally allocated five BSAI non-pollock trawl groundfish species to permit holders that formed a cooperative within the non-AFA trawl CP sector. The A80 sector is allocated a portion of the TAC for Pacific ocean perch in the AI, Atka mackerel, yellowfin sole, rock sole, and flathead sole in the BSAI, as well as an allowance of PSC quota for halibut and crab. Allocations were derived from the catch history of 28 original qualifying CPs from 1998 through 2004. Later, Amendment 85 allocated the A80 sector 13.4% of BSAI Pacific cod. Other eligible permit holders initially participated in a limited access fishery for the balance of the catch allocated to the sector.

The Council adopted Amendment 80 to meet the following objectives: (1) improving retention and utilization of fishery resources by the non-AFA trawl catcher/processor fleet by extending the groundfish retention standard (GRS) to non-AFA trawl catcher/processor vessels of all lengths; (2) allocating fishery resources among BSAI trawl harvesters in consideration of historic and present harvest patterns and future harvest needs; (3) authorizing the allocation of groundfish species to harvesting cooperatives and establishing a limited access privilege program (LAPP) for the non-AFA trawl catcher/processors to reduce potential GRS compliance costs, encourage fishing practices with lower discard rates, and improve the opportunity for increasing the value of harvested species; and (4) limiting the ability of non-AFA trawl CPs to expand their harvesting capacity into other fisheries not managed under a LAPP.

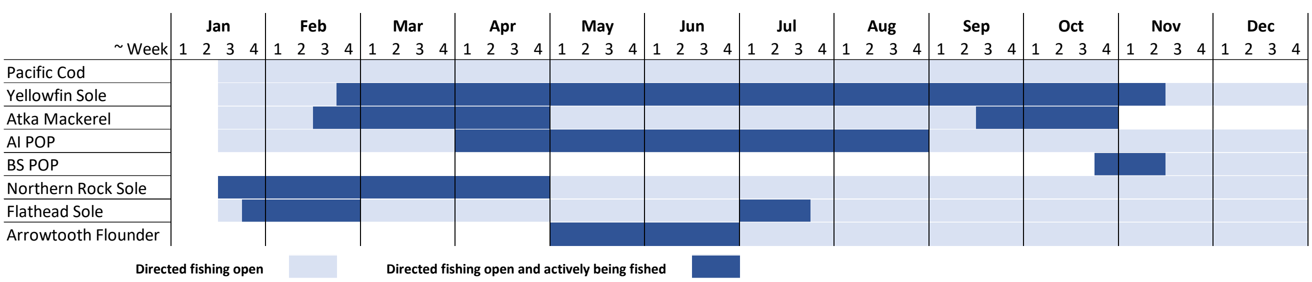
Amendment 80 established criteria for harvesters in the sector to apply for and receive quota share, and for NMFS to initially allocate and set up a system to permit future transfers of quota share among the shareholders. Vessels may choose to operate in a cooperative or in an open access fishery. Cooperative participants can consolidate fishing operations on a specific Amendment 80 vessel or subset of Amendment 80 vessels, thereby reducing monitoring, enforcement, and other operational costs, and permitting more efficient harvest. The ability to trade harvest privileges among cooperatives encouraged efficient harvesting and discouraged waste. A80 cooperatives receive an exclusive allowance of crab PSC and halibut PSC that may not be exceeded while harvesting groundfish in the BSAI. These halibut and crab PSC cooperative quotas are assigned to a cooperative in an amount proportionate to the groundfish quota shares held by its members; PSC quotas are not based on the amount of crab or halibut PSC historically removed by the cooperative members. The cooperative structure allows Amendment 80 vessel operators to better manage PSC rates relative to operators who must race to harvest groundfish as quickly as possible before PSC causes a fishery closure or causes companies/vessels to deviate from their optimal harvest strategy. By reducing PSC through more efficient cooperative operations (e.g., gear modifications, “hot spot” avoidance, deck sorting, or the relative flexibility afforded in the timing of fishing), Amendment 80 vessel operators may also increase the harvest of valuable targeted groundfish species and improve revenues that would otherwise be forgone.

Within the cooperative structure firms are allocated specific amounts of halibut PSC. Firms are allowed to transfer halibut PSC within the cooperative. While this creates some efficiencies for halibut PSC usage within the sector, constraining halibut PSC limits create disincentives for firms to transfer halibut PSC. Firms within the sector are competitors in the world market for Amendment 80 species sales. Transfers are less likely to occur until a firm determines that their limit will not constrain their ability to meet sales contracts during a year. Given the variability of halibut PSC usage during the year firms may not be able to find willing sellers of halibut PSC and if they do it is more likely to be late in the fishing year. These disincentives to of trade halibut PSC when it is a potential constraint to a firm may increase with lower limits .

The A80 sector initially included a set of vessels that formed a cooperative (the AKSC) and a set of vessels that fished in a competitive limited access fishery. Amendment 93 modified the requirements for a group of vessels to form a cooperative, removing unanticipated barriers, and also prevented “persons” (companies) from participating in both a cooperative and the A80 limited access fishery (Final Rule published at 76 FR 68354, November 4, 2011). This meant that a company could not fish its full amount of cooperative quota while also placing one company owned vessel in the A80 limited access fishery to harvest fish that would not have been allocated to that company based on qualifying catch history. The rule eliminated barriers for vessels fishing A80 limited access to form a cooperative and removed incentives for vessels that were in a cooperative to limit membership. The net effect was to increase cooperative participation and the associated benefits, such as more efficient targeting of catch, enhanced ability to avoid bycatch through time and area combinations, and opportunities for improved product quality and value. Since 2011, the A80 sector has been prosecuted exclusively by vessels operating as part of a cooperative. From 2011 to 2017 there were two cooperatives; since 2017, all active A80 vessels are part of a single cooperative (the AKSC). Though the single-cooperative model creates an environment for highly organized fishing and shared investment in bycatch avoidance research, the analysts note that the cooperative is still made up of five independent for-profit companies. Industry reports indicate that intra-cooperative in-season transfers of quota for constraining species – i.e., halibut PSC or Pacific cod – occur very rarely, if ever.

Figure 3-13 shows the typical BSAI non-pollock groundfish seasons for the species allocated to the A80 sector and several that are important unallocated catch (e.g., arrowtooth flounder and BS Pacific ocean perch). The trawl fisheries generally open on January 20 and close by regulation on November 1. For the A80 sector Pacific cod is—broadly speaking—an allocated, constraining non-target species that is encountered in multiple aspects of the sector's operations. A80 vessels might have trips that are recorded as directed fishing for Pacific cod in certain circumstances. However, in many cases, they are caught as an expected and commercially valuable incidental species along with other targeted groundfish. This is in contrast to other BSAI groundfish sectors such as the hook-and-line (HAL) CP sector and the trawl CV limited access sector (TLAS), both of which target Pacific cod primarily.

The other non-pollock groundfish species highlighted in Figure 3-13 are mainly targeted by A80 vessels (except yellowfin sole, which is also targeted by the TLAS). The figure reflects the A80 sector's revealed preference for catching particular species at different points during the calendar year. For example, some flatfish species are more desirable or more valuable when roe is present – e.g., northern rock sole. In some cases, the sector might focus on a particular flatfish species when fish aggregation and CPUE are expected to be higher. Lower value species such as arrowtooth flounder might show up as "actively fished" during gap periods between more valuable species as vessels seek to keep their platforms productive while also retaining valuable secondary species within regulatory limitations. Finally, the reader should note that the non-pollock/non-cod species include both flatfish and roundfish (e.g., Atka mackerel and Pacific ocean perch [POP]). These flatfish and roundfish are both allocated to A80 companies on the basis of qualifying historical catch and, while intra-sector transfers are possible, companies' portfolios are not necessarily balanced between the two types of species in a uniform manner (see Figure 3-15). The figure should not imply that any A80 company would have an unrestricted choice to make between yellowfin sole, rock sole, flathead sole, Atka mackerel, AI POP or Pacific cod at a given point during the year. A company's species quota allocations are the key element of how it plans its fishing year, but companies must also consider the capacity and the capability of their vessels to fish in certain areas (e.g., farther west in the Aleutians), the timing of when fish will be aggregated in fishable areas, and the times when both fish quality is high and the market demands them. To the latter point, a company might start one species later in the A season one year versus another if prices are low due to holdover inventories from the previous season.



Source: https://www.fisheries.noaa.gov/alaska/resources-fishing/federal-fishery-seasons-alaska (Accessed August 2020; last updated 4/12/2019)

Figure 3-13 Typical seasons for selected A80 target fisheries.

The whole of Section 3.3 gives evidence that the A80 sector has been in a near-constant state of change during the analyzed period and that the way in which historical fishery data are used for impact analysis in Section 5.3.2 should be carefully considered. The shifting factors that underlie the sector include the natural environment, external management (e.g., regulations, TACs, PSC limits), and internal management (e.g., cooperative structure, bycatch avoidance strategies).

Section 3.3 covers some of the exogenous factors that have influenced A80 sector operations and will likely continue to do so in the near-term. This section recognizes that the natural environment plays an important role in how fisheries occur – from stock status to fish aggregation (and CPUE). One small but important part of the underlying natural environment for these fisheries is the presence or absence of the Bering Sea "cold pool." Recent ocean temperature anomalies have likely impacted – or may impact in the future – the movement of target and non-target species. To the extent that fishery participants must reckon with this change, historical fishery data on catch, location, bycatch encounter rates, and CPUE might become less representative of the future state of the fishery.

The sector has experienced regulatory changes ranging from which species it might target on the margins (i.e. flatfish flexibility; Section 3.1.1.1) to how halibut encounter is estimated as PSC mortality (i.e. discard mortality rates and fish handling procedures like deck sorting; Sections 3.2.2 and 3.4.5). Some pre-existing regulations have built-in uncertainty that affects A80 operational decisions on an annual basis, such as crab conservation areas that might be open or closed to non-pelagic trawling from one year to the next (Section 3.2.4).

Participants in the A80 sector are linked to other groundfish fisheries to varying degrees. For example, a subset of A80 companies or vessels might also have direct linkages to the TLAS sector or to CDQ groups through ownership or at-sea processing relationships (Section 3.3.4). Recent changes in the regulations governing at-sea processing of CV catch (mothershipping) have shaped or limited revenue diversification opportunities for the A80 sector, and potential regulatory changes to the BSAI trawl CV sector (TLAS) could convey harvest privileges on CVs that deliver to A80 vessels in a mode that would not be affected by PSC limits subject to ABM.

Internally, the A80 sector has evolved since its establishment in 2008. Section 3.3.1 describes how the sector evolved from a mix of cooperatives and limited access participants to a single cooperative. That evolution involved companies exiting the sector or merging with the current managing cooperative, which is diverse in its mix of business plans but has made coordinated steps as a group to prioritize halibut mortality reduction on a progressive basis (Section 3.4.5). In certain years, these business transitions may have affected the catch and bycatch rates that the analysts can report at the sector level.

Recognizing the dynamics of the A80 sector, the analysts attempt to present time series data that reflect the shifts in internal and external management while acknowledging the stochastic effects of exogenous environmental factors. The full time series of A80 history is instructive in terms of how the sector arrived at the operational point where it currently exists, but in some cases the analysts have determined that the most recent set of years (e.g., 2017 through 2019) is most representative of the sector for the purpose of considering future outcomes under the considered ABM alternatives. Data from 2020 are included to the extent that they were available at the time of the analysis – i.e., for catch but not for revenue – with the caveat that the 2020 fishery encountered unique operational challenges and constraints due to the COVID-19 pandemic.

Throughout this document the analysts focus on fishery data for the years 2010 through 2020. The analysts sought to use as much data as possible to identify trends and historical events, while relying on years for which high-quality estimates are available and during which data are comparable across years. Years were also selected to focus on the period that best represents the current state of BSAI groundfish fishery management. While efforts to collect and process better data are always ongoing, it was determined that 2010 marks the earliest year after the implementation of Amendment 80 – as it is related to effects on other fisheries like TLAS and AFA – that the benefits of the eLandings system were achieved. The eLandings system began in 2006, but it took several years for it to be fully utilized and for its benefits to be realized in catch accounting and PSC estimation. The implementation of Amendment 80 in 2008 represented much change for managers as well as for fishery participants. Improvements in data collection and estimation procedures for the A80 sector were made in 2008 and 2009. In addition to eLandings and A80 implementation, the analysts note that NMFS Catch Accounting System (CAS) was modified over the course of 2013 and 2014; the current version of CAS is best applied to the years from 2010 to present. While CAS can still be used to query data from before 2010, the catch and bycatch estimates for earlier years were generated using a different set of programming procedures than the current practice. As a result, any data "fixes" needed to retroactively tag fishing activity to a sector definition that was developed specifically for this analysis would be difficult and potentially unreliable before 2010. In consultation with the Alaska Fisheries Information Network (AKFIN) and NMFS, the analysts determined that data beginning in 2010 offers the best achievable quality and consistency of sourcing, while also providing a 10-year sample through 2019 for revenues.

3.3.1 Fleet composition

Since 2010, the A80 fleet has consisted of 18 to 20 catcher processors, four to eight of which have also participated in the CDQ fishery in a given year (Table 3-12).[29] A majority of these vessels are owned by companies registered in Washington. Nine A80 CPs acted as motherships taking at-sea deliveries from the BSAI trawl CV limited access fishery (TLAS) in 2018, 2019, and 2020. NMFS has recently limited the number of CPs that can receive deliveries of TLAS Pacific cod (BSAI FMP Amendment 120, 84 FR 70064, December 20, 2019) and the CVs that can deliver TLAS yellowfin sole to CPs acting as motherships (BSAI FMP Amendment 116, 83 FR 49994, October 4, 2018). Only one A80 CP is allowed to receive TLAS Pacific cod deliveries (as is one AFA CP). Eight CVs are able to deliver TLAS yellowfin sole to CPs acting as motherships. The majority of those eight CVs are owned by A80 companies that also own the CP mothership to which they would likely deliver.

Table 3-12 Active A80 vessels that harvested A80 and CDQ allocations

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total
A80	19	20	19	18	18	18	19	19	19	20	19	23
CDQ	7	8	7	6	6	4	6	7	8	8	7	12
Total	19	20	20	18	18	18	19	19	19	20	19	23

From 2010 through 2017, A80 consisted of two cooperatives that received annual allocations from NMFS, the AKSC[30] and the Alaska Groundfish Cooperative (AGC). In 2017 the Fishing Company of Alaska began the process of terminating operations and selling its vessels, leading to the sector consolidating into a single cooperative, the AKSC. Apart from this, vessel ownership and cooperative membership has remained relatively stable through the years (Figure 3-16) and appears likely to remain stable in the foreseeable future. For some A80 companies, acquiring more of the limited number of permits is constrained by quota share ownership caps. While the sector has experienced a recent wave of newly built or refurbished vessels, total fleet transformation to high-capacity platforms may be tempered by the availability of catch (TAC), bycatch constraints (halibut PSC and others), and market demand for U.S. flatfish volume.

A80 companies vary in the A80 permits that they control, the number of CPs they own, whether or not they own the CVs with which they partner in the TLAS fisheries (vertical integration), and – importantly – the portfolio of groundfish species and PSC limits available to them each year. The cooperative receives annual catch allocations and PSC limits for specific species. Subsequently the cooperative calculates individual vessel harvest shares and PSC limits and establishes a mechanism for quota transfers within the cooperative and with the other A80 cooperative (if applicable). AKSC manages allocations by "initially apportion[ing] its annual NMFS-issued allocation to individual companies or vessels. Subsequently, AKSC companies can engage in transfers with other AKSC companies or vessels to maximize harvesting efficiencies. Because allocations are managed under hard caps, some portion of each of AKSC's allocations will be left unharvested to serve as a buffer prior to reaching allocation amounts" (Concepcion

[29] The F/V Golden Fleece qualified for a small amount of A80 cooperative quota based on 1998-2004 catch history but has elected not to participate in the sector (does not apply for quota) so that it is not subject to A80 sideboards on fishing in the GOA FMP area where it is historically highly engaged and reliant.
[30] http://www.alaskaseafoodcooperative.org/

and Fina 2019). The A80 fleet sorts roughly into companies or groups of vessels that focus more on flatfish or roundfish based on the qualified catch history associated with their permits.

Figure 3-14 shows the relative distribution of quota share for allocated A80 species associated with each of the 22 permits issued for the 2020 fishing year.[31] The allocation to 15 of the 22 permits is at least 50% flatfish. Only three of the permits are comprised of mostly roundfish (AI POP and Atka mackerel, excluding Pacific cod). Overall, 56% of QS units are for flatfish, 29% are for AI POP or Atka mackerel, and 15% are for Pacific cod. The QS units associated with a given permit does not reflect how a particular vessel will fish within the sector. Companies own multiple permits, and allocated pounds are transferable within the A80 cooperative(s).

Figure 3-15 illustrates the contrast between the five A80 fishing companies that are operative in 2020 in terms of the species mix upon which they rely. The vertical axis expresses the percentage that a species or species group comprises of a company's total catch or gross wholesale revenue over the entire 2010 through 2019 period. The figure defines companies by the historical catch of the vessels for which they claim current ownership in the most recent A80 Cooperative Report provided to NMFS and the Council. Data are obscured to preserve confidentiality; the purpose of the figure is to show that the A80 sector includes companies with different levels of dependence on flatfish and roundfish, and thus different degrees of exposure to expected PSC rates when bycatch is constraining as well as a different set of options in terms of how they might continue their operation in the context of an effectual halibut limit. For example, it was noted above that companies have not historically transferred halibut PSC with one another, but at some point, a greatly reduced PSC limit could force a company to either tie up vessels until lower-PSC fishing opportunities become available or pay what would presumably be a steep price for the ability to keep vessels working; a company in that situation is more likely to be one whose quota portfolio is tilted towards Bering Sea flatfish.

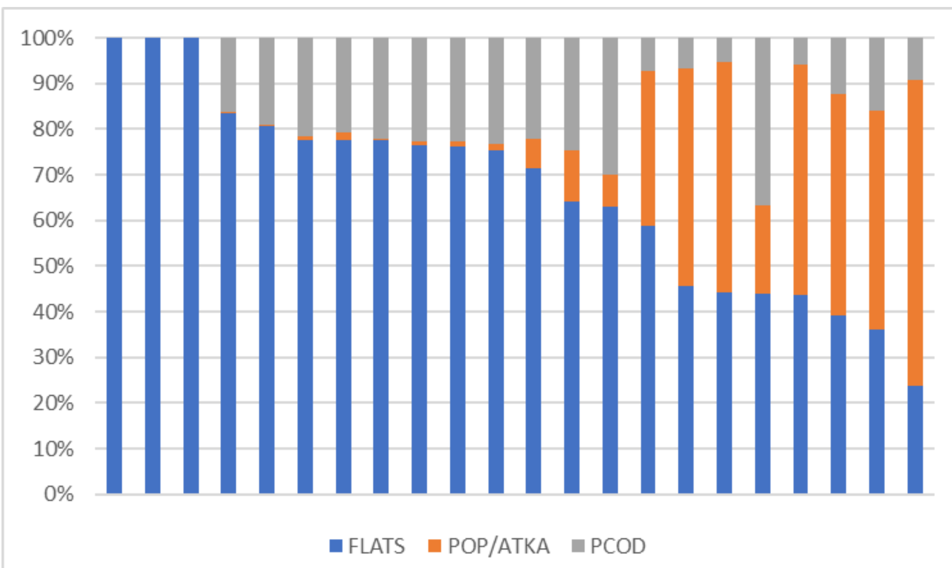


Figure 3-14 Proportion of species allocated on the 22 A80 quota share permits issued in 2020, by allocated species (FLATS = YFS, FHS, and NRS)

[31] Source: https://www.fisheries.noaa.gov/alaska/commercial-fishing/permits-and-licenses-issued-alaska. The annual NMFS report shows the gross number of quota share units associated with each permit. Fifteen of the permits were allocated an average of 56 million QS units while five permits were allocated seven million or fewer QS units.

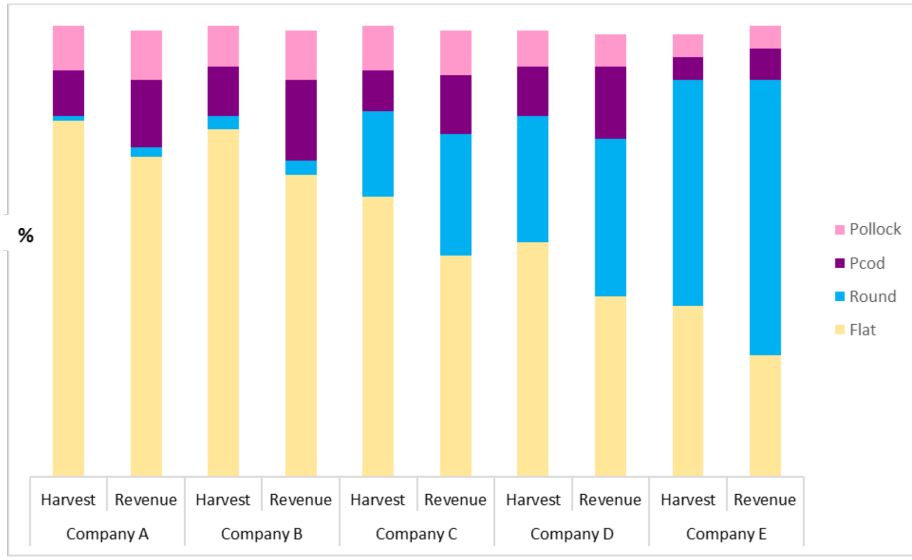


Figure 3-15 Aggregate 2010-2019 percentage of A80 harvest (mt) and gross wholesale revenue ($) by species group for fishing company fleets as comprised in 2020 (Sources: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA; Vessel company affiliations taken from AKSC Reports).

Figure 3-16 identifies the 28 CPs that have been enrolled in the A80 sector since 2010 by company and cooperative affiliation. Five of those 28 vessels were enrolled in a cooperative but have not actively fished in A80 during the analyzed period. Nevertheless, they are shown in the figure because they appear on a cooperative roster; a vessel may be enrolled in the cooperative but not fishing due to the initial vessel-based-allocation structure of the A80 program so that quota pounds can be fished on active platforms.[32] Inactive vessels might also be enrolled in a cooperative to meet the minimum requirements for a cooperative to be formed. One additional vessel that has been listed on a cooperative roster is not shown because it has not ever fished within A80. Vessels that drop out of the figure in more recent years (e.g., Alaska Voyager, Tremont, Ocean Alaska, Ocean Cape, and Alliance) have either been sold to another company or remain owned but are not active in the sector and their permit has been assigned to an active A80 vessel. Some of those permits were reassigned to vessels that only appear in recent years (e.g., Seafreeze America, Araho, and America's Finest), which are newly built vessels.

[32] The vessel-based initial structure of A80 also explains why the Alaska Ranger, which sank in 2008, appears in the figure; the permit and associated catch history linked to that vessel remained in the cooperative until the controlling company's assets were transferred in 2017.

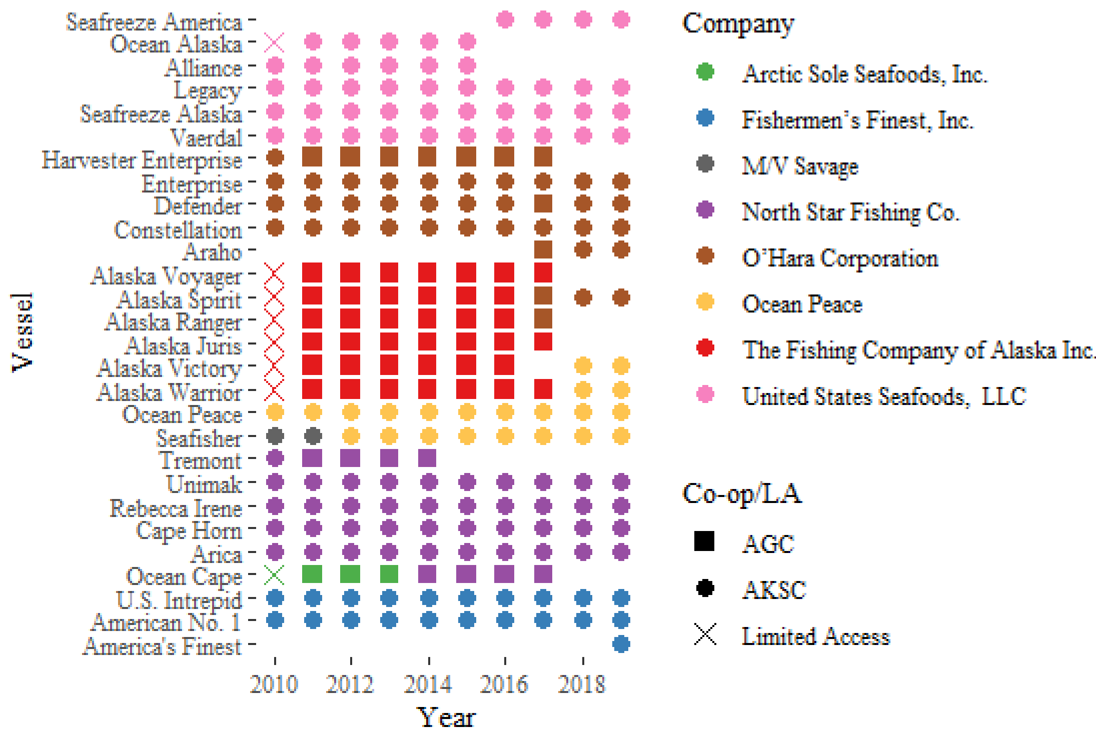


Figure 3-16 A80 Vessels by Company and Cooperative, 2010-2019. (Source: Adapted from information published in annual A80 Cooperative Reports and NMFS Permits & Licenses Issued)

The crew onboard A80 CPs typically includes between 30 and 40 individuals at a given time, and crews are rotated onto a vessel during a fishing year. From 2015 through 2019, the annual number of people who worked on A80 vessels ranged between 1,729 and 2,181. In 2018, the average number of workers by position on an A80 vessel was roughly five deck crew, 27 processing workers, and 8 "others" comprising the officers, engineers, and cooks. Section 10.2 of the SIA details the crew data that are available from the A80 Economic Data Reporting (EDR) program. Crew size on A80 vessels tends to be higher than that of other BSAI groundfish sectors. HAL CP vessels typically carry around 20 individuals while trawl and HAL CV vessels, including directed halibut CVs, tend to have a crew of around four people.

3.3.2 Catch and Revenue

A80 CPs target an array of flatfish and roundfish species and retain secondary groundfish species for commercial use. In addition to the six species for which BS and/or AI TAC is allocated to A80 QS holders – yellowfin sole (YFS), northern rock sole (NRS), flathead sole (FHS), AI Pacific ocean perch (POP), Atka mackerel (Atka), and Pacific cod (Pcod) – A80 vessels also catch and process arrowtooth flounder (ATF), Alaska plaice (AKPL), sablefish (Sabl), and pollock (Plck). The "Other" category shown throughout this section includes northern and other rockfish, Kamchatka flounder, Greenland turbot, "other" flatfish, skates, sculpins, squids, sharks, and octopuses.[33]

Table 3-13 reports the total gross revenues and catch by all A80 sector vessels during the 2010 through 2020 period; dollar values are standardized to 2018 values to better isolate productive value without the effect of inflation across the broader economy.[34] Revenue data for the 2020 fishing year were not

[33] During the three most recent years analyzed in the DEIS (2017-2019) the "Other" category is comprised by volume (mt) of roughly 44% Northern and other rockfish, 26% Kamchatka flounder, 13% Greenland turbot, 12% skates, 5% other flatfish, and negligible amounts of other listed species.

[34] In this section and throughout the document (including the analysis of revenue impacts), dollar values are indexed to 2018 based on the U.S. Bureau of Economic Analysis, Gross Domestic Product: Chain-type Price Index, which is also the method most commonly applied by the Alaska Fisheries Science Center. . 2018 was the most recent year

available at the time of publication of the DEIS. Typically, the highest grossing species for the sector in terms of cumulative gross value are YFS, Atka mackerel, and rock sole. Figure 3-17 shows catch (mt) and gross first wholesale value (2018$) by individual species or species group from 2010 through 2019. Figure 3-18 reports the utilization rate of the A80 allocated species, showing stable high proportion of catch relative to TAC across both flatfish and roundfish species.[35] A80 vessels are not uniform in the mix of species that they catch. Figure 3-14 showed the diversity of allocated species across A80 QS permits. As those permits are assigned to vessels and as A80 companies deploy quotas across their fleets, certain vessels might be more or less dependent on flatfish versus roundfish in a given year. The difference in fishing portfolios across companies and vessels can also mean that individual companies or vessels are more or less exposed to potential halibut bycatch (refer to Figure 3-15 for rough depiction of company portfolios and to Table 3-20 in Section 3.4 for halibut PSC rates by target species).

NMFS's Catch Accounting System categorizes A80 vessels' catch by trip target. A trip for a CP captures a week of harvesting activity and a target species is assigned based upon the predominate species caught.[36] According to the Council's BSAI Pacific cod allocation review (NPFMC 2019c), most of the targeted Pacific cod originates from test tows for other A80 species that were not intended as Pacific cod target tows. In some instances, however, a vessel could target Pacific cod to facilitate that vessel's mothership processing activity as it works with trawl CVs operating in the TLAS sector. The ability to target Pacific cod is limited by the relatively small allocations of that species to A80 QS holders (13.4% of the BSAI TAC) and the need to reserve Pacific cod quota to cover incidental catch of cod while targeting other A80 species throughout the fishing year. The amount of Pacific cod allocated to the A80 sector is small relative to the tonnage allocated or accessed from the nonspecified reserve for some other species, but it is utilized at a high rate (Figure 3-18). Figure 3-20 shows that while cod is a small component of total A80 catch it occurs throughout the year concurrent with primarily targeted species (e.g., rock sole and yellowfin sole). Figure 3-35 shows that cod catch occurs throughout the geographic range prosecuted by A80 vessels.

available when drafting the first version of this DEIS (presented at the October 2018 Council meeting) and has continued to be used as the index year in subsequent versions for consistency.
Citation: U.S. Bureau of Economic Analysis, Gross Domestic Product: Chain-type Price Index [GDPCTPI], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/GDPCTPI, August 24, 2020. Available at: https://fred.stlouisfed.org/series/GDPCTPI.

[35] Note that this information was drawn from A80 cooperative reports that were not available for 2020 at the time of DEIS publication.

[36] A trip is categorized as a flatfish target trip if the sum of flatfish catch (YFS, NRS, FHS, and other flatfish) is dominant over other species in the total catch. For YFS to be assigned as the trip target, the YFS catch must be greater than or equal to 70% of total catch. If that bar is not met on a flatfish target trip then the target is designated as the one of the other three flatfish species that made up the largest proportion of the trip's catch.

Table 3-13 **A80 gross first wholesale revenue (2018 dollars) and catch (mt), 2010 through 2020. Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA**

Year	Revenue (2018$)	Total Harvest (t)
2010	323,787,060	305,192
2011	385,153,549	302,157
2012	397,530,330	307,406
2013	307,582,132	306,775
2014	316,928,372	308,022
2015	290,450,269	289,169
2016	306,495,840	298,443
2017	359,357,539	278,771
2018	379,443,654	290,173
2019	335,260,125	288,302
2020		290,382

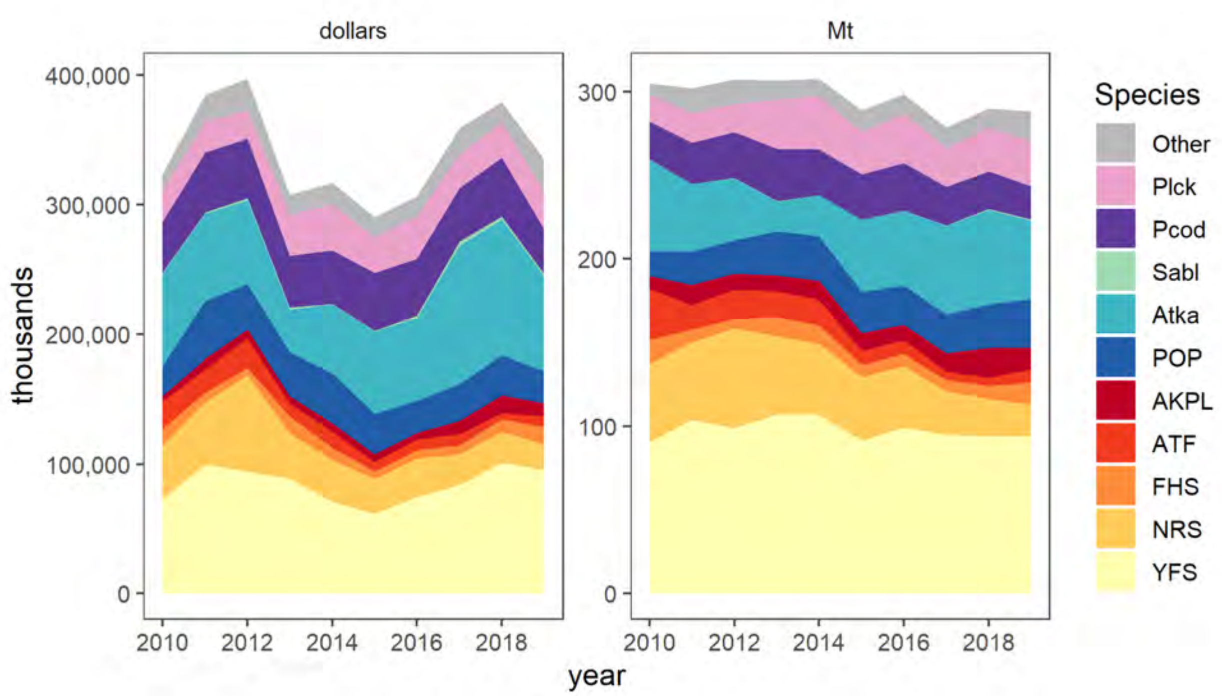


Figure 3-17 **A80 gross first wholesale revenue (2018 dollars) and catch (mt) by species, 2010 through 2019. Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA**

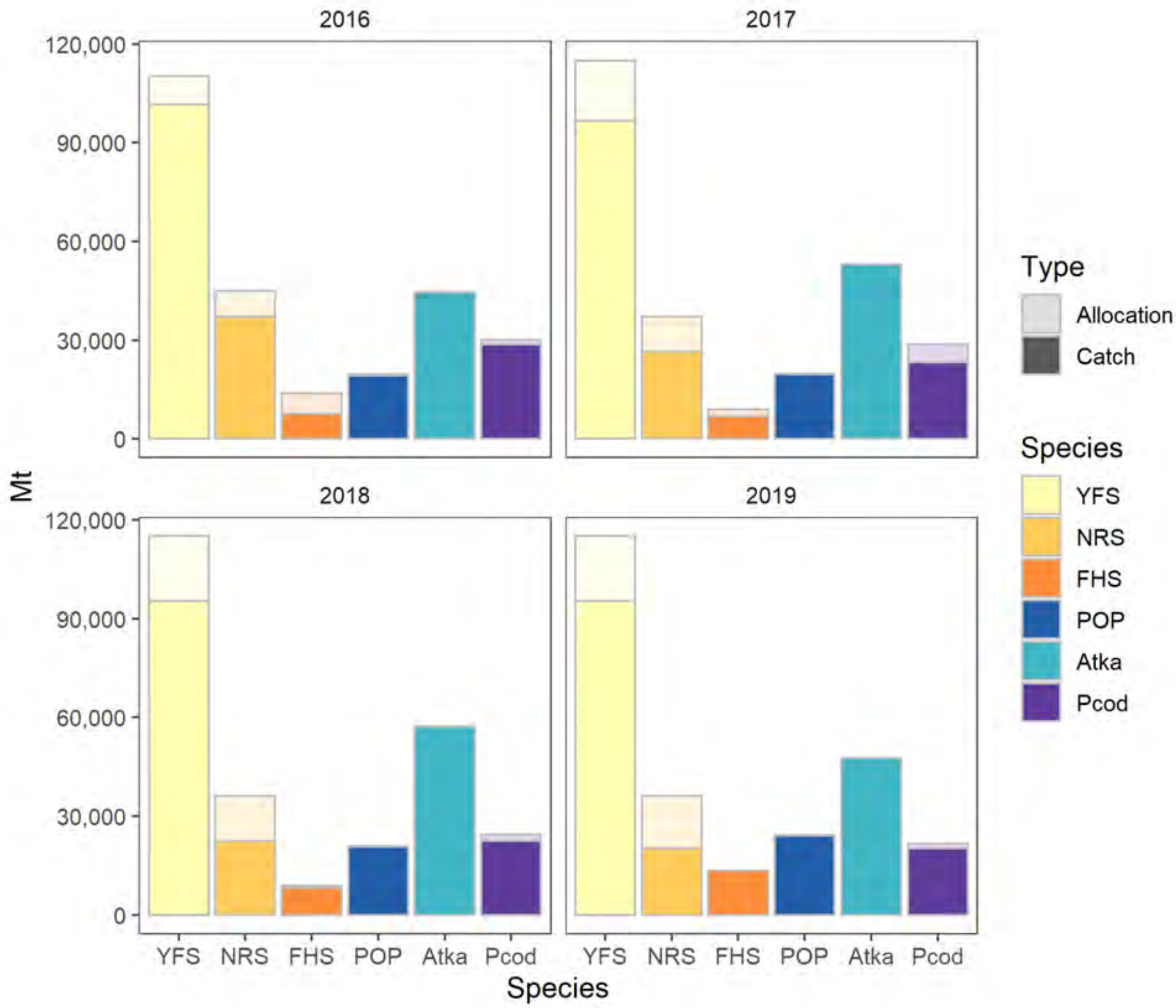


Figure 3-18 A80 allocation and catch 2016 through 2019. (Source: Adapted from information published in annual Cooperative Reports)

Consideration of first wholesale versus ex-vessel values for the A80 sector

In this document, A80 catch values are reported as gross first wholesale revenues. These values are derived from prices taken by AKFIN from COAR that are then linked to round weights and product weights by product type and linked to a specific processor by production reports. The first wholesale price is the market price of the primary processed fishery product. This is the value of a processed product when sold by a processor to an entity outside of their affiliate network; it is typically equivalent to the value of product as it leaves Alaska (AFSC 2019). The first wholesale value is the most appropriate value to represent A80 revenues given the typical supply-chain of A80 product. While there is some variation across operations and for specific groundfish species/products, most A80 product is exported to secondary processors as frozen head and gut product.

For fisheries harvested by catcher/processors, there is no reliable ex-vessel price generated from the sale of raw fish by a harvester to a primary processor. Approximate conversions can be made and are, in some cases, used in the fishery management world. Two examples where estimated ex-vessel values are imputed from A80 catch are NMFS cost recovery and the application of the State of Alaska's Fishery Resource Landing Tax. However, those estimates do not claim to represent real product values for catcher/processors and it is generally accepted that ex-vessel estimates have varying degrees of accuracy across species and product types. For the purposes of cost recovery and taxation, the estimate is based on the value of processed products from catcher/processors (from COAR) divided by the retained round-weight (unprocessed weight) of catch and then multiplied by a factor of 0.4 to correct for the value added to the fish product by processing (NOAA Fisheries 2020). This document generally does not report wholesale to ex-vessel value conversions for A80 due to the imprecision of a generic conversion factor and the relative lack of utility in characterizing a catcher/processor fishery in ex-vessel terms. One exception to this is Section 3.3.2 (A80 fishery taxes sub-section below). In that section, the analysts estimate the ex-vessel value of A80 catch from 2010 through 2019 (2018$) to reflect the order of magnitude for fishery taxes paid to the State of Alaska (Table 3-16). A reader who is intent on viewing the value of A80 catch in terms of ex-vessel revenue will find it there and is advised to apply all appropriate caveats to those estimates. The reader may find a different estimate – the total A80 fishery value used to calculate the cost recovery fee – in this section under the NMFS Cost Recovery Heading.

Diversification of revenue on A80 vessels

This subsection looks at the proportion and scale of gross wholesale revenues that A80 vessels generate from their allocated quotas (and secondary catch associated with that fishing), from acting as a mothership to CVs, from partnering with CDQ groups to harvest CDQ allocations, and from fishing in the sideboarded GOA trawl CP fishery. (Note that the operational relationship between A80 and the CDQ sector, as well as catch/revenue outcomes, is further described in Section 3.3.4).

In general, the A80 fleet is highly focused on BSAI non-pollock groundfish. That said, only two of twenty four vessels active between 2010 and 2020 fished *exclusively* within the A80 sector. Table 3-14 shows the seven different fishery combinations that active A80 vessels displayed over the entire period, and in 2019 as a snapshot. In 2020, there were 19 active A80 vessels; seven fished CDQ (9,550 mt of groundfish catch), nine operated as a mothership, and nine fished in the GOA. The analysts note that revenue derived from catching and processing CDQ fish, processing at-sea deliveries as a mothership, and operating in the GOA would not be directly impacted if the ABM alternatives result in A80 halibut PSC limits that suppress the reliable productivity of fishing the annual A80 cooperative quota and associated marketable secondary species.

Table 3-14 Modes of operations by A80 vessels active during 2010-2019: entire period and 2019 (M = mothership)

	Period	2019
A80	2	6
A80-CDQ	1	
A80-M-CDQ	1	4
A80-M-CDQ-GOA	6	2
A80-CDQ-GOA	4	2
A80-M-GOA	3	3
A80-GOA	7	3
Total	**24**	**20**

None of the currently active A80 vessels derive any revenue from Washington, Oregon, or California groundfish fisheries.[37] One A80 vessel is qualified as an AFA pollock CP. That vessel has not fished AFA pollock in the five most recent years reported at the time of the DEIS and, while catch or revenue data cannot be reported for an individual vessel, pollock fishing did not comprise a significant portion of its activity during the analyzed period.

Figure 3-19 shows total gross first wholesale revenues for all A80 vessels that were active during the 2010 through 2019 period. For the entire period, A80 vessels generated 80% of total wholesale revenues

[37] One A80-qualified vessel that is no longer active in the sector had catch history in the West Coast region.

from the catch and processing of quotas allocated to the sector and catch of unallocated species or marketable secondary species that was made on A80 trips. On an annual basis, that proportion never reached higher than 84% (2010) or fell lower than 76% (2017).

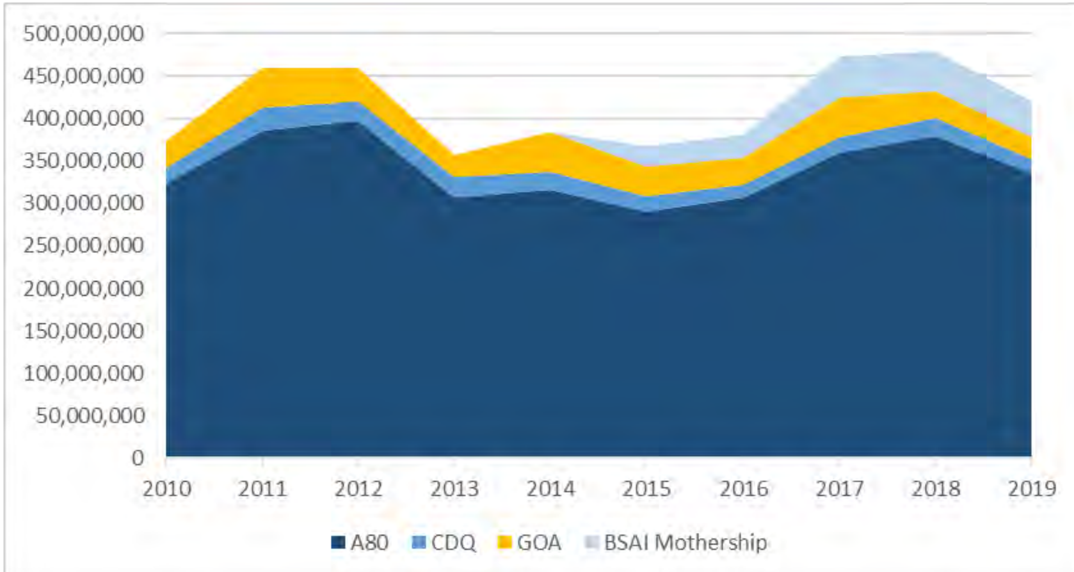


Figure 3-19 Total gross first wholesale revenues for A80 vessels across all activities (2018$), 2010 through 2019. (Note: BSAI mothership activity occurred from 2010 through 2014 but revenues are not shown because the data include fewer than three vessels.)

Since 2010, ten different A80 vessels have acted as a mothership, processing Pacific cod and yellowfin sole target fishery catch delivered by CVs. Some of the CV catch delivered to A80 mothership vessels may have been catch of CDQ fish, but the analysts consider this mothership activity as opposed to the catching and processing of CDQ fish all on an A80 platform, which is described below and captured as "CDQ" in Figure 3-19. Only two A80 vessels participated in mothership processing from 2010 through 2014. From 2015 through 2019, the number of A80 vessels taking at-sea deliveries from CVs increased to six, seven, eight, nine, and nine in those years sequentially.

As noted in the previous section, recent regulatory changes now allow only one A80 CP to process Pacific cod as a mothership (Amendment 120) and only eight CVs may deliver yellowfin sole to motherships (Amendment 116). The latter regulation effectively caps A80 vessels' activity as yellowfin sole at-sea markets to those owned by companies that are associated with these eight CVs through direct ownership or existing business arrangements. The vessels that have acted as motherships are owned by three of the five current A80 companies. From 2017 through 2020, the number of A80 CPs that took yellowfin sole target deliveries from CVs was eight or nine vessels each year. Seven or eight A80 CPs took target Pacific cod deliveries from CVs in 2017 through 2019, but under the newly implemented regulation only one such vessel is currently able to do so.[38]

The estimated gross wholesale value generated by A80 mothershipping activity increased from around $24.7 to $27.6 million in 2015 and 2016 to $49.6 million in 2017 and then declining to $46.8 million and $42.6 million in 2018 and 2019 respectively (2018$). The tailing off of mothershipping revenue in 2019 could be an effect of the recent regulations limiting mothership activity but is more likely reflecting lower unit values for key mothership species (Table 3-15). In 2019, the average mothershipping wholesale

[38] CPs acting as a mothership that are not permitted to function as an at-sea Pacific cod market may still receive and process cod up to an MRA, since Pacific cod is a maximum retention species. It is possible that a CP that is excluded from Pacific cod mothershipping might show up in observer data as having a mothership Pacific cod target if vessels targeting other species delivered more cod than intended, but the mothership's retention limit is still expected to be applied as fish are sorted in the processing factory.

revenue among the nine participants was $4.7 million but the median was $2.1 million, indicating that a few vessels are highly engaged in this mode of operation. In 2019 the average revenue from mothership processing among the three most highly engaged vessels was around $11.3 million. As a group, those three vessels generated 36% of their combined 2019 total gross wholesale revenues across all activities from processing as a mothership.

As shown in Table 3-12, 12 A80 vessels have harvested CDQ fish between 2010 and 2019. In recent years, the number of A80 vessels working with CDQ groups to harvest their non-pollock groundfish – either through a royalty arrangement or joint ownership – has been between six and eight vessels. Since 2010, three A80 companies have caught and/or processed CDQ fish; company-level participation cannot be reported over a smaller set of years due to confidentiality. Figure 3-23 reports that the average total annual wholesale revenue from CDQ catch on A80 vessels has been in the range of $17 million to $21 million in recent years. From 2017 to 2019, the average wholesale revenue generated by an A80 vessel's harvest and/or processing of CDQ fish was between $2.2 million and $2.7 million (2018$). In aggregate, the eight A80 vessels that have partnered in CDQ harvest from 2017 to 2019 generated between 8% and 9% of their total wholesale revenues from that activity.

From 2010 to 2019, 20 of 24 A80 vessels that were active at some point generated wholesale revenue when operating in the GOA. Sixteen A80 vessels fished the GOA from 2010 through 2012; no more than 13 A80 vessels fished the GOA since 2013, and in the three most recent years analyzed in the DEIS it was eight or 10 vessels.[39] All five of the current A80 companies were represented by at least one vessel in the GOA during the 2019 fishing year. At the sector level, GOA wholesale revenues accounted for between 6% and 12% of total A80 revenues annually, with the lowest proportion occurring in 2019. The average annual proportion was 8% of total sector revenue. The period average total GOA wholesale revenue for A80 vessels (2018$) was $35.8 million (median = $32.8 million). The highest value occurred in 2014 ($47.8 million) and the lowest values occurred in 2013 and 2019 (~$25.6 million). The PSC limitations governing A80 vessels fishing in the GOA are described in Section 3.3.3.

Market information for selected A80 species

Table 3-15 reports the average annual gross first wholesale value per pound of the groundfish species that make up the bulk of A80 catch and revenue reported in Figure 3-17. The NMFS At-Sea Production Reports that underly the table are pulled only from vessels fishing within the A80 sector so, for instance, values reported for at-sea pollock production do not reflect AFA CP activity. The values aggregate across all product forms for each species that might come out of the A80 sector. Value-per-pound is reported here in nominal terms, meaning no adjustment for inflation has been made. A species for which external determinants of nominal value are stable would be expected to display a slightly upward trend over a period of years, without placing too much importance on small year-on-year variations. The principal factors that influence average wholesale values per pound include the strength of international demand relative to supply for a species (or a group of highly substitutable species), the at-sea processors' emphasis on producing higher-value product forms, and the strength of the global market for U.S.-produced seafood in the context of currency valuations, tariffs, and competition from foreign fisheries that produce similar types of fish. The time series of available data does not capture market shifts related to disruptions from the 2020 global health and trade crisis, which is likely to impact the marginal value of A80 products in the near-term.

The first four species listed in Table 3-15 are the ones that make up the greatest proportion of sector-level catch and gross revenue. Of those, POP diverges the most from the expected upward trend over the full time series. Prices for marketable non-target species such as pollock are likely not reflective of the general market of at-sea pollock because A80 platforms are not necessarily set up to produce and market

[39] This does not include one A80-qualified vessel that has opted out of receiving cooperative quota share so that is not subject to A80 sideboards in the GOA, where that vessel conducts all of its fishing.

the higher value products forms that would increase average annual unit prices. Sablefish makes up a small amount of total A80 catch but is notable for a recent sharp decline in nominal wholesale unit value. While no single explanation is apparent, it is likely that sablefish prices are down due to smaller average fish size and a general softening in demand markets. Unlike many flatfish species or species primarily allocated to the A80 sector (e.g., Atka mackerel), Alaska sablefish prices could be influenced by the ability of the hook-and-line sectors to catch their quotas and the prices at which they set the market.

Table 3-15 Annual average gross wholesale value (nominal $/lb. for selected A80 groundfish species, 2010 through 2019. Order of species roughly reflects total A80 catch by volume in 2019.

Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Yellowfin sole	0.53	0.64	0.62	0.50	0.45	0.48	0.54	0.65	0.82	0.77
Atka mackerel	0.84	1.03	1.13	1.22	1.39	1.03	1.00	1.37	1.36	1.15
Pacific ocean perch	1.17	1.74	1.41	1.07	1.20	1.06	0.93	1.13	1.05	0.81
Northern rock sole	0.61	0.77	0.92	0.57	0.55	0.55	0.61	0.71	0.90	0.83
Pollock	0.61	0.73	0.69	0.65	0.57	0.55	0.88	0.46	0.52	0.60
Pacific cod	1.07	1.34	1.18	0.85	1.00	1.18	1.12	1.37	1.73	1.45
Alaska plaice	0.46	0.51	0.58	0.49	0.48	0.43	0.44	0.80	0.63	0.64
Flathead sole	0.69	0.90	0.93	0.85	0.70	0.62	0.74	0.86	0.98	0.86
Arrowtooth flounder	0.48	0.72	0.86	0.63	0.83	0.74	0.84	1.30	0.87	0.86
Greenland turbot	1.52	2.19	1.89	1.45	1.60	1.56	2.05	2.00	2.00	2.04
Kamchatka flounder	-	0.70	1.00	0.55	0.74	0.67	0.83	1.48	1.28	0.99
Sablefish	5.61	6.28	3.76	4.31	5.10	4.93	4.66	4.67	2.89	2.88

Source: NMFS Alaska Region At-Sea Production Reports, data compiled by AKFIN in Comprehensive_WPR.

Notes: Greenland turbot and Kamchatka flounder are part of the "Other Species" category in previous catch/revenue figures. No average annual value for 2010 Kamchatka flounder was retrieved from NMFS At-Sea Production Reports by AKFIN.

The remainder of this subsection are adaptations from three Economic Performance Reports (EPR) on A80 species or species groups that were produced by the Alaska Fisheries Science Center's Resource Ecology and Fisheries Management Division (REFM). The most recent available reports were produced in 2020 and focus on the 2019 fishing year as a baseline for retrospective trend analysis. The Groundfish Plan Teams recommend that stock assessment authors incorporate EPRs as an appendix to the assessment chapter, though that may not happen in cases when an assessment is in an "off-year" or if the EPR is for a broad species complex such as BSAI Flatfish. The three 2019 EPRs excerpted below are for BSAI flatfish, BSAI rockfish, and Atka mackerel.[40] The analysts caution that these reports do not necessarily represent the status of BSAI groundfish markets in the unique circumstances of the 2020 fishing year.[41]

<u>BSAI Flatfish 2019 Economic Performance Report</u>

BSAI FMP flatfish are predominantly caught in the Eastern Bering Sea by catcher/processors in the A80 Fleet. The two most significant flatfish species in terms of market value and volume are yellowfin and rock sole. These two species accounted for 64% and 12%, respectively, of the retained flatfish catch. Flathead sole, arrowtooth flounder, and Kamchatka flounder are also caught in significant quantities accounting for approximately 5-10% of the retained flatfish. The remainder of the catch volume is comprised of other flatfish which includes Alaska plaice and Greenland turbot.

First-wholesale value in the BSAI flatfish fisheries decreased 1% to $209.8 million with a 4% decrease in yellowfin sole price, a 6% decrease in the rock sole price, an 11% decrease in the flathead sole price, and

[40] Source: B. Fissel. AFSC REFM Division, personal communication, February 2021.

[41] One publicly available in-season tracker of fishery performance is a monthly report distributed by the McKinley Group for the Alaska Seafood Marketing Institute. That report draws on NMFS Office of Science and Technology (OST) data. Once 2020 value and export data are reconciled in 2021, analysts will be able to provide a more thorough analysis of the unique effects of 2020 on fishery value. Because NMFS OST data are not disaggregated by sector, management area, or even region of the county, the analysts continue to rely primarily on data provided directly by AKFIN for the analysis of impacts.

an 8% decrease in the arrowtooth flounder price.[42] Prices for most flatfish were at a decadal high in 2018 and the marginal decreases in 2019 left prices at a high level relative to prices over the last decade.

Flatfish are primarily processed into the headed-and-gutted (H&G) and whole fish product forms and changes in production largely reflect changes in catch. The export volume of yellowfin sole and rock sole is approximately 75-90% of the annual volume of processed products.[43] Exports are primarily destined for China and South Korea, with China typically accounting approximately 80-85% of total exports. In 2019 China's share of exports dropped to 71% and South Korea's share of value increased from approximately 15% to 20% in 2019. A significant share of this product is re-processed into fillets and re-exported to North American and European markets. Flatfish can serve as a substitute for other higher priced whitefish products, and price changes for these other species can influence flatfish demand. Some rock sole is processed as H&G with roe, which is a higher priced product which is primarily destined f or Japanese markets.

The Alaska flatfish fishery became MSC certified in 2010 and received the Responsible Fishery Management (RFM) certification in 2014. Certification provides access to some markets, particularly in Europe, and may enhance value. Some media reports have attributed the price increase in 2011 to the MSC certification and Asian markets where demand is expected to increase with growth in the middle class population. Reduced fishing opportunities in 2013-2014 for higher valued Atka mackerel may have diverted additional fishing effort towards flatfish increasing catch in these years. Increased supply and inventories from the additional catch put downward pressure on prices. As Atka mackerel fishing resumed more normal levels in 2015 and later, flatfish supply and inventories were reduced, prices began to rise. Atka mackerel catches were high in 2017 and 2018 which may have contributed to the reduced catch of flatfish despite high prices. Because of China's significance as a re-processor of flatfish products, the tariffs between the U.S. and China have put downward pressure on flatfish prices and may inhibit value growth in some flatfish markets. Industry lacks immediate alternative reprocessing options to China. Export quantities of yellowfin sole and rock sole increased in 2019 from 2018 and the share of exports to China decreased despite rising export prices.

BSAI Rockfish 2019 Economic Performance Report

Rockfish catch in the BSAI increased in 2019 from 2018 with a total catch of 54 thousand mt and a retained catch 49.8 thousand mt with significant catch increases for both of the primary rockfish species: northern rockfish and Pacific ocean perch. Catch levels in 2019 were the highest observed over the 2003-2019 time series analyzed and were 30% higher than the previous high in 2018. Rockfish are an important component of the A80 fleet's catch portfolio. First-wholesale value of rockfish was down 2% in 2019 to $42.5 million despite the increased catch and production as first-wholesale prices decreased 21% to an average of $0.80 per pound.

The most significant rockfish species caught in the BSAI in terms of volume and value is Pacific ocean perch, which typically accounts for approximately 90% of the total BSAI rockfish value. In 2019, Pacific ocean perch's value share fell to 80% as it's price declined was larger than other rockfish species. Northern rockfish, which typically accounting for under 10% of the value, increased to 14% in 2019. Other rockfish, such as rougheye and shortraker rockfish are caught in significantly smaller quantities.

Rockfish are among the more valuable species caught by the A80 fleet with an average price per pound is typically higher than the flatfish prices (though this was not the case in 2019), however the volume of catch is significantly smaller than flatfish catch. Rockfish are typically harvested close to the total allowable catch (TAC) and TACs for Pacific ocean perch are set close to the Allowable Biological

[42] Because BSAI flatfish are primarily targeted by catcher/processor vessels there is not a substantive ex-vessel market.
[43] Yellowfin sole and rock sole are the only species with species specific trade data. The other primary BSAI flatfish are aggregated into a non-species specific flatfish category.

Catches (ABC). Because of this, annual changes in catch and production largely reflect changes in abundance and TAC. In recent years approximately 90-95% of the total rockfish catch has been retained.

First-wholesale prices decreased 22% for Pacific ocean perch to $0.80 per pound and decreased 12% for northern rockfish to $0.69 per pound. Increases in catch and production were not enough to offset the decrease in price for Pacific ocean perch and first-wholesale values were down to $34 million. Northern rockfish value increased to $5.9 million.

The majority of rockfish produced in the U.S. are exported, primarily to Asian markets. Pacific ocean perch is the only rockfish species with specific information in the U.S. trade data. Other species are aggregated into a non-specific category. Approximately 70% of the Pacific ocean perch exported from the U.S. went to China in 2019. This is an increase relative to recent years where approximately 60% of exports went to China. Exported H&G rockfish to China is re-processed (e.g., as fillets) and re-exported to domestic and international markets. Rockfish are also sold to Chinese consumers, as whole fish. The U.S. has accounted for just over 15% of global rockfish production in recent years and 85-90% of global Pacific ocean perch production. Global production of rockfish has increased 15% from the 2010-2014 average to 337 thousand mt in 2018 and global production of Pacific ocean perch has increased 22%. Global production of Atlantic redfish, a market competitor to Pacific ocean perch, increased slightly to 52 thousand mt but in recent years has remained relatively stable at roughly 50 thousand mt. The U.S. dollar was relatively stable in 2019 against other currencies, such as the Chinese Yuan, which mitigates its potential impact on market price. Because of China's significance as a re-processor of rockfish products, the tariffs between the U.S. and China have put downward pressure on rockfish prices and has inhibited value growth in rockfish markets. Industry lacks immediate alternative reprocessing options to China. Export quantities of Pacific ocean perch decreased in 2019 from 2018 and the share of exports to China increased despite declining export prices and increased production.

Atka Mackerel 2019 Economic Performance Report

Atka mackerel is predominantly caught in the Aleutian Islands, and almost exclusively by the A80 fleet. Atka mackerel is an important source of revenue for A80 because of its high price relative to other species. In 2019 Atka mackerel total catch decreased to 58.5 thousand mt and retained catch decreased to 57.5 thousand mt. Catch levels peaked in 2018 after significant reductions in the TAC in 2012 and 2013 when catch levels were low due to area closures to protect endangered Steller sea lions, and survey-based changes in the spatial apportionment of TAC. The 2019 decrease in the catch is a result of a reduction in the Allowable Biological Catch and TAC. Commensurate with the change in catch, first-wholesale production decreased to 34 thousand tons. The decrease in production coupled with a 14% decrease in price to $1.16 resulted in a 34% drop in first-wholesale revenue to $86.6 million.

The U.S. (Alaska), Japan and Russian are the major producers of Atka mackerel.[44] Typically, approximately 90% of the Alaska caught Atka mackerel production value is processed as head-and-gut (H&G) products, the remainder is mostly sold as whole fish. In 2019, 99% of the catch was processed as H&G as whole fish production dropped off. Virtually all of Alaska's Atka mackerel production is exported, mostly to Asian markets. In Asia it undergoes secondary processing into products like surimi, salted-and-split and other consumable product forms. Industry reports that the domestic market is minimal, and data indicate U.S. imports are approximately 0.1% of global production.

The upward trend in first-wholesale and export prices through 2018 had been influenced by international factors. Global supply of Atka mackerel was in decline because of substantial decreases in catch volume in Japan. In 2018 catch volumes in Japan began to increase, coupled with increasing supply from the U.S. in 2018, which may be putting downward pressure on prices that carried through into 2019. Despite the decrease, Atka mackerel prices remain high relative to pre-2017 levels.

[44] Japan and Russia catch the distinct species Okhotsk Atka mackerel which are substitutes as the markets treat the two species identically.

Global production dropped from an average of 226 thousand mt between 2008-2012 to an average of 108 thousand mt between 2015-2017. The reductions in international supply meant that the U.S. has captured a larger share of global production in recent years relative to the 2008-2012 average. The global supply reductions put upward pressure on the price which is reflected in the higher price after 2011. Additionally, the opening of previously restricted areas off the Aleutians has given industry more access to larger fish which yield a higher price per pound in the market. The increased price of Atka mackerel in recent years has helped to increase first-wholesale value. International production of Atka mackerel was on the decline because of reductions in Japanese and Russian catch and production which were particularly severe in 2015. The U.S. supplied 55% of the global market of Atka mackerel in 2018. This resulted in increased demand for U.S. Atka mackerel in Japan where it is used to make surimi among other products. Because Atka is primarily exported to Japan, which constitutes roughly 70% of the export value, the U.S. exchange rate can influence first-wholesale prices, and the exchange rate has remained stable since 2016.

A80 fishery taxes

The A80 sector's production generates taxes that are important revenue sources for communities, boroughs, and the State of Alaska. That production includes the catch and processing of A80 groundfish species, the catch and processing of CDQ groundfish on A80 platforms, and the processing trawl limited access sector (TLAS) catch on A80 platforms. In addition to taxes paid, the A80 sector remits cost recovery fees to NMFS to defray direct costs of management, data collection, and enforcement. This section summarizes the taxes levied on the A80 sector's fishing activity and estimates the fish tax liability and cost recovery payments incurred by the sector in recent years. Additional analysis of tax revenues related to the ABM action is provided in Section 10.4 of the SIA attached to this FEIS. Taxes and other fees that pertain to the directed commercial halibut fishery are addressed in Section 4.5.1.3 of this FEIS.

There are two main sources of fishery taxes in Alaska: shared taxes administered through the State of Alaska – described below – and municipal fisheries taxes independently established and collected by select municipalities. Municipal fish taxes are typically levied on raw fish landings, and thus would not apply to vessels that catch and process BSAI groundfish at-sea. A80 vessels contribute to municipal tax bases through non-fishery tax programs related to marine fuel sales and transfer, port usage, sales tax related to provisioning, and bed and other commerce taxes related to crew rotation through Alaska communities. There is no single source for data on these revenue streams and available municipal-level tax summaries do not disaggregate non-fishery tax payments by business sector (i.e. fisheries), much less by fishery management sector (e.g., A80). The Alaska Department of Commerce, Community, and Economic Development (DCCED) provides a summary of municipal taxes.[45] Port calls by A80 vessels are a rough measure of the sector's interaction with Alaskan communities and the potential for local taxes on spending by the vessel and its crew, but they are the best available proxy. Section 4.5.3 of the SIA attached to this FEIS summarizes A80 port calls by community (Table 6). The SIA reports that the A80 sector typically makes between 215 and 250 port calls each year. Since 2015, the prevalent trend in port calls has been roughly 67% to Unalaska, 12% to Adak, 7% to Togiak, and a small number of calls to St. Paul, Atka, and Sand Point. According to Observer Data, roughly 10% of port calls are attributed to "Other/Unknown Community." Transfers at sea are rare in the A80 sector; dating back to 2010 only five are documented (four in 2010 and one in 2016). A transfer at sea could be relevant to State of Alaska taxation if it occurs outside of the 3nm state boundary.

The two State of Alaska fish taxes paid by the A80 sector are the Fishery Resource Landing Tax and the Seafood Marketing Assessment.

[45] The 2019 Alaska Taxable Supplement is available at https://www.commerce.alaska.gov/web/Portals/4/pub/OSA/Official%202019%20Alaska%20Taxable.pdf. At that site the reader can refer to Table 1A ("Reported Tax Rates") for sales tax and other commerce taxes and revenues for 2019.

The Fishery Resource Landing Tax (FRLT) is levied on fish processed outside the 3-mile limit but, within the U.S. EEZ, and first landed in Alaska. The tax liability is based on the estimated unprocessed (ex-vessel) value of the resource. The State determines the unprocessed value for CP production by multiplying a statewide average price per pound of unprocessed fish – as derived from ADF&G data – by the unprocessed weight. The tax is collected primarily from CPs that bring their products into Alaska for transshipment and applies whether the product is destined for local consumption or shipment abroad. Under Alaska Statute (AS) 43.77, CPs and motherships are required to pay this tax at a rate that is equivalent to rates paid by catcher vessels and shore-based processors under the Fisheries Business Tax (AS 43.75). The levy is set at 3.0% for fisheries classified by ADF&G as "established," as would be the case for the A80 sector. According to state statute, all revenue from the Fishery Resource Landing Tax is deposited in the state's General Fund but half of the revenue is available for sharing with the municipalities where fishery resources are landed. If the offload or landing occurs at a community in an "un-organized borough" (as is the case for communities like Unalaska and Adak), the fish taxes are shared primarily between that community and State; a small portion could go to other communities in the un-organized borough. This tax was established in 1994. The State of Alaska Department of Revenue reports that the FRLT brought in between $9.72 million and $9.95 million from 2016 through 2018, and $12.47 million in 2019, though it should be noted that much of that revenue was likely generated in the at-sea sector of the AFA pollock fishery.[46] The footnoted report shows that the amount of the FLRT that is shared with municipalities is highly variable by year. Table 3-16, described below, provides an estimate for the order of magnitude in tax payments generated by A80 vessels.

The State of Alaska also levies a Seafood Marketing Assessment of 0.5% on all seafood processed or first landed in Alaska and any unprocessed fishery products exported from the state (AS 16.51.120).[47] Revenues from the Assessment are deposited in the State's General Fund by statute but are historically appropriated to the Alaska Seafood Marketing Institute.

Table 3-16 provides an estimate of the State of Alaska tax revenues generated on A80 vessels from 2010 through 2019. The estimated tax rate of 3.5% is the sum of the FRLT and the Seafood Marketing Assessment. AKFIN uses a proxy value to estimate the unprocessed value of A80 catch because the sector does not trade in unprocessed fish by definition. The AKFIN estimate of ex-vessel value is based on an assumed 40% relationship between ex-vessel value and first wholesale value. That assumption is augmented, when possible, by ADFG Fish Tickets that are not required of A80 vessels but may be submitted with the vessel's own estimate of unprocessed value. The reader should be aware that the values presented in Table 3-16 are not the same values used by the State of Alaska to calculate fish tax liabilities. From 2010 through 2019, AKFIN estimates the average annual unprocessed value of production on A80 vessels at roughly $158 million (2018$). At a 3.5% tax rate accounting for the FRLT and the Seafood Marketing assessment, the A80 sector would have paid roughly $5.5 million per year in Alaska fish taxes (2018$).

[46] Alaska Department of Revenue – Tax Division: Fishery Resource Landing Tax Annual Report Data: http://www.tax.alaska.gov/programs/programs/reports/AnnualData.aspx?60631, accessed August 2020.
[47] Processors or harvesters who produce less than $50,000 worth of seafood products during the year are exempt.

Table 3-16 **Estimated ex-vessel value of production on A80 CP vessels and estimated State of Alaska tax revenues, 2010 through 2019. Estimated tax based on sum of Fishery Resource Landing Tax and Seafood Marketing Assessment (3.5%).**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
Sector				**Estimated Ex-Vessel Value (2018$)**							
A80	134.2M	154.3M	161.9M	128.8M	123.7M	116.3M	125.4M	144.8M	150.6M	140.7M	1,380.6M
CDQ	8.3M	12.5M	11.7M	10.2M	8.3M	8.2M	9.0M	11.5M	10.8M	11.0M	101.5M
TLAS	3.7M	9.5M	10.5M	9.7M	8.0M	8.8M	8.9M	16.0M	13.8M	12.7M	101.5M
Total Ex-Vessel	146.2M	176.3M	184.1M	148.7M	140.0M	133.3M	143.3M	172.2M	175.2M	164.3M	1,583.6M
Sector				**Estimated Tax at 3.5% Rate (2018$)**							
A80	4.7M	5.4M	5.7M	4.5M	4.3M	4.1M	4.4M	5.1M	5.3M	4.9M	48.3M
CDQ	0.3M	0.4M	0.4M	0.4M	0.3M	0.3M	0.3M	0.4M	0.4M	0.4M	3.6M
TLAS	0.1M	0.3M	0.4M	0.3M	0.3M	0.3M	0.3M	0.6M	0.5M	0.4M	3.6M
Total Tax	**5.1M**	**6.2M**	**6.4M**	**5.2M**	**4.9M**	**4.7M**	**5.0M**	**6.0M**	**6.1M**	**5.8M**	**55.4M**

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

The activity on A80 vessels captured in Table 3-16 includes the harvest of groundfish quotas allocated to CDQ groups (Sector = CDQ). Under AS 43.77.040, a taxpayer – i.e., an A80 company or the LLC associated with an A80 permit holder – may claim as a credit *up to* 45.45% of the tax liability on CDQ fish revenues if contributions are made to one of a set of qualifying purposes defined in the statute. Qualifying purposes include scholarships for in-state study related to fisheries management or related business, training in the state for employment in the seafood industry, capital contributions to fishery infrastructure construction or improvement, or Alaska fisheries research grants. This provision does not mean that CDQ fish are taxed by the State of Alaska at a lower rate; rather, those gross revenues may be offset to a limited extent by voluntary tax-deductible contributions to qualifying purposes.

NMFS Cost Recovery

The A80 sector is subject to NMFS cost recovery fees assessed on the estimated ex-vessel value of catch. The MSA authorizes the collection of cost recovery fees for LAPPs, the CDQ program, and the halibut/sablefish IFQ program (MSA section 304(d)(2)). Cost recovery fees recover actual costs directly related to the management, data collection, and enforcement of the programs. The MSA mandates that cost recovery fees do not exceed 3% of the annual ex-vessel value of fish harvested by a program subject to a cost recovery fee (MSA section 305(d)(2)(B)). The fee calculation is based on NMFS standard prices for the species relevant to a fishery subject to cost recovery. NMFS's Cost Recovery and Fee Programs web page[48] links to the **Federal Register** notice announcing each subject fishery's standard prices and fee percentages by year through 2019, as well as to cost recovery annual reports by sector for 2016 through 2019. Fees are determined by dividing direct program costs by the value of the fishery's landings. The factors and methods that go into the fee calculation are described at 50 CFR § 679.95(c)(2). Table 3-17 reports cost recovery fees for selected programs from 2017 through 2020.[49] From fiscal year 2017 through fiscal year 2020, direct costs for A80, which is the amount paid by the sector, increased from $836,924 to $962,757 to $1,048,481 to $1,058,662. For those years, respectively, the assessed fishery value in estimated ex-vessel terms was $118.2 million, $127.7 million, $111.6 million, and $89.2 million. (Note that these values differ from what is shown in Table 3-16 due to the difference between the NMFS standard pricing methodology, which incorporates rolling average annual species values, and the method that AKFIN utilizes to estimate CP ex-vessel value from at-sea production reports and ADF&G Fish Tickets that are supplied by A80 vessels.)

[48] https://alaskafisheries.noaa.gov/fisheries/cost-recovery-fee-programs

[49] 2020 cost recovery fee percentages for A80 and CDQ are published at 85 FR 77180 (December 1, 2020); the 2020 cost recovery fee percentage for IFQ is published at 85 FR 82442 (December 18, 2020).

Table 3-17 NMFS cost recovery fees for selected fisheries (Source: NMFS Cost Recovery Reports)

Cost Recovery Program	*Year Implemented*	*2017 Rate*	*2018 Rate*	*2019 Rate*	*2020 Rate*
A80	2016	0.71%	0.75%	0.94%	1.19%
CDQ	2016	0.55%	0.66%	0.70%	0.84%
Halibut/Sablefish IFQ	2000	2.20%	2.80%	3.00%	3.00%

For CP sectors such as A80, there is no reliable ex-vessel price generated from the sale of fish from a harvester to a processor. Therefore, NMFS estimates the ex-vessel price for those species using reported information on the first wholesale price from CPs that harvest A80 species. The first wholesale price is the market price of the primary processed fishery product. The estimated standard ex-vessel price is the value of processed products from CPs divided by the retained round-weight (unprocessed weight) of catch and multiplied by a factor of 0.4 to correct for the value added to the fish product by processing. NMFS calculates an annual standard price for A80 Pacific cod using volume and value data reported in the Pacific Cod Ex-Vessel Volume and Value Report, which includes data from January 1 through October 31. Each landing made under the program is multiplied by the appropriate NMFS standard price to arrive at an ex-vessel value for each landing. These values are summed together to arrive at the total ex-vessel value of the A80 fishery.

3.3.3 Operations and Annual Planning

A qualitative understanding of the A80 fishing year – and the diversity of company-level business plans and vessel-level fishing plans within the sector – is especially important because the sector works with a highly varied portfolio of allocated target species and marketable unallocated groundfish species compared to other BSAI sectors. Annual data on harvest volume and gross revenue – either by Catch Accounting System (CAS) "target species" or by individual species (see Figure 3-17) – do not reflect how species are physically comingled or, critically, the decisions that vessel operators make to derive value from a trawl tow. For example, CAS might retrospectively show that fishing occurred in the arrowtooth flounder or flathead sole target based on the relative proportion of catch, but the fishing was made profitable by the value of other retained species. Annual data also smooth over calendar-based decision factors like roe content, flesh quality, aggregation (CPUE), fishing conditions (e.g., water temperature or lunar cycles), market demand, the timing of in-season reallocations from other fisheries (e.g., non-pollock TAC from AFA, PSC from TLAS), and unallocated fishing opportunities that may be opened by NMFS in-season managers at unpredictable times based on TAC that would otherwise go unharvested (e.g., BS POP or WGOA rockfish).

The information in this section is bolstered by anecdotal information and local knowledge offered by A80 company and vessel managers as well as skippers. The analysts have verified information about the timing and location of fishing using available catch data. The inclusion of this narrative description of A80 sector operation is important for understanding the factors that can dictate a company or a vessel's response to external constraints, which includes – but is certainly not limited to – halibut PSC limits. This section represents one of the analysts' best tools to characterize the *practicability* of maintaining historical levels of groundfish fishing under moderately to severely reduced PSC limits, and how the amount of the PSC limit reduction would be experienced across the diversity of business/fishing plans that exists within the sector. That said, the analysts do not contend that this qualitative information allows the reader to draw "bright lines" where a sector-level PSC limit of, say, 1,350 mt is "practicable" but a limit of 1,300 mt is not (See also Section 5.3.2.3)

Skippers make in-season decisions about targeting and location based on expected halibut PSC rates associated with a given target, area, or time of year. At the same time, a vessel operator must manage an annual allocation of important "choke species" such as Pacific cod or risk losing the opportunity to keep the vessel working later into the year in other profitable targets that have an intrinsic cod encounter rate. Section 3.1.7.2 of the Amendment 80 Program 5-Year Review (Northern Economics & NPFMC 2014) describes how allocation of Pacific cod transitioned the species from a target to an incidental catch species and how that reality influences vessels' annual fishing plans. After Pacific cod was allocated to A80 cooperatives, fleet managers have had to calculate the amount of cod their vessels will need in fall fisheries and adjust their targeting decisions in the earlier part of the year.

The A80 5-Year Review noted that 55% to 75% of the fishery's Pacific cod was taken in a CAS "target" fishery before the program's 2008 implementation, whereas recently cod "targeting" accounts for less than 10% of the sector's cod catch. The Review cited as examples that effort in high cod-rate fisheries like flathead sole has declined in favor of arrowtooth and Kamchatka flounder, for which directed fishing is not opened until May 1. Among the key allocated A80 species, YFS has a relatively low cod catch rate, as do roundfish like Atka mackerel and POP. While cod rates are low in the YFS fishery, managing cod quota is important due to the high TAC for YFS relative to other flatfish species. Rock sole, which can be a higher-value flatfish species during the early-year roe season, has among the highest cod rates. It is important to acknowledge that cod can drive decision-making as much as halibut, and that each company or vessel enters the fishing year with a different intra-cooperative cod allocation based on the qualifying catch history of the permits they hold.

A80 companies and vessel operators work within constraints other than halibut PSC and allocations of choke species like Pacific cod. Trawl vessels are excluded from certain areas by regulation – e.g., crab protection zones (see Section 3.2.4) or Steller sea lion critical habitat – and might be excluded de facto if fishing grounds are preempted by fixed-gear vessels (including crabbers) in Federal or state-waters fisheries. Vessel operators might not be able to follow an aggregation of "clean" (low-bycatch) A80 species if it moves into a prohibited or preempted area. Some areas are only prohibited in certain years, dependent on exogenous factors. For example, the Subarea along the southern edge of the Bristol Bay Red King Crab Savings Area is open or closed annually based on BBRKC stock status (Figure 3-10). Other constraints might be temporal.

A80 companies and vessels respond to bycatch constraints in the context of other non-regulatory factors that determine when and where vessels target certain groundfish species. The allocation of BSAI non-pollock species to A80 CPs has allowed companies to plan for groundfish fisheries that span most of the calendar year and has insulated companies that want or need to pursue late-year opportunities from the effects of other participants whose incidental catch or PSC might have otherwise closed the entire sector. Many vessels strive to stay working from January 20 to November. Most overall catch occurs from February through October with catches falling off November through January (Figure 3-20). Other monthly patterns include higher catches of POP in the summer months (particularly July) and a larger proportion of Pacific cod and rock sole earlier in the year (February through April or May) (Figure 3-20). The focus on cod and rock sole early in the year is driven in part by fish aggregation (cod) and roe content (rock sole).

An A80 vessel that is experiencing unacceptable Pacific cod bycatch or halibut PSC rates in an early-season flatfish target might switch focus to an unallocated target. Those unallocated species might include arrowtooth/Kamchatka flounder or Greenland turbot which open on May 1, or BS POP which is only opened to directed fishing as the BS pollock fishery winds down in the fall. Some flatfish species might be technically open before May but the fish are not aggregated or catchable until later in the year (e.g., flathead sole). "Fall-back" opportunities for A80 vessels when early season fisheries are utilizing too much of a constraining species vary depending an operation's ability to target roundfish – particularly in the AI – or its endorsement to fish in the GOA (arrowtooth flounder in the spring or the Central GOA Rockfish Program after May 1). Variation across A80 companies in terms of access to roundfish are illustrated in Figure 3-15; diversification of total revenue across A80 cooperative fishing, mothershipping, CDQ partnerships, and fishing in the GOA are described in Section3.3.2. Broadly speaking, alternatives to BS flatfish for A80 vessels are not an option for some vessels to consider until May or June.[50] Prior to that, a company with limited options might have no better response to high PSC rates than to deck sort aggressively and testing different locations. Accessibility to non-flatfish species can also vary within a company if, for instance, the smaller vessels are not equipped with the fuel, horsepower, or packing capacity to fish safely and effectively in the Aleutians.

While this analysis does not estimate companies' operational costs or their net profitability, participants report that most A80 companies rely on a full and varied season to run their business. When constraints such as high Pacific cod or halibut bycatch rates emerge, vessel operators do not have the option to cease fishing completely because cost accrual on such large platforms would be unsustainable. Participants also noted that a mid-year stand down could result in crew-retention issues. Moreover, it was noted that shutting down and restarting a CP factory could actually cause mechanical challenges, spinning off new costs. As a result, A80 operators do not follow a uniform progression from one target to the next over the course of the season. Annual fishing plans are designed with contingency in mind, and when all options are suboptimal the response is often to stay active and look for areas with the right species combinations even if it is in a time/area that history would not have predicted. Participants noted that "looking" for the right fish does not necessarily require a net in the water, and that it is better to continue learning the present situation on the grounds than to leave and have to reestablish that knowledge later. Vessels have increasingly utilized shorter test-tows to gauge haul composition and the presence of limiting species, though. Vessels are likely evaluating the benefit of a test tow in light of the cost of running a factory at less than full capacity and also the risk of bringing in a haul of constraining or PSC-limiting species. Regardless of these complicating factors, A80 vessels are unlikely to preemptively cease fishing due to an unpredicted mid-year constraint.

The annual planning process begins the preceding fall with harvest specifications. The A80 sector has a unique consideration in the harvests specifications flexibility procedure where the cooperative(s) (and CDQ groups) can exchange TAC of YFS, rock sole, or flathead sole for TAC of another species from that group, up to the limit of the ABC and the 2 million mt cap. It is possible that flexibility exchanges could be made with expected bycatch rates in mind if the PSC limit were to become the preeminent decision-driver for the sector. In practice, flatfish specification flexibility has mostly been used in recent years to maximize the availability of species that are catchable. For example, in years when the early season rock sole roe fishery does not materialize to the point that all TAC is harvested, the cooperative might utilize specifications flexibility to exchange rock sole TAC for YFS TAC that can be prosecuted later in the year.

A80 operators tend to spend the early months of the year in the BS, striking a balance between CPUE, profitability, and market demand while managing Pacific cod and halibut bycatch to preserve opportunities to fish later in the year. Some opportunities are only available early in the year, such as the rock sole roe fishery (and its associated Pacific cod bycatch rate). Monthly catch data display this pattern with generally higher catch of rock sole and Pacific cod early in the year, tailing off by May (**Figure 3-20**). The timing of YFS targeting is more variable and can be opportunistic depending on the availability of other species and bycatch rates. In some cases, vessels might target YFS earlier in the year in the Togiak/Bristol Bay area; that activity can include bycatch of other flatfish species like Alaska plaice that is marketable at a lower value. The optimal timing of allocated species catch is also driven by market quality. Markets for flatfish and roundfish can differ, meaning that not all companies are facing the same decision-set when selecting targets at a given time of year. In some years, holdover inventories from the previous year's market might incentivize a company to delay harvest of a certain species until prices rebound, but that option might not be available if a vessel does not have viable alternative target

[50] While 2020 data are incorporated into this analysis to the extent they are available, the analysts note that market disruptions due to international trade relations and a global health pandemic affecting demand for A80 species might have shaped companies' business plans as much or more than halibut PSC rates.

opportunities at the time or if a company plans to deploy that vessel in other areas/targets later in the season.

Operators must also manage their catch of unallocated species that NMFS accounts for under the "non-specified reserve." NMFS In-season management uses this reserve to account for unallocated species on a BSAI-wide basis, meaning that bycatch in other fisheries (e.g., AFA pollock) can affect how much of a species like BS POP is available for a directed fishing allowance by A80 CPs at a given point in the calendar year. For example, the availability of turbot as a secondary species might determine whether arrowtooth flounder is a viable fall-back fishery if other targets are yielding high halibut or cod bycatch. If incidental catch causes the TAC for an unallocated species such as skates to be exceeded, NMFS may use the non-specified reserve from other species to cover that catch under the 2 million ton cap. Drawing down the reserve could, in some instances, reduce the opportunity to catch species that are typically of more value to the sector later in the year, such as BS POP.

May through August is typically when A80 vessels might branch out to the GOA or to the AI depending on their area endorsements – to the CGOA Rockfish Program, or to other GOA rockfish and flatfish participation. YFS fishing can remain productive and clean through May or June until they spawn and disaggregate. Opportunities to diversify in the case of constraining bycatch expand for some participants in June and July as AI rockfish are pursued. Summer fishing for Atka mackerel tends to offer lower CPUE, so after rockfish vessels might move back into BS flatfish before returning to the AI for the mackerel B season. Vessels that overuse cod or other allocations early in the year might be forced to trade within the cooperative to fish in the fall. Similarly, vessels that accrue halibut in spring or summer fisheries might jeopardize their ability to fish YFS in October and November. Because some fall fisheries for unallocated species such as BS POP are reliant on usage in other fisheries, companies might plan their business strategy and bycatch usage differently from one year to the next.

Many A80 vessels will return to allocated species in the fall, with the fleet breaking down across YFS vessels and Atka mackerel vessels depending on the history that they brought to the cooperative. These patterns can be seen in monthly catch figures with the year bookended by relatively high YFS catch in February through May and again in September through October (Figure 3-20). The 2020 fishing year followed the familiar pattern in terms of target catch by month. One difference from the most recent years was that catch in the rock sole target tilted earlier in the year, similar to the timing seen from 2010 through 2015.

A80 companies are not uniform in their area endorsements or their cooperative allocations of flatfish and roundfish, and thus might have different levels of exposure to a lower halibut PSC limit (Figure 3-15). Operators that have greater Atka mackerel and AI POP allocations are more able to move out of the BS if early-year halibut bycatch rates are unusually high. Flatfish-oriented operations might only have the option to remain in the BS or to move into the GOA. The ability to fish in the GOA is limited in regulation by endorsements and season-date limitations but can also be limited by halibut PSC limits in that area. The number of A80 vessels that have fished in the GOA and the relative proportion of their total revenues generated in that fishery were discussed in Section 3.3.2; that section demonstrates that GOA revenues are likely not enough to replace what would be lost if an A80 company with no BSAI alternatives to flatfish was effectively closed out early by PSC. GOA CPs and CVs share seasonal halibut PSC apportionments, and GOA deep-water complex flatfish fisheries could be closed if effort and bycatch by GOA CVs targeting arrowtooth flounder are high. It is possible that an A80 vessel could move to the GOA due to poor fishing in the BS but would exhaust its GOA opportunities well before the end of the year and have no alternative to returning to the BS to search for fish.

Finally, A80 companies differ in their engagement in fishing CDQ groundfish through partnerships and in acting as a mothership for CVs, as detailed in Section 3.3.2.

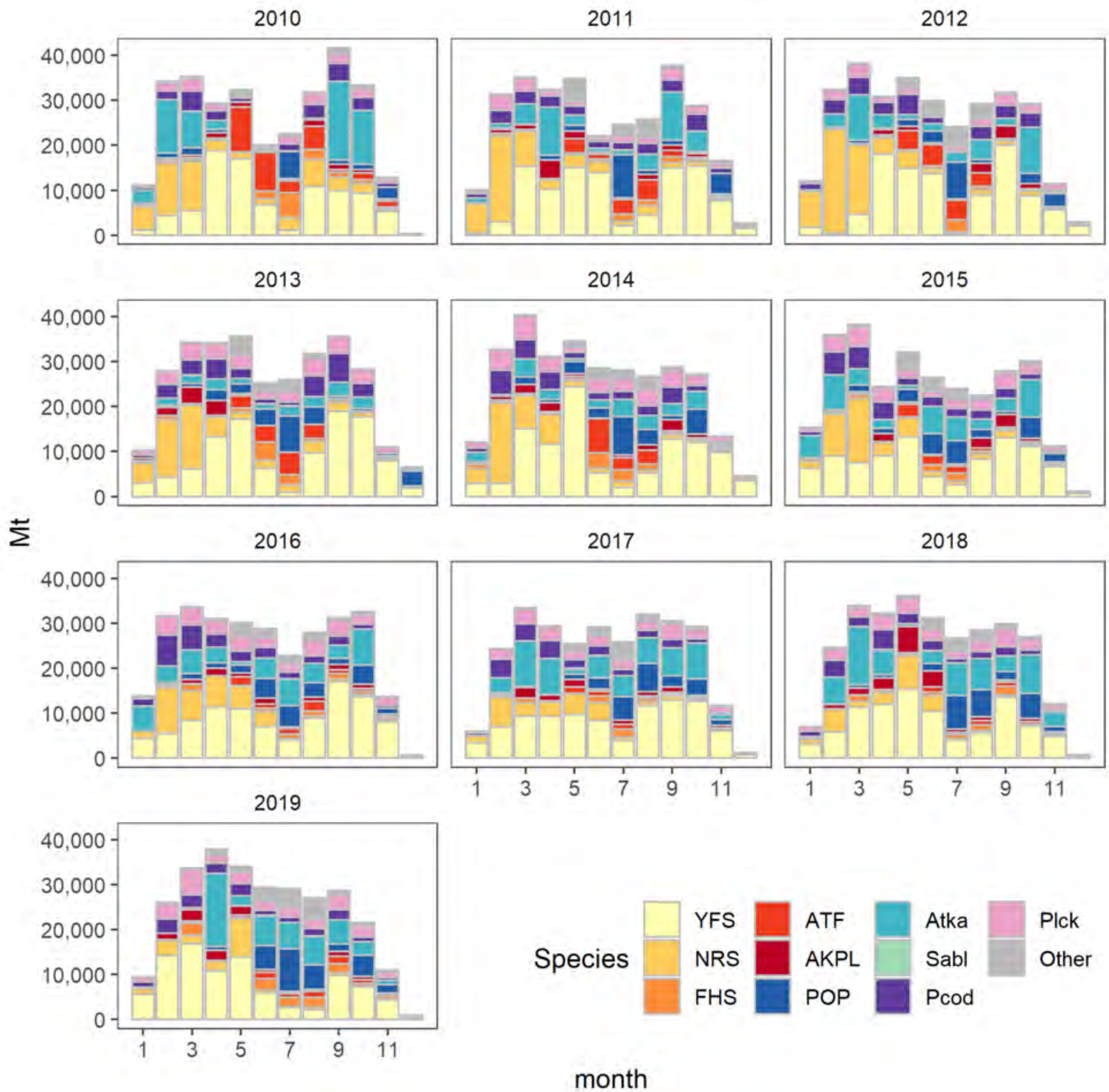


Figure 3-20 Amendment 80 monthly catch (mt), 2010 through 2019. (Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA)

There are several important caveats to any notion that companies with access to roundfish quotas in the AI can easily move into those fisheries if PSC is high or catch rates are low elsewhere. Aside from the limitations of quota allocation and area endorsements, the AI region is heavily restricted in the amount of area open to trawl gear (Figure 3-21). AI Atka mackerel fishing is even more restricted than AI rockfish because it is a designated prey species for Steller sea lions (SSL), leading to additional area closures of directed fishing and a seasonal split of the TAC. In 1993, NMFS established critical habitat (CH) for SSLs in the GOA, AI, and BS. Directed fishing for Atka mackerel and other SSL prey species is prohibited within some CH areas (grey areas in Figure 3-21). In 2005 the Council adopted additional closures to conserve essential fish habitat (EFH) in the AI, prohibiting all bottom trawling in the AI except in small, discrete open areas where bottom trawling had previously occurred in order to minimize the effects of fishing on EFH (red areas in Figure 3-21). In total, over 95% of the AI management area is closed to bottom trawling. In addition to area closures, AI trawl fishing is spatially constrained by practical factors like untrawlable bottom surfaces, grounds preemption by fixed-gear vessels (e.g., WAI golden king crab), or just the size of the "open" areas relative to what an A80 vessel needs to tow. Some of the relatively smaller A80 vessels may not have the option to fish quotas in the western AI due to range capacity or the operational and safety issues of larger seas. The fishery is temporally constrained by seasonal TAC allocation and the movement of target fish inshore to closed areas before spawning. Together, this means that AI fishing could not likely support an influx of all the vessels with mackerel quota in a short span. As it stands currently, Area 541 accounts for the largest share of AI TAC and has the most spatially concentrated fishing area. Moreover, the behavior of roundfish like Atka mackerel in the presence of trawl nets is said to mean that additional effort would reduce catch on a rate basis (CPUE) for all participants in a localized open area.

For evidence of the spatial concentration in the AI, even relative to the limited open areas shown in Figure 3-21, NMFS Habitat Conservation Division provided the analysts with spatial catch data from 2003 through 2020. By the numbers, roughly 42,000 km^2 are open to non-pelagic trawling across all of Areas 541/542/543. Roughly half of that area (21,000 km^2) is open to directed Atka mackerel fishing. Since 2003, there were 4,247 observed tows with an Atka mackerel designation in areas open to directed mackerel fishing. Drawing on VMS data, it was shown that the total area contacted by the fishery was 1,672 km^2. That means that the footprint of the fishery during that span covered only 8% of the area that was open to it.

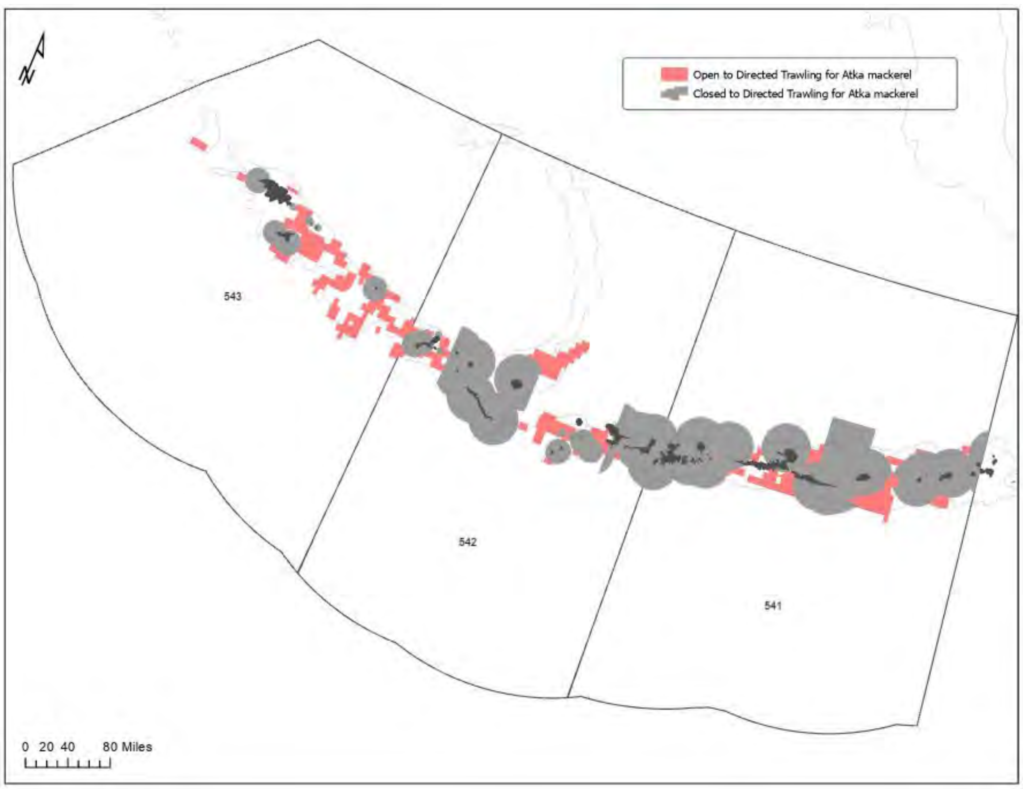


Figure 3-21 Aleutian Islands areas open/closed to directed trawl fishing for Atka mackerel; White area is closed to all trawl fishing, Grey areas are closed due to SSL critical habitat protection measures (Source: NMFS AKRO Habitat Conservation Division)

3.3.4 Community Development Quota (CDQ) program as related to the A80 sector

This section provides a brief description of the CDQ Program and accounts for the amount of CDQ harvest activity that occurs on A80 vessels. The halibut PSC limit that applies to CDQ hauls on A80 vessels is not subject to change under the considered alternatives, but the overall business sustainability of those vessels is necessary for CDQ groups to be able to access the portion of their allocations of non-pollock groundfish that is typically caught with trawl gear. The SIA attached to this FEIS provides greater detail on CDQ communities and their organizing non-profit entities' engagement and reliance on a variety of commercial and subsistence fisheries off Alaska.

The CDQ Program was established by the Council and NMFS in 1992 and authorization for the Program was incorporated into the Magnuson-Stevens Act in 1996. The purpose of the CDQ Program is (1) to provide eligible western Alaska villages with the opportunity to participate and invest in fisheries in the BSAI, (2) to support economic development in western Alaska, (3) to alleviate poverty and provide economic and social benefits for residents of western Alaska, and (4) to achieve sustainable and diversified local economies in western Alaska (16 U.S.C. § 1855(i)(1)(A)). The CDQ Program consists of six different non-profit managing organizations (CDQ groups) representing different geographical regions in Western Alaska. The CDQ Program receives annual apportionments of total allowable catches (TACs) for a variety of commercially valuable species in the BSAI groundfish, crab, and halibut fisheries, which are in turn allocated among the six CDQ groups.

The six CDQ groups represent 65 eligible villages in Western Alaska. Geographically dispersed, the member communities extend westward to Atka on the Aleutian Islands chain and northward along the Bering Sea coast to the village of Wales near the Arctic. CDQ communities generally are remote, isolated places with relatively few commercially valuable natural assets with which to develop and sustain a viable, diversified economic base.

Aleutian Pribilof Island Community Development Association (APICDA) represents the villages of: Akutan, Atka, False Pass, Nelson Lagoon, Nikolski, and Saint George.
Bristol Bay Economic Development Corporation (BBEDC) represents the villages of Aleknagik, Clark's Point, Dillingham, Egegik, Ekuk, Ekwok, King Salmon, Levelock, Manokotak, Naknek, Pilot Point, Port Heiden, South Naknek, Togiak, Twin Hills, and Ugashik.
Central Bering Sea Fishermen's Association (CBSFA) represents the village of Saint Paul on Saint Paul Island.
Coastal Villages Region Fund (CVRF) represents the villages of Chefornak, Chevak, Eek, Goodnews Bay, Hooper Bay, Kipnuk, Kongiganak, Kwigillingok, Mekoryuk, Napakiak, Napaskiak, Newtok, Nightmute, Oscarville, Platinum, Quinhagak, Scammon Bay, Tooksook Bay, Tuntutuliak, and Tununak.
Norton Sound Economic Development Corporation (NSEDC) represents the villages of Brevig Mission, Diomede, Elim, Golovin, Gambell, Koyuk, Nome, Saint Michael, Savoonga, Shaktoolik, Stebbins, Teller, Unalakleet, Wales, and White Mountain.
Yukon Delta Fisheries Development Association (YDFDA) represents the villages of Alakanuk, Emmonak, Grayling, Kotlik, Mountain Village, and Nunam Iqua.

Under the CDQ Program, a portion of the federal TAC for commercially important BSAI species — including pollock, crab, halibut, and various groundfish — is allocated to participants in the CDQ Program. In 1992, CDQ groups received their initial allocations of pollock based on population, quality of proposed economic development plans, and dependence on fisheries. Since 1992, the CDQ Program has expanded several times and now includes allocations of pollock, halibut, sablefish, crab, all of the remaining groundfish species (cod, Atka mackerel, flatfish, and rockfish), and prohibited species catch (i.e., as bycatch allowances for salmon, halibut, and crab). The percentage of each annual BSAI catch limit allocated to the CDQ Program varies by species and management area. Currently, the CDQ Program is allocated approximately 10.7% of the groundfish directed fisheries. The percentage of other catch limits allocated to the CDQ Program (as CDQ reserves) is determined by: the BSAI Crab Rationalization Program (10% of crab species, except for Norton Sound red king crab, which is 7.5%); the BSAI Fishery Management Plan for all other groundfish and prohibited species (7.5%, except 20% for fixed-gear sablefish); and 50 CFR part 679.31 for halibut (20% to 100%, depending on IFQ management area – see Section 4.5.1.1 of this document). These allocations position CDQ groups as stakeholders in both the directed halibut fishery and the groundfish fisheries that encounter halibut as a limited bycatch species.

Annual CDQ allocations provide a revenue stream for CDQ groups through various channels, including the direct catch and sale of some species and the leasing of quota to various harvesting partners. CDQ groups receive royalty payments on each allocation harvested by a partnering firm. In addition to direct and indirect participation in fishing, CDQ group earnings are also derived from investments distributions in subsidiary companies and vessels. Since the implementation of the CDQ Program, individual groups have made large capital investments in vessels, infrastructure, processing capacity, and specialized gear.

Local programs purchase limited access privileges in a fishery and acquire equity position in existing fishery businesses including halibut, sablefish, and crab. CDQ groups have invested in peripheral projects that directly or indirectly support commercial fishing for halibut, salmon, and other nearshore species. These projects include seafood branding and marketing, quality control training, safety and survival training, construction and staffing of equipment maintenance and repair facilities, and assistance with bulk fuel procurement and distribution.

Investments by individual CDQ groups include ownership interest in the at-sea processing sector and in catcher vessels and are made with the expectation of financial gain or expanding equity in the fishing fleet. Investments in subsidiaries, such as limited liability corporations, allow CDQ groups to wholly or partially own vessels directly related to fisheries, including in the A80 sector. These vessels provide revenue through the direct catch and sale of target species and, in some cases, vessel ownership increases a subsidiary's holdings of quota in fisheries, such as BS pollock. In addition, investments in harvesting and processing capacity provide revenue through profit sharing, contractual agreements to harvest other CDQ groups' quota, and chartering commercial fishing vessels to government agencies conducting stock assessment surveys. Vessel ownership varies by CDQ group, target species, and affiliation with subsidiary corporations.

CDQ revenue also supports permit brokerages and revolving loan programs that build and sustain fisheries development within their regions. Such programs are intended to retain limited entry salmon permits within CDQ communities, provide the financing necessary for resident fishermen to purchase new boats and gear, and supporting market development for locally-harvested seafood products.

CDQ catch and revenue is dominated by pollock harvest in the AFA fishery (Figure 3-22). Halibut PSC caught when directed fishing CDQ pollock accrues to the CDQ halibut PSQ. CDQ non-pollock, non-IFQ groundfish catch is dominated by Pacific cod, yellowfin sole, and to a lesser extent Atka mackerel and northern rock sole. Non-pollock, non-IFQ CDQ groundfish catch is driven early in the year by Pacific cod in the HAL CP sector and rock sole on A80 platforms. Later in the year this category of CDQ harvest shifts more toward yellowfin sole on A80 platforms. Figure 3-23 and Figure 3-24 detail the CDQ harvest and revenue generated on A80 vessels. Figure 3-22 provides a relative sense of how much CDQ activity occurs on A80 vessels; the "Other_GF" category includes non-trawl gear types and trawl CVs that harvest CDQ fish. Note that the revenues reported in Figure 3-22 are AKFIN's estimates of ex-vessel revenue; ex-vessel revenue is not the natural metric for at-sea operations but is necessary to incorporate revenue data from crab fishing which is an important piece of the CDQ portfolio. The wholesale revenue estimates for CDQ catch on A80 vessels (Figure 3-23) are recently in the range of $17 million to $21 million (2018$). Total CDQ non-pollock, non-IFQ groundfish wholesale revenue (also excluding crab) across all platforms has been around $70 million to $75 million in recent years.

A80 vessels that harvest CDQ fish must record whether a haul is a CDQ haul within two hours after completion of weighing all catch in the haul (679.5(c)(4)(ii)(B)(2)). This may be advantageous for A80 vessels fishing CDQ alongside their cooperative quota as they can more flexibly manage to which sector tows are allocated based on different operational portfolios and allocations. Halibut PSC that occurs on a

CDQ haul accrues to the CDQ halibut PSC limit (315 mt), which is not being considered for change under this action.

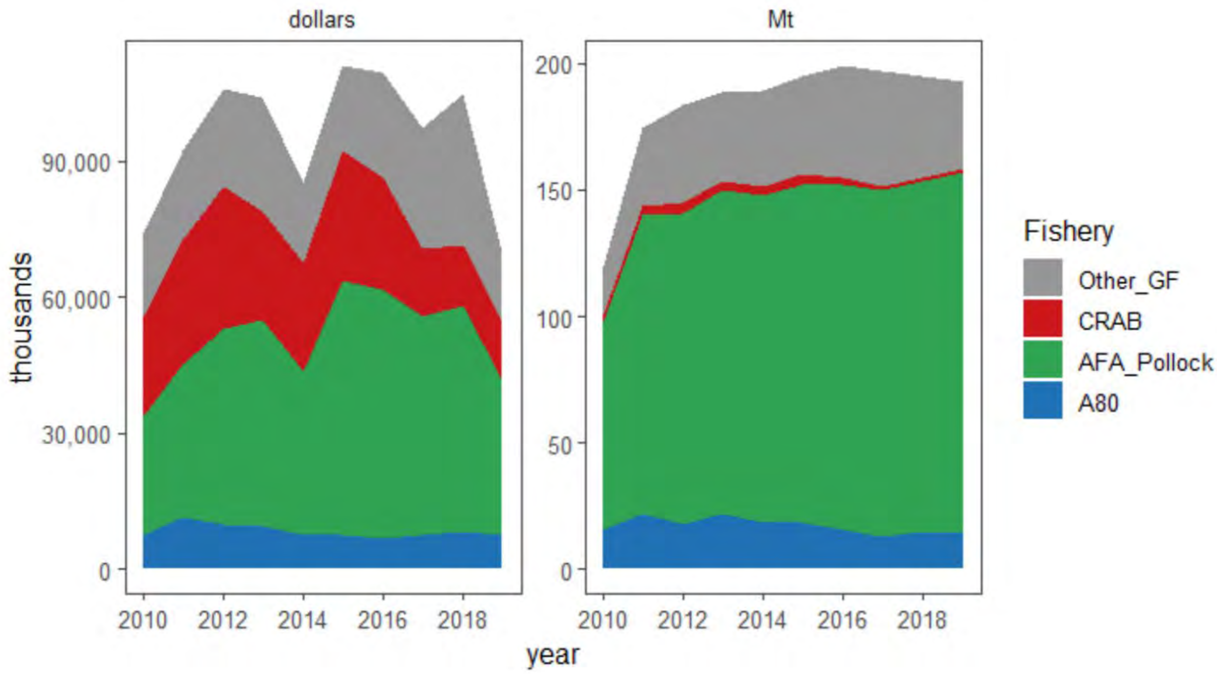


Figure 3-22 Distribution of CDQ estimated ex-vessel revenue (2018 dollars) and catch (mt) by fishery or fishery group, 2010 through 2019. (Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA)

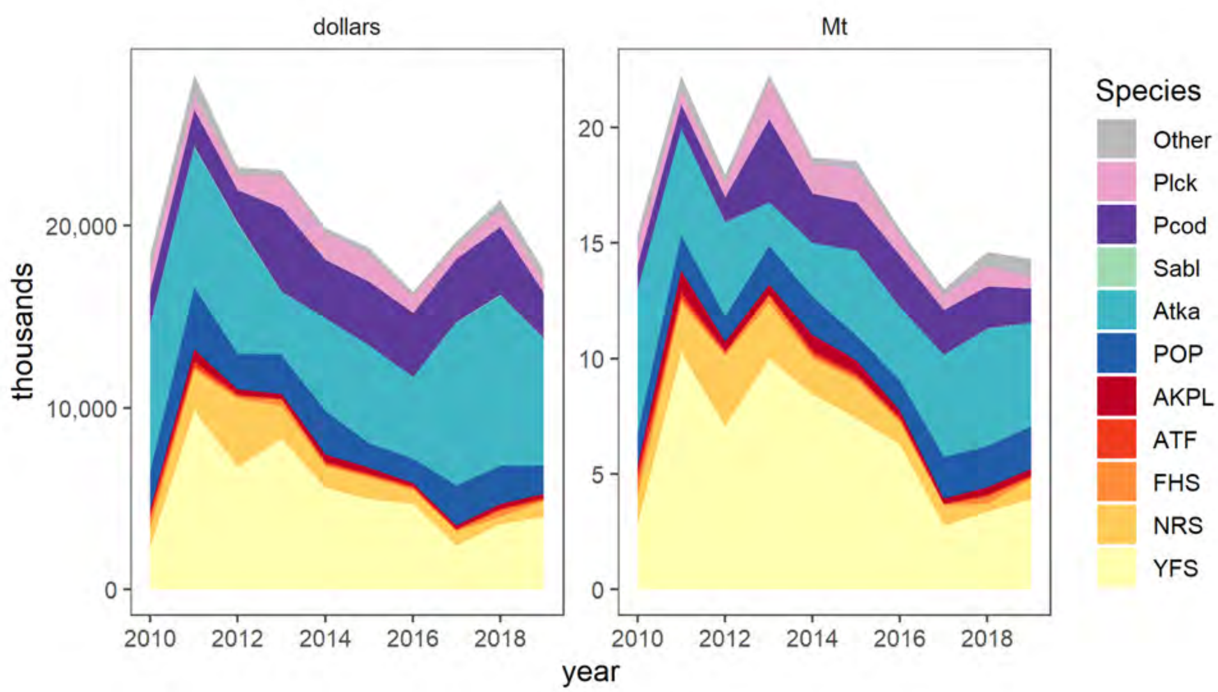


Figure 3-23 CDQ harvest on Amendment 80 vessels: gross first wholesale revenue (2018 dollars) and catch (mt) by species, 2010 through 2019.
(Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA)

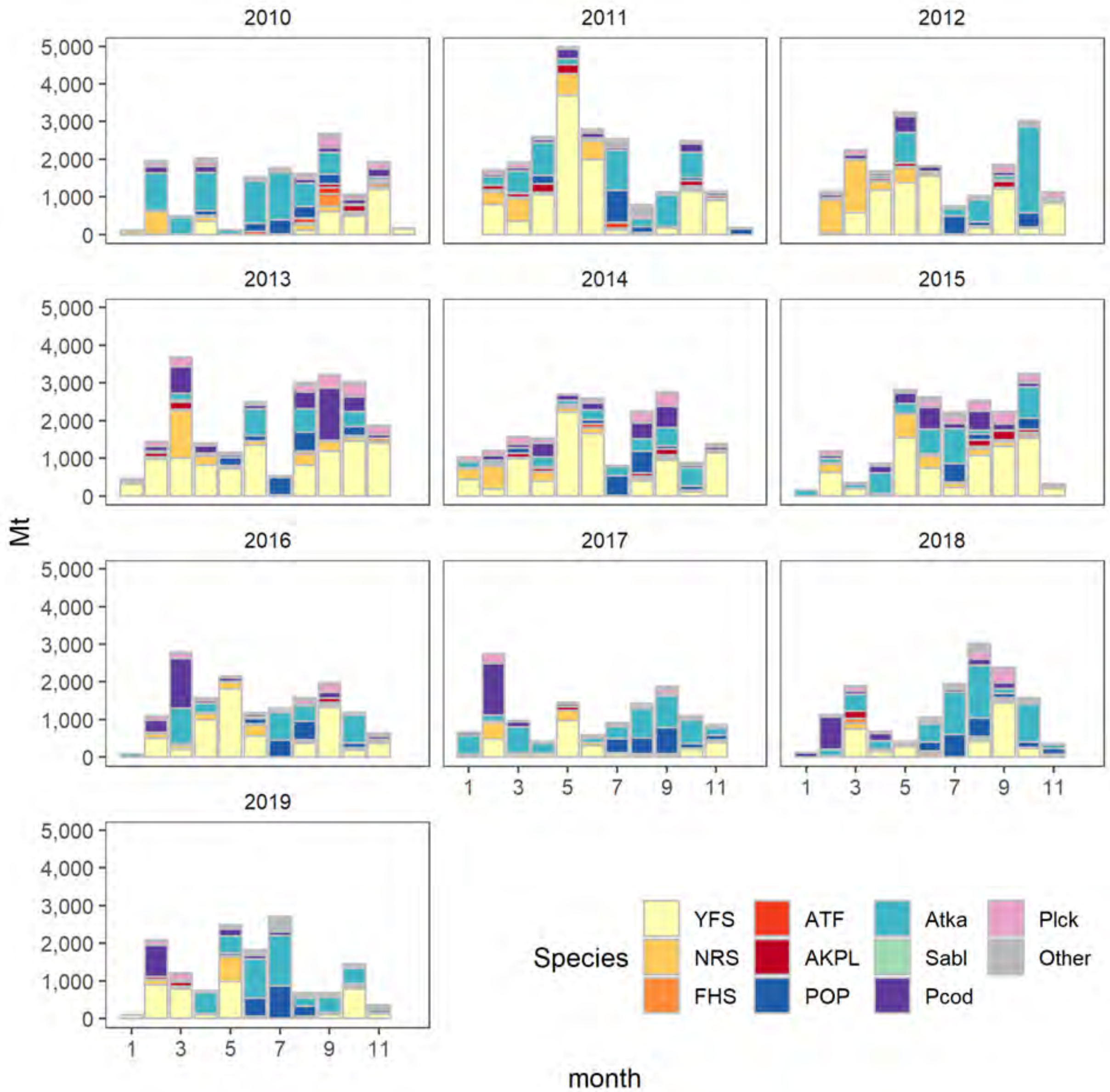


Figure 3-24 Monthly CDQ harvest on A80 vessels (mt), 2010 through 2019.
(Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA)

The volume of commercial halibut harvested by CDQ stakeholders is reported in Section 4.1.1.

3.4 Amendment 80 Pacific halibut bycatch

This section details the A80 sector's direct interaction with Pacific halibut as a PSC species, focusing on the period from 2010 through 2020. For this FEIS, displays that are linked to revenue data terminate in 2019; revenue data were not available for 2020 at the time of DEIS publication. This section presents data on final assessed halibut PSC totals, halibut encounter rates, and effective mortality (mortality divided by catch). Spatial data on effort and halibut PSC are presented to compare the A80 fishery to the EBS shelf trawl survey. Halibut PSC is also described in terms of A80 revenue generated per mt of PSC at the sector level and by groundfish target species.

This section also summarizes publicly available information regarding the A80 cooperative's effort to reduce bycatch mortality by minimizing catch or improving catch handling procedures to the extent practicable on a high-volume platform.

3.4.1 Amendment 80 halibut PSC summary

The total assessed Pacific halibut mortality to the A80 sector in mt, defines the relationship between the PSC limit and the sector's operation, irrespective of halibut encounter and mortality rates. **Table 3-18** places the A80 sector in context with regard to the other BSAI groundfish sectors. For reference, the current mortality limit for A80 halibut PSC is 1,745 mt, the TLAS limit is 745 mt, the CDQ limit (all gears) is 315 mt, and the non-trawl limit that covers both HAL CP and HAL CV is 710 mt. From 2010 through 2020, the A80 sector has accounted for roughly 60% of BSAI groundfish halibut PSC mortality. This total is not surprising given the species mix that that A80 sector catches and the associated halibut PSC rates (Table 3-20). Table 3-19 compares A80 halibut catch and PSC mortality to other BSAI groundfish sectors from 2010 through 2019. In 2020, the A80 sector recorded 2,031 mt of halibut catch and was credited with 1,097 mt of halibut PSC mortality, which was the lowest total during the analyzed period (see also Figure 3-25).

Examining trends in A80 halibut PSC catch and mortality is complicated by the fact that many variables that affect these metrics have changed in recent years.[51] PSC limits, DMR estimation methods, and halibut handling procedures have all changed to varying degrees since 2010. PSC limits have decreased multiple times since 2010, most significantly in 2015 with the implementation of Amendment 111. Figure 3-25 illustrates that A80 sector annual halibut mortality has declined since 2014 and, more notably, has declined relative to total halibut catch since 2015. Halibut catch – sometimes referred to as encounter – is the weight of halibut caught before the DMR is applied. The ratio of estimated halibut PSC mortality to halibut catch is defined here as "effective mortality rate." Effective mortality in the A80 sector declined from 2015 to 2019, breaking from a consistent relationship between catch and mortality. The effective mortality rate increased slightly in 2020, but that is largely an artifact of the greatly reduced encounter rate shown in Figure 3-25. The 2015 breakpoint coincides with the implementation of proactive strategies by the A80 sector in response to the request of the Council as it made its final action recommendation on BSAI Amendment 111 in June 2015 (Figure 3-26). The published DMRs – shown in Table 3-7 – might differ from the sector-level effective mortality rate when fishery data with and without deck sorting is combined since deck-sorted hauls have a specific DMR applied based on sampling.

The specific measures taken by the A80 sector to reduce halibut PSC mortality are described in Section 3.4.4 of this document. Those measures are not limited to deck sorting of halibut bycatch, but Figure 3-27 provides a compelling correlation of deck sorting effort to effective mortality. Effective mortality rates also capture the effect of reduced halibut DMRs achieved through deck sorting, noting the reduced reference period for halibut DMR estimation that rewards bycatch handling performance on a more immediate timeline – as described in Section 3.2.2 (refer to Table 3-7).

Table 3-18 Proportion of Pacific halibut mortality by BSAI groundfish sectors (2010 through 2019)

A80	TLAS	HALCP	CDQ	HALCV	*POT**	*AFA**
60.3%	16.1%	11.1%	6.9%	0.1%	*0.1%*	*6.3%*

* The Pot and AFA sectors' halibut mortality does not accrue to annual PSC limits.

[51] In 2015, the first year of implementation of the deck sorting exempted fishing permit (EFP), deck sorted PSC was only reported through logbooks and is not available in the usual specificity of observer data. As a result, PSC data in 2015 is only available as a total metric. Any tables and figures of the overall total annual PSC of A80 from 2015 are correct, however for tables and figures that include PSC in more discrete categories (i.e., target species, monthly totals), 234 mt of total PSC is not included. This does not apply to any year other than 2015.

Table 3-19 Bycatch of Pacific halibut by year and sector by estimated catch (mt) and PSC mortality (mt)

Year	Measure	A80	TLAS	HALCP	CDQ	HALCV	Total
2010	Catch	**2,808**	399	4,814	837	37	8,895
	Mortality	**2,243**	286	482	151	4	3,166
2011	Catch	**2,277**	469	4,698	844	22	8,310
	Mortality	**1,810**	346	470	203	2	2,831
2012	Catch	**2,469**	824	5,380	796	20	9,489
	Mortality	**1,944**	606	538	258	2	3,348
2013	Catch	**2,676**	669	5,280	817	40	9,482
	Mortality	**2,165**	503	476	253	4	3,401
2014	Catch	**2,667**	673	4,523	604	74	8,541
	Mortality	**2,178**	508	407	224	7	3,324
2015	Catch	**1,719**	508	3,313	339	20	5,899
	Mortality	**1,638**	381	299	122	2	2,200
2016	Catch	**1,965**	689	2,192	451	1	5,298
	Mortality	**1,412**	488	198	165	0	2,263
2017	Catch	**1,976**	654	2,133	436	5	5,204
	Mortality	**1,167**	394	171	147	1	1,880
2018	Catch	**2,556**	649	1,440	412	25	5,082
	Mortality	**1,343**	412	115	148	4	2,022
2019	Catch	**3,067**	880	975	418	39	5,379
	Mortality	**1,461**	539	78	189	2	2,270

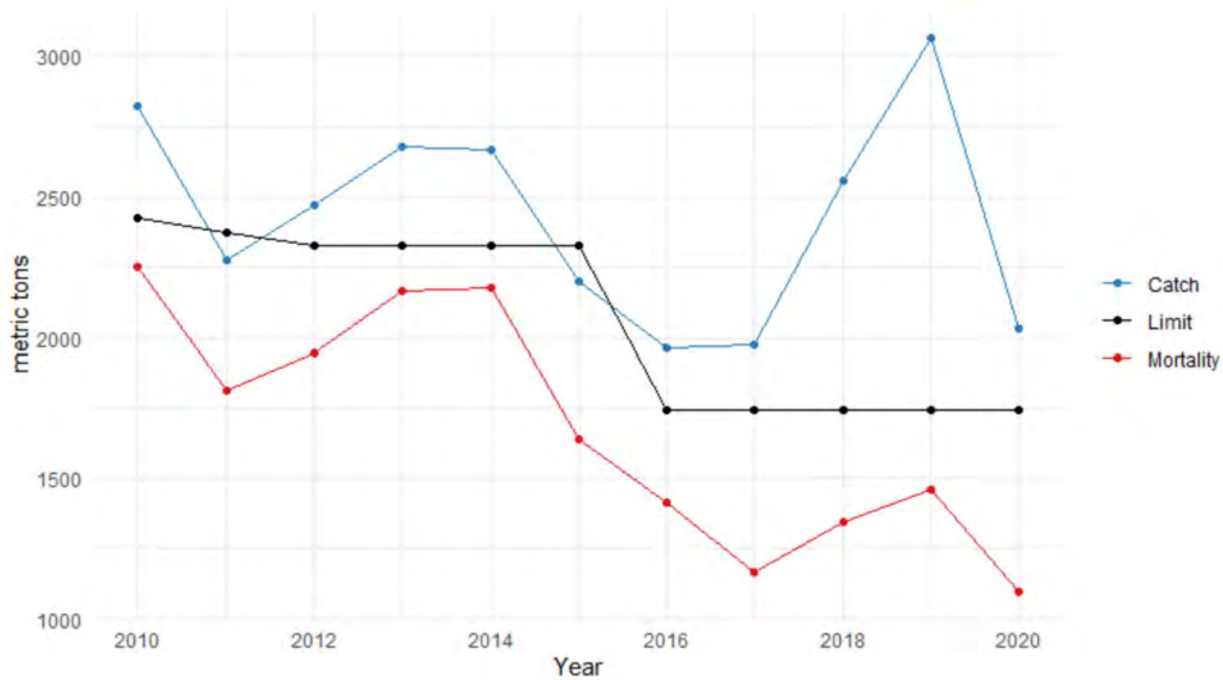


Figure 3-25 A80 halibut PSC limit, catch, and mortality, 2010 through 2020

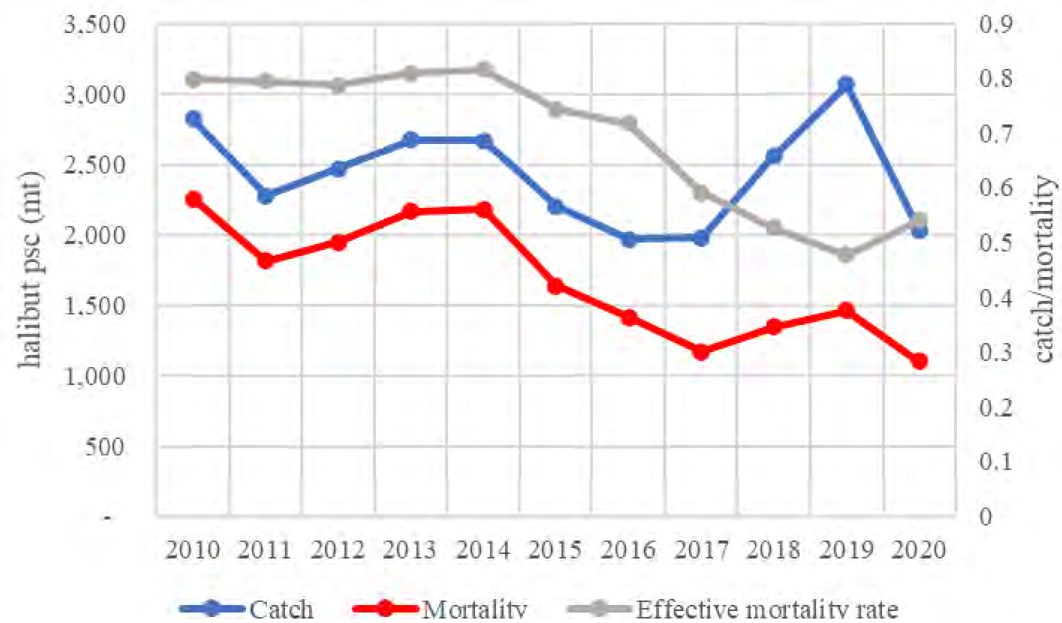


Figure 3-26 **A80 sector effective mortality rate: function of halibut catch and mortality (2010 – 2020)**

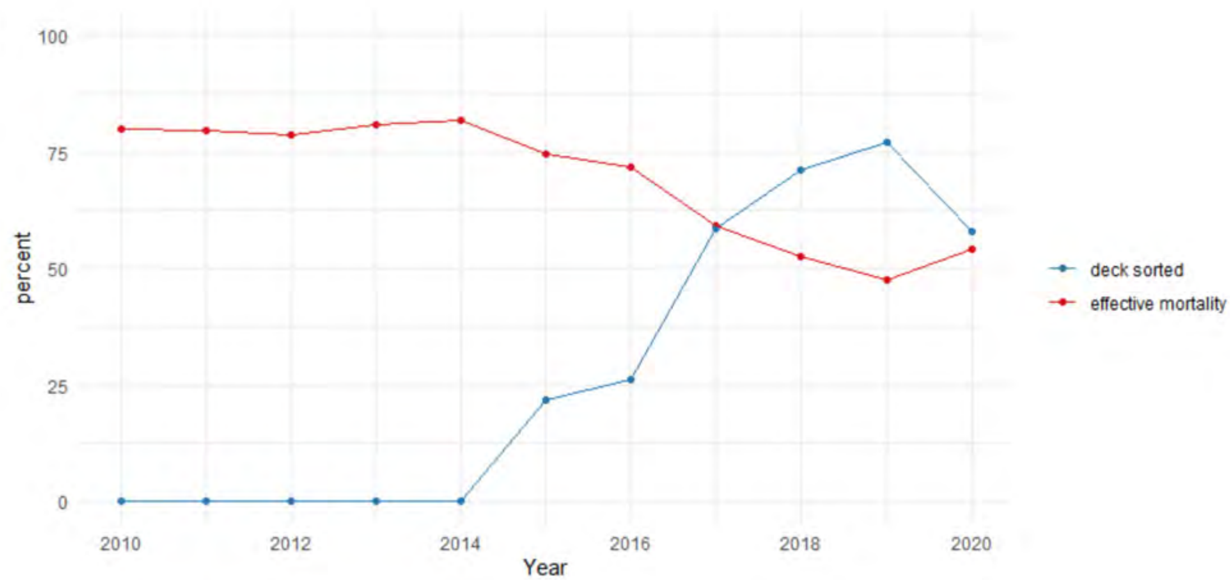


Figure 3-27 **A80 halibut PSC effective mortality (%) versus percent of PSC catch receiving deck sorting DMR estimate, 2010 through 2020**

Figure 3-28 plots the A80 halibut encounter rate by target species for 2010 through 2019. Yellowfin sole target fishing clearly accounts for the highest groundfish catch volume and the highest halibut encounter rate, followed by northern rock sole. After those two, halibut encounter drops off due to either lower effort (other flatfish) or lower PSC rates (Atka mackerel and POP). Refer to Figure 3-14 for the relative proportion of allocated flatfish versus groundfish species on A80 permits and refer to Table 3-20 for PSC rates by target species.

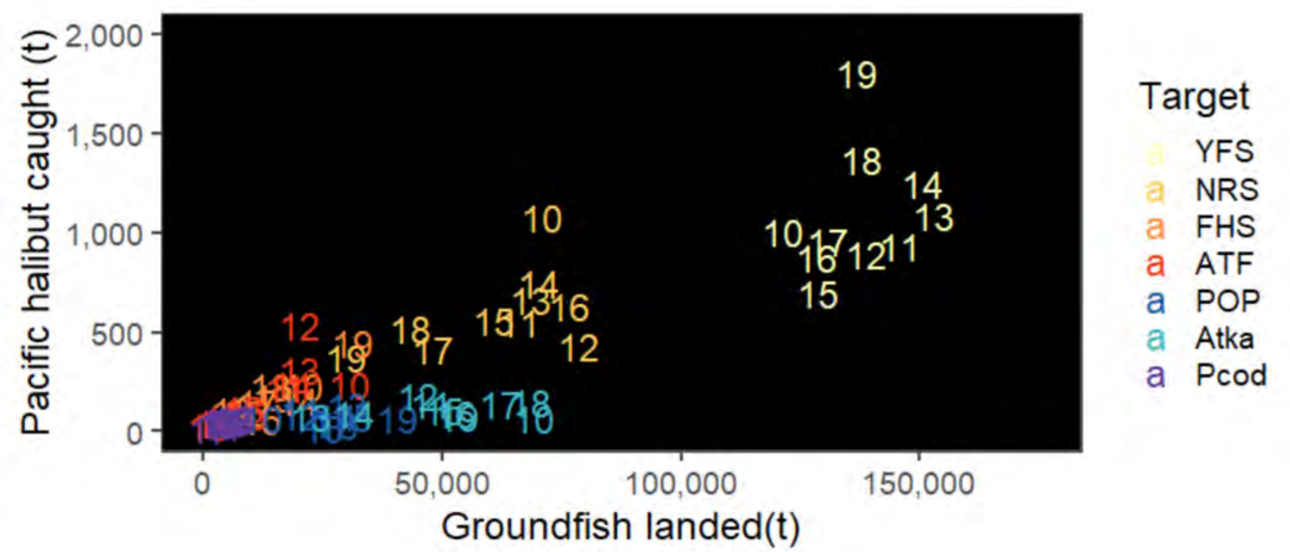


Figure 3-28 **A80 sector bycatch of Pacific halibut (mt) versus groundfish catch by target species, 2010 through 2019.**

Table 3-20 lists the halibut PSC rate for selected A80 targets species, shown as kilograms of halibut PSC mortality per mt of groundfish catch. The species are ordered descending by the target with the highest PSC rate. The order is unchanged whether looking at average or median values over the entire period or only at the three most recent years. The table omits species that are sometimes assigned as an A80 trip target in the CAS but are not typically explicitly targeted by A80 vessels – e.g., Pacific cod, "other flatfish," sablefish, and pollock.

Table 3-20 **A80 Pacific halibut PSC mortality rate by selected groundfish target species (kg halibut mortality per mt of groundfish catch), 2010 through 2019**

Target	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Arrowtooth flounder	6	10	20	12	10	7	9	9	13	8
Northern rock sole	13	7	4	8	9	8	7	5	6	7
Flathead sole	8	9	14	9	6	4	6	5	7	6
Yellowfin sole	7	5	5	6	7	4	5	5	5	6
Alaska Plaice	2	3	2	5	16	1	3	4	5	5
POP/Rockfish	4	4	3	3	2	2	1	1	1	1
Atka Mackerel	1	2	3	3	2	2	1	2	1	1

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Figure 3-29 and Figure 3-30 break down A80 PSC mortality by month for the entire 2010 through 2019 period and by year. The figures demonstrate the predominance of halibut PSC in flatfish targets relative to other targets, and also reflect annual fishing patterns within the flatfish category; for example, northern rock sole tend to be targeted earlier in the year for valuable roe content. Halibut PSC by target fishery tends to reflect effort as translated through the PSC rates reported in Table 3-20; there are no surprising results where the analysts can point to an outlier species-specific PSC rate for a given month. The yearly panels in Figure 3-30 reflect the sector-wide reduction in halibut PSC beginning in 2016, which is generally attributed to the investment of time and resources in halibut avoidance and mortality rate mitigation (i.e., deck sorting). Lower gross levels of halibut PSC in the later months of the year might also be attributable to the sector's Halibut Avoidance Plan (HAP) that requires vessels to maintain a certain rate-performance standard regardless of where the sector stands in relation to the annual limit of 1,745 mt (Section 3.4.5). Additional detail on targeting patterns during the course of the A80 fishing year are included in Section 3.3.3. The most notable deviation from the recent trend in 2020 was the reemergence of PSC attributed to the arrowtooth flounder target, which largely occurred in May and June. This likely has more to do with more trips being counted in CAS as arrowtooth trips due to catch rates than a change in fishing strategy or time/location, since arrowtooth is generally a commercial bycatch species. Flathead sole catch was low in 2020; some of the PSC that occurred in that target fishery around July-September of 2019 shows up in roughly similar magnitudes in 2020 but attributed to the yellowfin sole and rock sole targets.

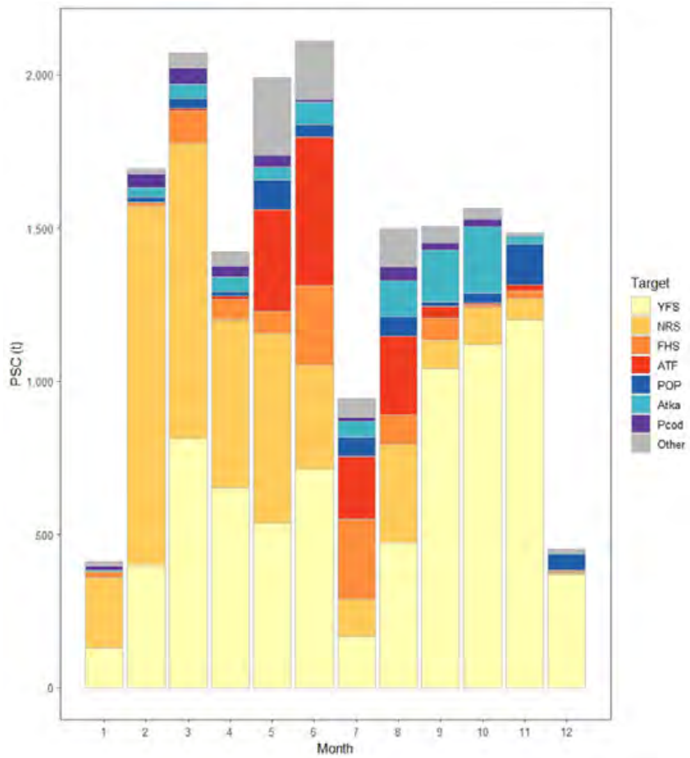


Figure 3-29 A80 Pacific halibut PSC mortality (mt) by month and target fishery, aggregated over 2010 through 2019.

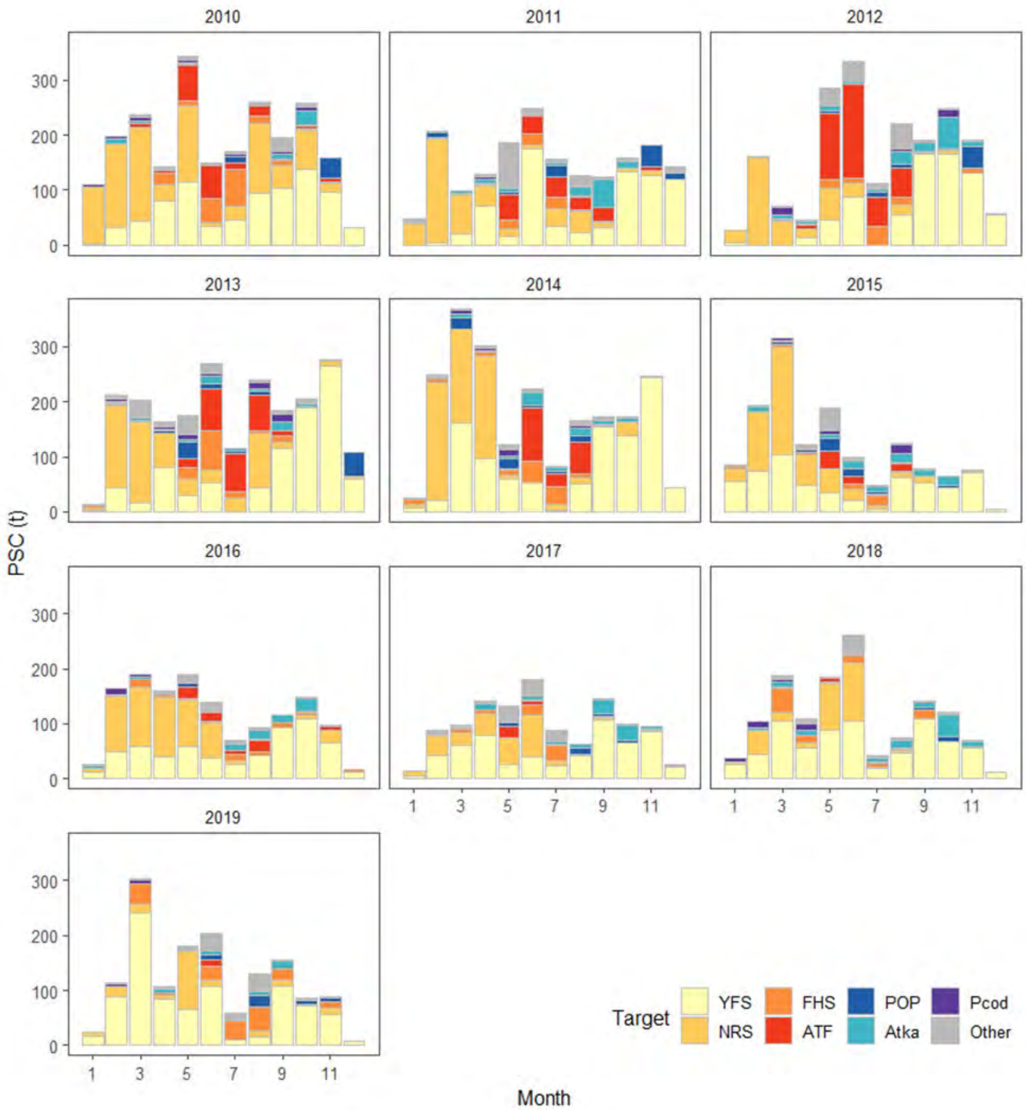


Figure 3-30 **A80 Pacific halibut PSC mortality (mt) by month and target fishery, with panels corresponding to years 2010 through 2019.**

3.4.2 Pacific halibut mortality as related to groundfish revenue

The relationship between halibut PSC mortality and A80 groundfish revenue is a key indicator of the sector-level and distributional impacts of potential changes to halibut PSC limits. The revenue/PSC relationship encompasses the full array of possible determinants: groundfish harvest levels (TAC; effort; CPUE), bycatch mortality (encounter rates; DMRs and effective mortality), and other external factors (wholesale markets; environmental/ecosystem conditions that affect the co-occurrence of halibut and groundfish species). Figure 3-31 plots the relationship between mt of halibut mortality (PSC use) and groundfish wholesale revenue for 2010 through 2019 (2018$). It is important to note that the figure is plotting gross revenues that do not account for operational costs. It is possible that lower PSC mortality was achieved at a higher cost in some years (e.g., search costs, fewer or less efficient tows). The figure reflects that yellowfin sole is the highest volume target in the A80 sector, and with a relatively high PSC rate it typically incurs the greatest amount of halibut mortality. Northern rock sole performs similarly but at a lower volume. As evident from the unit values and PSC rates shown in Table 3-15 and Table 3-20, respectively, Atka mackerel and Pacific ocean perch generate greater revenue per ton of PSC. The other species shown are clustered because they are less often designated as A80 trip targets in CAS data. Aside from visible outliers like arrowtooth flounder in 2012, the other species' revenue/PSC relationship is driven mainly by harvest intensity.

At the sector level (not shown), lower PSC rates can result in similar levels of groundfish harvest volume with different PSC totals. For example, PSC use in 2014 and 2016 were quite different – 2,667 mt versus 1,965 mt – but gross wholesale revenues were similar ($317 million in 2014 versus $306 million in 2016, 2018$). The difference has many causative factors; lower effective mortality is likely a key factor, but species composition of catch and market conditions should not be discounted.

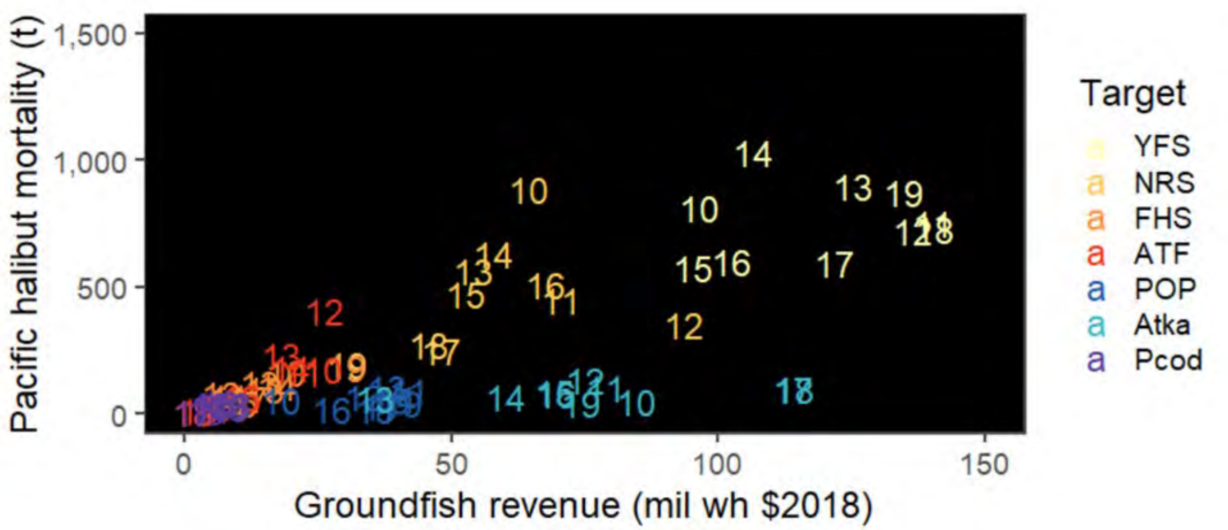


Figure 3-31 A80 Pacific halibut PSC mortality (mt) versus groundfish revenue (2018$ millions in wholesale) by target and year, 2010 through 2019.

Another metric to evaluate the productive value that halibut PSC contributes to the A80 sector is the wholesale revenue generated per mt of estimated halibut mortality. The more wholesale revenue that can be generated per ton of halibut PSC, the more valuable that unit of halibut PSC becomes. In general, wholesale revenue per halibut PSC can be increased three ways: (1) increased wholesale revenues (holding halibut PSC constant); (2) decreased halibut PSC (holding wholesale revenues constant); or (3) a combination of both. If wholesale revenue increases or halibut PSC decreases by the same relative amount, wholesale revenue per halibut PSC remains the same. Figure 3-32 shows the annual value of a mt of halibut PSC from 2010 through 2019. Noting that the values in the table are adjusted for inflation, the sector-level increase since 2014 is likely attributed to lower PSC rates. The lower panel in Figure 3-32 shows gross revenue per ton of PSC by target species, aggregating across all years.[52] This panel underlines the fact that a metric defined as a ratio can be strongly determined by one factor. The low PSC rate for Atka mackerel and POP target trips separates that target group from other A80 species. If the A80 sector were able to restructure its total activity around the harvest of low-PSC groundfish species it could achieve high gross revenues at a low PSC rate, but that is not possible given that roundfish species have defined catch limits and A80 companies cannot alter the flatfish/roundfish quota share mix that they are allocated under the program. In effect, the only levers that the sector can use to increase its revenue per mt of PSC is to reduce usage in flatfish targets or to generate higher value from flatfish, which may be occurring but is inevitably limited by market and operational factors.

[52] Previous versions of this analysis included revenue per mt of halibut PSC by month but no discernable pattern with a plausible explanation to link available seasonal catch, its value, and the observed PSC rate was apparent.

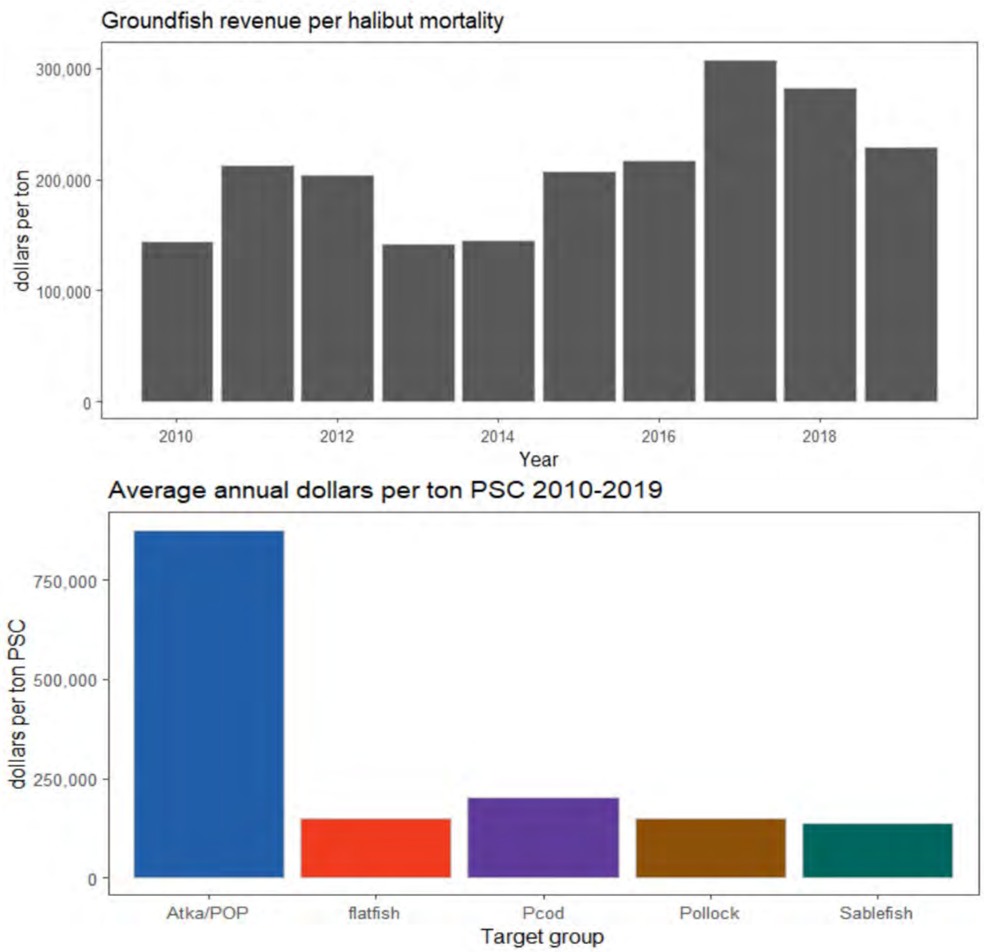


Figure 3-32 A80 wholesale groundfish revenue (2018$) per mt of halibut PSC, 2010 through 2019. Top panel: Sector-level revenue per mt by year; Bottom panel: revenue per mt by targets species aggregated over years.

Figure 3-33 further illustrates the consistent difference in target categories' revenue per ton of halibut PSC. Atka mackerel and POP ratios stand out from flatfish and Pacific cod. Pacific cod ratios should not be overly interpreted because the A80 sector often records "trips" that are assigned a cod target designation as a byproduct of other operational factors; the analysts are led to understand that it is rare for an A80 vessel to truly target Pacific cod over the course of a week's fishing. The difference in revenue per ton of PSC by flatfish/roundfish species group is an integral part of understanding the distributional impacts of a constraining halibut bycatch limit within the A80 sector. Figure 3-15 shows that the A80 companies are heterogeneous in terms of their flatfish/roundfish quota mix. While intra-sector transfers are possible, they likely come at a cost that is not observable by public analysis, and transfers on the margin would not change the essential disposition of an A80 company as one that is "flatfish-dependent" versus one that is less so. To the analysts' knowledge, intra-sector transfers may occur within a company's fleet of vessels but are not being made between companies, even within the single cooperative.

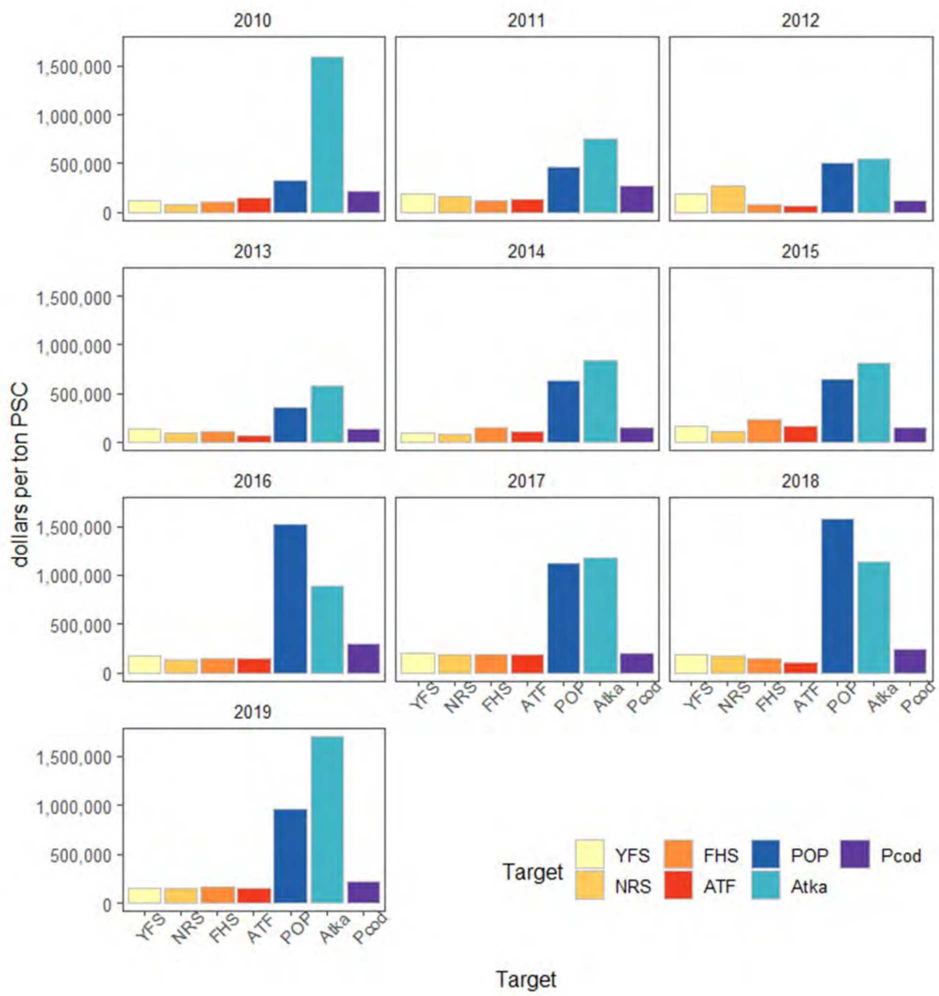


Figure 3-33 A80 wholesale groundfish revenue (2018$) per mt of halibut PSC by selected target species, 2010 through 2019.

3.4.3 Spatial data on A80 fishery and EBS shelf trawl survey

This section presents visual comparisons of the A80 sector's spatial range and halibut PSC to that of the EBS shelf trawl survey. Data are pulled from the three most recent years that were used in the development of the ABM operating model reviewed in October 2020 – i.e., 2017 through 2019. The EBS shelf trawl survey is typically conducted in June and July so, in some figures, data are selected to provide a direct comparison. The purpose of this section is not to affirm or question the approach of linking PSC limits to abundance estimates derived from the trawl survey – as seasonal surveys are utilized in many instances to condition management of year-round fisheries in Alaska. These spatial data are simply provided to give the reader the best publicly available understanding of where the fishery occurred, where halibut PSC typically occurs, and where the EBS shelf trawl survey encountered halibut. The selected years represent the groundfish stock and environmental conditions as they occurred in the background of this fishery and survey data. Note that all mapped data are drawn from Observer Program information and are presented by ADF&G statistical area.

Figure 3-34 shows where the A80 sector operated from 2017 through 2019 based on the number of hauls recorded in Observer Program data. The figure also pares back to the activity that occurred in June and July to mirror the EBS survey season. Figure 3-35 depicts where halibut PSC occurred within the main A80 target species. Halibut PSC is not a direct representation of all fishing activity, but all of the targets represented in the figure incurred halibut PSC at a known rate (Table 3-20) so the figure provides an adequate depiction of the fact that flatfish species tend to be targeted in the eastern Bering Sea while roundfish (Atka mackerel and POP) are generally targeted along the Aleutian Island chain. Targets that predominately show up along the shelf break (i.e., flathead sole and arrowtooth flounder) are species that sometimes end up as “targets” in the CAS when a vessel was primarily working on other species up to their retainable amounts, like POP or Pacific cod.

Figure 3-36 shows where halibut PSC occurred from 2017 through 2019, with a breakout for the EBS survey months of June and July. When compared with Figure 3-35, it is apparent that PSC tracks with the areas fished for flatfish (YFS, NRS) plus a cluster around Unalaska and Unimak Pass where roundfish, Pacific cod, and arrowtooth flounder are predominant.

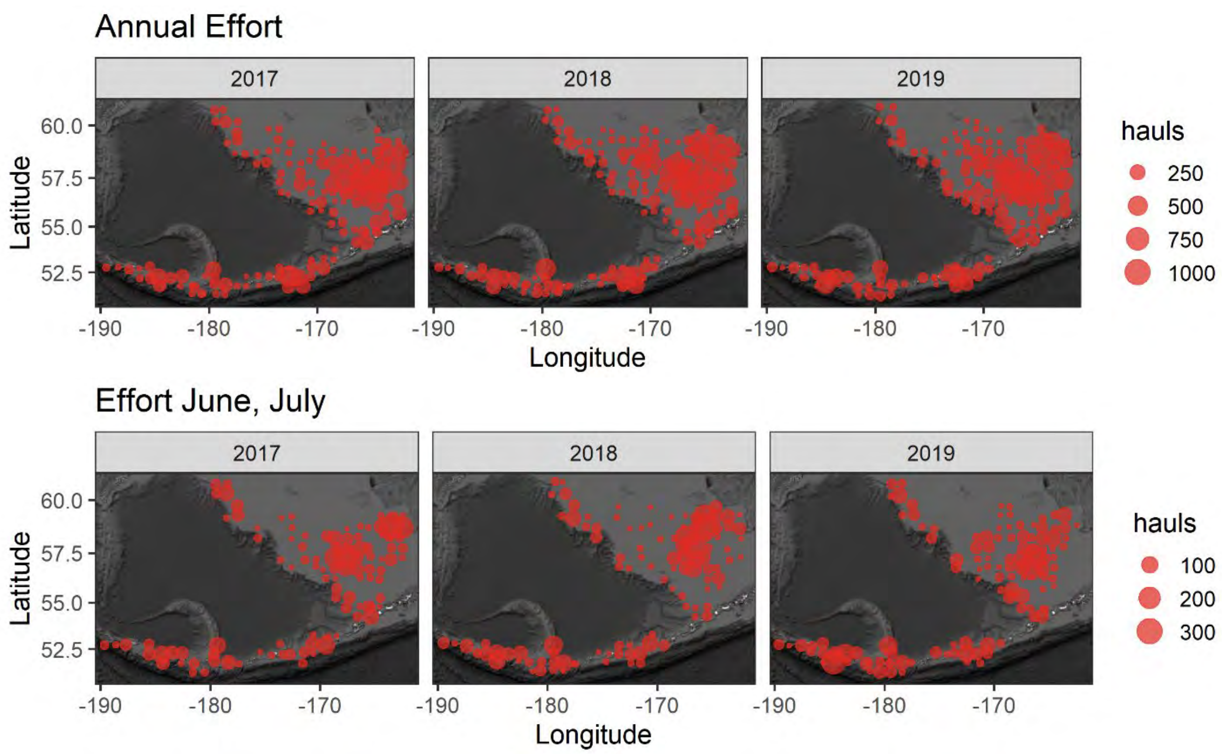


Figure 3-34 A80 sector effort by ADF&G statistical area, 2017 through 2019. Lower panel shows fishery data for months when the EBS survey is conducted. Size of plotted circles is proportional to number of hauls.

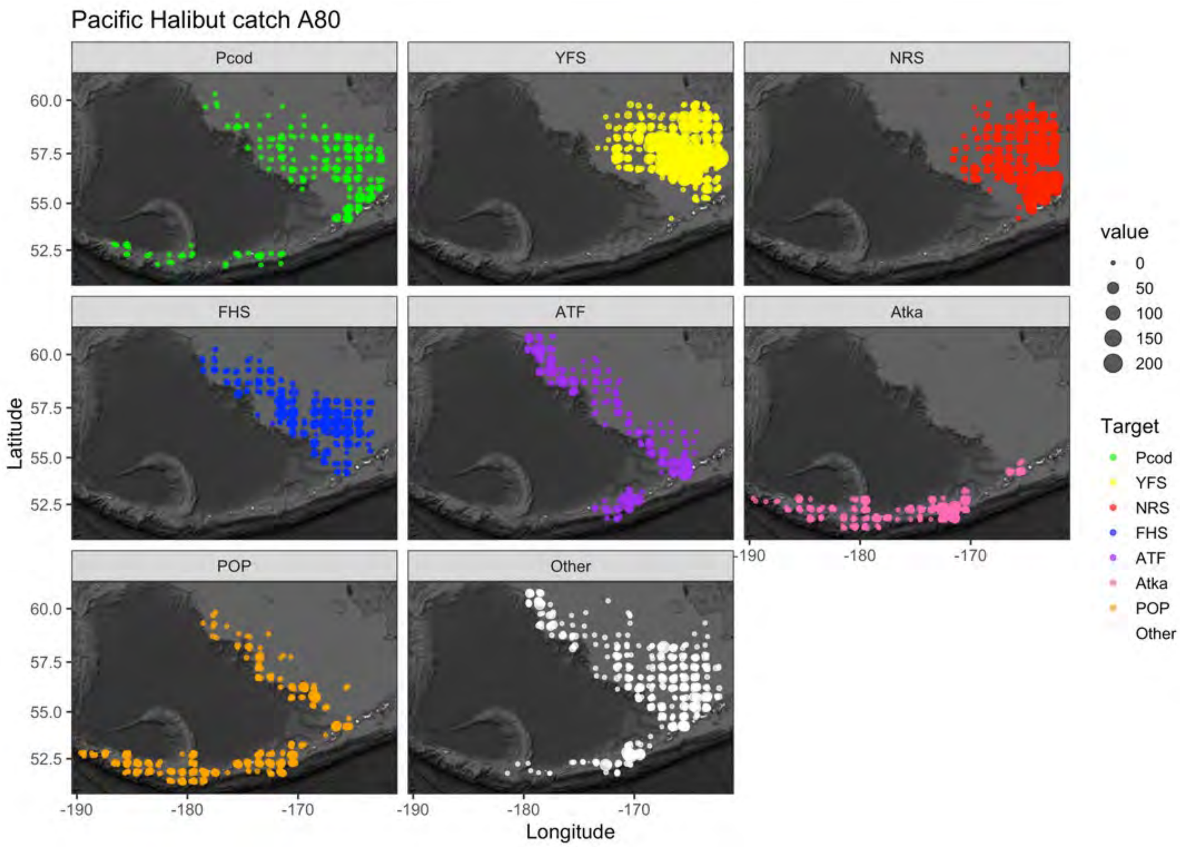


Figure 3-35 A80 sector catch (pre-mortality) of Pacific halibut by ADF&G statistical area and target groundfish species, aggregated over 2010 through 2018. Size of plotted circles proportional to volume ("value" in legend equals mt).

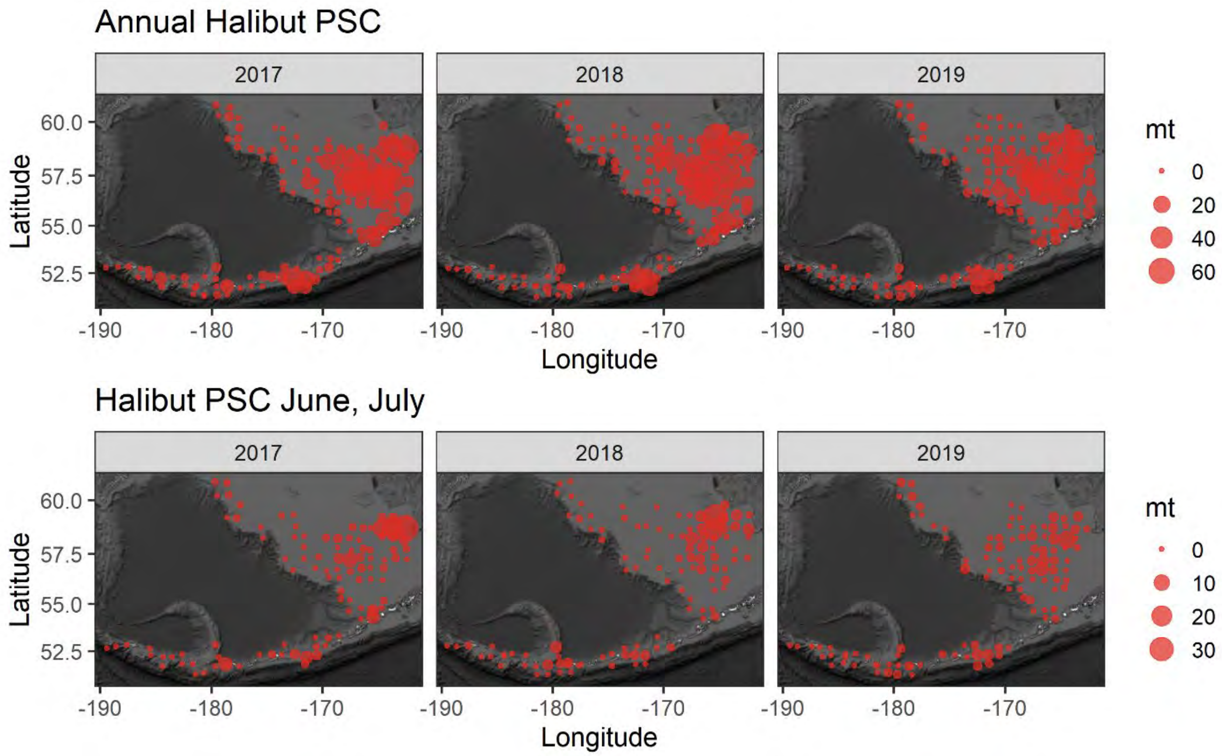


Figure 3-36 A80 sector Pacific halibut PSC (mt of mortality) by ADF&G statistical area, 2017 through 2019

Figure 3-37 compares the ADF&G statistical areas where fishing occurred during the EBS survey season (June/July) with areas where the survey encountered halibut. Figure 3-38 overlays ADF&G statistical areas where halibut occurred in the fishery throughout the year and during the survey season on the surveyed areas that encountered halibut.

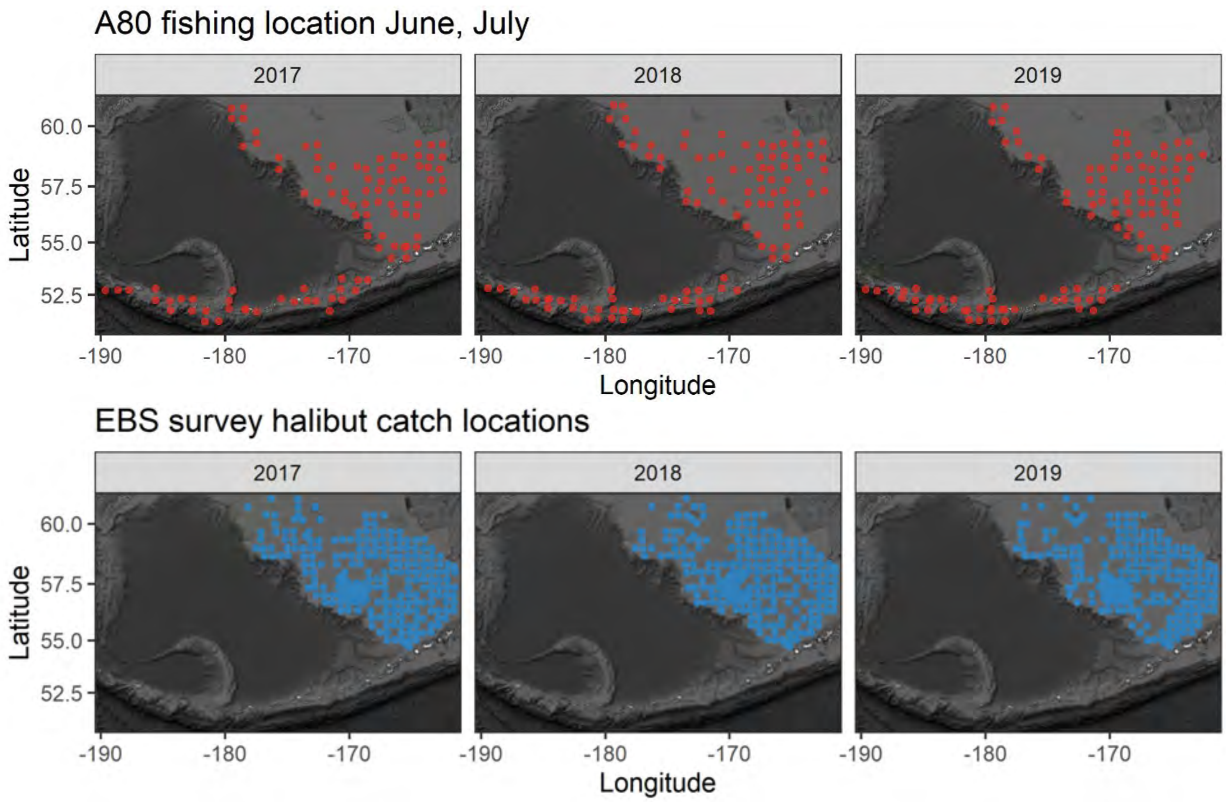


Figure 3-37 **ADF&G statistical areas where the A80 sector fished during the months when the EBS shelf trawl survey (EBS) typically occurs and ADF&G statistical areas where the EBS survey encountered halibut, 2017 through 2019**

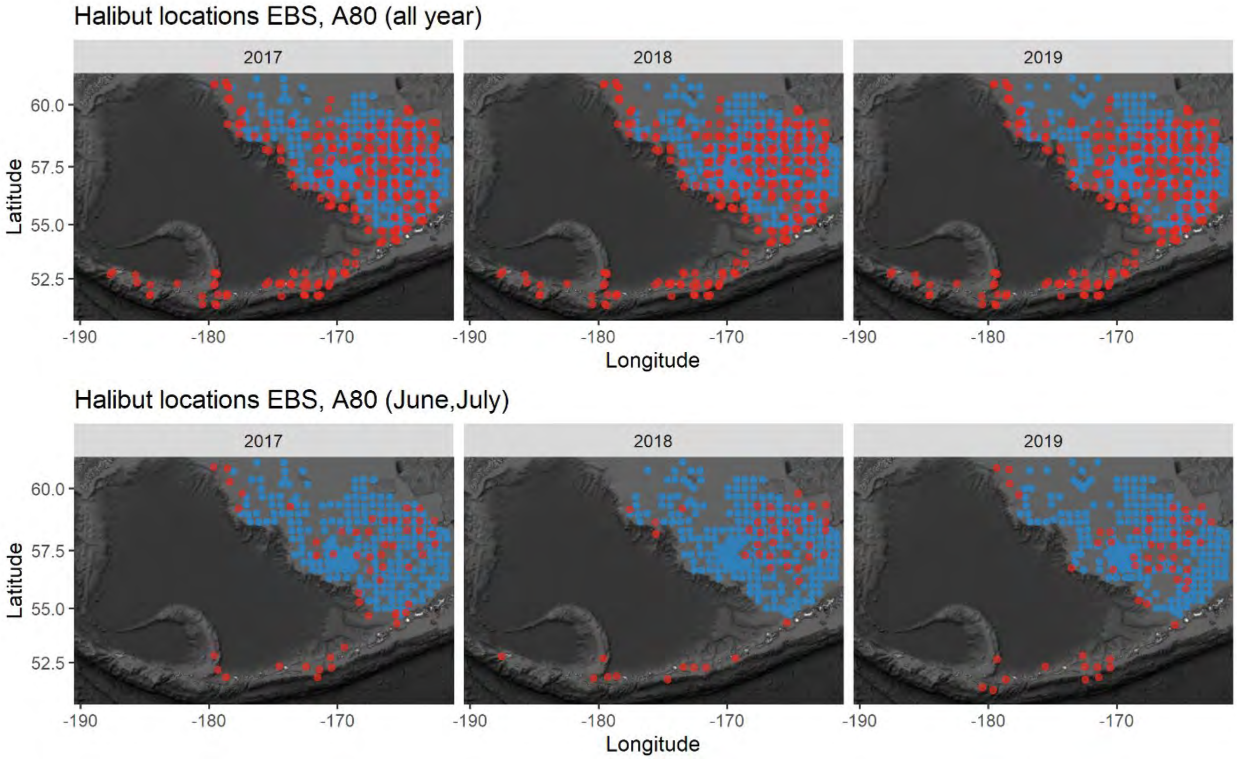


Figure 3-38 ADF&G statistical areas where halibut PSC occurred in the A80 fishery overlaid on areas where the EBS shelf trawl survey (EBS) encountered halibut, 2017 through 2019. Top panel shows areas with A80 halibut catch throughout the year; bottom panel show areas with A80 halibut catch for the months during which the EBS trawl survey typically occurs.

3.4.4 Comparison of A80 PSC and survey trends

This section reports survey trends as they relate to A80 halibut mortality at the sector-level and by A80 groundfish target species.

Figure 3-39 shows A80 halibut catch and mortality in the top panels and shows the EBS trawl and setline survey index values in the bottom panels (Table 2-6 shows these metrics numerically). The vertical axis represents mt for all panels (note that the vertical scale is different in each panel). Both surveys display downward abundance trends. Halibut catch and mortality (PSC) follow similar trajectories from 2010 through 2015, but since then halibut catch has increased at a greater rate than mortality due to changes in catch accounting and fish handling procedures described in the following section (3.4.5).

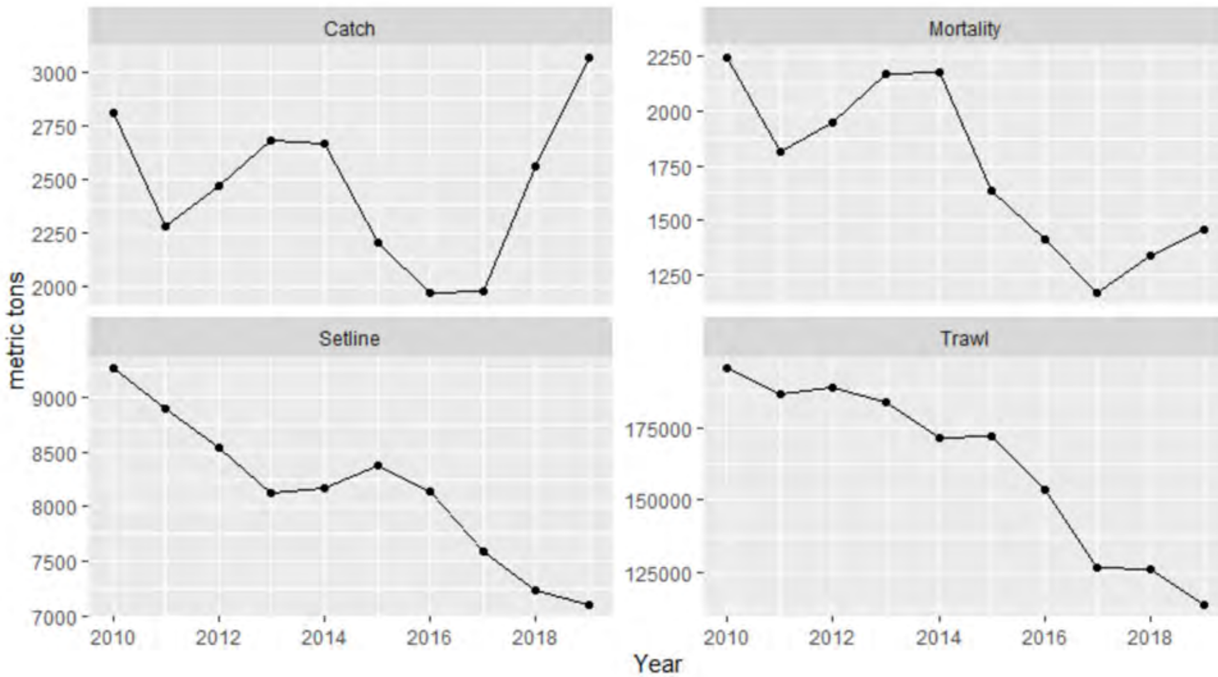


Figure 3-39 A80 halibut catch and mortality (top panels) and setline and trawl survey indices (bottom panels), 2010 through 2019

Figure 3-40 plots A80 halibut PSC catch (encounter) and mortality in relation to the two survey indices. Survey indices have consistently declined while catch reached a high in 2019; mortality has increased since 2017 but at a slower rate than catch. The relationship between halibut catch and the survey value is not well correlated. Factors other than halibut population size that may lead to increased encounter rates include mixing with target species, variable groundfish aggregation behavior across years, and targeting of different species by the various fleets/companies within the sector. Halibut mortality shows a slightly better correlation with both abundance indices. Halibut population size and distribution certainly plays some role in the abundance to mortality relationship, but total PSC mortality is likely also driven by fleet behavior. For example, deck sorting, test tows, shorter tows, and excluder use have become more widely adopted since 2015, resulting in lower effective mortality (ratio of halibut mortality to catch) even though halibut catch has increased (see Figure 3-26, Section 3.4.5). In the bottom panel of Figure 3-40, there would likely be no trend without the inclusion of 2015 through 2019 – the period during which active mortality mitigation measures became widely adopted throughout the A80 fleet. Based on the data available one might conclude that halibut catch rates are somewhat stochastic, but may have increased in recent years as the A80 fleet has found ways to mitigate the negative consequences of halibut encounter, thus allowing the fleet to prioritize finding the right mix of groundfish slightly ahead of minimizing the number of halibut in a haul. That said, the analysts do not solely attribute the recent upward trend in halibut encounter to fleet choices; it is possible that higher encounter rates are at least partially attributable to environmental conditions (e.g., comingling of species in an ocean environment with less temperature variation that could help separate species and guide time/area targeting).

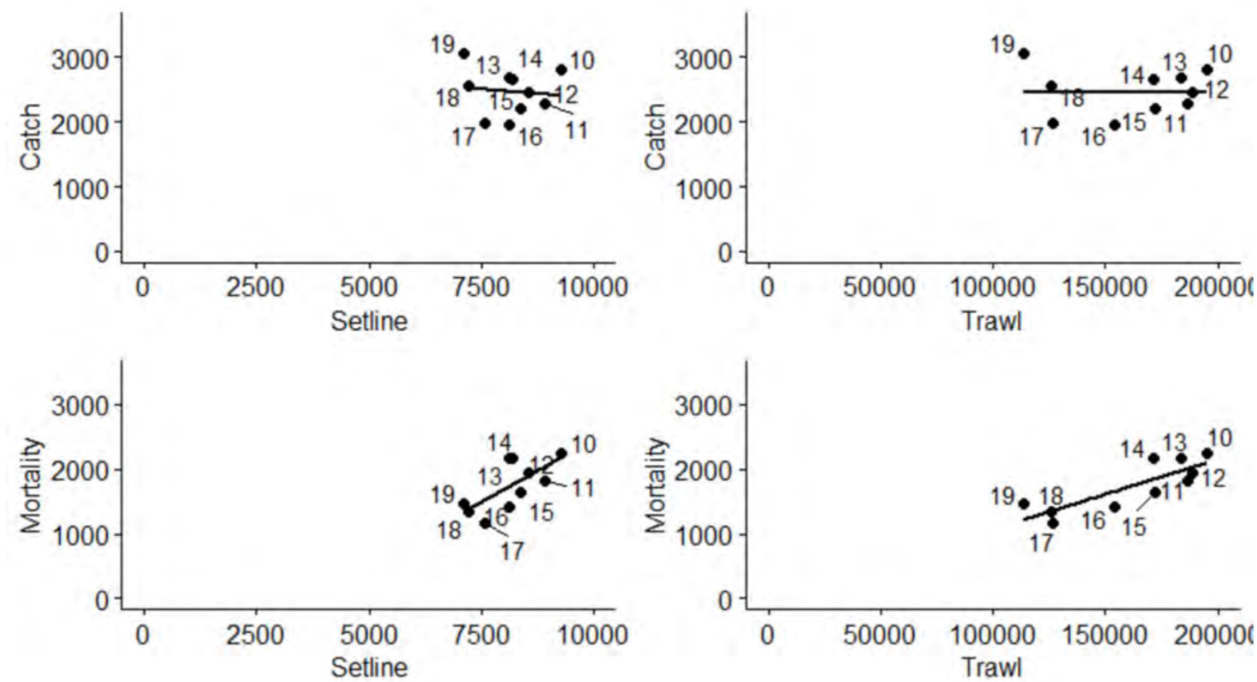


Figure 3-40 Plot of annual halibut catch and mortality against setline and trawl survey indices 2010-2019.

A80 halibut encounter rate by target species for 2010 through 2019 are shown in Section 3.4.1 (Figure 3-28). Yellowfin sole target fishing clearly accounts for the highest groundfish catch volume and the highest halibut encounter rate, followed by northern rock sole. After those two, halibut encounter rates drop off due to either lower effort (other flatfish) or lower halibut PSC rates (Atka mackerel and POP). Table 3-21 provides the survey values and look up table “states” as well as total A80 mortality by year and the mortality by target for the species shown in Figure 3-28. There may be some utility in examining the general association between trends in mortality by year (overall and by target) and trends in survey indices (Table 3-21). For most targets and for overall A80 PSC mortality, higher values of both surveys (2010-2014) trended with higher overall A80 PSC mortality as well as higher halibut PSC for most targets. Both surveys have been at lower abundance levels in more recent years. Total PSC has been lower relative to the 2010-2014 period, and the analysts attribute at least some of that trend to active mitigation measures implemented by the A80 sector. PSC mortality by target has varied considerably, trending upward in 2018 and 2019 for both yellowfin sole and flathead sole targets. The two, clear target-level conclusions that can be made are: fishing for yellowfin sole and northern rock sole account for the greatest proportion of halibut PSC mortality because they are the highest volume flatfish targets; and Atka mackerel/POP generally account for less PSC per ton of groundfish catch when compared to flatfish targets (**Table 3-20**).

Table 3-21 Survey index values (WPUE and metric tons (mt)) and "State" from Table 2-6 with associated tons of A80 sector halibut mortality in total and by selected targets, 2010 through 2019. Shading corresponds to higher (darker) and lower (lighter) values within individual columns. [53]

Year	Setline Survey 4ABCDE		EBS shelf trawl survey		Mortality (mt)	Target					
	Index (WPUE)	State	Index (mt)	State	Total A80	YFS	NRS	FHS	ATF	POP	Atka
2010	9,271	Medium	195,535	High	**2,254**	833	913	302	190	57	55
2011	8,896	Medium	186,666	High	**1,810**	790	467	119	172	92	111
2012	8,539	Medium	189,000	High	**1,944**	761	378	104	415	75	144
2013	8,133	Medium	183,989	High	**2,166**	955	583	159	238	107	62
2014	8,173	Medium	171,427	High	**2,178**	1,102	645	112	188	63	77
2015	8,385	Medium	172,237	High	**1,638**	598	480	46	62	60	86
2016	8,134	Medium	153,704	High	**1,412**	631	521	63	71	18	80
2017	7,583	Low	126,684	Low	**1,167**	608	256	63	35	34	105
2018	7,228	Low	125,957	Low	**1,343**	752	278	105	12	24	110
2019	7,104	Low	113,855	Low	**1,461**	890	207	183	17	44	51

Comparison of spatial coverage of the EBS trawl survey and A80 fishery (Section 3.4.3) indicate that the survey stations capture the area where the A80 sector is fishing during the survey season in the Bering Sea and along the shelf. The EBS survey, by its nature, does not provide data on catch and halibut encounter rates in the Aleutian Islands. The analysts note that the predominant A80 species caught in the Aleutian Islands are Atka mackerel and Pacific ocean perch, which are typically associated with lower halibut bycatch (see Figure 3-38 Table 3-21). The lower panel of Figure 3-38 illustrates the year-to-year variability in areas where the A80 sector operates at a given point in the season. That variation can be ascribed to any of several reasons: groundfish CPUE, halibut encounter rates, or mix of species including constraining Pacific cod, to name a few.

There are many reasons why it would not be expected for A80 halibut PSC encounter rates to be consistently, positively correlated with halibut survey abundance indices, including, but not limited to different temporal and spatial coverage, selectivity, and targeting behavior. Surveys are designed to collect standardized data and therefore operate differently than fishing operations that are actively targeting specific species based on any number of changing variables such as catch limits, allocations, and economic incentives. This is one reason fishery catch limits are not set solely using solely fishery dependent data. Similarly, the premise of abundance-based management correlated to halibut PSC is that the PSC limit would be set based on the surveyed abundance of halibut, not based on the halibut encounter by A80. In years of low halibut abundance and associated lower PSC limits, there may be impacts to A80 fishing operations if A80 encounter rates are high.

[53] YFS = yellowfin sole; NRS = northern rock sole; FHS = flathead sole; ATF = arrowtooth flounder; POP = Pacific ocean perch; Atka = Atka mackerel; Pcod = Pacific cod. Note that Pacific cod is not shown in Table 3-21 because, in most cases, cod is not the explicit target of an A80 "trip." Rather, Pacific cod is taken as a valuable and necessary secondary species when fishing for other A80 species but might be targeted in circumstances where a vessel is already processing cod delivered at-sea by CVs. In many cases, NMFS Catch Accounting System identifies Pacific cod as a trip target when catch by volume exceeds a certain proportion as a matter of circumstance.

3.4.5 Bycatch mortality reduction strategies

This section describes existing efforts and projects in development within the A80 cooperative to minimize halibut PSC catch and mortality. Note that Section 3.5.1 of the preliminary DEIS (NPFMC 2019a) and Section 1.4.4 of the October 2017 ABM Discussion Paper (NPFMC 2017) provided earlier iterations of this information as well as contrasting and overlapping avoidance strategies in the BSAI TLAS and HAL CP sectors. Those other sectors would no longer be directly regulated by the alternatives under consideration and thus have been excised from this section.[54] Some of the information reported below is drawn from the most recent cooperative report submitted to the Council by the lone A80 cooperative that is currently operating, which includes all active A80 vessels as members.[55]

Vessels that currently participate in the A80 sector have been engaged in halibut avoidance to some degree before A80 implementation when limited access BSAI flatfish fisheries were often closed due to halibut bycatch limits. The implementation of A80 in 2008 created a binding constraint on the qualifying vessels. Since 2011, all A80 vessels have participated in one or two voluntary A80 cooperatives (as opposed to the A80 limited access fishery), resulting in additional capabilities to take organized steps to minimize bycatch. All A80 vessels have participated under a single cooperative since 2017 (the AKSC). According to AKSC's most recent report to the Council, the sector increased its focus on voluntary halibut bycatch avoidance in 2014 as the Council was considering hard cap PSC limit reductions for A80 and other BSAI groundfish sectors. Those reductions were implemented via Amendment 111 in 2016. Upon taking action to reduce PSC limits in 2015, the Council requested a proactive plan to maintain low bycatch rates. The A80 sector responded with a HAP that was agreed to by the two cooperatives that covered all A80 vessels at the time: AKSC and the Alaska Groundfish Cooperative.

The HAP defined operational practices and accountability measures to avoid halibut and reduce halibut mortality. The Plan imposed rate-based halibut PSC standards for the calendar year and, separately, for the last quarter of the year. The latter measure is meant to prevent overuse of halibut PSC if the annual rate does not appear to be a constraint in that year. Acceptable rates are established based on target species due to the different intrinsic halibut bycatch rates among the A80 species groups (see Table 3-7). Intra-cooperative accountability measures for failure to meet the standards include monetary fines, increased monitoring, and possible reduction in vessel-level halibut PSC allocations within the cooperative for the following year. The AKSC report to the Council on the 2019 fishery notes that all vessels complied with the Plan's standards in that year.

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[54] In summary, halibut avoidance in TLAS is structured around existing affiliations by most – but not all – TLAS CVs with A80 and AFA companies and/or cooperatives. Unaffiliated TLAS vessels receive information from cooperatives regarding halibut avoidance and encouragement to voluntarily adopt best practices and information sharing. Specific measures include the A80 tools described in this subsection as well as Better Practices Protocols established for AFA CVs when trawling for BSAI Pacific cod. Those protocols include halibut excluders that meet certain specifications, no night fishing, minimum mesh size for escapement of small fish, voluntary full observer coverage, and real-time catch/location information sharing through their cooperative managers. AFA CVs are also subject to internal cooperative bycatch allocations. AFA cooperatives may impose internal accountability measures through vessel rankings of PSC rates and monetary sanctions for vessels that do not comply with the Protocols. AFA cooperatives manage their vessels such that the PSC limit is not exceeded and allows the managers of cooperatives that do not need their full suballocated PSC to harvest the cooperative's non-pollock sideboard catch to redistribute PSC to other AFA cooperatives at no cost.

The HAL CP sector (Freezer Longline Coalition Cooperative, or FLC) approaches halibut avoidance and PSC minimization through real-time communication facilitated by a third-party data manager. That information includes location data on catch rates and observed discard mortality, which incentivizes careful release practices to increase halibut discard viability. Vessel-specific internal reports on PSC rates promote social incentives to avoid activity that could result in lost fishing opportunities for the cooperative as a whole. All vessels in the HAL CP sector operate with flow scales and 100% observer coverage or greater.

[55] Alaska Seafood Cooperative Report to the NPFMC for the 2019 Fishery (April 8, 2020). Accessible at: https://www.npfmc.org/wp-content/PDFdocuments/catch_shares/CoopRpts2019/AKSC.pdf.

The three principal halibut avoidance measures used by the sector are choice of fishing time and location, use of halibut excluders, and deck sorting of halibut. Active communication among vessel captains on the fishing grounds, facilitated through the cooperative and a third-party data manager, is central to the effectiveness of halibut bycatch minimization under changing fishery conditions. Captains are informed of avoidance measures and operational decisions that are yielding good results at that particular time. Performance reports are shared internally, characterizing the areas being fished by cooperative members in terms of halibut mortality rates, target species, excluder effectiveness, deck sorting, halibut movement, fishing depths, and bottom temperatures. The fleet does not presume seasonal halibut movement to be constant from one year to the next, underlining the importance of continuous data collection and real-time communication. An A80 skipper's primary decision-drivers are the catch and bycatch rates in the particular area where they are fishing. Participants also noted that actively looking for clean fishing can be more productive and less risky than leaving the grounds and returning to make their next decisions based on older information.

The most recent AKSC Cooperative Report states that operators incur direct costs to avoid bycatch and/or reduce mortality rates. For example, participants cite that halibut excluders not only reduce target catch per effort but also increase fuel consumption. Fuel costs and efficiency loss is also incurred when vessels transit to move away from time/area combinations that are experiencing in high encounter rates. Transit time also increases total fishing time and reduces productivity for the vessel and its crew, who are compensated based on harvest. Another category of cost is shorter tows that yield fewer groundfish. Shorter tows include test tows to ascertain halibut rates in that area and reduced tow time to increase the viability of the halibut that are caught when a vessel is practicing deck sorting. Costs related to deck sorting and the amount of deck sorting occurring are described below.

The total annual number of hauls made by A80 vessels had been increasing in recent years until a relative drop in the unusual 2020 year. The fleet-wide number of hauls peaked in 2019 at 16,574 (Table 3-22). From 2010 through 2014 the number of annual hauls ranged between roughly 11,000 and 12,500. Since 2015, total hauls were between roughly 12,500 and 16,500. Haul-level data on groundfish catch (mt), wholesale value (2018$), and PSC (catch and mortality) are shown in Figure 3-41.[56]

The total number of hauls may be influenced by a variety of factors including TACs, CPUE, and business plans, but is likely driven at least in part by efforts to minimize halibut mortality. While 2015 is somewhat of an arbitrary demarcation for this particular metric, that year corresponds to the implementation of active measures by the fleet to mitigate PSC. In the impacts section of this analysis (Section 5.3.2), 2015/2016 is used to broadly distinguish a shift in how the A80 sector approaches halibut mortality mitigation. Table 3-13 shows that the most recent years have yielded lower PSC use with total gross wholesale value and harvested groundfish weight remaining in a range comparable to the preceding period. PSC mitigation efforts could result in making more hauls of shorter duration for several reasons.[57] First, test tows with lower intended catch volume are used to assess the time/area fishing conditions and the risk of a high bycatch rate on subsequent longer tows. Second, marginally reducing the duration and volume of a normal tow allows captains to manage the risk of a high magnitude bycatch encounter and provides more frequent opportunities to move out of an area if necessary. Finally, shorter tows increase the expected viability of halibut that are brought onboard due to less time spent in the codend. The A80 fleet has placed an emphasis in recent years on reducing discard mortality, as evidenced by the broad adoption of deck sorting (Table 3-23).

[56] The data in this figure are drawn from the same observer dataset that was used for the revenue analysis in Section 5.5. Data from 2015 are included here – in contrast to their exclusion in the impacts analysis – because confidence in annual aggregate haul-level data is high whereas specific haul data in 2015 were complicated by the early implementation of a deck sorting EFP.
[57] Alaska Seafood Cooperative, via personal communication. August 2020.

Table 3-22 Total A80 sector hauls by year, 2010 through 2020

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
A80 Hauls	12,507	11,163	10,892	11,338	11,702	12,443	14,167	13,821	15,908	16,574	14,430

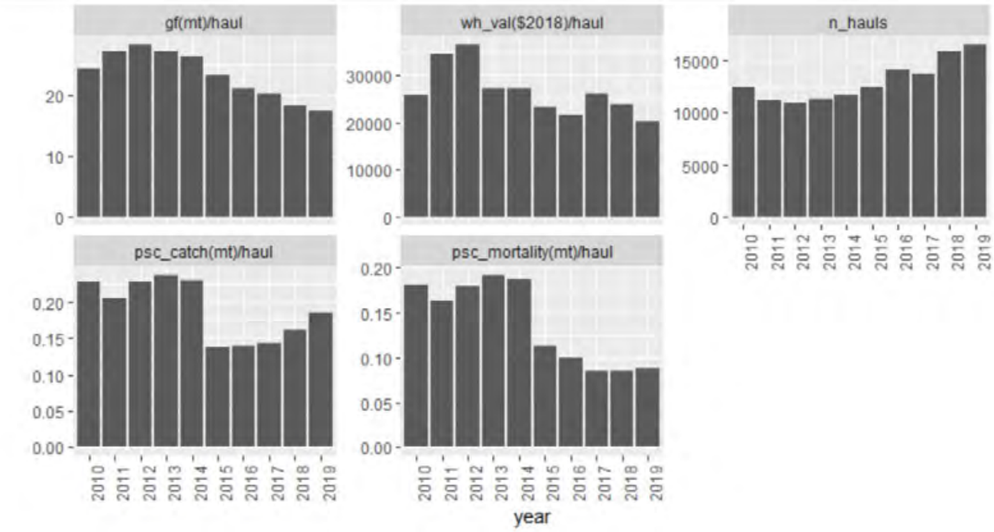


Figure 3-41 Haul-level data on A80 groundfish catch (mt), first wholesale revenue (2018$), and halibut PSC encounter/mortality (mt)

The 2019 AKSC report states that A80 vessels continue to experiment with halibut excluder designs to improve effectiveness and reduce target loss. The cooperative stated that excluder effectiveness varies across fisheries and vessels with conditions, vessel and net characteristics, and operating practices. Metrics for effectiveness are not well measured. For example, fishery participants and managers can only speculate about whether excluders might be less effective when encountering a higher proportion of small size halibut. In February 2021, the A80 cooperative brought an EFP proposal to the Council, seeking to better study the efficacy and efficiency of the most up-to-date excluder designs. The Council recommended that the EFP application be approved by NMFS.[58]

Previous iterations of the ABM analysis and associated discussion papers had noted a possible trade-off in the efficacy of excluder use and deck sorting – in other words, they were not viewed as purely complementary because it was thought that excluders increased mud or siltation on fish in the net, reducing release viability. Continuing gear experimentation may have reduced this effect by bringing the excluder section of the net higher in the water, reducing mud and increasing the proportion of tows when excluder use could be advantageous (AKSC, personal communication, July 2020). Innovations that work well with deck sorting are increasingly important now that all A80 vessels are deck sorting at least some of the time (**Table 3-23**). In 2019, nine of the 10 A80 vessels that fished in the GOA utilized deck sorting at least some of the time that they were fishing in that area.

[58] The EFP application can be seen at: https://meetings.npfmc.org/CommentReview/DownloadFile?p=924c31f1-0bdf-4625-a44d-c7f643b16024.pdf&fileName=D2%20Halibut%20Excluder%20EFP%20Application.pdf.

Table 3-23 A80 vessel participation in deck sorting EFP, 2015 through 2019

Year	A80 Vessels in EFP	Deck Sorted BSAI	Deck Sorted GOA
2015	9	9	-
2016	10	10	-
2017	15	15	-
2018	19	19	8
2019	20	20	9

The A80 sector has invested substantial time and labor in the development of deck sorting as an EFP, and in 2020 deck sorting was implemented as a regulation and is fully incorporated as an option within the observer program. Note that – as a byproduct of deck sorting implementation – observer data no longer include a separate 'purpose code' that identifies a deck-sorted haul so 2020 data cannot be characterized in this manner. In addition to direct costs, deck sorting may reduce a vessel's daily productivity if it is able to complete fewer tows and if tows are shortened to increase viability. These costs could be compensated if lower DMRs reduce the likelihood that the sector or a company within the sector loses fishing opportunities or has to diverge from its optimal operating plan due to PSC levels that approach internal limits, standards set within the sector's HAP, or the overall sector limit. These benefits would be of marginally greater value in years that can be described as a high-PSC environment, which the sector has avoided in recent years (partly as a result of deck sorting – see Figure 3-25 through Figure 3-27).

Figure 3-42 shows a strong correlation between the percentage of A80 PSC catch that receives a deck sorting DMR and the effective halibut mortality rate (the ratio of halibut PSC mortality to total halibut catch). Figure 3-43 shows that the sector has expanded deck sorting from a practice used only when fishing for the highest-PSC-rate targets. The sector apparently now sees a net benefit from deck sorting even when the target tends to have a lower PSC rate, such as Atka mackerel or Pacific ocean perch. Figure 3-44 illustrates the marked change in the number of halibut assessed by viability category on A80 vessels beginning in 2015 with the ramped-up deck sorting EFP. The investments made by the A80 sector and NMFS to improve fish handling and to collect viability information has resulted in better information about the release mortality of halibut bycatch, which has translated into lower DMRs for the sector (Table 3-7).

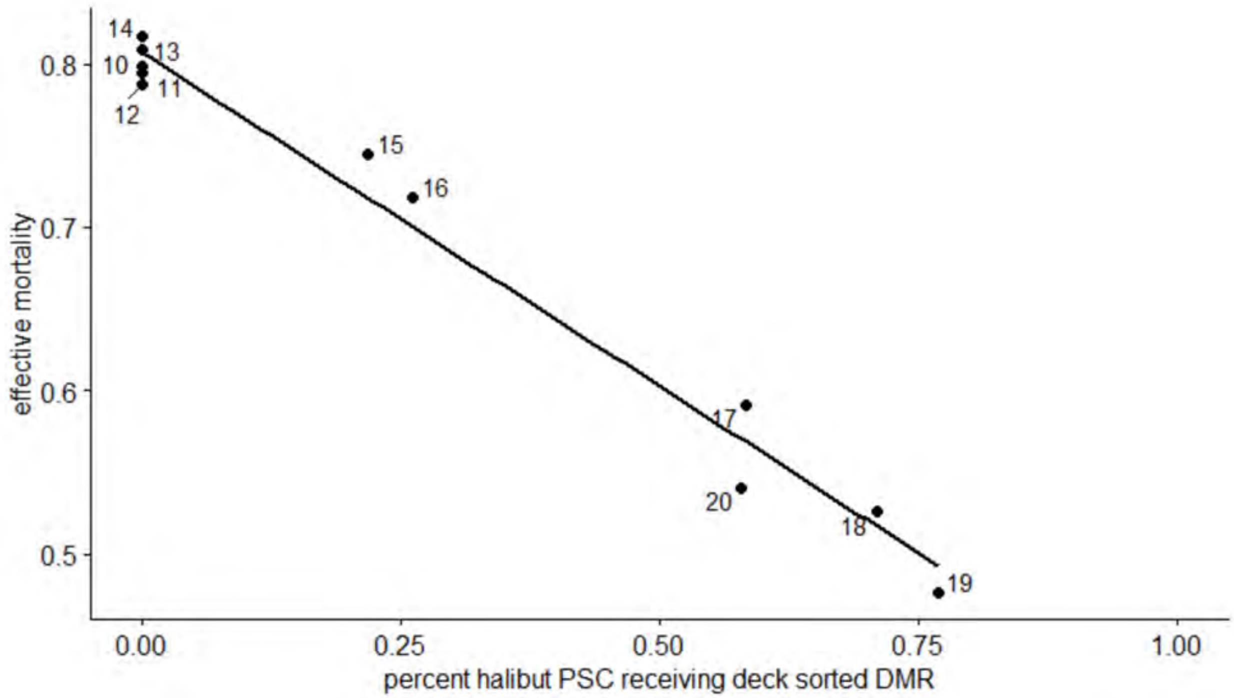


Figure 3-42 Relationship between effective mortality rate (halibut mortality/catch) and percent of A80 PSC catch receiving deck sorted DMR.

Figure 3-43 Proportion of A80 catch deck sorted, by targets species (2014 through 2019)

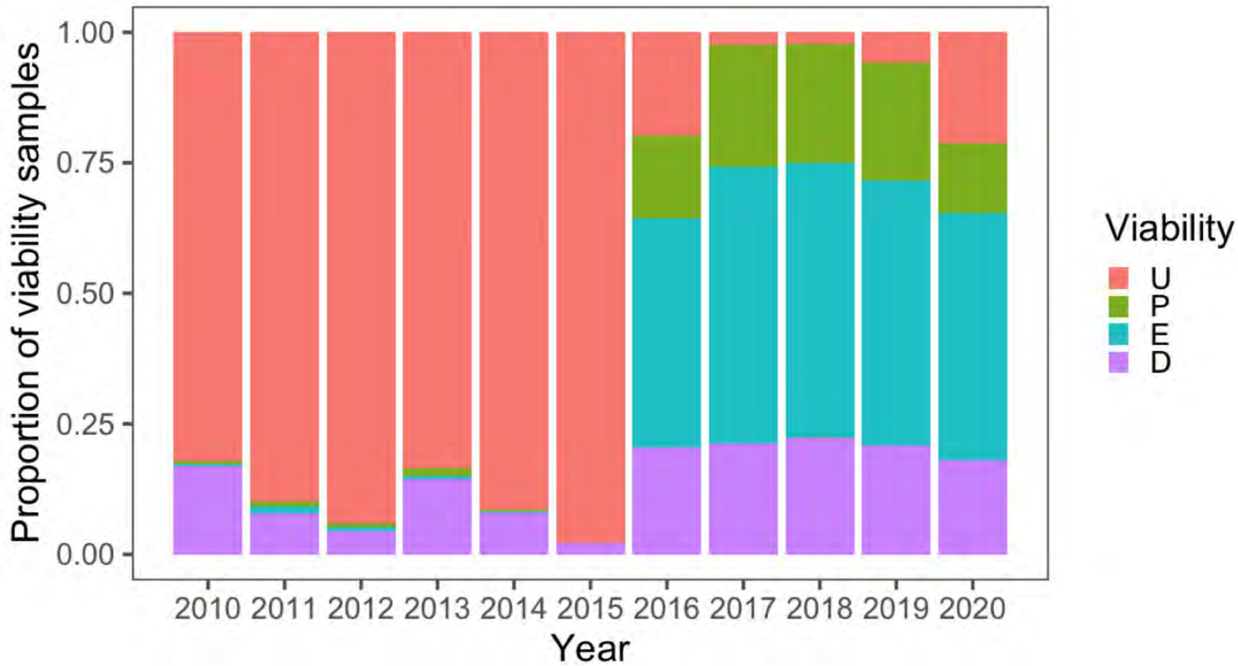


Figure 3-44 Observer estimates of Pacific halibut viabilities taken on A80 vessels, 2010 through August 2020. Viability codes (which affect DMR estimates) are: D=Dead, E=Excellent, P=Poor, U=Unknown.

3.4.6 Count of SBA small entities

The Regulatory Flexibility Act (RFA), first enacted in 1980 and, amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (5 U.S.C. §§ 601-612), is designed to place the burden on the government to review all regulations to ensure that, while accomplishing their intended purposes, they do not unduly inhibit the ability of small entities to compete. Major goals of the RFA are 1) to increase agency awareness and understanding of the impact of their regulations on small business, 2) to require that agencies communicate and explain their findings to the public, and 3) to encourage agencies to use flexibility and to provide regulatory relief to small entities. The RFA emphasizes predicting significant adverse economic impacts on small entities as a group distinct from other entities, and on the consideration of alternatives that may minimize adverse economic impacts, while still achieving the stated objective of the action. When an agency publishes a proposed rule, it must either 'certify' that the action will not have a significant adverse economic impact on a substantial number of small entities and support that certification with the 'factual basis' upon which the decision is based, or it must prepare and make available for public review an Initial Regulatory Flexibility Analysis (IRFA). Under Section 603 of the RFA, an IRFA "shall describe the impact of the proposed rule on small entities." Required elements of an IRFA are specified at 5 U.S.C. § 603(b).

One of the required elements in an IRFA is a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply (including a profile of the industry divided into industry segments, if appropriate). This section identifies the number of small entities that would be directly regulated by an ABM action. As currently specified, the alternatives under consideration would only directly regulate the A80 sector, which is described in Section 3.3. Entities that fish for halibut either commercially under the IFQ Program or for subsistence and sport uses are important in the consideration of the ABM action and, as such, are described in this FEIS and the attached SIA but they are not directly regulated. Therefore, any documentation prepared under the RFA would not include directed halibut fishery participants. As the action alternatives are presently defined, the number and categories of small entities that could be directly regulated does not differ between alternatives.

Note that the preparation of a complete IRFA is not necessary for the Council to take action on this issue. NMFS Alaska Region prepares the IRFA for a proposed action in the Classification section of the proposed rule. Thus, this section only discusses the small entities that would be directly regulated by a regulation under the alternatives. Section 5.3.2 of this document identifies the general nature of the potential economic impacts on directly regulated entities, whether the impacts may be adverse or beneficial, and how impacts might be distributed among directly regulated entities.

The RFA recognizes and defines three kinds of small entities: 1) small businesses, 2) small non-profit organizations, and 3) small government jurisdictions. The analysts have preliminarily concluded that the considered action would only directly regulate the first type of small entity (small businesses – i.e., fish harvesting businesses). As noted above, the only BSAI groundfish sector that is regulated by a PSC limit is A80. Some A80 vessels harvest groundfish that were allocated to CDQ groups. Vessels harvesting CDQ allocations are distinct from the non-profit CDQ groups, themselves. Vessels that are owned by or are fishing on behalf of CDQ groups are evaluated according to the same affiliation and income thresholds as for all other vessels. NMFS typically considers CDQ groups to be small entities due to their non-profit status. The CDQ groups that partner with A80 vessels or partially own vessels are not considered to be directly regulated but, nevertheless, are identified elsewhere in Section 3.3.4 of this document and in the attached SIA.

The following paragraphs provide the parts of the SBA definition of small businesses that are relevant to the directly regulated entities and for which the analysts possess the data necessary to make a small/non-small determination:

Section 601(3) of the RFA defines a 'small business' as having the same meaning as 'small business concern,' which is defined under Section 3 of the Small Business Act (SBA). 'Small business' or 'small business concern' includes any firm that is independently owned and operated and not dominant in its field of operation. The SBA has further defined a "small business concern" as one:

> *"organized for profit, with a place of business located in the United States, and which operates primarily within the United States or which makes a significant contribution to the U.S. economy through payment of taxes or use of American products, materials or labor… A small business concern may be in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the firm is a joint venture there can be no more than 49 percent participation by foreign business entities in the joint venture."*

The thresholds applied to determine if an entity or group of entities is a small business under the RFA depend on the industry classification for the entity or entities. Businesses classified as primarily engaged in commercial fishing are considered small entities if they have combined annual gross receipts not in excess of $11.0 million for all affiliated operations worldwide (50 CFR § 200.2). Businesses classified as primarily engaged in fish processing are considered small entities if they employ 750 or fewer persons on a full-time, part-time, temporary, or other basis, at all affiliated operations worldwide. Since at least 1993, NMFS has considered CPs – such as A80 vessels – to be predominantly engaged in fish harvesting rather than fish processing. Under this classification, the threshold of $11.0 million in annual gross receipts is appropriate. Because this action directly regulates only fish harvesting businesses, the employment threshold does not need to be considered in determining SBA classifications. Thus, for this action, NMFS would evaluate whether A80 vessels would be classified as small entities based on their annual gross receipts; however, there is further analysis to be done because A80 vessels are in a cooperative.

The SBA has established "principles of affiliation" to determine whether a business concern is "independently owned and operated." In general, business concerns are affiliates of each other when one concern controls or has the power to control the other, or when a third-party controls or has the power to control both. The SBA considers factors such as ownership, management, previous relationships with or ties to another concern, and contractual relationships, in determining whether affiliation exists.

Individuals or firms that have identical or substantially identical business or economic interests, such as family members, persons with common investments, or firms that are economically dependent through contractual or other relationships, are treated as one party with such interests aggregated when measuring the size of the concern in question.

NMFS considers members of fishing cooperatives to be affiliated for purposes of applying thresholds for identifying small entities. In making this determination, NMFS considered SBA's "principles of affiliation" at 13 CFR § 121.103. Specifically, in section (f), SBA refers to "[A]ffiliation based on identity of interest," which states

> *"[A]ffiliation may arise among two or more persons with an identity of interest. Individuals or firms that have identical or substantially identical business or economic interests (such as family members, individuals or firms with common investments, or firms that are economically dependent through contractual or other relationships) may be treated as one party with such interests aggregated."*

If business entities are affiliated, then the threshold for identifying small entities is applied to the group of affiliated entities rather than on an individual entity basis. The AKSC – the lone A80 cooperative that operated during the year for which revenue data were examined by the analysts for this section (2019) – falls under this definition. Therefore, NMFS evaluated whether AKSC met or exceeded the threshold of $11.0 million in annual gross receipts. NMFS determined AKSC's annual gross receipts exceeded that threshold (see Section 3.3.2) and therefore, AKSC is not a small entity to be directly regulated for the purposes of this analysis.

One vessel has been identified as a potentially directly regulated small entity based on revenue analysis. The vessel is Amendment 80-eligible but has chosen not to utilize its Amendment 80 permit right. Thus, it is not Amendment 80 cooperative-affiliated or Amendment 80 ownership-affiliated, as it is an independent company. The vessel is a member of a marketing cooperative, markets the catch of several Amendment 80 catcher/processors. However, NMFS does not have access to information regarding contractual relationships necessary to determine whether membership in this marketing cooperative also affiliates the vessel with Amendment 80 vessels. Therefore, the vessel is considered to be the only small entity directly regulated by this action. However, since it has not participated in the Amendment 80 fishery, it is not possible to quantify adverse impacts other than to acknowledge that the proposed rule may constrain the halibut PSC limits. In times of lower halibut abundance, that constraint may mean that there is not adequate PSC quota to allocate to the Amendment 80 limited access fishery to allow a directed fishery to be opened by NMFS in-season management were the vessel to choose to register for that fishery. Similarly, were the vessel to register in the Amendment 80 fishery as a cooperative of one, their ability to fish would similarly be constrained by the potentially lower halibut PSC limit.

With the exception of this one vessel, all directly regulated harvesting entities (i.e., A80 vessels) have participated in voluntary cooperatives since 2011. As a result of cooperative affiliation and aggregate gross revenues, only one directly regulated entity – the excepted vessel is considered to be small under SBA guidelines. Data on A80 gross revenues are provided in Section 3.3.2.

4 Pacific Halibut

4.1 Life history, and distribution

Pacific halibut (*Hippoglossus stenolepsis*) is one of the largest species of flatfish in the world, with individuals growing up to eight feet in length and over 500 lb. The range of Pacific halibut that the IPHC manages covers the continental shelf from northern California to the Aleutian Islands and throughout the Bering Sea. Pacific halibut are also found along the western north Pacific continental shelf of Russia, Japan, and Korea.

The depth range for halibut is up to 250 fathoms (457 m) for most of the year and up to 500 fathoms (914 m) during the winter spawning months. During the winter (November through March), the eggs are released, move up in the water column, and are caught by ocean currents. Female halibut release a few thousand eggs to several million eggs, depending on the size of the fish. Eggs are fertilized externally by the males. Prevailing currents carry the eggs north and west. By the age of 6 months, young halibut settle to the bottom in shallow nearshore areas such as bays and inlets. Research has shown that the halibut then begin what can be called a journey back. This movement runs counter to the currents that carried them away from the spawning grounds and has been documented at over 1,000 miles for some fish. Most male halibut are sexually mature by about 8 years of age, while half of the females are mature by about age 11.6 (Stewart 2015). At this age, they are generally large enough to meet the minimum size limit for the commercial fishery of 32 inches.

Halibut feed on plankton during their first year of life. Young halibut (1 to 3 years old) feed on euphausiids (small shrimp-like crustaceans) and small fish. As halibut grow, fish make up a larger part of their diet. Larger halibut eat other fish, such as herring, sand lance, capelin, smelt, pollock, sablefish, cod, and rockfish. They also consume octopus, crabs, and clams.

Halibut also move seasonally between shallow waters and deep waters. Mature fish move to deeper offshore areas in the fall to spawn and return to nearshore feeding areas in early summer. It is not yet clear if fish return to the same areas to spawn or feed, year after year.

4.2 Stock assessment and management

As the Pacific halibut directed and non-directed fisheries have evolved, the methods to assess the stock and manage the fishery have also evolved over many decades. The stock assessment began with simple catch-per-unit-effort models, moved to yield-per-recruit models in the 1970s, surplus production models in the early 1980s, catch-at-age models in the 1980s and 1990s, and more recently integrated age-structured models (see Clark 2003 for a brief history of IPHC's first 80 years). Currently, the stock assessment for Pacific halibut uses four integrated age-structured models in an ensemble to account for parameter and structural uncertainty (Stewart & Martell 2015). The advice from the stock assessment ensemble is presented to the Commission as a risk-based decision table with different catch levels as columns and various performance metrics as rows (Stewart et al. 2021).

As with all stock assessment models, the IPHC stock assessment ensemble is a simplification of reality that attempts to capture the trends in the stock, supply useful management advice, and characterize an appropriate level of uncertainty. The ensemble is composed of coastwide models, which means that the annual estimated biomass is a single value for the entire coast (U.S. and Canada) and migration between areas is not modeled. Natural mortality is estimated in some models and fixed for one sex in others. Each of the models use annual empirical weight-at-age observations to convert numbers-at-age to biomass. This allows the model to account for the observed large changes in historical weight-at-age. Steepness (a stock-recruit relationship parameter that relates to productivity/resilience of the stock) was fixed at 0.75 for all models. However, a dominant source of recruitment variability comes from treating the average recruitment as a function of environmental conditions where a regime (cool or warm) is determined from the Pacific Decadal Oscillation (PDO) (Clark & Hare 2002).

Ensemble modeling provides a more robust assessment approach that acknowledges structural uncertainty and that, along with other recent improvements, has effectively stabilized management decision tables relative to catch recommendations and potential impacts on spawning biomass (in probabilistic terms). Prior to 2012 assessments for Pacific halibut had consistently overestimated spawning biomass causing a retrospective pattern of overly optimistic short-term forecasts (Stewart & Martell 2014). Figure 4-1 shows the estimates of fishing intensity (a measure of the harvesting rate over all sizes and sources) on the coastwide stock compared to the current interim Spawning Potential Ratio (SPR)-based harvest policy of $F_{SPR=43\%}$ (reproduced from Stewart and Hicks 2021). The fishing intensity is estimated to have been more than 1.2 times the current interim harvest policy fishing intensity in some years with considerable uncertainty. Over this period, the current stock assessment retrospectively estimates stock status to have mostly been above 30% (i.e., higher than the threshold precautionary management action) and always above 20% (i.e., higher than the threshold for biological concern Figure 4-2). Weight-at-age was declining since the 1980s (even without fishing, a decline in spawning biomass and recommended catch levels are predicted over this period) but has since stabilized (Stewart and Webster 2021) and recent recruitment is estimated to have been mostly below average since 2006 (Stewart and Hicks 2021). Large changes in the spawning biomass of Pacific halibut, which do not seem explicitly linked to fishing, have been observed over the more than 100 years of commercial fishing.

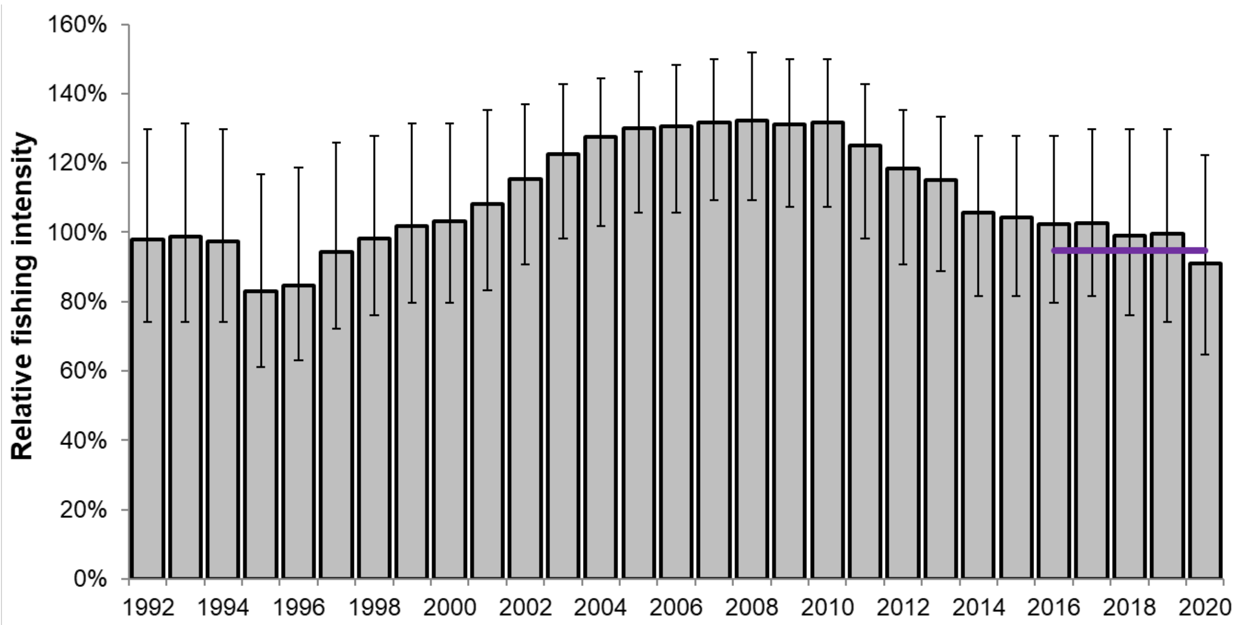


Figure 4-1. Time-series of coastwide fishing intensity (1992-2020; based on the Spawning Potential Ratio) relative to the IPHC current interim harvest policy SPR = 43%, as estimated retrospectively in the 2020 pacific halibut stock assessment. The previous IPHC interim SPR = 46% reference level is shown as the purple horizontal line. Vertical lines indicate approximate 95% credible intervals from the stock assessment ensemble. Reproduced from Stewart and Hicks (2021).

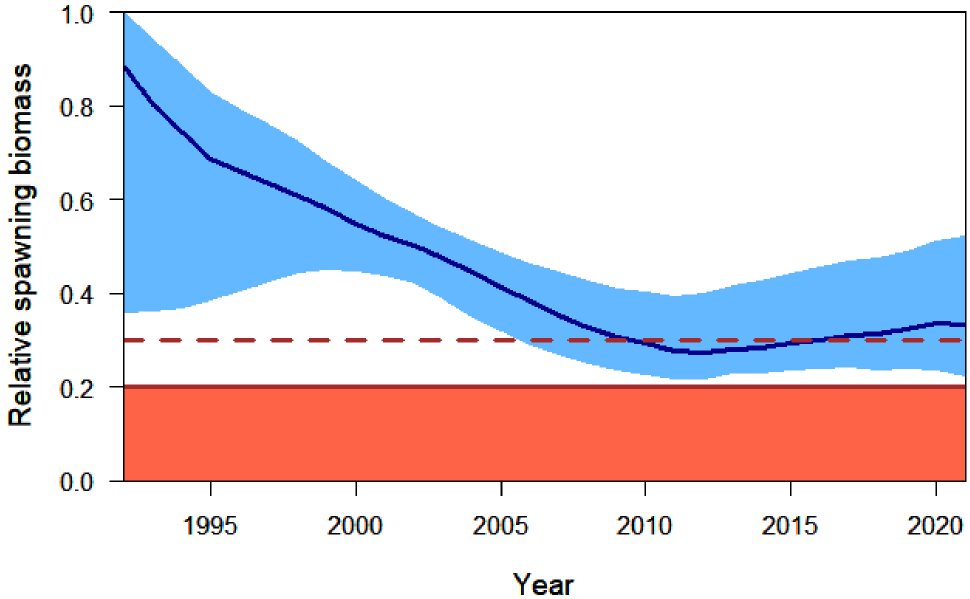


Figure 4-2 Estimated time-series of relative spawning biomass (compared to the unfished condition in each year) based on the median (dark blue line) and approximate 95% credibility interval (blue shaded area). IPHC management procedure reference points ($SB_{30\%}$ and $SB_{20\%}$) are shown as dashed and solid lines respectively, with the region of biological concern (<$SB_{20\%}$) shaded in red. Reproduced from Stewart and Hicks (2021).

Based on the most recent stock assessment for Pacific halibut (Stewart & Hicks 2021) the estimated spawning stock biomass has been stable since 2010 following a considerable decline since the late 1990s (Figure 4-3) which was partly a result of declining average weight-at-age. In recent years, the spawning biomass has been predicted to slightly decrease, even at low fishing levels, due to recent below average recruitment.

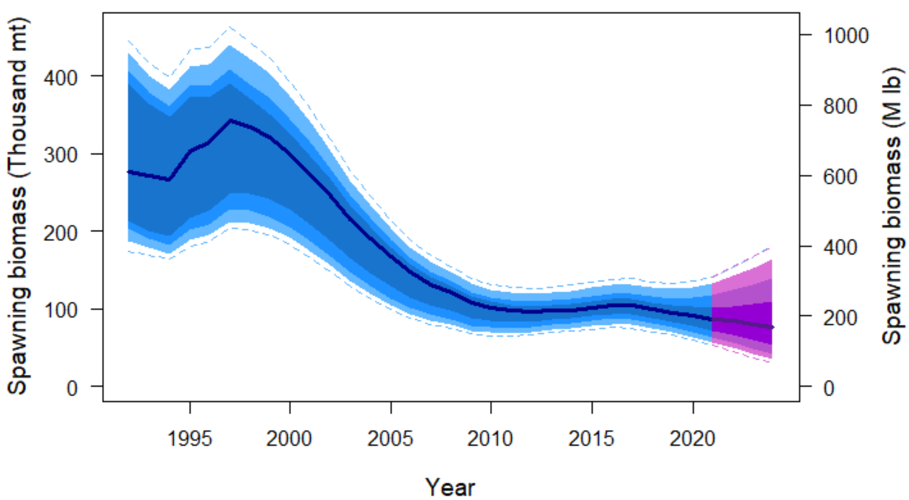


Figure 4-3. Estimated coastwide spawning biomass from the 2020 stock assessment ensemble (from Stewart & Hicks 2021) with a three-year projection (purple) based on a fishing intensity of $F_{SPR=43\%}$ (TCEY=39.0 million pounds, ~17,690 mt).

4.3 Closed loop simulation modeling

A closed loop simulation model was employed in previous iterations of this analysis (See Table 1-2). This had been reviewed multiple times by the SSC with resulting modifications made subsequent to each review. In April 2021, the SSC reviewed the full model and results and determined that while useful for context in understanding the sensitivities of various parameters to output results as well as to indicate unknowns in halibut population modeling, the simulation model configuration was unable to reliably estimate the degree of change in the BSAI halibut fishery per unit change in PSC. Therefore, the SSC recommended it not be employed to estimate the impacts of the alternatives. It is included here for context and for indications of areas recommended for further research.

4.3.1 Closed loop model description

A description of the closed loop model employed in previous iterations of this analysis and incorporated here for context is summarized briefly, followed by a review of issues and conclusions from this model. The steps of a closed loop simulation are as follows: (i) simulating the true biology of the natural system (referred to as the operating model, OM), (ii) sampling from the true population, (iii) calculating the measures of stock status (assessment), (iv) calculating recommended fishing restrictions using management alternatives, and (v) applying updated restrictions to the fishery, which allows the dynamics of the true population to be updated. Here, we provide a short overview of the closed loop simulation model. Additional details of the model are then described in the subsections that follow.

The OM consisted of a two-area, age- and sex-structured model of Pacific halibut population dynamics with the BSAI modeled as one area and the remaining components of the range of the halibut stock comprising the "other" area (this includes the GOA, British Columbia, and US West Coast). Recruitment is assumed to occur at the coastwide level and the proportion of new recruits that settle in the BSAI is time-varying and temporally autocorrelated. The OM allows adult movement between the two areas, based on a model validation exercise (described below) and values estimated in Webster et al. (2013). Weight-at-age was set equal to values used in the most recent (2020) IPHC assessment models. The model included five fishing fleets: the directed halibut fishery in the BSAI, the directed halibut fishery outside of the BSAI, the BSAI trawl PSC fishery, the BSAI HAL PSC fishery, and the bycatch fishery in the other area. Though BSAI trawl PSC is modeled as a single fleet when applying population dynamics, PSC limits and mortality are separated for the A80 and non-A80 components of trawl PSC when applying the Alternatives and for reporting purposes. Many values for halibut population dynamics were fixed based on results from the most recent IPHC coastwide long assessment model.

The EBS shelf trawl survey and the IPHC's Setline Survey were modeled as a function of halibut total biomass, survey selectivity, and observation error. These two survey indices served as the basis for calculating PSC limits according to each PSC management alternative.

The IPHC's process for setting coastwide catch limits for the directed fishery (called Total Constant Exploitation Yield, or TCEY) was simulated by using the true spawning biomass from the population dynamics model and applying assessment error. In a sensitivity analysis, a lag on assessment error was incorporated to recognize that the current year's assessment results may be correlated with those of the previous year. More recently the IPHC has used an SPR-based harvest strategy which may contribute to the uncertainty of using spawning biomass as a proxy for the TCEY.

The coastwide catch limits were then calculated in two ways such that there are two base case runs of the model comprising bookends of the IPHC's decision-making process:

(1) a linear relationship between historical IPHC estimates of spawning biomass and total mortality of halibut in the following historical year. This approach assumes that the process of decision-making at the IPHC in the future will resemble that of the past. In contrast to the model configuration presented in 2019, the most recent model iteration used the current year's linear relationship between historical IPHC spawning biomass and the total mortality in the following historical year used fewer years of earlier observations (2011 onward instead of 2007 onward). This led to a shallower slope, or less drastic changes in predicted total mortality in the following

year, as was recommended by the SSC. Removing all but the most recent period, as also suggested, led to a completely unresponsive relationship between spawning biomass and total mortality in the following year, which is likely not true. Additionally, there has been little change in the coastwide spawning biomass in recent years, thus there is not a lot of contrast to measure how well spawning biomass may correlate with the TCEY.

(2) The linear relationship described in (1) was used when coastwide relative spawning biomass was greater than 30% of unfished biomass, and a 30:20 harvest control rule was implemented without variability when coastwide relative spawning biomass (with assessment error) was below 30% of unfished biomass.

The model allocated a proportion of the coastwide catch limit (TCEY) to the BSAI in each year, according to the proportion of all-sizes setline survey biomass in the BSAI in the previous year. However, distribution of the TCEY determined in the current interim IPHC harvest strategy further reduces the TCEY in IPHC Regulatory Areas 3B, 4A, 4B, and 4CDE to account for a strategy to harvest at a rate in the western areas that is three-quarters the rate in eastern areas. The previous year's O26 PSC mortality was used as a proxy for expected O26 PSC in coming year in the BSAI and in the other area and was subtracted from the area-specific TCEY to determine directed fishery catch limits in the following year in both areas. As is the case in the current management system, the PSC in the BSAI may exceed the TCEY allocated to the BSAI in any given year. Bycatch limits in the other area are fixed to their 2019 value throughout the simulation.

The relationship between PSC use and limit was modeled stochastically according to the historical distribution of this relationship for each sector. A sensitivity analysis was conducted that assumed that as the PSC limit decreased, the proportion of the limit comprising the use would become higher.

The simulations were conducted for 100 future years and 500 simulations, each with a unique set of random deviations defining the process and observation errors modeled.

The model was first run for 26 historical years to verify that population dynamics, survey indices, distribution of survey biomass by area, and catches by fleet were able to mimic our historical data and assessment-based perceptions of stock dynamics. This process is detailed in Appendix 3 of the April 2020 analysis[59], entitled "Model Validation," and prompted the inclusion of several key features of the OM before conducting forward simulations. In summary, several elements were included or adjusted to best match the coastwide stock dynamics estimated by the most recent Pacific halibut stock assessment and BSAI dynamics from a BSAI-only assessment submodel, as well as the proportion of setline survey biomass that has been observed in the BSAI over the past 25 years. These elements include time-varying recruitment allocation among areas, an influence of the PDO on unfished recruitment, the ability of the model to simulate fluctuating weight-at-age over time, and the chosen mean recruitment allocation and adult movement parameters

The simulation model used two areas to model the population and fishery dynamics. The BSAI area incorporates three IPHC Regulatory Areas for which the IPHC sets TCEYs (4A, 4B, and 4CDE), and each of those areas has unique trade-offs between directed halibut mortality limits and PSC usage. Therefore, drawing model inferences on the area-specific directed fishery effects are limited. Also, summing over the three IPHC Regulatory Areas may dampen the effects on directed fisheries in certain areas, such as 4CDE.

There are not meaningful differences in spawning stock biomass (SSB) trajectories for the range of alternative PSC mortality examined and expected population dynamics were minor; the alternatives impacted allocation across sectors, but the analysis showed that SSB and stock status differed across alternatives only in a few extreme circumstances.

[59] April 2020 initial review Halibut ABM PSC Limits DEIS

4.3.2 Summary of findings and issues from the closed loop simulation model

The model results showed that, despite potentially conserving up to 785 mt of halibut PSC mortality per year, the differences in Pacific halibut spawning biomass trajectories among alternative PSC mortalities and expected population dynamics were minor. The alternatives impacted allocation across sectors, but the analysis showed that stock status was similar across alternatives. Under each alternative, changes from the status quo alternative were larger for PSC limits than for directed halibut fishery catch limits. However, the amount of uncertainty about impacts to the directed halibut fishery was large. Several reasons for this uncertainty on relative impacts to the directed Pacific halibut fishery includes:

- The IPHC decision-making process is uncertain, occurs annually, and may deviate from a defined procedure (deciding coastwide catches and how much is allocated to BSAI- socioeconomic factors are considered on a year-to-year basis)
- The two management agencies (IPHC and NMFS) have different spatial area boundaries and the model used simplifications of these boundaries.
- The variability in weight-at-age for Pacific halibut varies substantially and adds to future uncertainty. The processes leading to the large variability observed in the historical weight-at-age of Pacific halibut is poorly understood.
- The relationship between PSC limits and realized PSC (usage) under future conditions is highly uncertain, especially when PSC limits are projected outside of the historical range.
- The dynamics of halibut movement into and out of the BSAI are variable and uncertain; results from analyses using the IPHC tagging data are inconsistent with BSAI survey abundance data.

Additional sources of uncertainty include variability in the PSC selectivity from trawl gear in the BSAI which creates differences in age-specific mortality and causes variability in downstream impacts to the directed fishery. Results from the model also indicate little effect of the IPHC's 30:20 harvest control rule on SSB except under extreme situations of recruitment failure. Recruitment variability is high and linked to the Pacific decadal oscillation (PDO) based on the IPHC's analysis. The closed loop simulation model included this impact but for simplicity included a fixed set of future changes in the PDO. In fact, the timing of PDO changes are uncertain and including this variability would add future uncertainty in the results (but the contrast among alternatives would be similar). Therefore, this model was not employed to assess impacts of the alternatives for this FEIS.

4.4 Management of Pacific Halibut

4.4.1 IPHC and process for setting catch limits

The IPHC process for setting catch limits for the directed halibut fisheries is described here to provide context in evaluating the potential impacts of the alternatives on the directed halibut fisheries and on spawning stock biomass. This description will put into context how halibut PSC use is considered within the IPHC's overall harvest strategy policy.

In 2017, the previous IPHC harvest policy paradigm was replaced with an interim SPR-based harvest strategy policy (Figure 4-4) while a management strategy evaluation (MSE) process is underway. This new paradigm sets a coastwide mortality limit (scale) and then distributes the mortality limits (distribution) across IPHC Regulatory Areas (Figure 1-4, Hicks & Stewart 2017). Previously, the IPHC Regulatory Area mortality limits were determined by multiplying the apportioned biomass (based on estimated biomass from survey catches and assumed selectivity) in each IPHC Regulatory Area by a harvest rate specific to each IPHC Regulatory Area. This new SPR-based harvest strategy policy now considers mortality from all sources and sizes when setting a coastwide mortality limit but still uses estimates of stock distribution from the IPHC fishery independent setline survey (FISS), along with relative harvest rates, to distribute the mortality limits across IPHC Regulatory Areas. Currently, there are interim agreements through 2022 for IPHC Regulatory Areas 2A and 2B that define how the mortality limits are specifically determined in each of those areas (paragraph 97 in the Report of the 96th Session of the IPHC Annual Meeting IPHC 2020a).

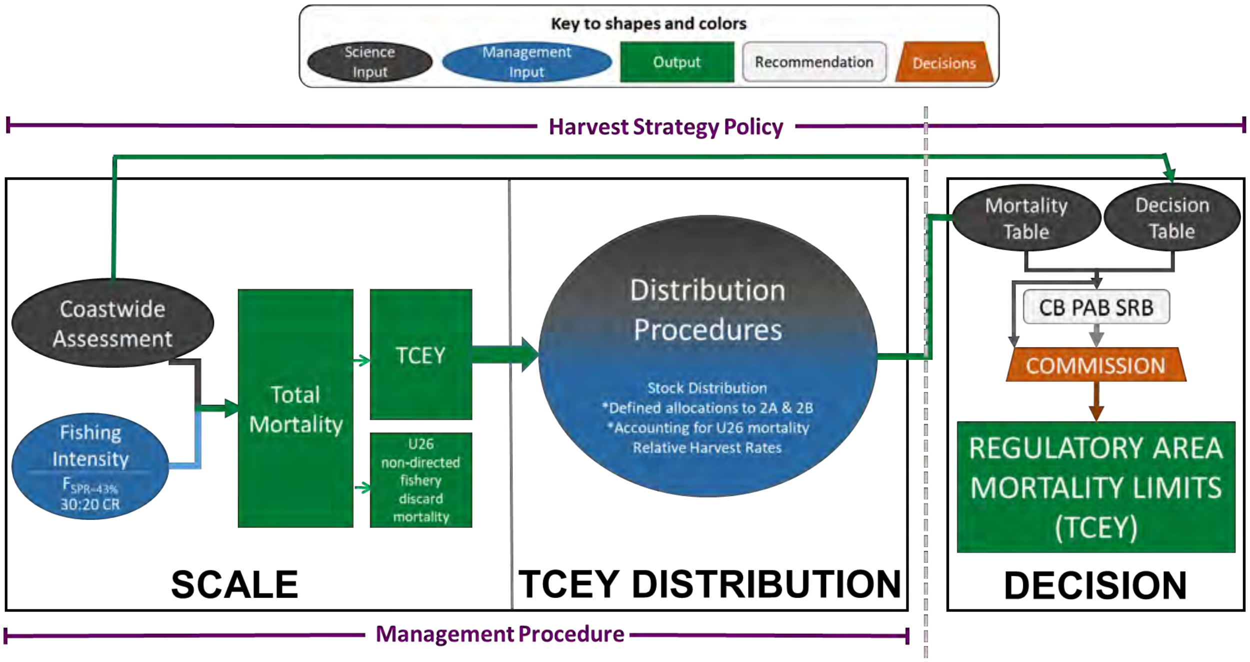


Figure 4-4. Illustration of the Commission interim IPHC harvest strategy policy (reflecting paragraph ID002 in IPHC CIRCULAR 2020-007) showing the coastwide scale and TCEY distribution components that comprise the management procedure. Items with an asterisk are three-year interim agreements though 2022. The decision component is the Commission decision-making procedure, which considers inputs from many sources.

An SPR-based harvest policy defines a default or reference level of fishing intensity ($F_{xx\%}$, the level of fishing that would reduce the lifetime spawning output per recruit to xx% of the unfished level given current biology, fishery characteristics and demographics where lower values indicate higher fishing intensity) to determine mortality limits. This fishing intensity adopted in 2016 for the IPHC interim harvest policy was $F_{SPR=46\%}$. In response to MSE simulations investigating the coastwide scale portion of the harvest strategy policy the reference fishing intensity was adjusted to $F_{SPR=43\%}$ after the 2020 Annual Meeting (AM096). The MSE simulations found that an $F_{SPR=43\%}$ in conjunction with a control rule where the fishing intensity is reduced when the stock status is estimated to be below 30% and set to zero when stock status is estimated to be below 20% would successfully meet the coastwide conservation and fishery objective (paragraph ID002 in IPHC CIRCULAR 2020-007). A reduction in fishing intensity invoked by this control rule is expected to mainly affect the directed fisheries, primarily because bycatch mortality, including halibut PSC use by groundfish fisheries, is taken into account before directed halibut fisheries' catch limits are set by the IPHC. Other agencies may consider action when the stock status of Pacific halibut is estimated to be at low levels.

The Total Mortality determined from F_{SPR} is split into two components: U26 non-directed commercial fishing (i.e., U26 bycatch) mortality and all other mortality which is called the TCEY and consists of mostly O26 halibut. The IPHC delineates U26 and O26 differently for a number of reasons, including: 1) directed commercial fisheries encounter mainly O26 halibut, 2) U26 Pacific halibut are highly mobile and much less likely to occur in the same IPHC Regulatory Area in the upcoming year in which mortality limits would apply, 3) the setline survey captures almost exclusively O26 Pacific halibut, 4) there is currently no reliable tool for describing the annual distribution of U26 across the entire IPHC convention area, and 5) the mortality of U26 Pacific halibut has a differing effect on the Spawning Potential Ratio than O26 fish (they are not entirely exchangeable although the SPR-based harvest policy accounts for the mortality of all sizes) (IPHC 2020b).

The TCEY is distributed among IPHC Regulatory Areas based on estimates of biomass from the setline survey and defined relative harvest rates where western areas (Area 3B and all of Area 4) are harvested at a lower level (a factor of 0.75). The lower harvest rate in western areas is due to concerns about historical uncertainty, past observed declines in those regions, and likely different life-history characteristics and population dynamics. The westward areas also differ from the central and eastern regions in the levels of bycatch of juveniles (which can affect the overall productivity of the stock) and evidence that there is net emigration of exploitable halibut from these areas (Hare & Clark 2008, Hare 2011). All of these factors suggest that target harvest rates should be lower in the western IPHC Regulatory Areas.

Annually, a stock assessment is completed using all of the available data for that year and a decision table (e.g., risk analysis) is presented at the IPHC Annual Meeting in January. Various advisory bodies as well as the public provide recommendations to the Commissioners. Unlike the MSA, neither the Treaty nor the Halibut Act include specific provisions that require Commissioners to allocate quotas within, for example, an overfishing threshold; their broad mandate is the conservation of the halibut stock. Decisions for Area-specific TCEYs are made considering all the input received; they may differ from the harvest policy output.

The IPHC formula for determining TCEY and allocating catch limits among regulatory areas has shifted over the past two years and is expected to shift again, as Commissioners evaluate the results of the IPHC's management strategy evaluation (described below). The MSE evaluated 11 potential management strategies for allocating catch limits among areas and were presented to the Commission at the January 2021 Annual Meeting (Hicks et al. 2021). These results will inform the Commission as they make decisions in the coming years to update the harvest policy in terms of both the scale of the coastwide TCEY and the methods for distributing TCEY among areas.

The specific formula used by the IPHC Commissioners to distribute catch limits among Regulatory Areas has been different for each of the past three years. In 2019, the US and Canadian Commissioners departed from the interim harvest policy at that time, written as follows in the Annual Meeting report from 2019, with further adjustments then made to the distribution of TCEY among Alaskan Regulatory Areas (IPHC AM095 Report 2019):

> *"69. The Commission ADOPTED: a) a coastwide target SPR of 47% for 2019; b) a share-based allocation for IPHC Regulatory Area 2B. The share will be defined based on a weighted average that assigns 30% weight to the current interim management procedure's target TCEY distribution and 70% on 2B's recent historical average share of 20%. This formula for defining IPHC Regulatory Areas 2B's annual allocation is intended to apply for a period of 2019 to 2022. For 2019, this equates to a share of 17.7%; and c) a fixed TCEY for IPHC Regulatory Area 2A of 1.65 mlbs is intended to apply for a period from 2019-2022, subject to any substantive conservation concerns."*

In 2020, the formula used by Commissioners to set TCEY by Regulatory Area was again slightly different from the interim harvest policy at that time, as follows, with further adjustments then made to the distribution of TCEY among Alaskan Regulatory Areas (IPHC AM096 Report 2020):

> *"97. The Commission ADOPTED: a) a coastwide mortality limit (TCEY) of 36.6 million pounds; and b) a fixed TCEY for IPHC Regulatory Area 2A of 1.65 million pounds is intended to apply for a period from 2019-2022, subject to any substantive conservation concerns; and IPHC–2020–AM096–R c) a share-based allocation for IPHC Regulatory Area 2B. The share will be defined based on a weighted average that assigns 30% weight to the current interim management procedure's target TCEY distribution and 70% on 2B's recent historical average share of 20%. This formula for defining IPHC Regulatory Areas 2B's annual allocation is intended to apply for a period of 2019 to 2022. For 2020, this equates to a share of 18.2% before accounting for U26; and d) an accounting for some impacts of U26 non-directed discard mortality from US IPHC Regulatory Areas on available harvest in IPHC Regulatory Area 2B. The accounting increases*

the 2B TCEY by 50% of the estimated yield lost due to U26 non-directed discard mortality in Alaskan waters and is intended to apply for the period 2020-2022. For 2020 this calculation equates to 0.21 million pounds and reduces all Alaskan IPHC Regulatory Area TCEYs to maintain a coastwide TCEY of 36.6 million pounds; and e) the use of a rolling three-year average for projecting non-directed fishery discard mortality by IPHC Regulatory Area; this is also intended to apply for a period of 2020 to 2022."

In 2021, the Commission set the coastwide mortality limit (TCEY) at 39.0 Mlbs, which followed the current interim harvest policy coastwide fishing intensity level ($F_{SPR=43\%}$). The distribution of that TCEY among IPHC Regulatory Areas includes the current estimate of stock distribution, relative harvest rates by IPHC Regulatory Area, specific adjustments to the TCEY in IPHC Regulatory Areas 2A and 2B, as well as an increase in the TCEY in IPHC Regulatory Area 2B accounting for the U26 non-directed discard mortality in Alaska (IPHC-2021-AM097-INF02).

Due to a combination of changing harvest policies and Commission decisions that depart from harvest policy recommendations, as described above, the IPHC has adopted coastwide catch limits of varying fishing intensities in recent years. The Commission has adopted TCEYs above those recommended by the harvest policy in three of the last five years (Table 4-1). Estimates of fishing intensity are highly uncertain and change in subsequent years based on actual mortality and updated stock assessments.

Table 4-1 Comparison of reference TCEY and SPR based on the Interim harvest policy and those adopted by the IPHC commissioners

	Interim Harvest Policy (reference)		Adopted	
Year	TCEY	SPR	TCEY	SPR*
2021	39.00	43	39.00	43
2020	31.90	46	36.60	42
2019	40.00	46	38.61	47
2018	31.00	46	37.21	41
2017	39.10	46	40.74	45

*As estimated at the time of adoption (in the decision table presented at the IPHC annual meeting)

Currently, a management strategy evaluation (MSE) framework is being done at IPHC to determine a level of fishing intensity and distribution procedure that meets the short- and long-term objectives of the directed fishery and managers. These include biological sustainability, optimizing yield, and stability in yield, with biological sustainability objectives as the top priority for evaluation. Recent MSE analyses have informed the change to a fishing intensity using SPR=43% and are being used to evaluate trade-offs in distributing the mortality limits between IPHC Regulatory Areas.

Bycatch mortality in IPHC MSE closed loop simulations is simulated from an assumed relationship with simulated total biomass tuned to recent coastwide bycatch levels (one unit increase in total biomass results in 0.4% increase in bycatch mortality). This integrates the MSE results over a wide range of possible bycatch scenarios to determine a management procedure that is robust to various levels of bycatch. In the future, allocation between directed and non-directed fisheries may be specifically investigated with involvement from other agencies and fishing sectors.

Another factor of interest in the management of Pacific halibut is the size limit for the directed commercial fishery (currently 32 inches; see Stewart et al 2020 for a recent investigation). A change in the size limit could increase efficiency of the commercial fleet but would result in a change in selectivity. A change in selectivity could result in a change to the target SPR that meets the defined goals and objectives, although in the likely range of potential selectivity, this change in SPR would be slight.

Changes to the IPHC harvest strategy policy to meet objectives as defined in the IPHC MSE process will benefit the management of the coastwide stock of Pacific halibut, distribute the TCEY using an agreed upon procedure, and provide opportunity to measure impacts from different fisheries. However, it does not solve the difficult issues of allocation between fisheries within IPHC Regulatory Areas. One can understand the components of the harvest policy and measure impacts of each fleet, but ultimately choosing a management strategy involves understanding and balancing the trade-offs between the goals and objectives of each fishery, which may be achieved in an MSE context if that is the goal of the evaluation. The IPHC MSE uses the currently defined catch-sharing plans to distribute the mortality limits among fisheries within IPHC Regulatory Areas, which does not include ABM alternatives in the Bering Sea and Aleutian Islands. Given the generalized IPHC MSE framework, it is possible to use this framework to simulate and evaluate alternative procedures for allocating mortality between fisheries within IPHC Regulatory Areas.

The Fishery Constant Exploitation Yield or FCEY is the Regulatory Area specific amount of yield for most directed Pacific halibut fisheries dependent upon allocation agreements for each IPHC Regulatory Area. The FCEY is determined by subtracting all other removals of O26 halibut from the TCEY.
The FCEY forms the basis of the directed fishery catch limits, although may not include all components of the directed fishery mortality for some Regulatory Areas. The FCEY includes commercial fishery landing limits in all areas, and other sectors in any area subject to Catch Sharing Plans for allocation of the halibut harvest. The Catch Sharing Plans are developed by the responsible fishery management organizations in each IPHC Regulatory Area. Non-FCEY removals include catches which either have no explicit limits on the amount of harvest (unguided sport harvest in Alaska, subsistence/personal use harvest in Canada and Alaska, and wastage from the commercial halibut fishery, except where this is explicitly included in catch-sharing plans) or catches which the IPHC has no authority to manage (bycatch mortality, such as halibut PSC in Alaska).

The IPHC detailed sector mortality information (Table 4-2) shows the relationship between the different types of mortality and the TCEY and FCEY. The two rows in this table that include mortality from non-directed discards is where mortality from A80 PSC use is incorporated:[60] the second row from the bottom titled “U26 Non-directed discards” and the second row from the top titled “O26 non-directed discards.”

U26 non-directed discard (including U26 A80 PSC) is accounted for in the stock assessment with respect to total mortality on the halibut stock but is not part of the TCEY. However, it is accounted for in the calculation of the coastwide TCEY by subtracting it from the coastwide total mortality limit. O26 non-directed discards are subtracted from the TCEY within each IPHC area when calculating the FCEY. According to the IPHC’s Interim Management Procedure (specified during AM096 para. 97), the default projection for non-directed discards is to use the three-year average of recent non-directed discard mortality to avoid some of the interannual variability of annual discard estimates.

[60] More information on trends of A80 PSC use by IPHC regulatory and potential impacts on directed catch limits is in Section 5.4.1

Table 4-2 IPHC Detailed sector mortality information as presented at 2021 Annual Meeting (IPHC-2021-AM097-INF02)

Detailed sector mortality information

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
Commercial discards	0.03	0.17	NA	NA	0.11	0.15	0.05	0.08	0.59
O26 Non-directed discards	0.10	0.23	0.09	1.14	0.42	0.24	0.12	2.20	4.54
Recreational	NA	0.04	1.16	1.70	0.01	0.02	0.00	0.00	2.93
Subsistence	NA	0.41	0.37	0.19	0.02	0.01	0.00	0.03	1.02
Total non-FCEY	0.14	0.84	1.61	3.03	0.56	0.42	0.17	2.31	9.09
Commercial discards	NA	NA	0.06	0.24	NA	NA	NA	NA	0.30
Recreational	0.61	0.92	0.65	1.94	NA	NA	NA	NA	4.12
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.87	5.23	2.84	8.91	2.56	2.09	1.29	1.67	25.46
Total FCEY	1.51	6.15	3.55	11.09	2.56	2.09	1.29	1.67	29.91
							4C FCEY	*0.74*	
							4D FCEY	*0.74*	
							4E FCEY	*0.19*	
TCEY	1.65	7.00	5.16	14.12	3.12	2.51	1.47	3.98	39.00
U26 Non-directed discards	0.00	0.03	0.00	0.29	0.06	0.08	0.01	0.78	1.25
Total	1.65	7.03	5.16	14.41	3.18	2.59	1.48	4.75	40.25

Similar to the coastwide catch limit, the TCEY and FCEY limits in each IPHC Regulatory Area adopted by the Commissioners often differ from those recommended by the IPHC harvest policy (Table 4-3).

Table 4-3 TCEY and FCEY by IPHC Regulatory Area as recommended by IPHC harvest policy and adopted by commissioners

		TCEY				FCEY			
Year	Area	Harvest Policy	Adopted	Difference (adopted-policy)	% Difference	Harvest Policy	Adopted	Difference (adopted-policy)	% Difference
2021	2A	1.65	1.65	0.00	0%	1.51	1.51	0.00	0%
	2B	7.00	7.00	0.00	0%	6.15	6.15	0.00	0%
	2C	5.16	5.80	0.64	12%	3.55	4.41	0.86	24%
	3A	14.12	14.00	-0.12	-1%	11.09	11.14	0.05	0%
	3B	3.12	3.12	0.00	0%	2.56	2.56	0.00	0%
	4A	2.51	2.05	-0.46	-18%	2.09	1.66	-0.43	-21%
	4B	1.47	1.40	-0.07	-5%	1.29	1.23	-0.06	-5%
	4CDE	3.98	3.98	0.00	0%	1.67	1.67	0.00	0%
	Total	39.00	39.00	0.00	0%	29.91	30.34	0.43	1%
2020	2A	1.65	1.65	0.00	0%	1.50	1.50	0.00	0%
	2B	5.80	6.83	1.03	18%	5.44	6.00	0.56	10%
	2C1	4.97	5.85	0.88	18%	3.28	4.26	0.98	30%
	3A	9.80	12.20	2.40	24%	6.41	9.06	2.65	41%
	3B	2.94	3.12	0.18	6%	2.30	2.41	0.11	5%
	4A	2.26	1.75	-0.51	-23%	1.87	1.41	-0.46	-25%
	4B	1.27	1.31	0.04	3%	1.06	1.10	0.04	4%
	4CDE	3.22	3.90	0.68	21%	0.69	1.73	1.04	151%
	Total	31.90	36.60	4.70	15%	22.54	27.48	4.94	22%
2019	2A	0.78	1.65	0.87	112%	0.64	1.50	0.86	134%
	2B	4.91	6.83	1.92	39%	4.09	5.95	1.86	45%
	2C1	6.26	6.34	0.08	1%	4.42	4.49	0.07	2%
	3A	16.35	13.50	-2.85	-17%	13.12	10.26	-2.86	-22%
	3B	2.97	2.90	-0.07	-2%	2.41	2.33	-0.08	-3%
	4A	2.21	1.94	-0.27	-12%	1.92	1.65	-0.27	-14%
	4B	1.95	1.45	-0.50	-26%	1.70	1.21	-0.49	-29%
	4CDE	4.59	4.00	-0.59	-13%	2.62	2.04	-0.58	-22%
	Total	40.00	38.61	-1.39	-3%	30.90	29.43	-1.47	-5%
2018	2A	0.59	1.32	0.73	124%	0.47	1.19	0.72	153%
	2B	3.84	7.10	3.26	85%	3.14	6.32	3.18	101%
	2C1	5.65	6.34	0.69	12%	3.76	4.45	0.69	18%
	3A	12.07	12.54	0.47	4%	8.98	9.45	0.47	5%
	3B	2.56	3.27	0.71	28%	1.95	2.62	0.67	34%
	4A	1.69	1.74	0.05	3%	1.32	1.37	0.05	4%
	4B	1.21	1.28	0.07	6%	0.99	1.05	0.06	6%
	4CDE	3.39	3.62	0.23	7%	1.36	1.58	0.22	16%
	Total	31.00	37.21	6.21	20%	21.96	28.04	6.08	28%
2017	2A	0.96	1.47	0.51	53%	0.84	1.33	0.49	58%
	2B	6.08	8.32	2.24	37%	5.28	7.45	2.17	41%
	2C1	6.47	7.04	0.57	9%	4.69	5.25	0.56	12%
	3A	13.84	12.96	-0.88	-6%	10.88	10.00	-0.88	-8%
	3B	4.39	3.98	-0.41	-9%	3.53	3.14	-0.39	-11%
	4A	1.84	1.80	-0.04	-2%	1.43	1.39	-0.04	-3%
	4B	1.46	1.34	-0.12	-8%	1.25	1.14	-0.11	-9%
	4CDE	4.06	3.84	-0.22	-5%	1.92	1.70	-0.22	-11%
	Total	39.10	40.74	1.64	4%	29.81	31.40	1.59	5%

Source: https://www.iphc.int/data/time-series-datasets

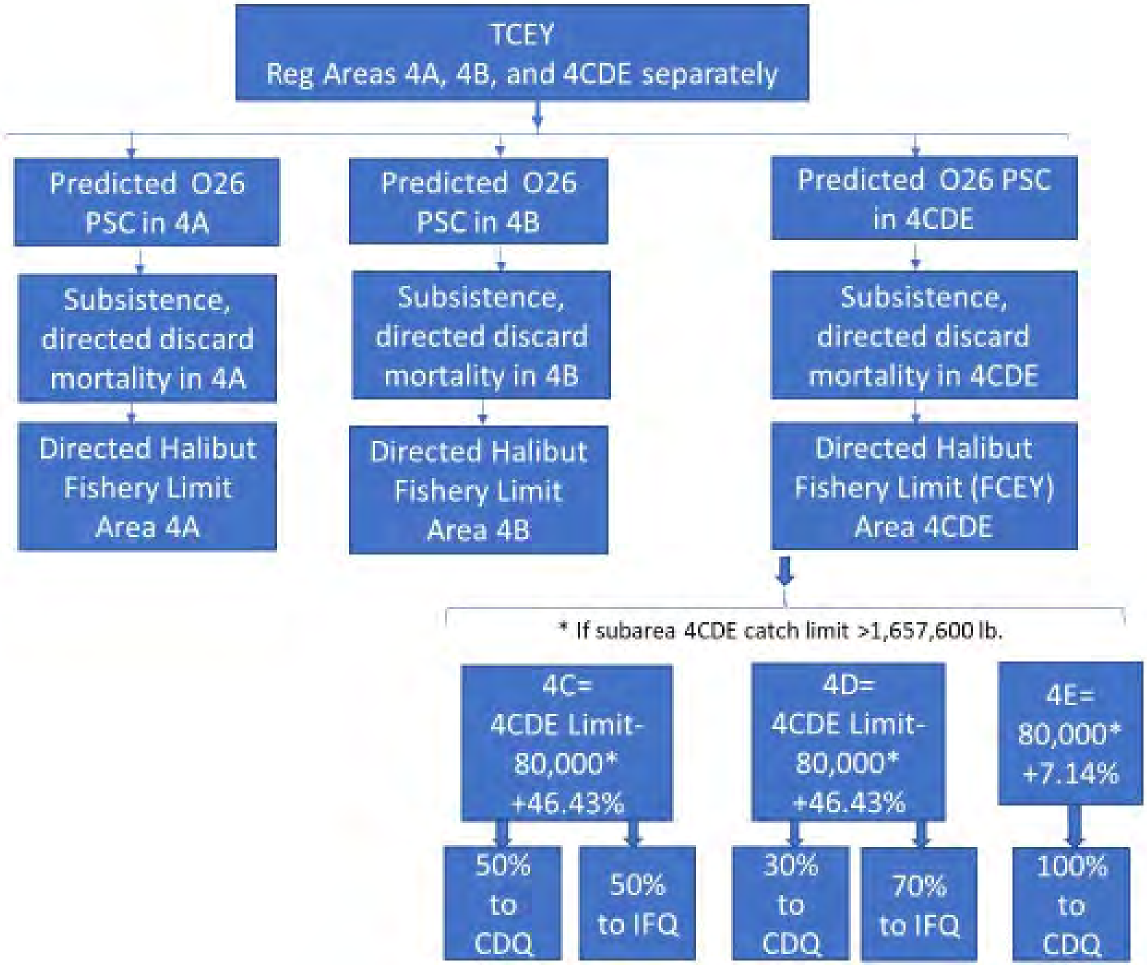


Figure 4-5 illustrates the distribution of TCEY to the Area 4 subareas and the Area 4 Catch Sharing Plan (CSP) that is described in the following subsection. Areas 4C, 4D, and 4E are considered as a unit by IPHC when harvest policy analyses are conducted. Note that the figure is incorporating a provision that is in place when the catch limit for that combined area is above a certain threshold. If that threshold is not met, the FCEY for those combined areas is distributed by the percentages shown with no adjustment applied.

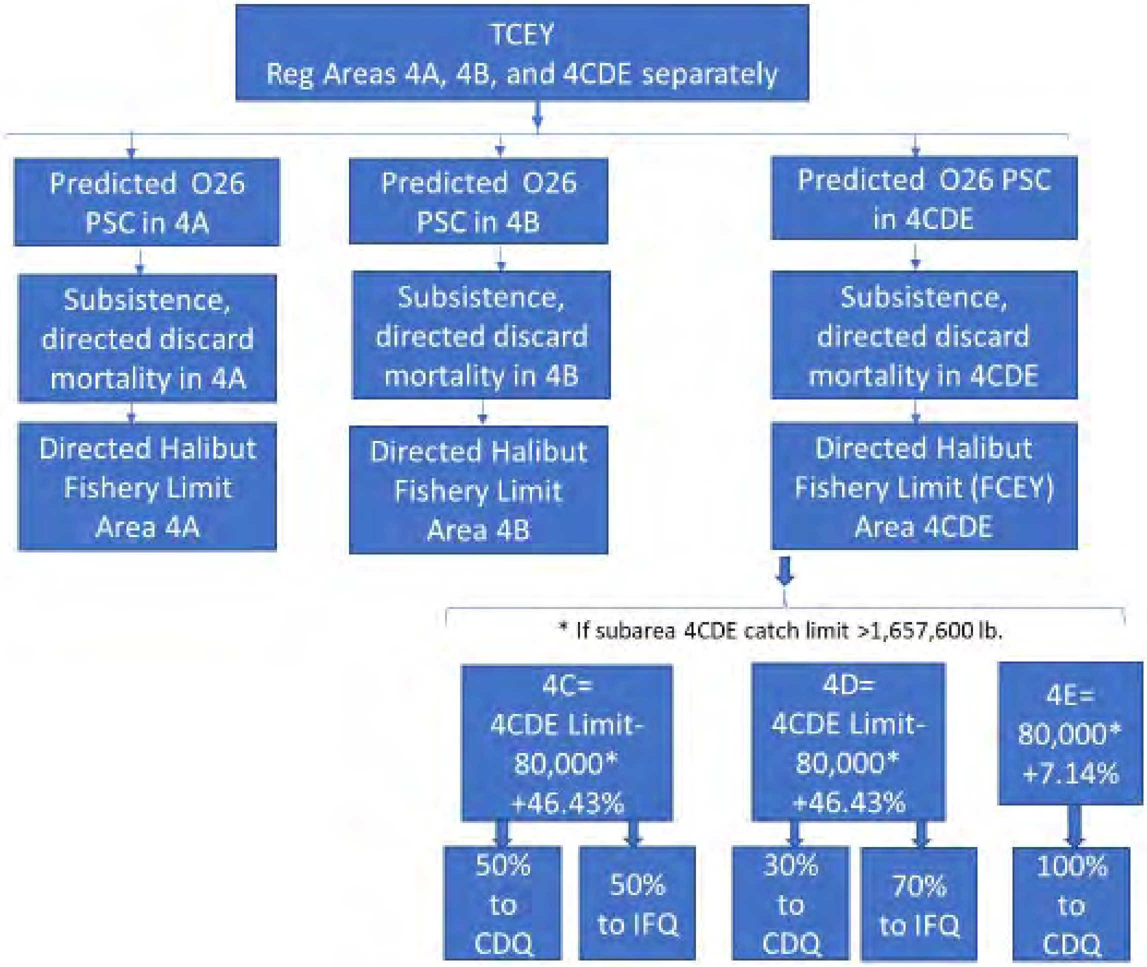


Figure 4-5. Distribution of TCEY to directed fishery users in IPHC Area 4 when the 4CDE catch limit is greater than 1,657,600 lbs.

Figure Notes: CSP: Area 4 Catch Sharing Plan; TCEY: Total Constant Exploitation Yield = Total mortality minus U26 bycatch mortality; FCEY in Area 4CDE = commercial catch limit (TCEY minus subsistence and O26 non-directed commercial discard mortality ("bycatch) and directed commercial discard mortality)

4.4.2 NPFMC Area 4 Catch Sharing Plan

The BSAI management area equates approximately to the IPHC's Area 4 regulatory areas, except a portion of Area 4A that overlaps the GOA management area. Area 4CDE and the Closed Area are considered to be a single unit in all IPHC apportionment and harvest policy analyses. Within each of the Area 4 regulatory areas (4A, 4B, and 4CDE), allocation of the IPHC catch limit to different sectors is under the jurisdiction of the Council and NMFS, not the IPHC.

The 4C, 4D, and 4E subareas were created to serve the needs of the Council's Area 4CDE catch sharing plan (CSP). Each year, the IPHC adopts the Council's CSP to determine the specific catch limits for these subareas. The percentage shares for these areas, as determined by the Council, are: Areas 4C and 4D each receive 46.43% of the IPHC's adopted catch limit for Area 4CDE and Area 4E receives the remaining 7.14%. If the total catch limit for Area 4CDE exceeds 1,657,600 lbs., Area 4E receives 80,000 pounds off the top of the total 4CDE catch limit *before* the percentages are applied.

Within Area 4CDE, the annual catch limit is further allocated among CDQ and IFQ fishing within subareas. The amounts allocated to CDQ by area are: Area 4C 50%, Area 4D 30% and Area 4E 100%.

The CDQ component of the commercial halibut fishery is described in Section 4.5.1.1. There are also provisions within the CSP allowing Area 4C CDQ and IFQ to be harvested in Area 4D, and for allowing Area 4D CDQ fish to be harvested in Area 4E. The CDQ allocations are apportioned among the six CDQ groups that represent CDQ communities.

4.4.3 IPHC Closed Area

The IPHC has identified part of the Bering Sea shelf as a Closed Area, in which commercial fishing for halibut is prohibited. The IPHC considers the halibut resource in this area to be part of the Area 4CDE halibut stock unit.

The Closed Area was created by the IPHC in 1967 to protect a nursery area for juvenile halibut, in response to severe declines in halibut abundance. The current Closed Area is slightly smaller than the original definition due to reductions that occurred when Areas 4C and 4E were created. The Closed Area had historically accounted for a relatively small percentage (<10%) of the commercial halibut landings in the Bering Sea but was a source of significant halibut mortality from foreign vessel bottom trawling. The IPHC recommended the closure to both commercial halibut fishing, which was under IPHC jurisdiction, and to bottom trawling, which was not under Commission jurisdiction. However, through negotiations within the International North Pacific Fisheries Commission and bilateral agreements with foreign governments, the Closed Area was also closed to foreign bottom trawling. Throughout the late 1960s until the early 1970s, the Closed Area provided significant protection for juvenile halibut, with bycatch mortality dropping to an estimated low of 4.21 million lbs. in 1985. Coincidentally, halibut abundance improved dramatically, fueled in part by strong year classes of the mid-1970s.

With the Americanization of the Bering Sea trawl fisheries in the early 1980s, following promulgation of the U.S. Extended Economic Zone, the protection to juvenile halibut afforded by the Closed Area diminished. Bycatch mortality on halibut again increased substantially in the 1985 through 1991 period, reaching a peak of approximately 10.7 M lbs. in 1992. Bottom trawling within the Closed Area accounts for a significant proportion of the halibut mortality in the Bering Sea. The Closed Area remains open to all fishing except commercial halibut fishing.

The IPHC requested a review of the Closed Area in 1998 (Trumble 1999). That review examined the purpose of the Closed Area and its value to halibut management. The summary of that review is reproduced below:

The closed area does not reduce halibut PSC mortality. Bycatch is managed by bycatch mortality limits through the NPFMC, with quota reductions and harvest rate reductions by the IPHC.

Ecosystem effects from the IPHC closed area have little benefit. The fishing by other gear types throughout the Bering Sea- Aleutian Island area, especially on the Bering Sea shelf, preclude an undisturbed ecosystem. A small no-trawl zone occurs on the eastern edge of the IPHC closed area. Evaluation of ecosystem stability in the Bering Sea must include the other fisheries, both in and out of the IPHC closed area and the no-trawl zone.

The IPHC requested another review of the Closed Area in 2012. The 2012 report noted that the area remained closed after 1989 as a hedge against uncertainty concerning assessment and management of halibut in the Bering Sea. Since 1998, the Commission has accumulated sufficient data and has been able to generate stock assessments for the Bering Sea with considerably greater confidence than was possible in 1998. Therefore, in 2012 the IPHC staff no longer saw a purpose for the Closed Area as a guard against uncertainty.

It also stated that halibut PSC was managed through PSC limits for various groundfish fisheries, with particular time and area specificity, and the IPHC Closed Area played no role in the management of bycatch. IPHC staff concluded that from a halibut assessment and management perspective, there was no continued purpose in maintaining the current Closed Area to the commercial halibut fishery in the eastern Bering Sea. In 2012, the IPHC took no action to open the Closed Area to the commercial halibut fishery.

If the Closed Area was to open to the commercial halibut fishery, allocations within the new area would have to be incorporated in the Council's Area 4CDE halibut CSP because the IPHC treats Area 4CDE, including the Closed Area, as a single management unit..

The IPHC again reviewed the Closed Area in 2018 (IPHC-2018-AM094-PropA1) with the following outcome (IPHC-2018-AM094-R, paragraph 47).

> *The Commission DEFERRED regulatory proposal IPHC-2018-AM094-PropA1, which considered the intent, purpose and effectiveness of the IPHC Closed Area, as defined in IPHC Fishery Regulations (2017) Section 10, NOTING that the NPFMC is currently undertaking an Abundance-Based Management process aimed at limiting bycatch. The ABM process should be closely monitored and if considered necessary, the IPHC closed area proposal should be reconsidered at subsequent meetings of the Commission, but no later than in 2020.*

4.5 Directed halibut IFQ fishery description

Note to the reader: CFEC/ADF&G Fish Ticket information and COAR data were not available for 2020 at the time the DEIS was prepared. As a result, tables and figures that report revenue or catch tables based on Fish Ticket information terminate in 2019.

This section provides a broad overview of commercial halibut IFQ fishery management, but the focus of the section is the fishery that occurs in Area 4 (IFQ and CDQ) and putting that area in the context of the halibut fishery on the Alaska statewide scale. Greater detail on the regulations that govern the fishery are most recently provided in the Council's IFQ Program 20-Year Review (NPFMC 2016[61]) and through resources accessible on the NMFS Alaska Region website.[62] Section 4.5.4 provides a brief synopsis of information on subsistence and recreational uses of halibut in Alaska, and directs the reader to a more detailed description in the SIA Appendix to this FEIS (Appendix 1, Sections 5.9, 5.10, and the subsections of Section 6 that are titled "Engagement in the Subsistence BSAI Halibut Fishery").

In December 1991, the Council chose an IFQ Program as the preferred management alternative for both halibut and sablefish fixed gear fisheries. The IFQ Program was approved as a regulatory amendment by the Secretary of Commerce in 1993 and implemented by NMFS in 1995 (58 FR 59375). The IFQ Program was developed to address issues associated with the race-for-fish that had resulted from the open-access and effort control management of the halibut and sablefish fisheries. Specifically, the Council identified several problems that emerged in these fisheries due to the previous management regime, including increased harvesting capacity, decreased product quality, increased conflicts among fishermen, adverse effects on halibut and sablefish stocks, and unintended distributions of benefits and costs from the fisheries.

In the original Supplemental Environmental Impact Statement for the IFQ Program, the Council identified 10 policy objectives that it intended to address through elements of the IFQ Program. In selecting the elements of the IFQ Program the Council attempted to do the following:

1) Address the problems that occurred with the open-access management regime.
    - The Council identified 10 specific problems: Allocation conflicts, gear conflicts, deadloss from lost gear, bycatch loss, discard mortality, excess harvesting capacity, product wholesomeness, safety, economic stability in the fisheries and communities, and rural coastal community development of a small boat fleet.
2) Link the initial quota share (QS) allocations to recent dependence on the halibut and sablefish fixed gear fisheries.
3) Broadly distribute QS to prevent excessively large QS from being given to some persons.

61 https://www.npfmc.org/wp-content/PDFdocuments/halibut/IFQProgramReview_417.pdf
62 https://www.fisheries.noaa.gov/alaska/sustainable-fisheries/pacific-halibut-and-sablefish-individual-fishing-quota-ifq-program

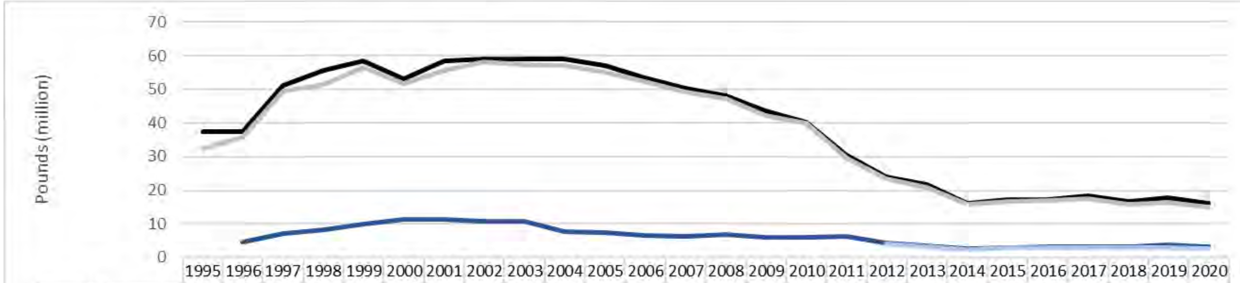
4) Maintain the diversity in the fleet with respect to vessel categories.
5) Maintain the existing business relationships among vessel owners, crews, and processors.
6) Assure that those directly involved in the fishery benefit from the IFQ Program by assuring that these two fisheries are dominated by owner/operator operations.
7) Limit the concentration of quota share ownership and IFQ usage that will occur over time.
8) Limit the adjustment cost to current participants including Alaskan coastal communities.
9) Increase the ability of rural coastal communities adjacent to the Bering Sea and Aleutian Islands to share in the wealth generated by the IFQ Program.
10) Achieve previously stated Council goals and objectives and meet MSA requirements.

A primary impact of implementing the IFQ Program was the elimination of the derby-style fishery that existed previously and the transition to longer seasons. The prolongation of the fishing season was made possible by the allocation of exclusive harvesting privileges through QS. Longer fishing seasons have allowed for better handling of fish, a shift in product form from frozen toward fresh halibut, the removal of unused fishing gear from grounds, and likely fewer gear conflicts.

This document is focused on Area 4. Fresh markets have not developed equally in all parts of Alaska. The markets that purchase halibut caught in Area 4 predominantly rely on frozen product due to their remote location relative to consumers, yielding a lower ex-vessel value relative to the statewide average. Ex-vessel values may also be affected by the cost of operating processors and bringing products to market, which can be higher for halibut caught in Area 4 (noting that not all halibut caught in Area 4 are processed in communities adjacent to the BSAI). Information on ex-vessel values by area is provided in Section 4.5.1 (see Figure 4-8 through Figure 4-10) and information on the processing component of the halibut IFQ fishery is provided in Section 4.5.2.

In terms of how participants have fared under the IFQ program, the 20-Year Review found that many significant impacts were the result of the changing commercial halibut TAC levels in the time since implementation. Figure 4-6 shows total IFQ (non-CDQ) TAC and landings dating back to 1995 for all IPHC management areas in Alaska and for Area 4 in particular. Statewide, halibut TAC has generally declined since 2004. The Area 4 TAC and landings encompass Areas 4ABCD; Area 4E is not included because 100% of the available harvest in that area is allocated to the CDQ reserve. CDQ TAC and harvest data are provided in Section 4.5.1.2. Decreasing TACs may change how QS holders and hired masters participate in the IFQ fisheries. For example, since decreasing TAC results in QS holders having fewer IFQ pounds to harvest they may choose to consolidate QS onto fewer vessels by coordinating with other QS holders to fish on one vessel, they might sell their QS, they might lease IFQ or act as a hired master for eligible shareholders, or they might purchase additional QS to increase their annual harvest potential. Hired masters with fewer IFQ pounds on their vessel might choose to lease IFQ or bring onboard more IFQ via individual QS holders who do not operate a vessel. The aggregation of QS holders onto fewer vessels eliminates some crew positions and other indirect economic activity that is associated with the operation of an active vessel. The number of unique vessels that have operated in Area 4/BSAI through 2019, based on Fish Tickets, is shown in Table 4-7.

The 20-Year Review notes that biologists have not found direct linkages between overall stock abundance and the IFQ Program (NPFMC 2016, Section 2.9), and that changes in the TACs are understood to be external to the IFQ Program itself. Section 4.2 of this document similarly notes that large changes in the spawning biomass of Pacific halibut, which do not seem explicitly linked to fishing, have been observed over the more than 100 years of commercial fishing.



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
TAC	37.4	37.4	51.1	55.7	58.4	53.1	58.5	59.0	59.0	58.9	57.0	53.3	50.2	48.0	43.5	40.3	30.4	24.0	21.8	16.0	17.1	17.1	18.3	16.6	17.7	16.1
Catch	32.3	35.6	49.4	51.4	56.4	51.8	55.8	58.1	57.4	57.2	55.2	52.2	49.3	47.3	42.3	39.9	29.6	23.3	20.8	15.8	16.7	16.8	17.6	15.9	16.5	15.0
Area 4 TAC		4.7	7.1	8.2	9.9	11.3	11.3	10.8	10.8	7.8	7.4	6.6	6.3	6.7	5.9	6.0	6.2	4.4	3.5	2.5	3.0	3.2	3.2	3.1	3.7	3.2
Area 4 Catch																		4.1	3.1	2.4	2.9	3.0	3.0	2.8	3.0	2.7

Figure 4-6 Commercial IFQ (non-CDQ) halibut TAC and catch (millions of pounds), statewide and Area 4ABCD.

Sources: 1995 through 2012 are taken from the annual NMFS IFQ Report to the Fleet, which do not include harvest amounts at the subarea level (https://www.fisheries.noaa.gov/resource/document/pacific-halibut-sablefish-ifq-report-report-fleet); 2013 through 2020 are taken from NMFS Annual IFQ Catch and Landings Reports (https://www.fisheries.noaa.gov/alaska/commercial-fishing/fisheries-catch-and-landings-reports).

All halibut QS has regulatory area designations that specify the area in which the IFQ derived from those shares may be harvested. Catch and value data by regulatory area and subareas within Area 4 are provided in Section 4.5.1.

There are four vessel classes in the halibut IFQ fishery (A through D). Class A shares are harvested on catcher/processors and there is no vessel length restriction. Class B, C, and D are designated by harvesting vessel length, where B class vessels are greater than 60’ LOA, C class vessels are greater than 35’ and less than 60’, and D class vessels are 35’ or less. Vessel class designations were intended to maintain the diversity of the IFQ fleets, and the Council intended for the Class D QS to be the most likely entry-level opportunity. In most cases, quota can be “fished down” on smaller-class vessels. In regards to Area 4, class D QS may be harvested on any vessel that is less than or equal to 60’ LOA in Areas 4B and 4C. Table 4-4 shows the percentages by which QS is distributed among vessel classes. The table shows that in Area 4 the plurality of QS units in each subarea are designated as class B. Class A shares (catcher/processors) account for a small percentage of potential harvest in each area, and no QS is allocated to class A in Area 4C. Area 4C has the highest proportion of QS that is designated class D but, as noted above, class D QS can be fished up on class C vessels in that area.

Table 4-4 Halibut quota share distribution by vessel category

Vessel Category	2C	3A	3B	4A	4B	4C	4D	4E	4ABCD Subtotal	Grand Total
A	2%	3%	3%	4%	6%	0%	8%		5%	3%
B	4%	37%	55%	59%	77%	40%	83%	All	65%	37%
C	79%	53%	39%	30%	15%	22%	9%	CDQ	21%	52%
D	15%	7%	3%	7%	3%	38%	0%		9%	8%

The overall management context of the IFQ Program for the 20-plus years since its implementation has largely been one of decreasing restrictions over time. For example, within the first year of the IFQ Program, the Council added the “fish down” provision allowing IFQ designated for larger vessel classes to be fished on smaller vessels and increased the allowable “sweep up” limit to allow larger amounts of IFQ to be swept up into QS blocks. Over the course of the IFQ Program, the Council has also allowed for some inter-area harvest of QS, increased the number of QS blocks that a shareholder may hold, and allowed for “fishing up” in some areas (e.g., the allowance to fish category D QS on C class vessels in 4B, 4C – mentioned above – and in 3B).

The main exception the general trend of decreasing restrictions has been with respect to the owner-operator characteristic of the fleet. The Council has repeatedly re-asserted its position on limiting hired master use for the harvest of catcher vessel IFQ and the acquisition of catcher vessel QS by non-individual entities in an effort to continue progress toward an owner-operator catcher vessel fleet. At the same time, however, the Council elected to authorize certain communities to be able to form community quota entities (CQEs) that can purchase halibut and sablefish QS and lease the resultant IFQ to their residents.

4.5.1 Catch, value, and harvest participation

IPHC Area 4 is comprised of five subareas (ABCDE) and generally covers the BSAI groundfish FMP area. A portion of Area 4A overlaps the GOA FMP area. This section is based on catch and processing data for all halibut IFQ and CDQ harvest that occurred in Area 4 ABCDE. IPHC management areas are depicted in Figure 1-4. To compare Area 4 to Alaska statewide commercial halibut catch, Table 4-5 shows IFQ landings in mt (round weight, or “CFEC whole pounds”) for each area from 2010 through 2020. Values are shown in round weight tons to better put commercial harvest in the context of PSC limits for the groundfish fisheries and the units output from the Operating Model are referenced in the impact analysis. During that period, Area 4 accounted for 21% of statewide catch on average, ranging from 18% in 2010 to 24% in 2011. Area 4 accounted for 23% of catch in both 2019 and 2020.

The summary data below are based on ADF&G/CFEC Fish Ticket information, and values are reported at the ex-vessel level. Section 4.5.1.1, below, describes why the analysts have elected to present ex-vessel values for commercial halibut, but also provides what information is available to help a reader consider the relative scale of the fishery’s value at the primary processing level (gross first wholesale value). The best available information on gross first wholesale value is applied alongside ex-vessel values in the impact analysis results tables that are presented in Section 5.4.

Table 4-6 shows total ex-vessel value by area in inflation-adjusted 2018 dollars (millions). Overall, Area 4 accounted for 18% of state-wide ex-vessel value from commercial halibut catch. On an annual basis, Area 4 accounted for 16% (2010, 2013, 2014) to 23% (2011) of total value. Area 4 accounted for 19% of total ex-vessel value in 2019. Figure 4-7 plots the gross ex-vessel value (2018$) of commercial halibut catch in Area 4 by subarea.

Table 4-5 Alaska commercial IFQ and CDQ halibut catch (mt) by IPHC area, 2010 through 2020

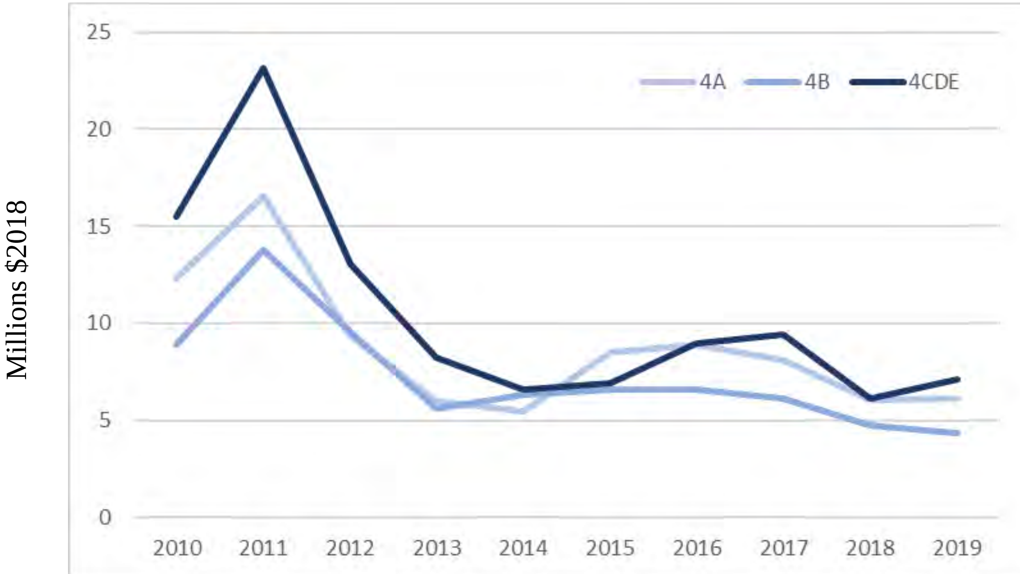
IPHC Area	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
2C	2,627	1,416	1,565	1,766	1,991	2,202	2,345	2,412	2,049	2,027	1,936
3	18,432	13,277	10,310	9,152	6,385	6,435	6,216	6,406	5,789	6,056	5,483
4	4,534	4,710	3,409	2,567	1,982	2,205	2,398	2,379	2,214	2,409	2,207
Total (t)	25,593	19,403	15,284	13,485	10,358	10,842	10,959	11,197	10,052	10,492	9,625
Total (M lbs.)	56.4	42.8	33.7	29.7	22.8	23.9	24.2	24.7	22.2	23.1	21.2

Source: CFEC Fish Ticket data provided by AKFIN Note: Conversion to mil of lbs. (M lbs.) provided for comparison to Figure 4-6.

Table 4-6 Alaska commercial IFQ and CDQ halibut ex-vessel value (million 2018$), 2010 through 2019

IPHC Area	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2C	24.8	17.8	18.4	17.4	23.5	25.6	28.8	26.6	18.3	18.5
3	173.7	163.3	111.6	86.5	73.3	73.6	73.7	69.0	52.6	55.2
4	37.6	54.6	32.6	20.3	19.1	22.5	24.9	23.7	16.9	17.6
Total	236.1	235.6	162.6	124.2	115.9	121.8	127.4	119.3	87.8	91.3

Source: CFEC Fish Ticket data provided by AKFIN

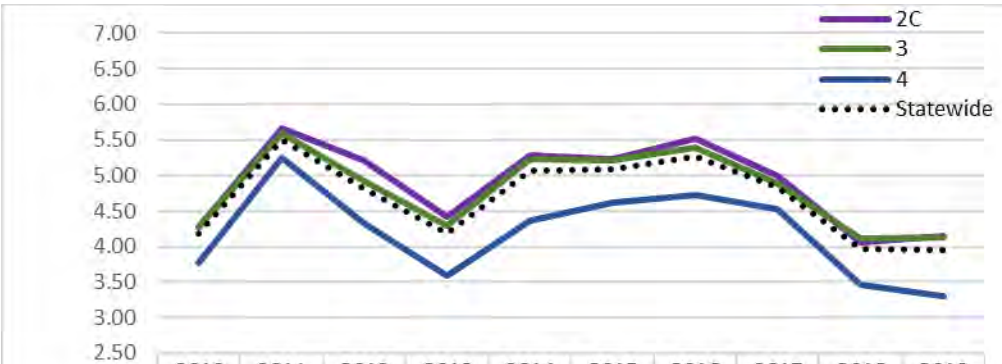


Source: CFEC Fish Ticket data provided by AKFIN

Figure 4-7 Alaska commercial IFQ and CDQ halibut ex-vessel value (million 2018$) within Area 4, 2010 through 2019

Figure 4-8 plots average annual halibut value per pound calculated based on the round weight totals shown in Table 4-5 and Table 4-6, adjusted to 2018 dollars to account for general inflation. Calculating value per pound based on round weights results in lower estimates that the reader is likely accustomed to seeing, as IPHC and RAM typically report on the halibut fishery in terms of IFQ pounds, i.e., head-and-gut net weight. Those values are reported in Figure 4-9 and Figure 4-10.

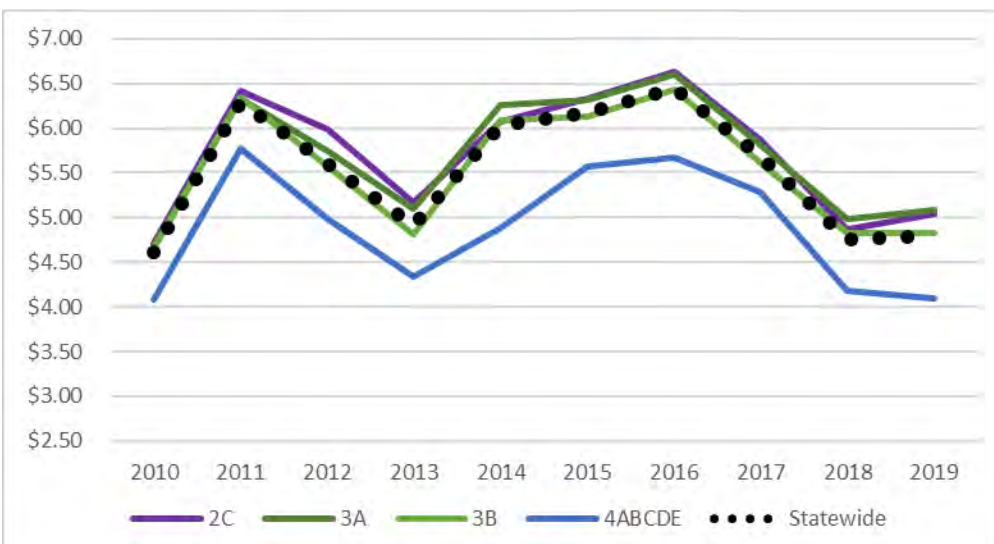
The purpose of Figure 4-8 is to show that, in real dollar terms, the unit value of the resource has been flat to decreasing over the analyzed period, and that unit value in Area 4 displays the same time trend as the rest of the state but at a lower level. This document does not fully analyze the reason that Area 4 catch produces lower value per pound relative to other areas. However, several factors that might be at play include higher plant operating costs at some of the smaller, remote plants in western Alaska that purchase halibut, as well as a general focus by processors in the BSAI region on the higher volume groundfish species for which processing facilities are specifically set up. Related to this point, the IFQ Program 20-Year Review includes an exploration of whether and to what extent the issuance of quota exclusively to the harvest sector reduced profit margins on halibut for the processing sector (see Section 2.4.2 in NPFMC 2016). Accepting the conclusion that the IFQ program tilted economic rents toward the harvest sector, it is reasonable to conclude that processors in western Alaska, which are either focused on high-volume groundfish species or have high operating costs, would have less demand for halibut and thus might offer a lower price than what is observed in areas such as 2C and 3A. In those areas, halibut is a primary focus and processors have both incentive and ability to market the product in ways that can generate a greater unit return.



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2C	4.28	5.67	5.21	4.42	5.29	5.22	5.52	5.00	4.06	4.14
3	4.27	5.59	4.92	4.29	5.23	5.21	5.39	4.88	4.12	4.14
4	3.76	5.24	4.34	3.59	4.37	4.62	4.72	4.52	3.46	3.31
Statewide	4.18	5.51	4.82	4.18	5.08	5.09	5.27	4.83	3.96	3.95

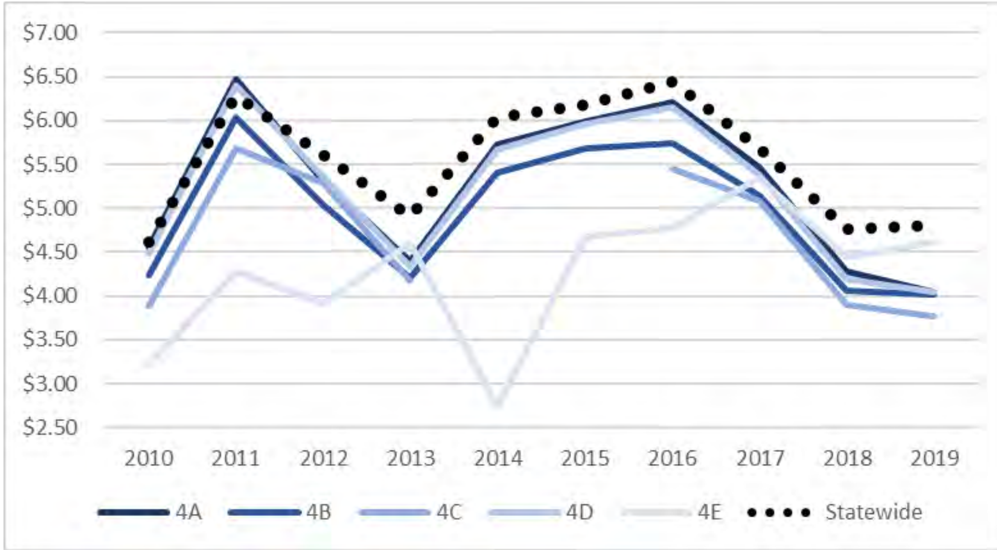
Figure 4-8 Average annual ex-vessel value per pound (2018$) by IPHC areas within Alaska, calculated from round weight catch. (Source: CFEC Fish Tickets provided by AKFIN)

Figure 4-9 and Figure 4-10 plot ex-vessel by area in nominal dollars (not inflation-adjusted) in terms of head-and-gut net weight. These values are taken from NMFS Alaska Region website and are the annual estimates with which the reader will be most familiar. Like the data shown above, these values are based on CFEC Fish Tickets for all commercial catch delivered by catcher vessels to inshore processors. The statewide estimate is a weighted average based on the volume and value of harvest taken across all Alaska IFQ areas. Figure 4-10 breaks out the subareas within Area 4, comparing them to the statewide average and to each other. Data for Area 4C is redacted in 2014 and 2015 due to confidentiality. Figure 4-10 highlights that average values are lower in Area 4.



Source: NMFS – See "Annual ex-vessel and volume prices – Halibut" at https://www.fisheries.noaa.gov/alaska/sustainable-fisheries/alaska-fisheries-management-reports. Note: Area 4ABCDE estimates for 2014 and 2015 omit Area 4C due to confidential data.

Figure 4-9 Commercial halibut ex-vessel value/lb. (nominal dollars) by IPHC area, 2010 through 2019



Source: NMFS – see "Annual ex-vessel and volume prices – Halibut" at https://www.fisheries.noaa.gov/alaska/sustainable-fisheries/alaska-fisheries-management-reports Note: Area 4C data in 2014 and 2015 is redacted as confidential.

Figure 4-10 Area 4 subarea commercial halibut ex-vessel value compared to statewide value (nominal dollars), 2010 through 2019

Annual ex-vessel value estimates for 2020 at the state-wide level and in each area were not at the time the DEIS was written. The analysts did state, however, that 2020 was not likely to reflect an upward movement in the ex-vessel value of Alaska halibut. In-season dock prices at the beginning of the season, reported voluntarily by quota brokers and in online trade-press, were around $3.25/lb. to $4.40/lb. depending on size and varying across locations (all reporting locations were in Areas 3A and 2C)[63]; it is appropriate to presume that prices are similar or lower in more westward areas). Summer prices represented a slight improvement but did not exceed the 2019 nominal ex-vessel values shown in Figure 4-9 (e.g., Homer dock price reported at $4.25 to $4.75/lb. on August 5, 2020[64]).

The 2020 market for U.S. halibut faced several headwinds; the extent to which these factors remain in effect into 2021 is not yet known but a price holding steady at recent historical levels would likely be viewed as a positive outcome. Though not vetted through the AKFIN process for ex-vessel price reporting, early 2021 prices in the 3A/2C region appear higher, between $5.25 and $5.75/lb. in March 2021 (Sitka, Petersburg, Whittier, and Homer).[65] It is likely that ex-vessel prices in Area 4 are slightly lower, but that information is not publicly available at the time of writing. Alaska halibut markets are currently facing at least three headwinds. First, domestic demand has been depressed by the ongoing global health crisis, especially in high-end fresh markets to supply the restaurant industry. Second, air services were stalled in the early months of 2020, impeding high-value fresh markets and adding to a backlog in frozen inventories. Third, Alaska halibut is facing increased competition from foreign imports that have penetrated U.S. retail markets in all regions at lower prices. The U.S. increased its purchase of farmed halibut from Norway in 2019 and 2020. Atlantic halibut from eastern Canada is increasingly entering U.S. markets and is being supplied fresh year-round. The U.S. is also importing an increasing volume of halibut caught in Russia and China. A news article published in May 2020 – citing industry analysts – notes that U.S. imports of Russian halibut were 140,000 lbs. in 2018 and up to approximately 2 million lbs. in 2019. Russian imports in just the first two months of 2020 were triple the annual total for 2018. Halibut caught in Russia and China are entering U.S. frozen markets via importation through Canada to circumvent tariffs on trade with those two countries and are marketed in the U.S. at lower prices than Alaska halibut. The relatively weak Russian currency is making that nation's product

[63] Alaska Fish Factor, published in Anchorage Daily News, March 24, 2020.
[64] Alaska Boats & Permits, Inc. www.alaskaboat.com
[65] Ibid., accessed March 2021.

attractive to U.S. buyers and buyers in China whose reprocessed product may be destined for U.S. end-markets. In terms of U.S. halibut exports, Russia has not purchased U.S. seafood since 2014 and China imposes a reciprocal tariff of 25% that suppresses demand for many U.S. seafood products.

From 2010 through 2019, the number of CVs participating in Area 4 averaged 200 per year, ranging from 337 CVs in 2011 to 117 CVs in 2017 (Table 4-7). As noted in Table 4-4, the bulk of the harvest opportunity is in the class B category. The total number of vessels decreased substantially in 2015, with the largest drop-off occurring among class B vessels. In the average across years, 86.3% of active CVs were owned by individuals who listed their residence as Alaska average (equating to an average 180 CVs owned by Alaska residents). There were 568 unique CVs participating in the Area 4 halibut fishery; 523 of those were owned by Alaska residents, 41 were owned by Washington residents, 4 were owned by Oregon residents, and 8 were owned by residents of other states. Table 4-7 also shows the number of CPs and catcher-sellers (listed as "CASO" in the data) that fished A class quota during the period. The average number of vessels that processed their own halibut catch in Area 4 was six. Note that all annual vessel counts shown in Table 4-7 include the unique number of vessels participating in IFQ, CDQ, or both; a vessel that fished both IFQ and CDQ halibut in a given year would not be double-counted.

Table 4-7 Number of vessels in the Area 4 halibut fishery by vessel class, 2010 through 2019

	Catcher Vessels				CP/CASO
	B	**C**	**D**	**Total**	**A**
2010	216	60	33	309	10
2011	243	62	32	337	4
2012	214	60	28	302	2
2013	227	52	25	304	3
2014	81	48	21	150	1
2015	44	53	22	119	3
2016	48	50	21	119	4
2017	48	50	19	117	8
2018	47	56	20	123	9
2019	49	53	20	122	12
Average	**122**	**54**	**24**	**200**	**6**
Median	**65**	**53**	**21.5**	**136.5**	**4**

Section 5.2 of the SIA Appendix provides information on engagement and reliance on the BSAI halibut fishery by community of vessel ownership address. For the Area 4 fishery, commercial halibut vessel ownership among states is heavily concentrated in Alaska. Within Alaska, ownership is distributed across numerous communities. The SIA identifies 25 Alaska communities with two or more vessels participating in the fishery annual (on average), another four communities with 1 or 2 vessels participating, and 21 communities with one or fewer vessels participating (on average). The SIA notes a downward trend in CV participation in recent years that spans multiple BSAI communities and regions but is most notable in the communities associated within the Coastal Villages Region Fund (CVRF) CDQ group region.

Table 4-8 shows total catch (CFEC whole lbs.) of Area 4 halibut IFQ and CDQ by subarea from 2010 through 2019. On average, the Area 4 fishery generated 6.34 million whole lbs. per year. The greatest proportion of catch occurs in Areas 4A, 4B, and 4D. The annual catch trend peaked in 2011 but currently appears to be at a stable level around 5 million whole lbs. This trend conforms to the decline in statewide TACs that is shown in Figure 4-6.

Table 4-6 reported gross halibut ex-vessel revenue from the Area 4 fishery for 2010 through 2019 (2018$). Table 4-9 reports inflation-adjusted ex-vessel revenues (2018$) by Area 4 subarea. The annual average value was around $27 million across all areas and years. Ex-vessel value by subarea clearly tracks the relative amount of catch by subarea. By residence of vessel ownership, Alaska-owned vessels accounted for an average of 66% of gross revenue; Washington-owned vessels accounted for roughly 30%. For all CVs that participated in the fishery during the analyzed period, the Area 4 halibut fishery accounted for approximately 28% of total inflation-adjusted gross ex-vessel revenues from all fisheries, including other areas, species, and gear types that those vessels prosecuted.

Table 4-10 and Table 4-11 report shoreside halibut catch and gross ex-vessel revenues (2018$) by area and by vessel size category from 2010 through 2019. Section 5.2 of the SIA Appendix identifies the communities of vessel ownership with combined average annual revenues greater than $1 million. The higher-grossing communities located in the BSAI region were St. Paul and Unalaska. The other communities of residence with high ex-vessel gross revenues were Anchorage/Wasilla, Homer, Juneau/Sitka, Kodiak, and the Seattle MSA.

Table 4-8 Total halibut catch (IFQ + CDQ) in Area 4 (CFEC whole lbs.), 2010 through 2019

	4A	4B	4C	4D	4E	4ABCDE Total
2010	3,204,111	2,483,204	1,013,835	2,748,241	546,103	**9,995,494**
2011	3,070,785	2,749,754	1,055,179	2,923,669	609,221	**10,408,608**
2012	2,101,072	2,308,241	750,826	1,906,104	443,665	**7,509,908**
2013	1,615,029	1,661,653	678,671	1,315,880	372,694	**5,643,927**
2014	1,193,289	1,486,806	525,847	930,241	202,313	**4,338,496**
2015	1,778,525	1,455,041	539,997	948,399	118,177	**4,840,139**
2016	1,822,804	1,487,477	552,943	1,257,131	159,559	**5,279,914**
2017	1,742,815	1,397,215	678,302	1,207,444	218,307	**5,244,083**
2018	1,621,429	1,382,072	660,910	1,094,895	126,693	**4,885,999**
2019	1,800,135	1,296,887	646,908	1,377,635	158,403	**5,279,968**
Average	**1,994,999**	**1,770,835**	**710,342**	**1,570,964**	**295,514**	**6,342,654**

Source: CFEC Fish Tickets provided by AKFIN

Table 4-9 Ex-vessel value (2018$) of all halibut catch (IFQ+CDQ), 2010 through 2019

	4A	4B	4C	4D	4E	4ABCDE Total
2010	12,618,162	9,060,223	3,695,186	10,675,677	1,577,994	**37,627,241**
2011	16,843,193	14,018,154	5,455,909	15,818,404	2,418,054	**54,553,713**
2012	9,276,352	9,616,738	3,597,548	8,490,769	1,576,836	**32,638,219**
2013	5,834,081	5,694,057	2,540,492	4,666,917	1,520,714	**20,319,188**
2014	5,483,180	6,401,491	2,333,494	4,233,100	476,385	**19,094,363**
2015	8,467,071	6,530,732	2,458,248	4,468,937	438,439	**22,363,428**
2016	8,905,273	6,714,714	2,603,693	6,059,222	626,207	**24,909,108**
2017	8,119,576	6,122,683	2,938,104	5,522,621	995,331	**23,698,315**
2018	5,775,440	4,681,520	2,150,498	3,839,246	469,578	**16,916,281**
2019	5,996,834	4,276,457	2,009,123	4,580,441	601,322	**17,464,178**
Average	**8,731,916**	**7,311,677**	**2,978,230**	**6,835,533**	**1,070,086**	**26,958,403**

Source: CFEC Fish Tickets provided by AKFIN

Table 4-10 Halibut catch (IFQ+CDQ) delivered to shore in Area 4 subareas by vessel class (CFEC whole pounds), 2010 through 2019

Area	Vessel Class	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total	Average
4A	B	250,874	267,875	157,398	143,409	94,398	117,743	210,650	161,540	143,483	120,216	1,667,586	166,759
	C	1,890,376	1,947,014	1,388,485	1,024,378	774,632	1,191,948	1,163,793	1,232,961	1,139,628	1,286,393	13,039,608	1,303,961
	D	991,508	816,417	525,231	429,786	269,619	435,450	383,757	327,217	320,561	376,556	4,876,102	487,610
4A Total		**3,132,758**	**3,031,306**	**2,071,114**	**1,597,573**	**1,138,649**	**1,745,141**	**1,758,200**	**1,721,718**	**1,603,672**	**1,783,165**	**19,583,296**	**1,958,330**
4B	B	23,246	17,731	42,175	60,179	40,258	52,989	48,826	9,235	0	0	294,639	29,464
	C	1,339,774	1,404,528	1,478,062	965,649	965,348	947,941	1,024,715	962,853	952,369	884,186	10,925,425	1,092,543
	D	1,013,114	1,252,522	788,004	635,509	481,200	454,111	413,936	425,127	429,703	412,701	6,305,927	630,593
4B Total		**2,376,134**	**2,674,781**	**2,308,241**	**1,661,337**	**1,486,806**	**1,455,041**	**1,487,477**	**1,397,215**	**1,382,072**	**1,296,887**	**17,525,991**	**1,752,599**
4C	B	752,767	697,594	558,021	536,571	419,798	380,408	423,541	483,156	443,531	438,462	5,133,849	513,385
	C	252,519	324,621	184,102	126,228	96,440	135,529	110,009	181,973	203,317	196,134	1,810,872	181,087
	D	C	C	C	C	C	24,060	15,954	C	C	C	107,671	10,767
4C Total		*	*	*	*	*	**539,997**	**549,504**	*	*	*	**7,052,392**	**713,702**
4D	B	73,801	40,769	70,696	48,263	50,635	14,009	32,866	35,707	48,182	95,852	510,780	51,078
	C	1,590,306	1,501,540	1,029,335	698,816	468,913	566,988	659,847	639,464	585,446	744,037	8,484,692	848,469
	D	932,821	1,268,083	707,466	513,306	379,017	333,369	529,413	493,641	425,619	493,324	6,076,059	607,606
4D Total		**2,596,928**	**2,810,392**	**1,807,497**	**1,260,385**	**898,565**	**914,366**	**1,222,126**	**1,168,812**	**1,059,247**	**1,333,213**	**15,071,531**	**1,507,153**
4E	B	499,916	553,919	411,157	344,075	181,869	67,920	85,320	94,464	58,533	75,046	2,372,219	237,222
	C	43,914	55,302	31,130	C	C	38,862	46,442	100,583	42,684	62,265	*	*
	D	C						C				C	C
4E Total		*	**609,221**	**442,287**	*	*	**106,782**	*	**195,047**	**101,217**	**137,311**	**2,839,751**	**283,975**

C = confidential; * denotes data not shown to maintain confidentiality.

Source: CFEC Fish Tickets provided by AKFIN

Table 4-11 Ex-vessel value (2018$) of all halibut catch (IFQ+CDQ) delivered to shore in Area 4 subareas by vessel class, 2010 through 2019

Area	Vessel Class	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total	Average
4A	B	977,995	1,462,095	703,824	502,842	429,191	544,599	1,013,410	723,415	492,140	387,489	7,237,000	723,700
	C	7,418,891	10,664,680	6,091,410	3,640,776	3,538,623	5,671,619	5,668,659	5,761,092	3,993,178	4,248,983	56,697,912	5,669,791
	D	3,948,269	4,503,281	2,346,520	1,629,423	1,269,422	2,096,474	1,919,226	1,542,938	1,228,945	1,303,316	21,787,812	2,178,781
4A Total		**12,345,155**	**16,630,056**	**9,141,754**	**5,773,040**	**5,237,235**	**8,312,692**	**8,601,295**	**8,027,445**	**5,714,263**	**5,939,788**	**85,722,724**	**8,572,272**
4B	B	65,045	66,038	146,502	189,463	156,273	224,107	196,252	34,854	0	0	1,078,534	107,853
	C	4,655,280	6,883,715	6,024,333	3,217,308	4,040,695	4,174,988	4,520,287	4,162,187	3,225,129	2,919,329	43,823,250	4,382,325
	D	3,965,258	6,664,069	3,445,904	2,286,252	2,204,523	2,131,637	1,998,175	1,925,643	1,456,391	1,357,127	27,434,978	2,743,498
4B Total		**8,685,583**	**13,613,822**	**9,616,738**	**5,693,023**	**6,401,491**	**6,530,732**	**6,714,714**	**6,122,683**	**4,681,520**	**4,276,457**	**72,336,762**	**7,233,676**
4C	B	2,715,937	3,552,121	2,694,102	2,013,546	1,862,668	1,726,300	1,987,156	2,078,499	1,439,490	1,355,307	21,425,126	2,142,513
	C	946,477	1,722,552	865,285	471,598	428,656	619,211	524,725	796,341	664,943	615,101	7,654,887	765,489
	D	C	C	C	C	C	112,738	75,801	C	C	C	486,916	48,692
4C Total		*	*	*	*	*	**2,458,248**	**2,587,681**	*	*	*	**29,566,929**	**2,956,693**
4D	B	227,333	169,138	345,149	151,471	211,242	53,061	143,467	159,995	204,152	384,586	2,049,594	204,959
	C	6,200,154	8,118,717	4,573,303	2,491,887	2,144,409	2,696,690	3,191,274	2,915,013	2,029,891	2,412,287	36,773,625	3,677,362
	D	3,663,785	6,920,055	3,130,537	1,823,789	1,732,701	1,560,441	2,556,233	2,278,595	1,482,009	1,633,290	26,781,435	2,678,144
4D Total		**10,091,272**	**15,207,909**	**8,048,989**	**4,467,148**	**4,088,352**	**4,310,192**	**5,890,974**	**5,353,603**	**3,716,052**	**4,430,162**	**65,604,654**	**6,560,465**
4E	B	1,424,443	2,158,818	1,417,203	1,430,315	395,465	230,132	300,941	440,787	181,037	260,389	8,239,529	823,953
	C	149,859	259,236	152,693	C	C	136,144	195,605	443,399	187,627	254,500	*	*
	D	C						C				C	C
4E Total		*	**2,418,054**	**1,569,896**	*	*	**366,276**	*	**884,186**	**368,664**	**514,889**	**10,174,885**	**1,017,488**

C = confidential; * denotes data not shown to maintain confidentiality.Source: CFEC Fish Tickets provided by AKFIN

Table 4-12 reports the potential harvest for IFQ or CDQ participants in IPHC Areas 4BCDE from 2013 through 2020. Catch utilization is reported as a percentage from 2013 through 2020. The table reflects that the halibut resource has been near-fully utilized during the reported years, and that the harvest rate actually increased in 2020 relative to 2019. The concentration of CDQ harvest in Area 4D during 2020 may be the result of the unique operational challenges of 2020 resulting from the COVID-19 pandemic.

Table 4-12 Directed fishery halibut catch limits/allocations (lbs.) and utilization (%) in IPHC Areas 4CDE, 2013 through 2020

	Area	2013	2014	2015	2016	2017	2018	2019	2020
IFQ Catch Limit	**4C/4D**	1,030,800	715,920	715,920	880,320	902,400	880,200	1,092,000	919,200
		89%	*96%*	*96%*	*96%*	*96%*	*90%*	*82%*	*99%*
CDQ Allocation	**4C**	429,500	298,300	298,300	366,800	376,000	366,751	455,000	383,000
		*	*	*	*	*	*	*	*
	4D	309,240	178,980	178,980	220,080	225,600	220,050	273,000	229,800
		52%	*67%*	*65%*	*82%*	*99%*	*72%*	*97%*	*247%*
	4E	212,000	91,800	91,800	192,800	196,000	113,000	220,000	198,000
		132%	*166%*	*	*62%*	*	*	*	*
4CDE Total		1,981,540	1,285,000	1,285,000	1,660,000	1,700,000	1,580,001	2,040,000	1,730,000
%CDQ landed for 4BCDE		*86%*	*98%*	*90%*	*85%*	*94%*	*91%*	*83%*	*88%*

Notes: IFQ landings in Areas 4C and 4D are combined because 4C allocation may be fished in 4C or 4D. Harvest is debited from the account for the reported harvest area but the combined report is a better representation of activity in the two areas. CDQ allocation to 4D may be fished in 4D or 4E; harvest is debited from the account for the reported harvest area. CDQ allocation to 4C may be fished in 4C or 4D; harvest is debited from the account for the reported harvest area. Accounting for CDQ allocation that may be taken in more than one area could cause landings to appear overharvested in 4D or 4E, or underharvested in 4C or 4D.

Source: NMFS Alaska Region IFQ Catch & Landings Reports; data available from 2013. https://www.fisheries.noaa.gov/alaska/commercial-fishing/fisheries-catch-and-landings-reports-alaska#ifq-halibut/sablefish.

4.5.1.1 Consideration of ex-vessel versus first wholesale values for Area 4 halibut fisheries

Commercial halibut catch value is reported as ex-vessel revenues taken from ADF&G/CFEC Fish Tickets. The ex-vessel value represents the amount paid to fishermen by a primary processor for harvested seafood. Ex-vessel prices are the most appropriate value to represent halibut fishery revenue given the most common halibut supply chain in Alaska, particularly in Area 4, or the BSAI processing region. Most halibut is harvested by catcher vessels that deliver to shoreside processors: “Nearly all halibut is bled and gutted onboard, iced or chilled, and delivered to a shoreside plant for a small amount of additional processing, typically limited to heading or filleting. Less than one percent of annual first wholesale halibut production typically occurs aboard catcher/processor vessels. Alaska processors sell most halibut to Lower-48 seafood distributors that supply a specific region with a variety of products” (Fissel et al. 2021).

The Alaska Fisheries Science Center has recently begun reporting estimates of first wholesale production volume, value, and value per net-weight-pound (IFQ pound) of halibut in the “Economic SAFE” report; the most recent version covers 2015 through 2019 (Fissel et al. 2021). Table 4-13 excerpts first wholesale estimates for the head-and-gut product form from Table H7 of the Economic SAFE. That information is based data from Commercial Operators Annual Reports (COAR) that are reliant on the accuracy of processors’ reporting. Due to the dearth of COAR reporting on halibut products in the BSAI region, the Economic SAFE is only able to provide estimates at the statewide scale. These estimates may not be a reliably precise indicator of value-added production at the primary processing level in the BSAI/Area 4 region, or the Area 4CDE region in particular. As shown in Figure 4-8 through and Figure 4-10, ex-vessel values in Area 4 consistently trail the statewide average. Table 4-13 omits the Economic SAFE’s estimate of first wholesale values across “All Products,” which sums H&G estimates, fillet estimates, and “other products” estimates on an annual basis then divides by total reported revenues. More highly processed halibut product forms are less prevalent in the region of interest, so using All Products estimates would impute values from product forms that are not reported and may not be being produced in the area – at least not at the relative scale they are being produced statewide. Given that a substantial portion of Area 4 halibut are sold by primary processors in a head-on form, the values in Table 4-13 will be slightly overstated when those estimates were applied on a per-pound basis to Area 4 catch.

Table 4-13 First wholesale production volume (1000s of mt), value (nominal $millions), and price (nominal $/lb. net weight) in the commercial Pacific halibut fisheries off Alaska – head-and-gut product form – 2015 through 2019.

Year	Quantity	Value	Price
2015	5.38	92.07	7.77
2016	6.29	94.99	6.85
2017	5.64	91.86	7.39
2018	5.01	75.59	6.84
2019	5.07	71.12	6.37

Source: adapted from Table H7 in the 2020 Economic SAFE (AFSC 2021); data from COAR, provided by AKFIN

Upon the analysts' request, AKFIN and AFSC investigated the possibility of estimating area-specific wholesale values in the region of interest but the effort was stymied by the small number of shoreside processors buying halibut as well as reporting issues (the latter – it is important to say – is not strictly a reflection on the reporting and recordkeeping of the processing plants themselves). AKFIN screened processors' COAR data to exclude facility-years where the ratio of the volume of fish purchased and the volume of primary-processed product sold did not match within an acceptable range. Also, for specific halibut management areas – e.g., 4CDE – the small number of processors often makes the data confidential. The other issue that makes area-specific wholesale value difficult to use is that COAR data report "bought and sold" volumes on an annual basis, meaning that holdover inventory sold in the following year obscures the value-added supply chain and can cause a plant's data to fail the AKFIN ratio "screen." Such was the case for several facilities that the analysts know to be important local buyers of Area 4 halibut.

The high value of halibut relative to other white fish is widely acknowledged and is not diminished by the decision to describe the value chain only as far as the primary processing level. Research to fully describe the value chain and the broader economic impact of Alaska halibut fisheries – commercial and non-commercial – is currently in progress; an IPHC study of this question is referenced and described in Section 5.3 of this document. The analysts propose that the Area 4 commercial fishery value chain is distinct from other regions in important ways, and that ex-vessel values – with the additional context of first wholesale estimates – is the most appropriate metric. The reader can understand that secondarily processed halibut product forms, or even direct market sales to end-retail consumers, have a higher unit value. This does not need to be shown in table-form and likely should not be given the amount of information available on the extent to which those product forms are flowing out of the region of interest. It would not be appropriate to choose an end-retail value-per-pound, apply it to catch in Area 4, and consider that number to be net revenue (after fishing costs) as that would elide costs that accrue along the supply chain. Finally, the analysts do not provide a "what if" value estimate to represent how much Area 4 catch could be worth if it were directly marketed at retail prices because there are no data to gauge how much supply that type of market would demand from Area 4 considering its unique costs and processing capacity.

4.5.1.2 CDQ

When the IFQ Program was established, a portion of commercial halibut quotas in each Area 4 subarea (the CDQ reserve) was allocated to western Alaska communities via their CDQ groups. The structure of the CDQ program was initially developed as a component of BSAI pollock allocations ("inshore/offshore") and implemented under BSAI Groundfish FMP Amendment 18 (final rule published on June 3, 1992, 57 FR 23322). During that period, the Council was developing what would become the fixed-gear halibut and sablefish IFQ Program and was evaluating options for allocates of those species to CDQ communities.

Overall, the CDQ program is allocated a CDQ reserve equal to 20% of the Area 4B halibut TAC, 50% of the Area 4C TAC, 30% of the Area 4D TAC, 100% of the Area 4E TAC, and zero percent of the Area 4A

TAC. The remainder in each area constitutes the IFQ fishery. Figure 4-11 shows how the CDQ reserve is allocated among the six CDQ groups. For example, APICDA receives the full 20% of the Area 4B TAC that goes to the CDQ program (100% of the CDQ reserve for the area), while the 30% of the Area 4D TAC that goes to the CDQ program is divided among four different CDQ groups.

In 2019, the total halibut TAC for Areas 4BCDE (IFQ + CDQ) is 3,250,000 lbs. Of that amount, 1,190,000 lbs. go to the CDQ reserve, or 36.6% of the total. APICDA received 310,250 lbs. in Areas 4B and 4C; BBEDC received 136,980 lbs. in Areas 4D and 4E; CBSFA received 386,750 lbs. in Area 4C; CVRF received 219,520 lbs. in Area 4D and 4E; NSEDC received 81,900 lbs. in Area 4D; and YDFDA received 54,600 lbs. in Area 4D. The total size of the CDQ reserve is determined annually based on the 4BCDE TAC, while the distribution percentages to CDQ and among groups have remained constant. The 2019 TAC of 3.25 million lbs. was greater than in previous years. The Area 4BCDE TAC was 2.63 million lbs. in 2018, 2.84 million lbs. in 2017, 2.80 million lbs. in 2016, 2.43 million lbs. in 2015, and 2.43 million lbs. in 2014. In 2013 the TAC for these areas was 3.38 million lbs.

The total 2019 CDQ reserve equated to roughly 540 mt of halibut. For comparison, the total allocation of BSAI groundfish species to CDQ groups is 195,297 mt.[66] The total allocated of crab species to the CDQ program in 2019 was roughly 4.2 million lbs. (1,905 mt).

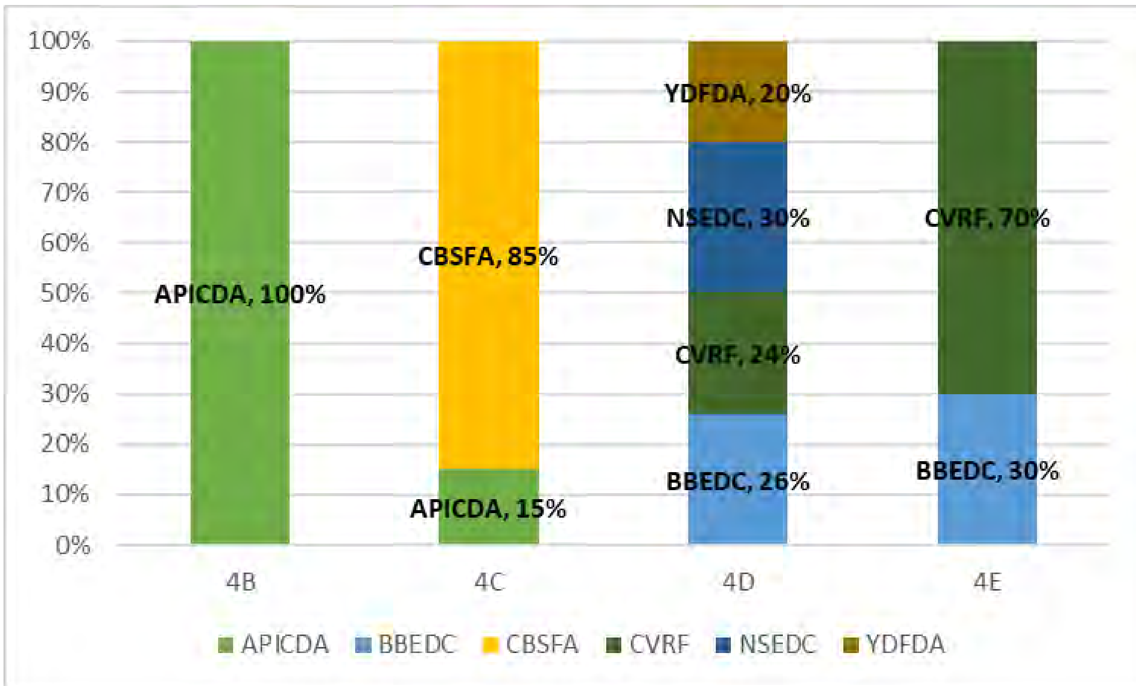


Figure 4-11 Allocation of CDQ reserve halibut by CDQ group in Areas 4BCDE

CDQ groups may use their allocation of the halibut catch limit to support nearshore small boat fisheries that provide economic opportunity and the social and cultural benefits inherent in active fishing participation to residents, or the groups can opt to lease the quota to fishing companies. CDQ groups might choose to lease the quota for a variety of reasons including, but not limited to (1) if the group's allocation is judged not large enough to support a viable or economically sustainable directed fishery, or (2) if the group judges that the social and economic benefit to their constituents would be greater by applying collected royalties to other community initiatives. Factors that influence consideration of the economic viability/sustainability of operating an in-region fishery include the size of a CDQ group's quota allocation, increases or decreases in resource abundance, and the difficulty or, under some

[66] https://www.fisheries.noaa.gov/webdam/download/90184482

arrangements, cost of providing or securing a processing market that is accessible to the fleet. Factors that influence consideration among different choices in providing other socioeconomic and cultural benefits to their constituents include the nature and complexity of that constituency, as some communities and individuals may not as directly benefit as others from in-region direct fishery engagement support initiatives. The complications that CDQ groups face when making this choice and the different structures they have chosen are discussed further in the Section 6 of the SIA Appendix.

Royalty revenues support CDQ projects that encourage fishery-based economic development and social development. These projects and programs include infrastructure (fishing and non-fishing), employment, training programs, equipment maintenance and repair facilities, bulk fuel procurement, seafood branding/marketing, and financial services to support small sale fishing operations that target nearshore species using small vessels. Until 2005, NMFS received information about royalty payments to CDQ groups by species harvested. Because submission of this information is no longer required, information about royalties collected from the leasing of halibut quota is not publicly available, and not all CDQ groups have chosen to present royalty information by species in their public reports.

CDQ groups have used earnings derived from investment in vessels and subsidiary companies to gain stakes in vessels, limited access privileges, and processing capacity across most BSAI fisheries (i.e., halibut, sablefish, crab, and groundfish). Investments by individual CDQ groups include ownership interest in the at-sea processing sector and in catcher vessels and are made with the expectation of financial gain or expanding equity in the fishing fleet. According to a 2016 report, at the time approximately 20% of vessels greater than 60’ LOA fishing in the BSAI or GOA were owned in full or in part by a CDQ group.[67] Those vessels included pollock (AFA), A80, and freezer longline cod (HALCP) catcher/processors, among others. Investments in subsidiaries, such as limited liability corporations, allow CDQ groups to wholly or partially own vessels directly related to fisheries. These vessels provide revenue through the direct catch and sale of target species and, in some cases, vessel ownership increases a subsidiary’s holdings of quota in fisheries such as BS pollock. In addition, investments in harvesting and processing capacity provide revenue through profit sharing, contractual agreements to harvest other CDQ groups’ quota, and chartering commercial fishing vessels to government agencies conducting stock assessment surveys. Revenue from such investments has exceeded direct royalty income from leasing halibut and non-halibut quota since 2004 (NMFS 2018[68]). In years when data were available, direct income from investments accounted for 55% to 84% of CDQ groups’ annual revenue. Until 2011, the six CDQ groups provided a joint report through the Western Alaska Community Development Association (WACDA) on assets and investments in CDQ communities. In 2011, the six CDQ groups held approximately $938 million in assets and they invested roughly $176 million in CDQ communities and fishery activities; that value was down from the reported peak of $251 million in regional investment reported for 2010. Similar information for more recent years is not publicly available.

In addition to fishery-related investments and support programs, MSA allows CDQ groups to make up to 20% of their annual investments in non-fishery related projects within the region.[69] Groups invest in capital projects such as village infrastructure, medical clinics, and environmental programs. Groups also expend funds on programs like vocational training, post-secondary education scholarships, and assistance for elders, to name only a few examples. Since the 2011 cessation of a combined report by WACDA, CDQ groups have highlighted the work completed in their member communities via public releases that vary in format and detail.

[67] McDowell Group. (2016). Modernization of the North Pacific Fishing Fleet: Economic Opportunity Analysis. Available at: www.edc-seaking.org

[68] https://www.fisheries.noaa.gov/resource/document/western-alaska-community-development-quota-program

[69] MSA Section 305(i)(1)(E)(iii)

Table 4-14 summarizes CDQ allocations, harvest, and the number of vessel landing events (i.e. trips) in Areas 4BCDE from 2013 through 2020.[70] A vessel landing could include harvests by more than one CDQ permit holder. Harvest is reported in IFQ pounds (head-and-gut net weight). In some cases, Areas 4CDE may appear over or underharvested because 4D CDQ may also be harvested in 4E, and 4C CDQ may also be harvested in 4D. NMFS catch reports debit harvest from the area in which the catch actually occurred. Note that much of the area-level data is redacted as confidential due to the number of processing facilities that received CDQ halibut deliveries. For that reason, the summary tables that follow focus on CDQ activity at the Area 4 level.

During the 2013 through 2020 period, the combined CDQ reserve halibut allocation was highest in 2013 (1.2 million lbs.), then dropped to roughly 800,000 lbs. during 2014 and 2015 before rebounding to between 1.0 and 1.2 million lbs. from 2016 through 2020. CDQ harvest was at its highest point in 2013 (1.1 million lbs.), representing an 86% harvest rate of available CDQ quota across the four subareas in that year. Harvest rates in the other years have ranged from 83% in 2019 to 98% in 2014. It is apparent from the annual subtotals that include all of 4BCDE that the subareas where data are confidential actually accounted for the majority of total CDQ harvest and individual landing events in most years. This trend reversed in 2020, which may again be attributed to the operational impacts of fishing during the COVID-19 pandemic. The pounds harvested could include both direct catch by vessels from CDQ communities and catch of quotas that were contracted to other vessels fishing in these areas and generated royalties for the CDQ group.

Table 4-14 CDQ halibut allocation, harvest, and landing events, 2013 through 2020 (Source: NMFS Catch & Landings Reports)

Year	Area	Vessel Landings	Allocation (lbs.)	Harvest (lbs.)	% Harvested	Year	Area	Vessel Landings	Allocation (lbs.)	Harvest (lbs.)	% Harvested
2013	4B	*	290,000	*	*	**2014**	4B	*	228,000	*	*
	4C	*	429,000	*	*		4C	*	298,300	*	*
	4D	165	309,240	160,877	52%		4D	176	178,980	120,075	67%
	4E	876	212,000	279,910	132%		4E	240	91,800	152,118	166%
	Subtotal	**1,462**	**1,240,740**	**1,066,864**	**86%**		**Subtotal**	**730**	**797,080**	**784,726**	**98%**
2015	4B	*	228,000	*	*	**2016**	4B	*	228,000	*	*
	4C	*	298,300	*	*		4C	*	366,800	*	*
	4D	98	178,980	116,847	65%		4D	122	220,080	180,790	82%
	4E	*	91,800	*	*		4E	122	192,800	119,821	62%
	Subtotal	**420**	**797,080**	**721,310**	**90%**		**Subtotal**	**558**	**1,007,680**	**851,869**	**85%**
2017	4B	*	228,000	*	*	**2018**	4B	*	210,000	*	*
	4C	*	376,000	*	*		4C	*	366,751	*	*
	4D	106	225,600	224,116	99%		4D	94	220,050	157,636	72%
	4E	*	196,000	*	*		4E	*	113,000	*	*
	Subtotal	**544**	**1,025,600**	**966,914**	**94%**		**Subtotal**	**493**	**909,801**	**828,334**	**91%**
2019	4B	*	242,000	*	*	**2020**	4B	*	220,000	*	*
	4C	*	455,000	*	*		4C	*	383,000	*	*
	4D	114	273,000	264,703	97%		4D	103	229,800	567,950	247%
	4E	*	220,000	*	*		4E	*	198,000	*	*
	Subtotal	**602**	**1,190,000**	**992,315**	**83%**		**Subtotal**	*****	**1,030,800**	*****	**88%**

* denotes confidential data

4.5.1.3 Cost recovery and other taxes and fees

MSA Section 304(d) requires the collection of cost recovery fees for LAPP programs and the CDQ program. Cost recovery fees recover the actual costs directly related to the management, data collection, and enforcement of the programs. The fee can be up to, but not exceeding, 3.0% of the annual ex-vessel

70 Data are based on NMFS Fisheries Catch and Landings Reports, which are available back to 2013 at: https://www.fisheries.noaa.gov/alaska/commercial-fishing/fisheries-catch-and-landings-reports

value of the fish harvested under the program (MSA section 304(d)(2)(B)). The cost recovery fee for halibut IFQ was at the maximum level of 3.0% in 2020 and 2019, up from 2.8% in 2018, and 2.2% in 2017. The fee percentage is based on a calculation of management and enforcement costs in relation to the calculated total value of the fishery. Had the fee percentage not been capped, the 2020 assessment based on direct program costs divided by total fishery value would have been 4.28%. The 2020 combined IFQ fishery value that NMFS used, based on its standard pricing methodology, was $103.1 million, which is down from $150.0 million in 2019, $161.4 million in 2018, and $208.0 million in 2017.

Cost recovery has been collected from IFQ fishing since 2000. The final rule implementing cost recovery for the CDQ program was published on January 5, 2016 (81 FR 150). Because CDQ groups are allocated groundfish species as well as IFQ species, the total value calculation includes non-halibut species as well. For CDQ halibut in particular, NMFS calculates an annual standard price using the same Bering Sea port group prices calculated under the Observer Fee Program, which itself is based on the annual IFQ Registered Buyer Ex-Vessel Volume and Value Report. The CDQ halibut value estimate is combined with value estimates of other CDQ species to arrive at a total value and calculate the fee percentage. For 2020, the CDQ cost recovery fee percentage was 0.84%, up from 0.70% in 2019, 0.66% in 2018, and 0.55% in 2017. The total ex-vessel value of CDQ fisheries – which, again, are comprised mostly of non-halibut species – was $66.9 million in 2020, which was a decrease from $77.7 million in 2019, $86.1 million in 2018, and $81.7 million in 2017.[71]

The state and municipal taxes that apply to commercial halibut landings include the Fisheries Business Tax ("raw fish tax") that the State of Alaska collects from shore-based and floating processors (3% and 5% of ex-vessel value, respectively). Revenues from this tax are shared between the State and the localities where the tax was first collected. Alaska also levies a Seafood Marketing Assessment of 0.5% on all seafood processed or first landed in Alaska and any unprocessed fishery products exported from the state. The state collects this tax from the processor or fisherman who exports the resource from Alaska. Processors or fishermen who produce less than $50,000 worth of seafood products during the year are exempt. Municipal fish taxes are also collected in 14 Alaska communities and four boroughs (Aleutians East, Bristol Bay, Kodiak Island, and Lake & Peninsula). Most municipal taxes are set at 2.0% but range from 1.5% to 3.5%.[72] Note that CPs (Category A halibut QS) do not pay taxes that are based on landings of raw fish. CPs would be responsible for the Alaska's Fishery Resource Landings Tax which is levied on fish processed outside the 3-mile limit but within the U.S. EEZ and is first landed in Alaska. That levy is currently set at 3% of the estimated unprocessed value of the resource and is also eligible for sharing with the municipalities or boroughs where the fishery resource was first landed.

Harvesting vessels and processors that are not part of the full observer coverage category – i.e., halibut CVs and the inshore processors who receive their landings – are also responsible for a joint payment of 1.6% of ex-vessel value that goes toward the administration of the North Pacific Observer Program's partial coverage category (including electronic monitoring).

4.5.1.4 Halibut discard mortality in the commercial halibut fishery

The commercial IFQ fishery, itself, incurs halibut bycatch mortality. The IPHC describes this as incidental mortality of halibut in the directed commercial fishery that do not become part of the landed catch. The three sources of discard mortality include (1) fish that are caught but discarded because they are below the legal size limit of 32 inches, (2) fish that are discarded for regulatory reasons (e.g., the

[71] https://www.fisheries.noaa.gov/resource/document/community-development-quota-cdq-cost-recovery-reports

[72] The 2019 Alaska Taxable Report, Volume LIX (Jan. 2020) is available at https://www.commerce.alaska.gov/web/Portals/4/pub/OSA/Official%202019%20Alaska%20Taxable.pdf. There, the reader can refer to Table 1A ("Reported Tax Rates for Each Municipality") for local raw fish taxes rates and revenues in 2019. The 2019 Alaska Taxable Supplemental Report, Volume LIX (Jan. 2020) is available at https://www.commerce.alaska.gov/web/Portals/4/pub/OSA/Full%20Supplemental.pdf. The Supplement provides greater detail at the community level, including whether a community imposes a raw fish tax and how much tax revenue was generated under that tax in 2019.

vessel has exceeded the amount of IFQ pounds that are possessed onboard), and (3) fish that are estimated to die on lost or abandoned fishing gear.[73] Information on lost gear and regulatory discards is collected through logbook interviews and fishing logs mailed to IPHC. The ratio of U32 to O32 halibut is determined from the IPHC Setline Survey in all areas off Alaska. Different mortality rates are applied to each category: mortality for released halibut is 16% and mortality for halibut estimated to be caught on lost gear is 100%.

Table 4-15 shows commercial halibut discards in all Alaska IPHC areas from 2009 through 2020. In 2019, all areas except for 3B experienced an increase in discard mortality relative to the preceding years. In 2020, commercial discards declined markedly in Areas 2C, 3A/B, and 4A, but held constant with the 2019 upticks in Areas 4B and 4CDE. On average, Area 4 accounted for 15% of the annual commercial discards that occurred from 2009 through 2020 across all Alaska areas. For comparison, total state-wide commercial IFQ halibut bycatch mortality was equal to 5.6% of the commercial catch by volume from 2009 through 2020 (16.0 million lbs. compared to 285.9 million lbs.). For those years, that relationship was highest in 2010 (6.9%) and lowest in 2020 (3.4%).

Table 4-15 Halibut discard mortality (net weight tons) in the Alaska commercial IFQ fishery and percent relative to total commercial halibut catch, by area , 2009 through 2020 (Source: IPHC)

Area	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
2C	138	118	38	43	50	54	55	56	39	27	36	29	57
3A	533	658	422	269	235	201	236	171	157	129	160	85	271
3B	361	410	349	239	183	148	98	105	106	94	74	44	184
4A	71	63	65	43	32	16	36	24	30	31	47	38	41
4B	8	17	20	17	16	25	16	27	14	9	17	16	17
4CDE	41	43	87	34	25	24	24	29	13	12	34	36	33
Total	**1,152**	**1,308**	**980**	**645**	**542**	**468**	**464**	**414**	**360**	**302**	**368**	**248**	**604**
% Comm. Catch	**5.8%**	**6.9%**	**6.8%**	**5.7%**	**5.4%**	**6.2%**	**5.9%**	**5.2%**	**4.2%**	**4.0%**	**4.5%**	**3.4%**	**5.6%**

4.5.2 Processing component

Shore-based processors accounted for over 99% of the processing of the Area 4 halibut catch from 2010 through 2019. The average annual ex-vessel value of halibut processed shoreside was $24.8 million (2018$), though the total value was low in 2018 and 2019 compared to the period as a whole – $14.7 million and $15.5 million, respectively. The balance of the processing activity involved two catcher/processor vessels registered to Seattle-based companies that were primarily involved in the Pacific cod fishery (catch data confidential), one catcher/processor registered to Petersburg, AK (catch data confidential), one vessel that was classified by its self-reported processor code as a direct marketer catcher/processor (catch data confidential), and 19 operations defined in AKFIN data as catcher-sellers that marketed their own unprocessed catch (total 2010-2019 catch was less than 400,000 lbs. with a combined estimated ex-vessel value of roughly $1.3 million in inflation-adjusted 2018$). Almost two-thirds of the non-shore-based activity that occurred in Area 4 during the analyzed period took place in Areas 4A and 4B during 2010 and 2011.

The shore-based processors that received halibut during the analyzed period for which revenue data are available were located in 22 Alaska communities, but seven of those operations processed halibut in fewer than half of the studied years. As noted in Section 5.3 of the SIA Appendix, Area 4 halibut was processed every year in 11 Alaska communities. Within the BSAI area, those communities included Adak, Akutan, Unalaska/Dutch Harbor, St. Paul, Nome/Savoonga, and Twin Hills (Togiak area). Communities elsewhere included Anchorage, Homer, King Cove, Kodiak, Sand Point, and Seward. In 2019, Area 4 halibut was processed in 13 communities, eight of which are adjacent to the BSAI area. Six

[73] IPHC fishery statistics (2020) published for the January 2021 IPHC Annual Meeting; available at https://iphc.int/uploads/pdf/am/am097/iphc-2021-am097-05.pdf.

of the eight communities that processed Area 4 halibut in fewer than half of the years were located in communities that are affiliated with the CVRF CDQ group; those operations were active from 2010 through 2013 but not since. The other communities with inconsistent processing participation were Togiak (BBEDC CDQ region), where halibut processing has occurred in all covered years since 2016, and False Pass (APICDA CDQ region), where halibut processing occurred in 2010, 2011, 2014, and 2015.

The average number of Alaska shore-based processing facilities the received Area 4 halibut in a given year from 2010 through 2018 was 24.2, ranging from a high of 29 in 2011 to just 20 in 2016. Over the period, 37 unique facilities processed shoreside halibut deliveries from the Area 4 fishery. In the average year, just below half of the shore-based facilities that processed Area 4 halibut (average of 11.4 shore-based processors) were located in communities adjacent to GOA waters (i.e., Kodiak, Homer, King Cove, Sand Point, Seward, and Anchorage).

While facilities located adjacent to the BSAI accounted for roughly half of the Alaska processors that received Area 4 halibut, those facilities combined to account for 86% of the combined Alaska-landed ex-vessel value derived from the CV fishery during the analyzed period. By CDQ region, processors in the APICDA and CBSFA regions combined to account for 81%, NSEDC and BBEDC together accounted for 3%, CVRF accounted for 2%, while facilities in GOA communities accounted for 15%. Processed volume and value cannot be further disaggregated to the community level due to confidentiality restrictions.

The shore-based processors that received Area 4 halibut deliveries over this period processed a total average annual ex-vessel value (all species, coming from multiple areas and gear types) of around $560 million (2018$), meaning that Area 4 halibut accounted for roughly just 4.4% of the plants' total activity as measured by ex-vessel. Among this group of processors, as defined by regional location, the GOA facilities were the least dependent on Area 4 halibut (~1.5% of average annual ex-vessel value). When operating, the facilities in the CVRF region were almost entirely reliant on Area 4 halibut (>99%). Facilities in the APICDA/CBSFA regions (combined) generated roughly 16% of ex-vessel value from Area 4 halibut. Facilities in the NSEDC/BBEDC regions (combined) generated roughly 7% of ex-vessel value from Area 4 halibut. The total ex-vessel value of all processing by all plants in the communities where Area 4 halibut were processed had an average annual value of $733 million (2018$); the value of ex-vessel payments for Area 4 halibut equate to 3.4% of that total.

The 20-Year Review found that the IFQ Program fundamentally changed processing needs in the halibut IFQ fishery, shifting from a primarily frozen to a majority fresh market – though that shift was experienced mainly in geographies outside of Area 4 (NPFMC 2016). After the implementation of IFQs, most processors that were engaged in the halibut fishery increased diversification in non-IFQ species. Processors who were interviewed for the 20-Year Review noted that diversification included entering into other fisheries, increasing processing of species that they had previously been processing, focusing on value added products, and entering into custom processing arrangements. Processors adjacent to the BSAI/Area 4 that derive the majority of their revenue from high-volume groundfish fisheries and crab were less likely to modify halibut operations in a manner similar to what has been observed in some facilities that are relatively more engaged in the Areas 2C and 3A halibut fisheries.

The 20-Year Review also noted that IFQ Program implementation likely caused a shift in the relative bargaining power between harvesters and shore-based processors (Matulich and Clark, 2003; Fell and Haynie, 2011; 2013). Analysis of price margins between wholesale and ex-vessel prices indicates that halibut processor price margins have decreased over time as a result of the harvesting sector receiving 100% of the fishery's quota share (NPFMC 2016, Section 2.4.2.3). Processor representatives who were interviewed as part of the review process listed the top impacts of the IFQ program. Most of those impacts bear on bargaining power and the relative share of economic rents derived from the halibut fishery. They include: devaluation of capital investments; the creation of surplus capacity (freezing and ice-making capacity that was less needed after the elimination of the pre-IFQ derby fishery); changes in relationships between processors and fishermen; changes in landings patterns; diversification into other fisheries and different product types; and previously active processors going out of business (especially in rural communities without access to transportation services). Again, some of these generalized impacts are more reflective of the post-IFQ experience in GOA communities where processors were not already focused primarily on high-volume groundfish fisheries. Processors also noted that the total volume of IFQ landings has generally trended downwards in the years since program implementation (Figure 4-6).

Those shore-based processors that remain engaged in the Area 4 halibut fishery are, in many cases, processing halibut as a side-line, using halibut deliveries as a means to keep workers utilized during gaps in deliveries from other fisheries, engaging in custom processing for buyer-exporters, or partnering with CDQ groups to provide a market for a local small-vessel fleet. One of the IFQ Program's positive impacts that was noted by processor interviewees was steadier and longer employment for the processing workforce.

4.5.3 Halibut IFQ/CDQ crew

The IFQ Program 20-Year Review (NPFMC 2016) estimated average crew size for CVs fishing for halibut at two to four persons. The range captures the difference between vessel categories B, C, and D, which spans vessels over 60' LOA to open skiffs. While this vessel-based crew estimate is small relative to A80 groundfish CPs, it is similar to the Fish Ticket-based average annual median crew estimates for trawl and fixed gear CVs of four persons. A likely range for the number of individuals who work as crew each year in the Area 4 halibut CV fishery is between 420 to 840. This range is derived from the average crew size (2 to 4) and the average number of CVs fishing in the area annually during the 2010 through 2019 period (211; citing Table 12 within SIA Section 5.2). The true number of unique individuals who crew in the Area 4 IFQ fishery in a given year is not known due to incomplete data collection on crew size. The analysts presume that the true value is closer to the high end of the range because B and C class vessels are unlikely to operate with a crew of two persons. The true value is likely not at the extreme high end of the range because a simple multiplication of average crew size and average vessel count does not adjust for the unknown number of individuals who crew on multiple vessels in a given year. The 20-Year Review cites a 2001 study finding that typical IFQ CV crew size had decreased from a range of three to six individuals before IFQ implementation. The decrease was attributed to greater use of auto-baiters and the slower pace of the fishery (Hartley and Fina, 2001).

Specific data on crew compensation was identified as a data gap in the 20-Year Review and is also listed as a category of unavailable information in Section 4.5.4 of the SIA. As such, the analysts cannot estimate crew shares as a percentage of ex-vessel revenues or average crew earnings. The 20-Year Review relied on previous research as well as information gathered at an IFQ crew workshop held in conjunction with a Council meeting in April 2016 (Anchorage, AK). Implementation of the IFQ Program in 1995 is estimated to have decreased the total number of crew jobs by several thousand due to quota share consolidation, the exit of vessels from the fisheries, and quota shareholders consolidating IFQ permits onto fewer vessels. The 20-Year Review concluded that the decline in the number of available crew jobs and an overall shift away from vessel owners' needs for manpower reduced the bargaining strength of crewmembers relative to vessel owners. Vessel operators that lease quota or fish as a hired master for an initial quota share recipient may also deduct quota fees from gross revenues, thus reducing crew compensation. For those crew who have remained in the fishery, average seasonal earnings are likely to have increased under the IFQ Program due to the longer season and more quota available to catch on the reduced number of vessels that remained in the fishery. The Review concluded that crewmembers who remained in the fishery likely have higher paying, more stable, and safer jobs. Since the most dramatic effects of IFQ consolidation occurred in the fishery several decades ago, the annual income of crewmembers who are currently active in the fishery is mostly driven by the amount of TAC available for harvest on their vessel and the effects of lease rates when the vessel is fishing quota that is not owned by the vessel operator or active crewmembers onboard.

The 20-Year Review includes a summary of discussions at the April 2016 IFQ crew workshop (NPFMC 2016, Section 2.4.1). That summary provides anecdotal references to how crew share percentages have changed over time and as a result of quota leasing arrangements. The workshop summary noted that before the IFQ Program crewmembers were making a 9% to 15% share of gross ex-vessel revenues. In most cases, operating costs were deducted from the gross before determining boat-, captain-, and crew-shares. The implementation of IFQs led to a wider variety of compensation modes based on whether the participant is an initial quota share recipient, acquired additional quota share, or largely operates as a hired skipper/lessee. For instance, some initial recipients deduct lease fees from gross revenues for initially allocated quota while others do not. For those that do not apply a lease fee, crew shares were reported to range from 8% to 20% of gross ex-vessel revenues. Operators who do apply a lease fee for initially allocated quota were said to set those fees between 15% and 30%, meaning that operating costs and other shares were dividing 70% to 85% of fishing revenues. Operators who purchased quota typically deduct a fee from the gross revenue, and the standard lease fee has grown over the life of the program to around 50%/50% or 60%/40% (with the greater percentage going to the quota owner). The workshop summary reports that operations with a mix of initially allocated and purchased quota share paid crew shares in the range of 6% to 15% of the gross ex-vessel revenue. Operators that were strictly hired skippers or lessees paid crew shares in the range of 3% to 8% of the gross. Operating costs that are related to boat expenses that did not exist before IFQs are also being deducted from gross revenue; for example, some individuals reported that auto-baiter costs were being accounted for in the boat share. In general, the Review found that crew shares as a percentage of gross ex-vessel revenues have decreased since IFQ implementation.

4.5.4 Subsistence and Sport Halibut Use in the BSAI

Subsistence and sport uses of halibut in BSAI communities are described in detail in the SIA Appendix. Impacts relative to subsistence and sport users are discussed in Section 5.5 of this DEIS. Within the SIA Appendix, subsistence use is described in SIA Section 5.4, and in the subsections to SIA Section 6 that address each CDQ region individually (subsections titled "Engagement in the Subsistence BSAI Halibut Fishery"). Sport uses of halibut in the BSAI are described in SIA Section 5.5.

The IPHC's 2019 annual fishery statistics report (Erikson & Tran 2021) lists estimated subsistence and recreational mortality by IPHC Areas. Table 21 in Section 5.4.3 of the SIA lists subsistence estimates from 2010 through 2019 based on the IPHC's reports. Within Area 4, 4E tends to take the largest amount. The 4E estimate for 2018 and 2019 (estimated biennially) was 25,160 lbs., compared to 13,237 lbs. in 4A, 5,152 lbs. in 4C, and 1,684 lbs. in 4B.

Halibut is one of the primary sources of wild food throughout the western Alaska CDQ regions. Some exceptions are interior remote areas and communities on St. Lawrence Island (part of the NSEDC CDQ region) that rely primarily on marine and terrestrial mammals. Even residents in the communities that do not directly harvest halibut for subsistence use the resource as they might receive it through gift or trade, or individuals might travel to harvest halibut in an area that is different from where they reside. CDQ groups have also supplied communities with halibut in circumstances of uncommon food shortage, such as failed marine mammal harvests or natural events that spoiled caches of other stored foods.

Sport uses include both unguided and commercially guided (charter) recreational halibut fishing. ADF&G only documents unguided recreational harvest in five of their management areas that geographically overlap the BSAI. Three of those management areas are in ADF&G's Southcentral region and two are in the Arctic-Yukon-Kuskokwim region. Aside from the Alaska Peninsula/Aleutian Islands area (Area R), recreational catch of halibut is reported in very low numbers (estimated at fewer than 50 fish per year, and often zero fish per year). Charter operations are not numerous Area 4. A 2013 ADF&G estimate found that charter operations in Area 3B and Area 4, combined, represented less than 0.4 percent of Alaska's total charter/non-charter recreational yield. AFSC's Alaska Community Profiles, with data available through 2014, found that the only charter operations were in Unalaska/Dutch Harbor. Fieldwork conducted in Unalaska by NPFMC staff and a contractor in July 2019 found that there are currently two part time charter operators and one ecotourism-focused business that reported having offered recreational fishing opportunities in the past.

5 Impacts of Alternatives: Amendment 80 fishery, halibut stock, and Directed halibut fishery (including direct, indirect, and cumulative)

5.1 Documents incorporated by reference in this analysis

This FEIS relies heavily on the information and evaluation contained in previous environmental analyses, and these documents are incorporated by reference. The documents listed below contain information about the fishery management areas, fisheries, marine resources, ecosystem, social, and economic elements of the groundfish fisheries. They also include comprehensive analysis of the effects of the fisheries on the human environment and are referenced in the analysis of impacts throughout this chapter.

Alaska Groundfish Harvest Specifications Final Environmental Impact Statement (NMFS 2007).
This EIS provides decision makers and the public an evaluation of the environmental, social, and economic effects of alternative harvest strategies for the federally managed groundfish fisheries in the GOA and the Bering Sea and Aleutian Islands management areas and is referenced here for an understanding of the groundfish fishery. The EIS examines alternative harvest strategies that comply with Federal regulations, the Fishery Management Plan for Groundfish of the GOA, the BSAI FMP, and the MSA. These strategies are applied using the best available scientific information to derive the TAC estimates for the groundfish fisheries. The EIS evaluates the effects of different alternatives on target species, non-specified species, forage species, prohibited species, marine mammals, seabirds, essential fish habitat, ecosystem relationships, and economic aspects of the groundfish fisheries. This document is available from:

http://alaskafisheries.noaa.gov/analyses/specs/eis/default.htm.

Stock Assessment and Fishery Evaluation (SAFE) Report for the Groundfish Resources of the BSAI (NPFMC 2020).
Annual SAFE reports review recent research and provide estimates of the biomass of each species and other biological parameters. The SAFE report includes the acceptable biological catch (ABC) specifications used by NMFS in the annual harvest specifications. The SAFE report also summarizes available information on the ecosystems and the economic condition of the groundfish fisheries off Alaska. This document is available from:

http://www.afsc.noaa.gov/refm/stocks/assessments.htm.

Final Programmatic Supplemental Environmental Impact Statement (PSEIS) on the Alaska Groundfish Fisheries (NMFS 2004).
The PSEIS evaluates the Alaska groundfish fisheries management program as a whole and includes analysis of alternative management strategies for the GOA and BSAI groundfish fisheries. The EIS is a comprehensive evaluation of the status of the environmental components and the effects of these components on target species, non-specified species, forage species, prohibited species, marine mammals, seabirds, essential fish habitat, ecosystem relationships, and economic aspects of the groundfish fisheries. This document is available from:

http://alaskafisheries.noaa.gov/sustainablefisheries/seis/intro.htm.

5.2 Impacts on the halibut stock

Impacts to the halibut biomass under all of the alternatives are expected to be similar and result in no impact to SSB. The IPHC's SPR-based management approach is expected to conserve spawning biomass across differing patterns in fishery selectivity and/or allocation among different fisheries. As such, there is likely to be little difference among the average future halibut spawning biomass under levels of PSC anticipated across all of the alternatives including status quo.

Closed loop model simulations are useful for context in modeling the halibut population and for exploring uncertainties. As described in Section 4.3.2, major population uncertainties for projecting halibut population estimates forward include weight-at-age, migration, and environmental variability (such as the PDO) on recruitment. Closed loop simulation results from previous analyses and described in Section 4.3.2 are consistent with the conclusion that given the IPHC's SPR management policy there are no expected impacts to SSB. The SSC concurred in April 2021 and noted that the estimated model uncertainty may be underestimated due to the limited treatment of recruitment scenarios related to the Pacific Decadal Oscillation and of historical variability of body weight-at-age projected forward. The April 2021 SSC report stated 'Although a closed loop simulation is helpful to understand the effects of potential lags in information use and observation uncertainty, even without this information, the SSC supports the general conclusion that there is likely to be little difference among the average future halibut spawning biomass under different levels of PSC…"[74].

5.3 Impacts to Amendment 80 groundfish and directed halibut fisheries

5.3.1 Approach to revenue estimates

The revenue estimates for the A80 fishery and the directed halibut fishery sectors are estimated separately using different methodologies, and are meant to help compare impacts across alternatives *within* each sector. They should *not* be used to compare impacts across sectors, especially since this action would regulates only bycatch from the A80 sector and would not regulate the directed halibut sector. Revenue estimates in this section are reported in gross first wholesale value for A80 and ex-vessel value for BSAI commercial halibut. Total halibut revenues are also reported in terms of estimated wholesale values, as requested in previous reviews. This is not a straightforward calculation due to limited data sources, as described in Section 4.5.1.1. The analysts do not attempt to present an analogous conversion of A80 wholesale revenue to ex-vessel value. Section 3.3.2 described the analysts' position on why ex-vessel values are not an appropriate unit to characterize revenues for a catcher/processor fishery. In short, there is no actual ex-vessel transaction price generated from the sale of raw fish by an A80 harvester to a primary processor. Also, the variety of species that make up A80 fishery catch – and their different value-added profiles and recovery rates – reduce the accuracy of any proxy ex-vessel value estimate that is based on a common conversion factor (multiplier).

The revenue estimates reported in this section do not represent the full scope of the economic impacts associated with the proposed action alternatives. This document does not incorporate generally understood but poorly quantified economic multipliers that would allow for an estimate of the total economic contributions of the A80 fishery or the directed halibut fishery in terms of output, income, employment or other economic measures. The broad, downstream economic impacts of commercial fishing can be understood and appreciated without drawing an equivalency between metrics or existing studies that have fundamentally different scopes. Previous studies have estimated economic multipliers for the A80 fishery and quantified economic contributions across multiple geographic regions.[75] More

[74] April 2021 SSC Report

[75] For example, Waters et al. (2014) estimated that the "A80 H&G sector's $281 million of first wholesale revenues produced in 2008 generated approximately $1 billion of total output and accounted for an estimated 6,800 total jobs in Alaska, the West Coast and the rest of the US (including the H&G sector's estimated 2,200 total employees)." The paper also estimated the impacts of a reduction in revenues from 2008 to 2009 of $41 million, or 14.5%, resulting in an estimated reduction of $150 million in total output, distributed as $72 million in Alaska, $26 million in the west coast and $52 million in the rest of the US. This change in total output generated estimated reductions of $82 million in total value added, $41 million in total labor income, $50 million in total household income, $12 million in total state and local government revenue, and about 1,000 total jobs in the three regions. The analysts of this document would surmise that the multipliers cited in the study, based on 2008 and 2009 data, likely underestimate the economic impact of the A80 sector in its current form as the fleet has increased its efficiency and productivity through vessel modernization and full cooperative participation since that time.

current models are being developed by both the Alaska Fisheries Science Center (Seung, et al. 2020) and the International Pacific Halibut Commission (Hutniczak 2020) to estimate economic multipliers that are specific to Alaska fisheries. These models employ a similar methodology, extending an input-output (IO) model to a multi-regional social accounting matrix (MRSAM) that links across industries to estimate the total economic impacts of an economic shock – in this case, increased or reduced harvesting revenues.

The AFSC model (Seung, et al. 2020) is a 10-region social accounting matrix that estimates impacts across six southwest Alaska boroughs and census areas (Aleutians West Census Area, Aleutians East Borough, Lake and Peninsula Borough, Bristol Bay Borough, Dillingham Census Area, and Kodiak Island Borough) as well as the rest of the State of Alaska, the West Coast (Washington, Oregon and California), the rest of the U.S., and a "region" representing at-sea catcher-processors and motherships operating in Southwest Alaska-region waters (Western Bering Sea, Aleutian Islands and Gulf of Alaska). This is an update of a previous 3-region model (Seung and Miller 2018) that will more accurately represent impacts on smaller, fishing-dependent areas such as boroughs and census areas or fishing communities. In order to characterize impacts at a community scale, researchers conducted primary data collections in the form of surveys and key informant interviews to collect specific information on employment, revenues and expenditures (intermediate inputs) by participating vessels and processors. The SSC reviewed the previous 3-region version of the MRSAM model during its February 2020 meeting and noted that the authors no longer considered the 3-region model appropriate for use in Council analyses. The SSC requested the opportunity to review the 10-region version of the model before it is used in any analyses of Council actions.

The IPHC adopted a similar methodology to develop a MRSAM model, the Pacific Halibut Multiregional Economic Impact Assessment (PHMEIA). The PHMEIA will describe economic interdependencies between sectors and regions with the specific purpose of assessing the economic contribution of the Pacific halibut resource to the economy of the United States and Canada (Hutniczak, 2020). The PHMEIA models impacts across six regions: Alaska, the West Coast (WA, OR and CA), British Columbia, the rest of the US, the Rest of Canada and the Rest of the world. Preliminary results were presented at the 2021 IPHC Annual Meeting.[76] However, the principal investigator notes that:

> *"…the current version of the model is based solely on secondary data sources. As such, the results are conditional on the adopted assumptions for the components for which data were not available. In order to improve the accuracy of the assessment, the IPHC intends to incorporate into the model primary economic data collected directly from members of Pacific halibut dependent sectors… The subsequent revisions of the model incorporating IPHC-collected data will bring improved estimates on the Pacific halibut sectors' economic impact."* (Hutniczak, 2020).

The IPHC is currently conducting primary data collection in the form of surveys to commercial harvesters, processors, and charter business owners. The addition of primary data from the survey results is expected to substantially improve the accuracy of the model, particularly regarding modeling the linkages and variations between regions (B. Hutniczak, personal communication, March 1, 2021). Additionally, the in-progress PHMEIA model estimates economic impacts based on region wide shocks

[76] "The preliminary results suggest that the region-wide Pacific halibut commercial fishery's total estimated impact in 2018 amounts to USD 281 mil. (CAD 364 mil.) in GDP, USD 176 mil. (CAD 228 mil.) in labor income (including estimated USD 21.5 mil. (CAD 27.9 mil.) in wages in the Pacific halibut fishing sector), 4,453 in jobs, and USD 179 mil. (CAD 232 mil.) in household income, and over USD 666 mil. (CAD 863 mil.) in output. This is about 5.1 times the fishery output value of USD 129 mil. (CAD 168 mil.) recorded for 2018 (DFO, 2020; NOAA, 2020a). The estimate is the total economic impact, the sum of the direct, indirect, and induced effects from changes to the Pacific halibut fishing sector, as well as indirect and induced effects associated with forward-linked industries (e.g., the Pacific halibut processing sector) … These results are based on **the current version of the model incorporating only secondary data sources**. As such, **the results are conditional on the adopted assumptions for the components for which data were not available and are subject to change"** (Hutniczak, 2020).

which may be less informative to the relative impacts of action alternatives that are specific to Area 4CDE.

Given the preliminary state of both the AFSC (10-region SAM) and IPHC (PHMEIA) models, and pending SSC review that was requested, these models are not used to estimate regional economic impacts for this analysis.

5.3.2 Amendment 80 impacts

5.3.2.1 Analytical approach for Amendment 80 revenue estimates

The analysts used a resampling approach to estimate a range of potential annual revenue totals for the A80 groundfish fishery under various PSC limits. The underlying data used for this analysis are NMFS observer data and NMFS Catch Accounting data that include date, groundfish target, mt of groundfish catch, wholesale value in 2018 dollars, and halibut PSC in mt for each haul by A80 vessels from 2010 through 2019 (see **Table 5-1** for annual summaries of data). In 2015, as part of an Exempted Fishing Permit, deck sorted halibut were reported through logbooks rather than the observer data; therefore, 2015 data at the haul level are not comparable to other years and are excluded from this analysis. In this section, when a time period of data is referred to as 2010-2019 it is actually 2010-2014 and 2016-2019.

Table 5-1 Annual totals of the underlying haul-by-haul data used for the revenue estimation. *2020 data are preliminary and revenue data are not yet available.

Year	Groundfish catch (mt)	Wholesale value ($ 2018)	PSC (mt)	Hauls
2010	305,241	323,870,339	2,254	12,507
2011	302,157	385,153,549	1,810	11,163
2012	307,406	397,530,330	1,944	10,892
2013	306,775	307,582,132	2,166	11,338
2014	308,022	316,928,372	2,178	11,702
2015	Not used due to reporting structure			
2016	298,449	306,505,259	1,412	14,167
2017	278,771	359,357,539	1,167	13,821
2018	290,173	379,443,654	1,343	15,908
2019	288,302	335,260,125	1,458	16,574
2020*	290,382	Not available	1,097	14,430

For hauls before 2015 or from 2016-2019 where deck sorting was not utilized, haul-level PSC is estimated by applying the appropriate DMR to the observed incidental catch of halibut in the factory (See Section 3.4.1for description of halibut DMR estimation methods and DMRs). For hauls where deck sorting occurred, halibut PSC is calculated as the sum of the estimates of the mortality observed on deck and in the factory. For the deck mortality estimate, the observer identifies the viability of the halibut in a simple random sample and applies a weighted average DMR based on the weight of halibut at each viability level.[77] For factory halibut mortality, the weight of halibut in an observer's species composition samples in the factory are extrapolated to the entire haul. In 2015 through 2017, a standard DMR of 90% was applied to the halibut recovered in the factory. Beginning in 2018, a DMR is applied to the halibut recovered in the factory based on DMRs published in harvest specification tables in the **Federal Register** (Section 3.4.1).

The haul-level wholesale value is calculated by multiplying a round wholesale value to the weight of catch by species as reported in Catch Accounting. The round wholesale value is estimated by matching the price reported in COAR Production by product type, species and processor to the weekly production

[77] The conditional mortality probabilities for halibut sorted on deck are 20% for "Excellent," 55% for "Poor," and 90% for "Dead"

reports (WPR). If a match at the processor, species and product type is not achieved then an algorithm matches at different levels of aggregation of products and species from the same processor. If products are still not priced then the algorithm will look for matches across other processors and further aggregate products and species. The WPR include the product weight and round weight, allowing the COAR price to be converted to a round wholesale value in the WPR that is then applied to the Catch Accounting weight.

From the haul-by-haul data, the analysts randomly sampled hauls without replacement and summed the combined wholesale value, groundfish catch, and halibut PSC until either the total halibut PSC reached the PSC limit or the total groundfish catch reached a predetermined limit (representing a hypothetical groundfish catch limit that is in the range of recent TAC and catch history). The total wholesale value summed across hauls when the PSC limit or groundfish catch limit is reached is the estimated annual revenue for the A80 fleet under that specific PSC limit. Under this random sampling method, hauls are selected at random regardless of when they occurred throughout the year. In scenarios when the annual effort is reduced, it is reduced proportional to the temporal distribution of the underlying data; therefore, the likelihood of selecting hauls from any given month is based on the level of effort (number of hauls) in that month, regardless of the order in the year. This resampling was repeated 500 times creating 500 different combinations of resampled hauls, or "years," under each PSC limit. Nine PSC limits are used in these resampling scenarios ranging from 960 mt to 2,007 mt, corresponding to limits that are specified in the look up table for each alternative (**Table 5-2**).

Table 5-2 PSC limits used in revenue estimates and the associated Alternatives and look up table states

PSC limit	960	1047	1222	1309	1396	1483	1571	1745	2007
Alternative(s)	4	4	3	3	2,3,4	2	2	1,2,3,4	3

PSC limits and use varied over the last 10 years (**Figure 5-1**). To capture this underlying variation in the fishery, analysts subset the haul data into five datasets drawing from different time periods that represent different PSC use: (1) Data from 2013-14 were combined to capture the years where PSC was high and revenue was low to provide a lower bound example from the "worst case" in the data, (2) 2010-2014, representing high PSC use years, (3) all years in the data (2010-2019, excluding 2015), (4) 2016-2019 representing low PSC use years, and (5) data from 2017-2018 were combined to capture the years where PSC was low and revenue was high, to provide an upper bound example from the "best case" in the data. Analysts conducted the resampling analyses on each dataset separately. For each time period, analysts varied the groundfish catch limits to reflect maximum groundfish catch in the three most recent years (290,000 mt) and maximum groundfish catch throughout the decade (310,000 mt). This results in a total of ten "scenarios" that represent the range of possible outcomes for each of the nine PSC limits (five time periods or "datasets" x two catch limits).

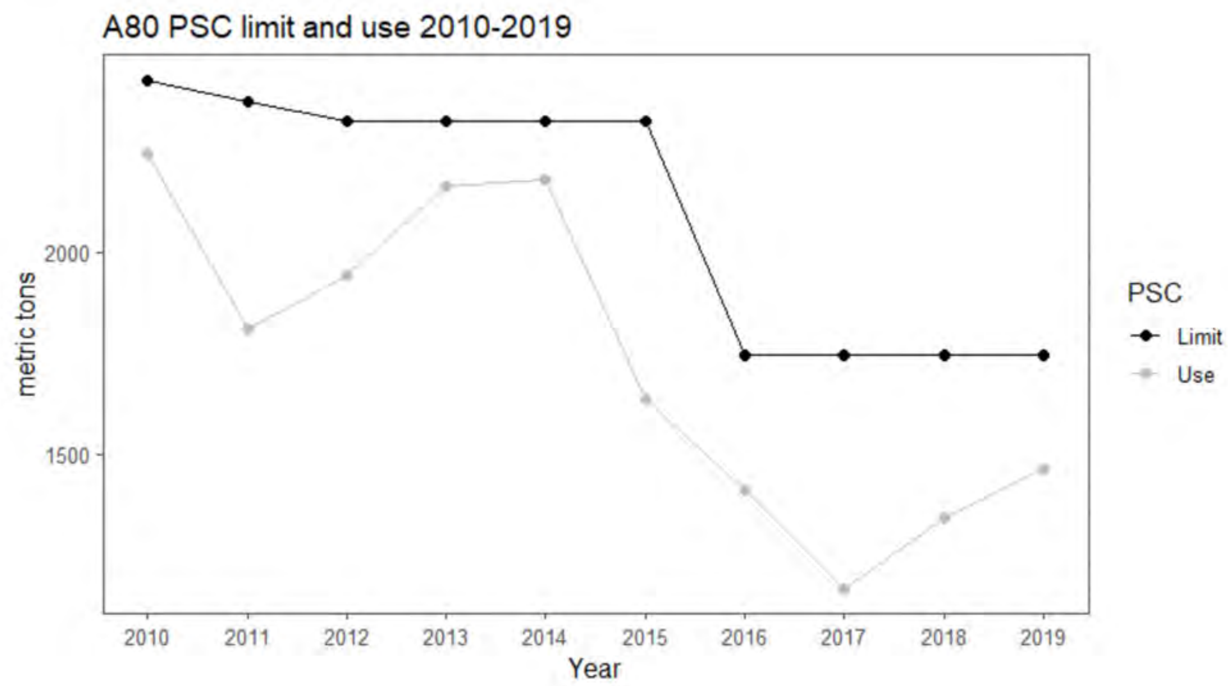


Figure 5-1 PSC limits and PSC use (mt) for the A80 sector, 2010 through 2019

The analysts did not predetermine a relationship between PSC use and the PSC limit to estimate revenue impacts. Rather, hauls were resampled until either the total PSC mortality reached the PSC limit (from the look up tables) or the total groundfish catch reached the groundfish limit (290k or 310k metric tons). This approach functions as an implicit assumption that 100% of PSC use is possible, although 100% PSC use is not met in scenarios where the groundfish limit is met before 100% of the PSC limit is reached. **Figure 5-2** shows the relationship between PSC use and the PSC limit (top panel) and groundfish catch and the groundfish catch limit (bottom panel) in three different scenarios for a PSC limit of 1,745 (status quo). The top panel shows the distribution of PSC use in all scenarios. The PSC limit of 1,745 is represented by the red vertical line. When the grey bar stacks up against the red bar, 100% of the PSC limit was caught and the PSC limit was constraining. This is evident in the high PSC use scenario (2010-2014 data) under either groundfish limit (290k and 310k) and for 2010-2019 data with a 310k groundfish limit. The 2010-2019 data with a 290k groundfish limit is constrained by the PSC limit in some runs, but not all. The lower panel shows the distribution of groundfish catch with the red line representing the groundfish limit. The groundfish limit is constraining in the scenarios where the PSC limit was not constraining (the opposite of the top panel).

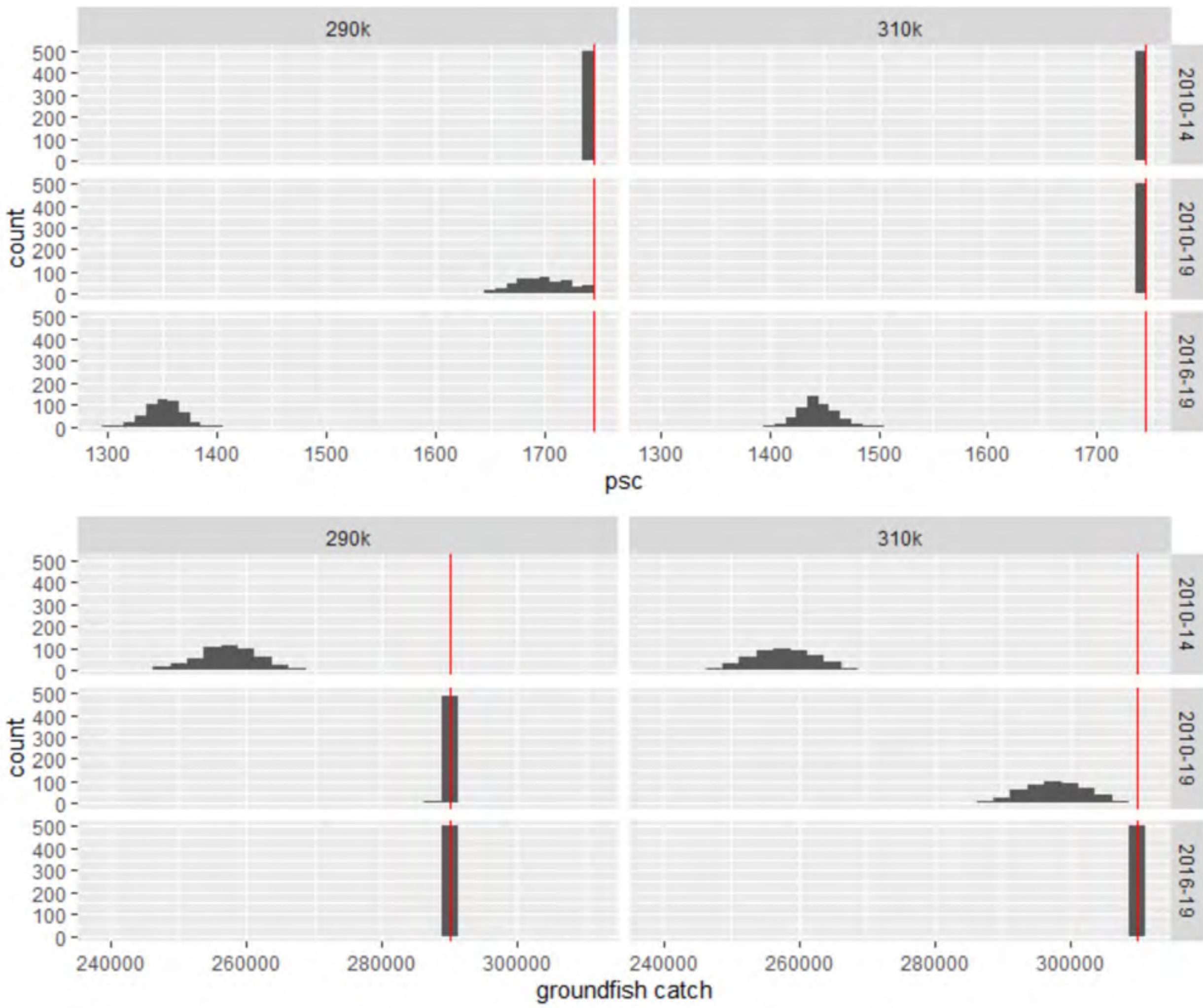


Figure 5-2 Distribution of PSC use (top panel) and groundfish catch (bottom panel) under each imposed groundfish catch limit (290k and 310k) for simulations of the status quo 1,745 mt PSC limit. PSC limit and groundfish limits are indicated by the vertical red lines.

5.3.2.1.1 Stratified random resampling approach

Analysts also completed revenue estimates using a stratified random resampling approach in response to SSC comments at the October 2020 Council meeting. This method stratifies the data by the month in which the haul occurred and resamples a number of hauls equal to the maximum hauls that occurred in that month during the years of the dataset (see **Figure 5-3** for haul by month). Annual total revenues, groundfish, and PSC are summed over hauls in the order of the month in which they occur (starting with January), until the PSC limit or groundfish catch threshold is reached. The stratified sampling approach was used on only three datasets: (1) high PSC use years (2010-2014), (2) all years (2010-2019, excluding 2015), and (3) low PSC use years (2016-2019). The two additional datasets that were used in the random resampling representing “worst case” (2013-2014) and “best case” (2017-2018) scenarios in the data were not analyzed using the stratified random sampling method.

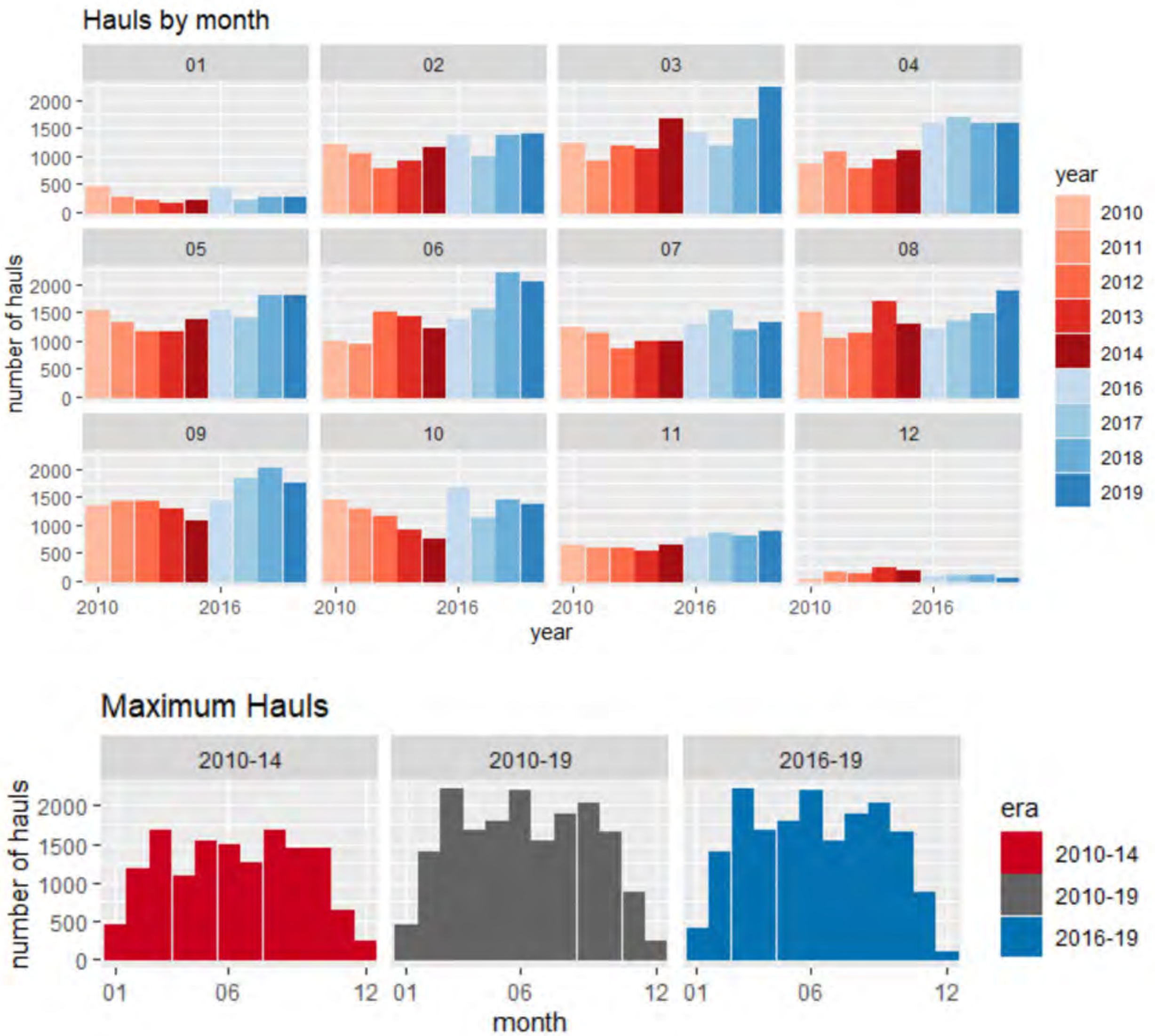


Figure 5-3 **Number of hauls per month by year from 2010 through 2019 (top panel) and maximum hauls by month in grouped datasets from underlying data used for the groundfish revenue analysis (bottom panel)**

Under the stratified sampling method, the represented effort is curtailed from the end of the year (backwards in time) for scenarios where effort is reduced by a PSC constraint. This means that hauls occurring earlier in the year are represented in the resampled data at the same effort levels as in the underlying data; later hauls are sampled at a reduced effort rate, if at all. **Figure 5-4** shows the cumulative groundfish catch and PSC throughout each year, with vertical lines representing the new PSC limits and horizontal lines representing the imposed groundfish limits. In the stratified sampling scenario, the general effect is that hauls are only sampled if they occur below the groundfish threshold and to the left of the PSC limit.

In reality, it is not likely that, under new PSC limits, fishing effort in terms of hauls would continue in the same frequency by month throughout the year as in previous years until constrained by the new limits. However, the stratified approach is included to demonstrate a "business-as-usual" scenario that can be used as an informative benchmark to compare to the results from the random resampling method.

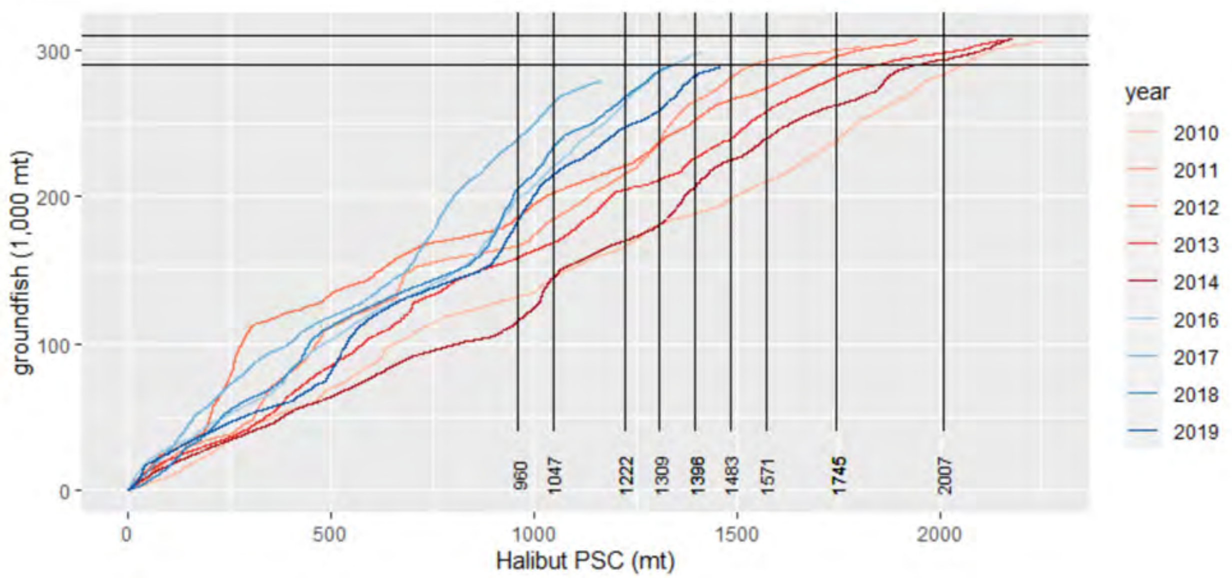


Figure 5-4 Cumulative groundfish catch and halibut PSC for 2010 through 2019. Black horizontal lines represent groundfish limits of 290k and 310k mt; vertical lines represent PSC limits in the Alternatives (look up tables)

Figure 5-5 shows the distribution of hauls by week in the underlying data in the top panel, compared to those of the resampled runs for the scenarios representing the lower and upper bounds under the random approach in the middle panel, and the stratified approach in the bottom panel. The distribution is displayed in kernel density estimates, which can be thought of as a smoothed-out histogram; higher "bumps" correspond to more observations within the fishery data (color) or the simulated results (black). The lower bound is represented by the scenario with a PSC limit of 960 mt (the lowest limit of the alternatives, corresponding to the look up limit under a Very Low setline survey and a Low trawl survey in Alternative 4), a groundfish catch limit of 290,000 mt (the lower of the two groundfish catch thresholds) and data from 2010-2014 (the higher PSC-use years). The upper bound is represented by the scenario with a PSC limit of 2,007 mt (the highest limit of the alternatives, corresponding to the look up limit when both surveys are in a High state in Alternative 3), a groundfish catch limit of 310,000 mt (the larger of the two thresholds) and data from 2016-2019 (the lower PSC-use years). The random resampled data generally follow similar temporal effort distributions as those in the underlying data and there is no substantial difference in distribution between the lower and upper bound scenarios. In the stratified approach it is clear that the early season effort is sampled and the later season effort is not – particularly in the lower bound scenario – although end of the year effort is still slightly curtailed in the upper scenario.

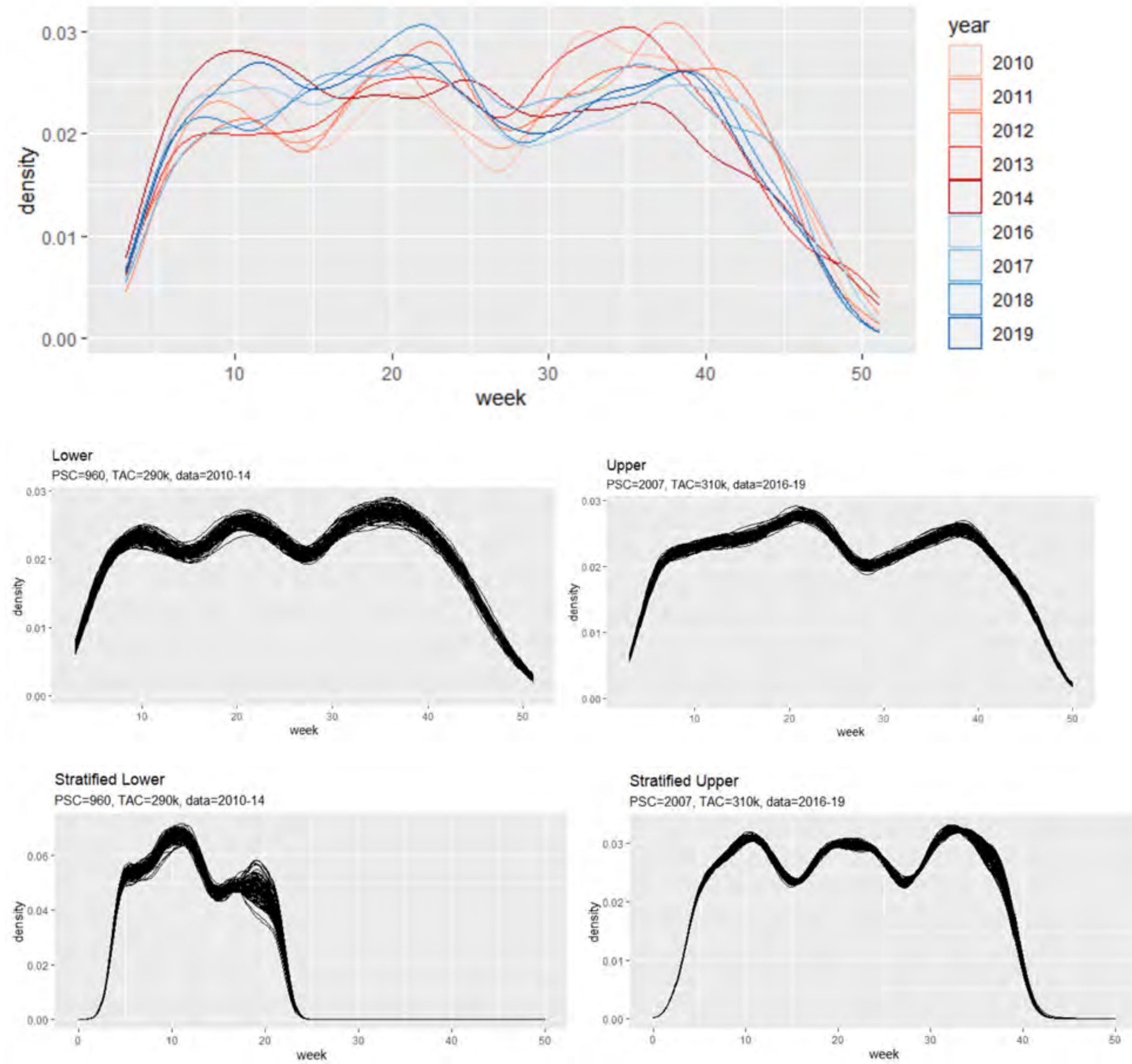


Figure 5-5 Distributions of hauls by week. Top panel = underlying data; middle panels = random sampled runs of lower and upper scenarios; bottom panels = stratified resampled runs of lower and upper scenarios

5.3.2.2 Amendment 80 sector revenue estimate results

The revenue estimates reported in this section should be read for comparison across alternatives. These results are not stand-alone predictions of future A80 revenues under each PSC limit. Harvesters are expected to make strategic choices that are different from the randomized or stratified random selection of hauls used in this analysis. The analysts estimated annual revenue, PSC use, and groundfish catch under a variety of scenarios for each of nine PSC limits identified in the alternatives. These estimates are meant to illustrate the potential impact of different variables on revenue – for example, how changing the groundfish catch limit by 20 mt or changing sector-level PSC use might affect estimated sector-level revenue. The range of estimates under each dataset (years sampled) should be considered when comparing alternatives. The different datasets (2010-14, 2010-19, 2016-19, 2013-14 and 2017-18) represent different levels of PSC use. The relevance of the estimates resulting from each of these datasets depends on numerous variables including, but not limited to, environmental conditions (i.e., aggregation of halibut and overlap with target species) and fleet behavior (i.e., prevalence of halibut avoidance strategies such as deck sorting). It is important for the reader to keep in mind that results are aggregated at the A80 sector level; the distribution of impacts across companies and vessels will certainly differ based on many factors, most notably a company's species allocation portfolio and whether it is relatively more dependent on species that tend to carry a higher halibut PSC rate. Background information on the A80 sector that frames the consideration of internal distributional impacts is provided in Section 3.3.

The results are summarized in the following tables and figures. The specific effects of each variable and sampling method as well as a discussion of the results across alternative and assumptions of the analytical approach are included in the subsections that follow.

Table 5-3 through **Table 5-5**, below, display the average estimated PSC use, revenue, and groundfish catch limit organized by the PSC limits that appear in the alternatives (look up tables). Unsurprisingly, lower PSC limits tend to result in reduced groundfish catch and revenue. Reductions in sector revenues are exacerbated under the high PSC-use datasets (2010-2014, 2013-2014) and minimized in the low PSC-use datasets (2016-19, 2017-18). Output estimates under higher PSC limits are more likely constrained by the groundfish catch limit (as demonstrated by blue shading in the tables) while those under lower PSC limits are more likely constrained by the PSC limit (demonstrated by green shading in the tables).

Figure 5-6 displays estimated revenue by PSC limit for each dataset under both the random and stratified sampling methods and under both considered groundfish limits. Annual totals from the underlying data are indicated by the black text for comparison purposes (10, 11, … 19). Proposed PSC limits are listed on the x-axis for reference. **Figure 5-7** displays the estimated revenue across all PSC limits in each alternative, by dataset, groundfish limit and sampling method.

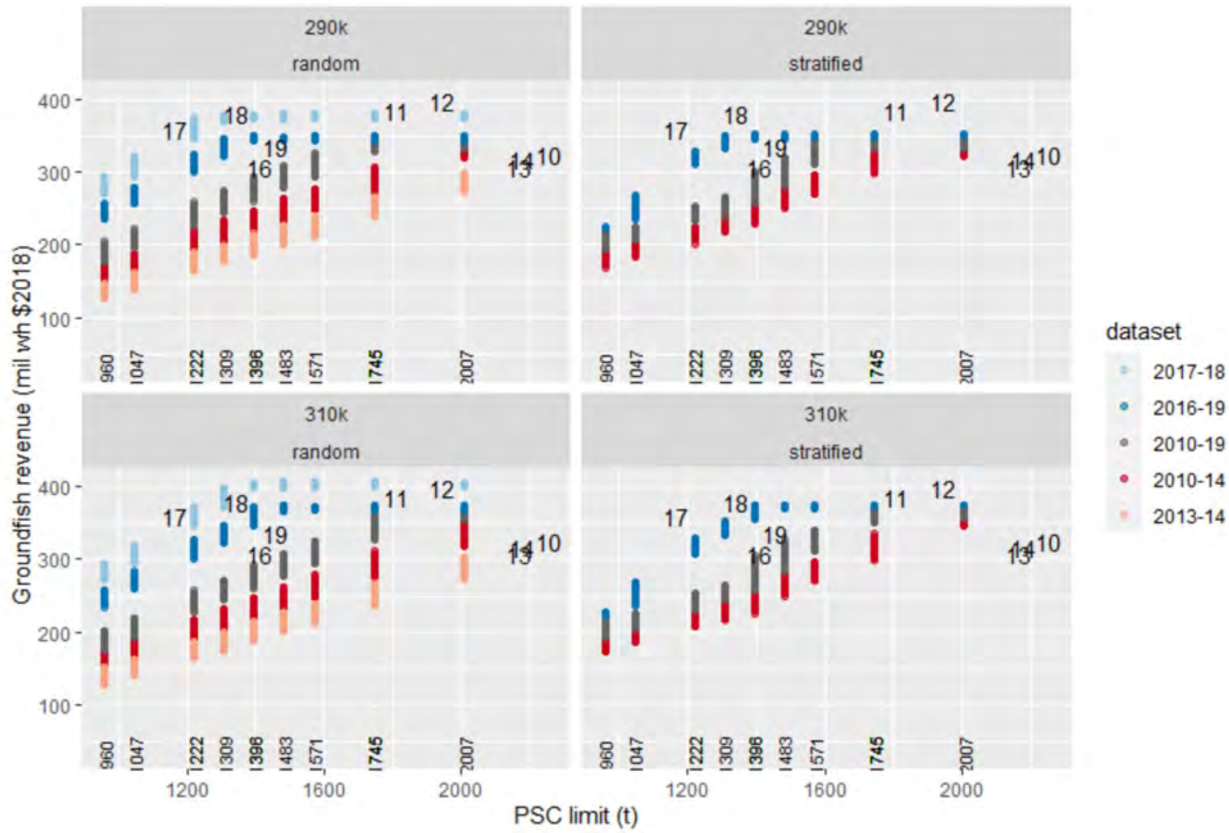


Figure 5-6 Estimated revenue by PSC limit for each dataset under both the random and stratified sampling method and both groundfish catch thresholds. Yearly totals from the underlying data are indicated by the black text (10-19) for comparison purposes. Proposed PSC limits are listed on the x-axis for reference.

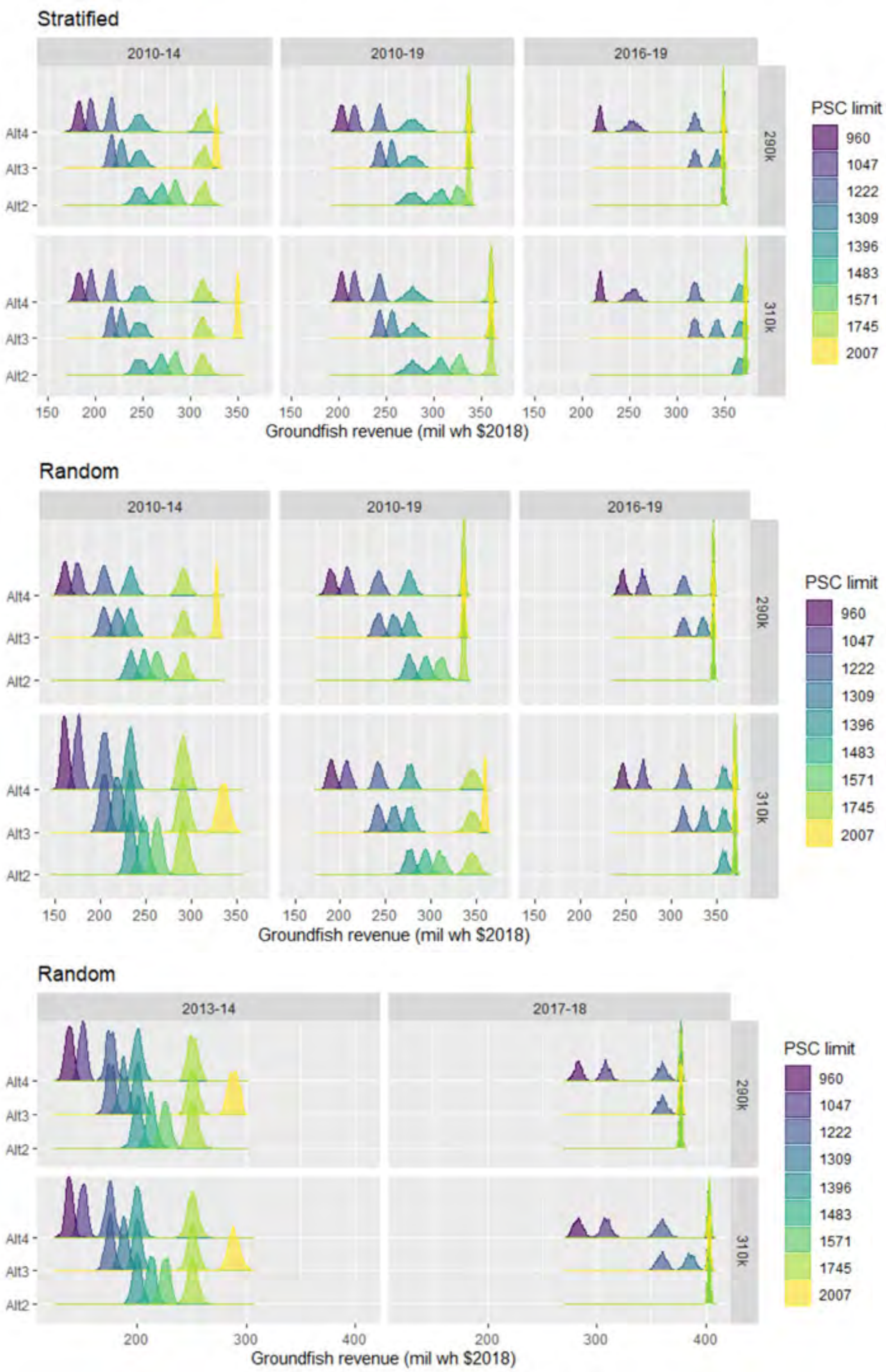


Figure 5-7 Estimated Amendment 80 sector gross wholesale revenue (2018$) associated with PSC limits specified in the look up tables by Alternative. Top panel uses stratified sampling method; middle and bottom panels use the random sampling method. Dataset is listed across top and groundfish limit is listed on the right of each panel.

Table 5-3 Average estimated groundfish catch (1,000 mt) by PSC limit and Alternative using different estimation methods. Green shading indicates the results were constrained by the PSC limit, blue shading indicates the results were constrained by the groundfish limit (290,000 or 310,000 mt).

Estimation method	PSC limit	960		1047		1222		1309		1396		1483		1571		1745		2007	
	Alternative(s)	4		4		3		3		2,3,4		2		2		1,2,3,4		3	
	GF limit (1,000 mt)	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	141.87	142.08	154.64	154.84	180.30	180.60	193.62	193.18	206.31	206.06	219.45	218.93	232.20	232.01	257.39	257.73	289.83	296.41
	2010-19	163.68	164.03	178.98	178.64	208.84	208.68	223.74	223.47	238.37	238.53	253.43	253.17	268.16	267.55	289.89	297.92	289.98	309.98
	2016-19	206.15	206.20	225.00	225.06	262.45	262.51	280.97	281.14	289.99	299.95	289.98	309.98	289.99	309.99	289.99	309.99	289.99	309.99
	2013-14	135.87	135.96	148.12	148.27	173.09	172.68	185.01	185.05	197.65	197.23	209.83	209.77	222.39	222.41	247.19	247.13	283.86	283.97
	2017-18	217.60	217.53	237.19	237.22	277.07	276.67	289.96	296.63	289.99	309.97	289.99	309.99	289.99	309.99	289.99	309.99	289.99	309.99
Stratified	2010-14	167.26	167.25	179.74	179.73	199.56	199.38	209.93	209.99	223.89	224.00	240.13	239.85	252.87	252.54	278.24	278.01	289.98	309.98
	2010-19	179.03	178.93	191.50	191.57	214.87	214.88	226.38	226.65	243.07	243.71	264.26	264.35	281.00	281.28	289.98	309.59	289.98	309.98
	2016-19	184.07	184.22	210.79	210.86	264.14	264.04	283.60	283.57	289.99	304.60	289.99	309.98	289.99	309.98	289.99	309.99	289.99	309.98

Table 5-4 Average estimated PSC use (mt) by PSC limit and Alternative using different estimation methods. Green shading indicates the results were constrained by the PSC limit, blue shading indicates the results were constrained by the groundfish limit (290,000 or 310,000 mt).

Estimation method	PSC limit	960		1047		1222		1309		1396		1483		1571		1745		2007	
	Alternative(s)	4		4		3		3		2,3,4		2		2		1,2,3,4		3	
	GF limit (1,000 mt)	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	960	960	1,047	1,047	1,222	1,222	1,309	1,309	1,396	1,396	1,483	1,483	1,571	1,571	1,745	1,745	1,960	2,007
	2010-19	960	960	1,047	1,047	1,222	1,222	1,309	1,309	1,396	1,396	1,483	1,483	1,571	1,571	1,698	1,745	1,699	1,817
	2016-19	960	960	1,047	1,047	1,222	1,222	1,309	1,309	1,350	1,396	1,349	1,443	1,350	1,443	1,350	1,443	1,350	1,443
	2013-14	960	960	1,047	1,047	1,222	1,222	1,309	1,309	1,396	1,396	1,483	1,483	1,571	1,571	1,745	1,745	2,006	2,007
	2017-18	960	960	1,047	1,047	1,222	1,222	1,280	1,309	1,279	1,367	1,280	1,368	1,278	1,368	1,281	1,368	1,280	1,368
Stratified	2010-14	959	959	1,047	1,047	1,222	1,222	1,309	1,309	1,396	1,396	1,483	1,483	1,571	1,571	1,745	1,745	1,808	1,911
	2010-19	960	959	1,047	1,047	1,222	1,222	1,309	1,309	1,396	1,396	1,483	1,483	1,571	1,571	1,620	1,719	1,619	1,721
	2016-19	960	960	1,047	1,047	1,222	1,222	1,309	1,309	1,337	1,396	1,338	1,419	1,338	1,420	1,337	1,421	1,337	1,419

Table 5-5 Average estimated revenue (million wholesale $2018) by PSC limit and Alternative using different estimation methods. Green shading indicates the results were constrained by the PSC limit, blue shading indicates the results were constrained by the groundfish limit (290,000 or 310,000 mt).

Estimation	PSC limit	960		1047		1222		1309		1396		1483		1571		1745		2007	
	Alternative(s)	4		4		3		3		2,3,4		2		2		1,2,3,4		3	
	GF limit (1,000 mt)	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	**2010-14**	160.582	160.815	174.982	175.215	204.050	204.313	219.181	218.550	233.493	233.235	248.384	247.668	262.813	262.705	291.338	291.603	327.968	335.497
	2010-19	189.686	190.121	207.396	206.935	241.993	241.715	259.314	258.923	276.215	276.468	293.723	293.380	310.690	310.046	335.887	345.264	335.937	359.123
	2016-19	246.206	246.385	268.807	268.887	313.489	313.519	335.524	335.829	346.417	358.232	346.366	370.300	346.425	370.269	346.417	370.311	346.454	370.271
	2013-14	137.994	138.184	150.453	150.591	175.812	175.384	187.950	187.992	200.795	200.295	213.141	213.202	225.934	225.979	251.137	251.123	288.273	288.545
	2017-18	282.581	282.479	307.928	308.073	359.795	359.146	376.517	385.223	376.582	402.458	376.509	402.584	376.623	402.591	376.558	402.546	376.604	402.554
Stratified	**2010-14**	182.258	182.272	195.088	195.065	216.307	216.059	227.666	227.668	246.072	246.276	268.338	267.997	283.966	283.479	313.799	313.520	327.054	349.666
	2010-19	202.931	202.828	216.382	216.445	242.752	242.719	255.780	256.090	277.083	277.964	305.385	305.515	326.047	326.307	336.782	360.053	336.793	360.511
	2016-19	218.741	218.978	253.143	253.251	319.090	318.907	341.704	341.720	349.070	366.178	349.027	372.528	349.165	372.536	349.034	372.499	349.147	372.479

Table 5-6 Average estimated status quo revenues (millions wholesale $2018) and percent difference from status quo by Alternative and PSC limit based on survey states. Percent differences are calculated across the rows (comparing estimates using same methods and datasets)

Estimation method	EBS shelf trawl survey / Setline survey				Low / Very Low		High / Very Low		Low / Low		High / Low		Low / Medium		High / Medium		Low / High		High / High	
	PSC limit	1745			1396		1483		1396		1483		1483		1571		1571		1745	
	GF limit (1,000 mt)	290	310		290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	291.338	291.603	Alternative 2	-20%	-20%	-15%	-15%	-20%	-20%	-15%	-15%	-15%	-15%	-10%	-10%	-10%	-10%	0%	0%
Random	2010-19	335.887	345.264	Alternative 2	-18%	20%	-13%	-15%	-18%	-20%	-13%	-15%	-13%	-15%	-8%	-10%	-8%	-10%	0%	0%
Random	2016-19	346.417	370.311	Alternative 2	0%	-3%	0%	0%	0%	-3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Random	2013-14	251.137	251.123	Alternative 2	-20%	-20%	-15%	-15%	-20%	-20%	-15%	-15%	-15%	-15%	-10%	-10%	-10%	-10%	0%	0%
Random	2017-18	376.558	402.546	Alternative 2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Strat.	2010-14	313.799	313.520	Alternative 2	-22%	-21%	-14%	-15%	-22%	-21%	-14%	-15%	-14%	-15%	-10%	-10%	-10%	-10%	0%	0%
Strat.	2010-19	336.782	360.053	Alternative 2	-18%	-23%	-9%	-15%	-18%	-23%	-9%	-15%	-9%	-15%	-3%	-9%	-3%	-9%	0%	0%
Strat.	2016-19	349.034	372.499	Alternative 2	0%	-2%	0%	0%	0%	-2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	PSC limit	1745			1222		1309		1309		1396		1396		1745		1745		2007	
	GF limit (1,000 mt)	290	310		290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	291.338	291.603	Alternative 3	-30%	-30%	-25%	-25%	-25%	-25%	-20%	-20%	-20%	-20%	0%	0%	0%	0%	13%	15%
Random	2010-19	335.887	345.264	Alternative 3	-28%	-30%	-23%	-25%	-23%	-25%	-18%	-20%	-18%	-20%	0%	0%	0%	0%	0%	4%
Random	2016-19	346.417	370.311	Alternative 3	-10%	-15%	-3%	-9%	-3%	-9%	0%	-3%	0%	-3%	0%	0%	0%	0%	0%	0%
Random	2013-14	251.137	251.123	Alternative 3	-30%	-30%	-25%	-25%	-25%	-25%	-20%	-20%	-20%	-20%	0%	0%	0%	0%	15%	15%
Random	2017-18	376.558	402.546	Alternative 3	-4%	-11%	0%	-4%	0%	-4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Strat.	2010-14	313.799	313.520	Alternative 3	-31%	-31%	-27%	-27%	-27%	-27%	-22%	-21%	-22%	-21%	0%	0%	0%	0%	4%	12%
Strat.	2010-19	336.782	360.053	Alternative 3	-28%	-33%	-24%	-29%	-24%	-29%	-18%	-23%	-18%	-23%	0%	0%	0%	0%	0%	0%
Strat.	2016-19	349.034	372.499	Alternative 3	-9%	-14%	-2%	-8%	-2%	-8%	0%	-2%	0%	-2%	0%	0%	0%	0%	0%	0%
	PSC limit	1745			960		1047		1047		1222		1222		1396		1396		1745	
	GF limit (1,000 mt)	290	310		290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	291.338	291.603	Alternative 4	-45%	-45%	-40%	-40%	-40%	-40%	-30%	-30%	-30%	-30%	-20%	-20%	-20%	-20%	0%	0%
Random	2010-19	335.887	345.264	Alternative 4	-44%	-45%	-38%	-40%	-38%	-40%	-28%	-30%	-28%	-30%	-18%	-20%	-18%	-20%	0%	0%
Random	2016-19	346.417	370.311	Alternative 4	-29%	-33%	-22%	-27%	-22%	-27%	-10%	-15%	-10%	-15%	0%	-3%	0%	-3%	0%	0%
Random	2013-14	251.137	251.123	Alternative 4	-45%	-45%	-40%	-40%	-40%	-40%	-30%	-30%	-30%	-30%	-20%	-20%	-20%	-20%	0%	0%
Random	2017-18	376.558	402.546	Alternative 4	-25%	-30%	-18%	-23%	-18%	-23%	-4%	-11%	-4%	-11%	0%	0%	0%	0%	0%	0%
Strat.	2010-14	313.799	313.520	Alternative 4	-42%	-42%	-38%	-38%	-38%	-38%	-31%	-31%	-31%	-31%	-22%	-21%	-22%	-21%	0%	0%
Strat.	2010-19	336.782	360.053	Alternative 4	-40%	-44%	-36%	-40%	-36%	-40%	-28%	-33%	-28%	-33%	-18%	-23%	-18%	-23%	0%	0%
Strat.	2016-19	349.034	372.499	Alternative 4	-37%	-41%	-27%	-32%	-27%	-32%	-9%	-14%	-9%	-14%	0%	-2%	0%	-2%	0%	0%

5.3.2.2.1 Effect of sampling method, groundfish limits, and dataset selection

The sampling method (random or stratified) has minimal impact on revenue results. One would expect a difference between these sampling methods if the distribution of revenue, groundfish, or PSC varied substantially by month. For example, if the fleet captured a majority of its revenue early in the season then a stratified approach would lead to higher revenue estimates than a random sampling approach since the early season revenue would be included in the resampling at the same effort levels in the stratified approach. To compare results based on sampling method, contrast the dark red, grey, and dark blue datasets between the left and right panels in **Figure 5-6** or compare the top two panels in Figure 5-7. Comparison of average estimates can also be made by comparing rows with the same dataset across each sampling method in **Table 5-3** and **Table 5-4**. There is slight variation in estimates for the earlier, higher PSC-use dataset (2010-14). Stratified sampling results in higher revenue estimates than random sampling, although this is muted at the highest PSC limit. This may be due to some years in which the early rate of groundfish catch was relatively steep, and in all years from 2010 through 2014 catch tends to taper off towards the end of the year (**Figure 5-5**). For the later, lower PSC-use dataset (2016-19), there is slight variation between sampling methods with stratified sampling resulting in lower revenue estimates at lower PSC limits. However, these differences do not persist at higher PSC limits when the entire dataset is more likely to be sampled regardless of the sampling method.

The lack of substantial difference in estimates by sampling methods indicates that results from both the stratified and random sampling method likely represent a lower bound of possible revenue estimates (and an upper bound of revenue impacts). This is not unexpected, as any changes in fleet behavior to adapt to changing PSC limits are likely to be more efficient than a proportional reduction in effort throughout a fishing year as estimated by the random sampling method, or a repeat of previous effort that is prematurely truncated as estimated by the stratified sampling method.

The impact of the groundfish limit can be seen by comparing the upper and lower panels in **Figure 5-6**, as well as the upper and lower strips within each panel in **Figure 5-7** or the columns listed "290" and "310" in **Table 5-3** through **Table 5-5**. Regardless of dataset or estimation method, there is no discernable difference in revenue estimates by groundfish limit until the PSC limit is large enough for the groundfish limit to become constraining. The PSC limit at which the groundfish becomes constraining depends upon the dataset, occurring earliest at a PSC limit of 1,309 for the lowest PSC use dataset (2017-18) and never occurring for the highest PSC use dataset (2013-14). Scenarios where the groundfish limit is constraining are shaded in blue in **Table 5-3** through **Table 5-5**. In these scenarios the higher groundfish limit of 310,000 mt results in larger estimated revenue.

The choice of which dataset to use in the revenue analysis has the largest impact of any other variations between the scenarios. Changing the sampling method between random or stratified or changing the groundfish limit between 290,000 mt and 310,000 mt have smaller impacts on total revenue estimates. This is unsurprising since there is large variation in the rate of PSC use and revenue generated between years, and because the range of datasets were selected to demonstrate these differences. Datasets including more recent years generate higher revenues at all PSC limits. The differences in estimated revenues from higher PSC use and lower PSC use datasets are larger at lower PSC limits and become less substantial at higher PSC limits.

5.3.2.2.2 Comparison across alternatives

Figure 5-7 displays the estimated A80 wholesale revenues by the PSC limits associated with each alternative. Alternative 1 is not shown but can be determined by comparing the results under the 1,745 PSC limit (shown in the lightest green/yellow color) to the other Alternatives. The range of potential revenue outcomes for each alternative is related to the range of the PSC limits associated with each alternative. Alternative 2 has the narrowest range of PSC limits (1,396-1,745) and thus the narrowest range of revenue estimates. Alternative 3 includes a wider range of PSC limits (1,222-2,007) than Alternative 2 and is the only alternative that includes a potential increased limit from status quo (2,007), shown by the yellow ridge. Alternative 4 includes the two lowest potential PSC limits and peaks at the status quo limit (960-1,745).

The PSC limit applied in each alternative is based on the combinations of the survey states as defined in the look up tables. Table 5-6 displays the percent change in average estimated revenue from status quo by the PSC limit associated with each alternative under equivalent survey states. These percent-differences are calculated across rows, so they are compared to the status quo revenue estimates using the same methodology and dataset as shown in the Alternative 1 column (in blue and green shading). The purple shading indicates reductions from status quo and yellow shading indicates increases from status quo; darker shading corresponds to larger changes.

The likelihood of falling into one of the cells in Table 5-3 through **Table 5-6** is based on multiple factors. The first, most direct, factor is determined by the survey indices and the applicable PSC limit as determined by the alternatives (look up tables). The second factor determining which cell represents the most likely outcome is which dataset was used to create the estimate. The lowest bound is represented by the 2013-14 dataset and the highest by the 2017-18 dataset. Given reductions in PSC limits and operational changes such as increased deck sorting, it is most likely that future PSC use will be similar to what has been seen in the years since 2015 – i.e., estimates using 2016-19 or 2017-18 data are most likely. However, it is possible that estimates using the earlier, higher PSC-use datasets may be representative if encounter rates were to increase and efforts to reduce mortality became less effective.

Currently, both the setline and the trawl surveys are in the Low categories, which correspond to PSC limits that represent immediate reductions from the status quo PSC limit of 1,745 mt. Revenue estimates under the resulting PSC limits using the 2016-19 dataset range from no change to a reduction of 3% under Alternative 2, reductions of 3% to 9% under Alternatives 3 and 5 (Preferred Alternative), and reductions of 22% to 32% under Alternative 4.

5.3.2.2.3 Discussion

This section discusses some of the assumptions and limitations of the resampling approach and resulting revenue estimates. One advantage of the resampling approach is that it is based on actual fishery data. The analysts are not creating any individual hauls that have not occurred during actual fishing. A limitation of this approach is that estimates only reflect the environmental conditions and fishing behavior that occurred during the past 10 years. As a result, this approach does not estimate outcomes under a changed environmental or management regime, nor does it incorporate fishing adaptations or behavioral changes that may occur in the future.

Under the random sampling method, there is no specified order to the combination of hauls so any haul is equally likely to be selected regardless of when it occurred. This does not impose any external structure on a fishing year; however, when effort is reduced it is equally likely to be reduced from any portion of the fishing year based on the basic effort distribution in the underlying data. Under the stratified method, effort reductions truncate the fishing year starting with the end of the calendar. While both sampling methods may accurately reflect fishing in that harvesters have a limited amount of control over the species composition in each haul, neither method captures behavioral adjustments such as changes in targeting, fishing location, or other halibut avoidance strategies that might be employed depending on the emphasis being placed on PSC at the time. As such, the resulting estimates likely represent an upper bound for impacts, in that adaptive behaviors could mitigate the impact of PSC limit reductions more than random or stratified random sampling methods reflect. The extent to which this is true is unknown; a key unanswered question is how close the A80 sector is to the point of diminishing returns in halibut PSC mitigation. This is discussed further in Section 5.4 which also notes that A80 companies are not homogeneous in the extent to which a marginal PSC limit reduction could affect expected groundfish revenues.

The random resampling of actual hauls might also underestimate the range of uncertainty in annual revenue estimates since results based on historical haul data tend to center around the mean. While this may represent the most likely outcome because hauls are selected based on their prevalence in the underlying distribution, it is less likely to include the most extreme examples such as a year in which the fleet has difficulty avoiding halibut and accumulates PSC at a more rapid rate. This method is unlikely to select rare "lightning strike" events that could result in adverse impacts for the A80 fleet simply because they are rare. This is particularly the case for this analysis because the distribution of the underlying data is skewed with many hauls capturing a small amount of PSC and very few hauls capturing relatively large amounts of PSC.

To incorporate a larger range of uncertainty in the results, the analysts separated the data into relatively high PSC-use years (2010-2014) and low PSC-use years (2016-2019) as well as selecting additional year combinations to bookend the results. Those combinations were 2013-2014 to capture the years where PSC was high and revenue was low and 2017-2018 to capture when PSC was low and revenue was high. Given recent mortality patterns and substantial changes in fleet operation, including widespread adoption of deck sorting, it seems unlikely that future years will be similar to those before 2015. Overall, the analysts presume that results from more recent years are likely to be better representative of future outcomes. Grouping datasets captures more uncertainty but results still cluster around the means of the grouped years and thus they do not capture the full range of potential outcomes – particularly in a scenario when halibut abundance and PSC limits are low but halibut encounters are high, which could have more negative consequences to the fleet.

The assumption that 100% PSC use is possible may contribute to less uncertainty in the revenue estimates for scenarios where the PSC limit is constraining. This assumption may also lead to relatively higher PSC use estimates than are likely, given that the fleet has not used 100% of the PSC limit in any of the past 10 years (**Figure 5-1**). This is not an uncommon challenge in PSC limit analyses and the Council has historically understood that in this case the analysts are presenting an estimate of the maximum adverse impact. The analysts considered other options for defining the relationship between PSC use and the limit. It makes sense to consider all types of relationships between the PSC limit and use – random, constant, or scaled (i.e. higher use-rate at a lower limit). Ultimately, for purposes of presentation, the analysts concluded that the results are most easily understood by showing 100% use as a maximum-impact and allowing the reader to adjust downward based on what is qualitatively understood. The implementation of a groundfish limit in this analysis also mutes the cases in which 100% of the PSC limit is attained. In most scenarios, at higher PSC limits, the groundfish limit is constraining before the PSC limit is met. It is possible that expected PSC use should be higher, all else equal, if halibut are more abundant in the BSAI, but this document has discussed the multiple, complex determinants of PSC encounter and mortality and in comparison to survey indices at several points (e.g., Sections 3.4.3 and 3.4.4).

Another reason not to take the 100% use assumption at face-value is that the marginal change in the constraint posed by a mt of PSC limit reduction (or increase) is not linear and is not experienced the same across A80 companies, per their groundfish quota portfolios. The analysts expect that an A80 operator's behavior would be modified to a similar extent if expected use relative to the PSC limit is, say, 85%, 95%, or 100%. In other words, it is not the analysts' impression that A80 companies create fishing plans to push their PSC use to the limit, given the substantial risk; this is borne out in the historical data shown in **Figure 5-1**. If an A80 company – or the sector as a whole – feels that it is making substantial investment and giving maximum practicable effort to minimize halibut mortality when PSC use is a fraction of the limit, then it is possible that additional efforts might yield less PSC reduction or have no effect. For example, A80 PSC limit use was 63% in 2020 (1,097 mt use vs. 1,745 mt limit). It is difficult for the analysts to draw a *direct* line between a reduced hard cap (either through the alternatives or the options) and lower use. Given the variability in annual halibut encounter and mortality, similar efforts – all else equal – could yield more or less halibut PSC in a different year. The relatively loose nature of the relationship between the PSC limit and mortality on an annual basis – especially given the efforts to avoid PSC that are currently being employed – make it difficult to quantify what "incentive" a given percent reduction in the limit would provide. This is not to say that a marginal reduction in the PSC limit or a rollover/flexibility option would carry no incentive; rather, that the incentive partially lies in how the Council is framing the limit and the options.

The analysts also note that PSC use is a function of many factors, some of which are outside of the fleet's direct control. For example, changing environmental conditions could disperse groundfish or cause them to move out of well-known, fishable areas. This could cause the fleet to tow more hours for the same amount of catch, increasing gross costs as well as the possibility of high-bycatch events. A changing environment might also change the extent to which groundfish and halibut are comingled, also changing the probability of bycatch. The extent of these changes is presently unknown, meaning that at this time they can be thought of as risk factors that may affect the fleet's ability to maintain harvest levels under a lower PSC limit in a practicable manner.

Finally, it is important to note that these estimates represent gross revenues and do not attempt to estimate the costs associated with changing fishing operations to avoid halibut that are described in Section 5.3.2.3. Estimates are fleet-wide and, thus, potential distributional impacts within the sector based on operational differences and fishing portfolios are considered qualitatively. A key figure for that consideration is Figure 3-15 in Section 3.3, which compares the quota share portfolios by species group across the presently active A80 companies.

5.3.2.3 Practicability of bycatch avoidance/meeting PSC limits by the A80 sector

This section addresses the practicability of further bycatch reduction under the action alternatives considered here, and in some cases, greater than the reduction instituted by Amendment 111 and considers this under the mandate to address competing National Standards in the purpose and need statement.

5.3.2.3.1 Balancing competing requirements among the national standards

The Council's problem statement addresses both National Standard 1 (prevent overfishing and achieving OY) and National Standard 9.

> *The Council intends to establish an abundance-based halibut PSC management program in the BSAI for the Amendment 80 sector that meets the requirements of the Magnuson-Stevens Act, particularly to minimize halibut PSC to the extent practicable under National Standard 9 and to achieve optimum yield in the BSAI groundfish fisheries on a continuing basis under National Standard 1.*

The current management structure for halibut is employed to ensure that halibut is not being overfished in either the directed halibut fisheries (IPHC) or as bycatch (NPFMC) in groundfish fisheries (See Sections 4.2 and 4.3). Section 5.6 describes expected changes in net benefits to the Nation and concludes that constraining halibut PSC limits set for species harvested by the A80 sector that result in reduced catch and marketing of those species is likely to result in negative impacts to net benefits to the Nation. This is not surprising given that this action aims to conserve the halibut resource by reducing halibut PSC mortality from the levels currently caused by the A80 sector during years of low abundance. Some alternatives involve significant reductions of such mortality and achieving those reductions would impose costs on the A80 sector. The MSA's requirement to minimize bycatch to the extent practicable inherently recognizes that such costs may be unavoidable; the standard does not require FMPs to contain conservation and management measures that minimize bycatch only when there are no economic impacts.

When considering non-economic impacts, the BSAI FMP[78] defines the OY of the BSAI groundfish complex (consisting of stocks listed in the 'target species' category, as listed in Table 3-1 of the FMP) as 85% of the historical estimate of MSY, or 1.4 to 2.0 million mt. The OY specification for BSAI groundfish was established as part of Amendment 1 to the BSAI Groundfish FMP and required by Public Law Number 108-199. Analysis of Amendment 1, was completed in August, 1981 (NPFMC 1981) and

[78] https://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf

stated that the 15% reduction from MSY was "intended both to assure the continued health of the target species themselves and to mitigate the impact of commercial groundfish operations on other elements of the natural environment." The EIS for Amendment 1 described a variety of direct and indirect impacts likely to result from this specification, including incidental harvest of other marine resources. A programmatic supplemental environmental impact statement (PSEIS) was completed in June 2004 that analyzed impacts on prohibited species as well as other species and habitats. The important social and economic factors summarized in the PEIS includes:

> 1. The OY range is not likely to have any significant detrimental impact on the industry. On the contrary, specification of OY as a constant range helps to create a stable management environment in which the industry can plan its activities consistently, with an expectation that each year's total groundfish catch will be at least 1.4 million mt.
>
> 2. The OY range encompasses the annual catch levels taken in the period immediately before its implementation, during which the fishery operated profitably.

Given that in 2021 the A80 sector's apportionment of all BSAI groundfish species is about 12% of the 2 million mt limit, it would be possible to achieve OY as defined in the FMP without harvesting any of the A80 allocation, based on current groundfish stock conditions. This means that the Council can meet their objective, as stated in their need statement, to achieve OY in the BSAI groundfish fisheries with the establishment of any of the alternatives analyzed. However, not harvesting any of the A80 allocation is not being proposed, would negatively impact the A80 sector, and would potentially reduce net benefits to the Nation; rather, this is illustrative of how the Council's need statement is met under the proposed action.

National Standard 9 (NS 9) states that "conservation and management measures shall, to the extent practicable, (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." NS9 has three primary components as it relates to halibut bycatch for the A80 sector:

1. The conservation and management measure must be practicable.
2. Bycatch should be avoided to minimize the catch of that species. A priority is placed on avoiding catching halibut.
3. If bycatch cannot be avoided, the mortality of the bycatch species should be minimized.

"The priority under this standard is first to avoid catching bycatch species where practicable" 50 C.F.R. § 600.350(d). Inconvenience is not an excuse; however, at the same time, practicability means more than mere possibility. Practicability is determined on a case-by-case basis.

Merriam-Webster defines practicable as "capable of being done or carried out." While this definition is useful when considering technologies that are currently being used and have been proven to be effective, it does not provide a straightforward answer to how the term should be applied when considering impacts on harvest, the economic viability of firms, or technological changes that may be developed in the future. The practicability standard does not state how much of a negative impact is acceptable.

On one end, it would be impracticable to minimize bycatch to a level where no A80 harvest were possible. On the other, zero or de minimis costs is not required for a measure to be practicable. Where, in between those two goal posts, lies the threshold of what is practicable versus impracticable may not always be clear. At the least, practicability implies that firms can operate under the proposed management measures and remain economically viable. Here, since all of the measures that could be implemented to reduce halibut mortality would have a cost to the fleet, the increased costs are relevant to the practicability (i.e. how those tools can be implemented while keeping the fleet economically viable). There may be costs in avoiding halibut and lost revenues from an incomplete harvest, and yet the alternative could still be practicable.

A general description of the A80 fleet's operations and annual planning to harvest its allocation is presented in Section 3.3.3. The following sections include a brief background section on the A80 fleet, a summary of issues that affect the A80 fleet's ability to avoid halibut bycatch, current halibut bycatch avoidance measures that have been implemented by the A80 fleet, mortality mitigation measures that have been implemented for halibut that could not be avoided, a discussion of potential bycatch avoidance measures that could be considered in the future, and a conclusion.

5.3.2.3.2 Background

The history of A80 and participants in the A80 sector is provided in other sections of this document. A detailed discussion of the sector is provided in Section 3.3.1. That section describes the consolidation of the firms within the sector. These changes are expected to make comparisons of halibut usage in the past less directly comparable to halibut usage rates in the future because individual firms have employed different strategies to address halibut bycatch and in the past bycatch rates were more divergent across firms.

External and internal factors impact A80 companies' ability to reduce halibut mortality. Factors they cannot control include environmental factors and annual allocations that are based on past catch history. The annual allocation was established by vessel based on qualifying landings history of the vessel. Vessels can be sold or replaced (QS is then assigned to the LLP license associated with the original vessel), but the number of QS units originally assigned to the vessel are static over time. Current (2021) QS holdings by vessel or license are provided on the NMFS website and summarized by firm in Table 5-7. Those data indicate two firms have small allocations of Atka mackerel and Rockfish (POP). In terms of target fisheries, these two firms are most heavily reliant on flatfish from their A80 allocation. The other three firms have more diverse A80 species portfolios, with two of the firms receiving about 85% of the Atka mackerel and POP allocations, combined. Even though firms are allocated varying portfolio mixes of A80 species, all firms and vessels rely on flatfish as an essential part of their annual fishing cycle.

Table 5-7: Percentage of A80 QS units held by company, 2021

Company	Atka Mackerel	Flathead Sole	Pacific Cod	Pacific Ocean Perch	Rock Sole	Yellowfin Sole
1	0.34%	36.40%	23.95%	0.03%	24.94%	20.85%
2	2.32%	14.90%	21.14%	0.43%	20.82%	12.33%
3	10.55%	9.74%	16.12%	14.32%	13.10%	9.44%
4	32.85%	28.53%	21.39%	28.41%	26.52%	32.57%
5	53.93%	10.43%	17.41%	56.81%	14.62%	24.81%
Total	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**	**100.00%**

Source: https://www.fisheries.noaa.gov/sites/default/files/akro/21A80_Owner_List.csv

Standard bycatch rates are established for each target fishery as part of the HAP implemented by the cooperative (discussed further in Section 3.4.5). Firms that have larger allocations of round fish, that historically has had lower bycatch rates of halibut, must still be careful when participating in their annual fishing cycle to ensure that individual vessels do not exceed the annual halibut standard bycatch rates by fishery established by the cooperative. For example, a firm could decide to send a vessel to the AI to fish Atka mackerel early in the year. When the vessel returns to the BS to fish yellowfin sole[79] it will need to ensure that halibut bycatch rates are low enough that each vessel will not be over a target fishery standard bycatch rate for halibut since they may have limited opportunities to reduce the rate later in the year when catch composition tends to be more mixed. The issue of a vessel exceeding a directed species halibut PSC rate is further complicated by the targeting algorithm used by NMFS (and applied by the cooperatives to

[79] Yellowfin sole target tows in the late winter and spring that are fished in shallower water 10 to 20 fathoms are reported to have lower halibut bycatch rates than when yellowfin sole is fished later in the year and in deeper water.

determine if vessels are within their allowable bycatch rates in the cooperative during a year or quarter) that is based on catch composition and the mixed flatfish species tows that often occur in the late summer and fall fisheries. A vessel could be intending to target yellowfin sole on a tow, but the tow could be defined as a rock sole target based on catch composition. If the trip takes place after the traditional rock sole with roe fishery in the late winter or early spring and the vessel has not established a lower average rate based on earlier rock sole fishing, it could be difficult for the vessel to target rock sole later in the year and reduce the halibut bycatch rate in that target fishery sufficiently to meet the rock sole standard bycatch rate and avoid penalties imposed under the HAP.

A summary of halibut mortality by A80 sector is provided in Section 3.4.1. Table 3-20 shows that since 2015, halibut rates (kg halibut mortality per mt target species) in the Atka mackerel and rockfish fisheries and have been about 1/6th the rates of the flatfish species. The first wholesale value derived from those species per mt of halibut mortality is also substantially higher than the flatfish species (see Figure 3-33). Firms that are allocated very small amounts of these fisheries have limited ability to participate in fisheries that are relatively less impacted by halibut PSC, but as stated earlier all vessels/firms are reliant on flatfish. Rock sole typically has slightly higher halibut PSC rates than yellowfin sole. However, since the fishery typically occurs early in the year (in part due to schooling of the fish and roe availability), that fishery may be less constrained by annual halibut PSC limits.[80] Still, vessel operators in the fleet will attempt to ensure that the halibut bycatch rate is within the standard bycatch rate established under the HAP for rock sole.

The relative first wholesale value derived from the flatfish fisheries per mt of halibut mortality vary by year but are, in general, fairly similar. The majority of the flathead sole target fishery typically takes place in the second half of the year and that is when the halibut mortality associated with that fishery is realized (see Figure 3-30). However, the magnitude of the flathead sole fishery (18,432 mt in 2021) is relatively small compared to the yellowfin sole fishery (15% of 123,154 mt in 2021) (85 FR 13553, March 9, 2020) and the halibut PSC associated with the fishery is accounted under a combined arrowtooth founder/flathead sole fishery within the cooperative. The amount of yellowfin sole that is allocated to the A80 sector and the way the sector chooses to fish it through-out the year make the yellowfin sole fishery the most vulnerable to negative economic impacts of reducing the halibut PSC limits.

Warmer Bering Sea water temperatures, in years like 2019, are reported to have impacted the aggregations and movements of certain species (Spencer, et al. 2019[81]). In that study, yellowfin sole was one of several fish stocks that were seen as potentially more resilient to warmer water temperatures because they may be able to move to areas that are more beneficial to their growth and survival. Members of the A80 sector have indicated that in years when the water temperature is warmer and the ice edge is farther north, the fish are more dispersed during the March through May fishery and seem to move north. The dispersion of the fish during the winter and spring fishery was stated to result in lower CPUE and the longer fishing times and yielded higher halibut PSC bycatch. **Figure 5-8** (Area 513) and **Figure 5-9** (Area 514)[82] shows that halibut mortality rates were generally higher in the yellowfin sole fishery during years when bottom temperatures were higher (e.g., 2019). However, there is considerable variation in halibut mortality rates by week, and the greater use of deck sorting to reduce mortality in years when halibut could not be avoided makes drawing definitive conclusions from the figure difficult. Areas 513 and 514 were selected because relatively large percentages of the CP yellowfin sole fishery are harvested from those two areas annually. These areas routinely comprise the majority of catch by area of yellowfin sole

[80] Markets also play an important role in determining when vessels harvest a species. If there is excess inventory or the buyers request the fish later in the year, the A80 sector must modify their fishing plans to accommodate their clients. The first wholesale market and client demand for products at a given time are outside of the control of the A80 sector.

[81] https://onlinelibrary.wiley.com/doi/full/10.1111/gcb.14763

[82] Source: NMFS car240_halibut_PSC annual reports of weekly PSC bycatch

annually with the highest proportion of overall catch occurring between February and April (Spies et al., 2020). Of the years considered in this figure, only 2017 was considered to be a ‘cold’ year, with 2020 described as ‘average’ water temperatures based on modeling indications as compared with previous years (Kearney, 2020).

Yellowfin sole survey biomass estimates have been shown to be positively correlated with bottom temperatures (Nichols, 1998) with lower estimates during colder years. The survey biomass estimates were highest in 2016 (a very warm year in the EBS) but have been declining since (Spies et al, 2020). In 2016 the adults were assumed to be more distributed in in the shelf area during the survey and outside of the traditional spawning areas having exhibited earlier spawning. Biomass of yellowfin sole has also been increasing in the Northern Bering Sea as assessed in recent years. The assessment authors are committed to continuing to explore spatial shifts in the population attributed to climate change and changing environmental conditions in the Bering Sea (Spies et al, 2020).

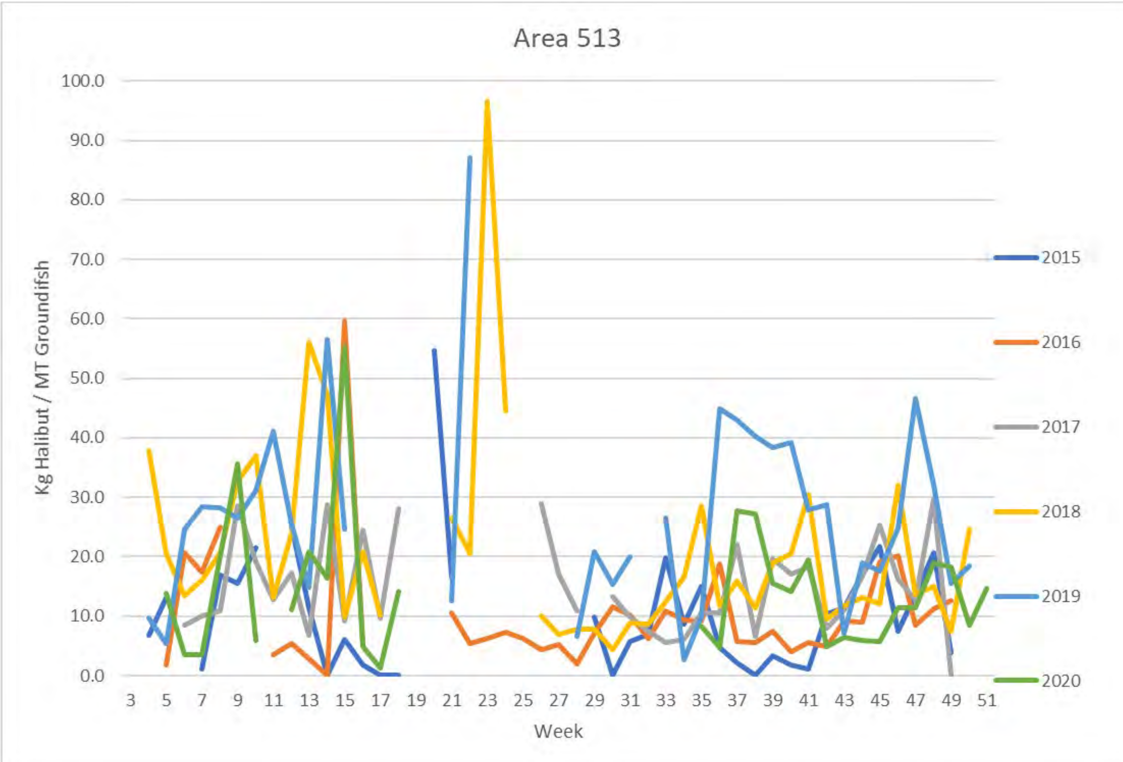


Figure 5-8 Halibut PSC rates in area 513 when targeting yellowfin sole 2015 through 2020

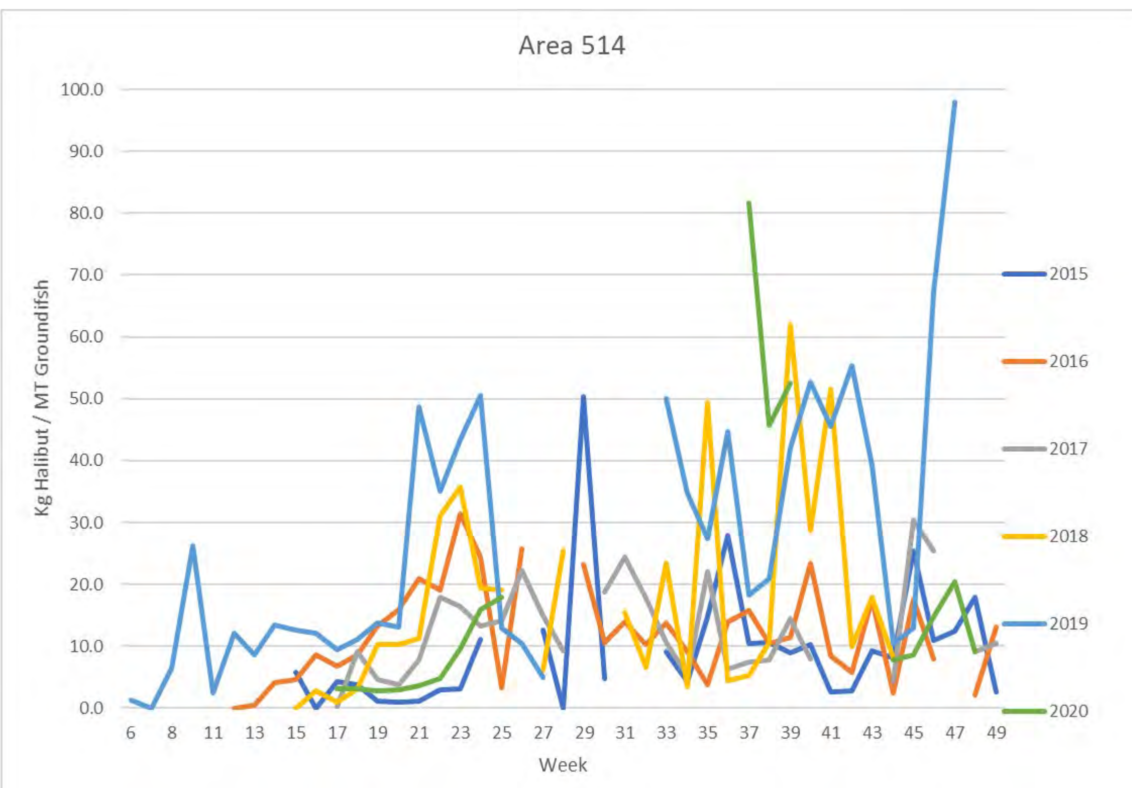


Figure 5-9 Halibut PSC rates in area 514 when targeting yellowfin sole 2015 through 2020

To the extent the A80 fleet spends additional time trying to find areas with higher CPUE and lower halibut bycatch, it will incur higher operational costs. Relatively weak markets for some A80 species in recent years, likely as a result of a variety of market factors including tariffs and changing consumer preferences, mean that the increased harvesting costs result in lower profits for the A80 firms.

5.3.2.3.3 Current bycatch avoidance/mitigation strategies

Information presented in this section describes the efforts that have been undertaken by the A80 fleet in recent years to reduce halibut bycatch and halibut bycatch mortality. Additional information is provided in Section 3.4.5. All of the tools utilized to avoid halibut or reduce mortality of halibut increase total costs associated with fishing. Following that discussion, information is provided on potential additional steps the fleet could take to reduce halibut bycatch or reduce its mortality. Finally, the information is considered in light of the proposed bycatch reductions to provide information on the practicability of the fleet's and individual firms' ability to comply with the proposed reductions.

A fleet's last response to constraining halibut PSC limits is to reduce total groundfish harvest. This fishing strategy includes an assumption that fishermen will optimize their harvest in response to constraining limits. For example, prioritizing fishing operations to the best target fishery, area, and time to maximize net revenue, and reducing effort in the target fishery, area, and time that produce less net revenue.

Estimated halibut mortality, not halibut catch or halibut interactions with the fleet's nets, drives each firm's decisions regarding halibut because that is the metric used to determine when the PSC limit becomes constraining. Accounting for halibut mortality is thought to be more accurate when deck sorting is used because the fish are all observed, and their condition estimated.[83] The use of excluders without deck sorting makes estimating actual halibut mortality less reliable because it is assumed that some unknown amount of injury or mortality results from the interaction with the net without being quantified. While this would not change the amount of mortality attributed to the A80 sector, it may impact actual halibut mortality. An FAO paper (Suuronen, 2005)[84] stated that,

> *"most scientific work on escape survival applies to towed gears, in particular trawl gears. In general, relatively high survival has been observed for many species, particularly gadoids and flatfishes, which escape from trawl codends. Substantially lower survival rates have been recorded for some pelagic species, but few studies have adequately explained the full range of stress, injury and mortality that can occur when fish escape from trawl codends under commercial fishing conditions."*

While not explicitly listed in the A80 HAP as a tool used by the fleet, tow duration may impact halibut mortality. The effects of tow duration on the proportion of fish that had reflex impairment (RAMP) in rock sole and Pacific halibut was studied by Davis (2007)[85] under laboratory conditions. He found that the percent of halibut that had RAMP greatly increased starting at tow durations of about 225 minutes. Indicating that tows lasting longer than 3.5 hours could have greater negative impacts on halibut RAMP. While, halibut showed a wider range of RAMP scores over which mortality increased, fish condition as measured by RAMP was a significant predictor for mortality in Pacific halibut under experimental conditions. Predictions of mortality using RAMP derived from laboratory fish are not expected to be valid for wild fish. However, he concluded that the concept of predicting mortality based on reflex impairment should be valid in field conditions.

5.3.2.3.4 Cooperative Fishing Strategy

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[83] Viability estimates may vary by observer, based on each observer's best estimate of condition and application of established standards.

[84] Suuronen, Petri. 2005. Mortality of Fish Escaping Trawl Gears. Food and Agricultural Organization of the United Nations Fisheries Technical Paper 478. Rome, 2005

[85] Davis, M. W. 2007. Simulated fishing experiments for predicting delayed mortality rates using reflex impairment in restrained fish. – ICES Journal of Marine Science, 64: 1535–1542.

In an effort to avoid catching halibut and reducing its mortality when caught, the A80 firms have all agreed to a general cooperative fishing strategy to manage their groundfish allocations and PSC limits. A cooperative fishing strategy has been achieved because of the vessel level allocations defined under A80. Participating A80 firms formed two cooperatives in earlier years but since 2018 they have coalesced around a single cooperative (the AKSC). Additional information on their participation in cooperatives is provided in Section 3.3.1. Part of the cooperative fishing strategy was the development of the HAP. The HAP establishes standard bycatch rates for each target fishery and provides a suite of tools designed to reduce halibut mortality that were either required to be implemented by the fleet under the HAP or were recommended to be implemented. In general, the HAP is a tool that provides various halibut avoidance measures that can be employed at the captain's or firm's discretion to keep the vessel from exceeding the defined standard bycatch rates. Firms typically rely on the captains to determine the best halibut avoidance measures to employ at any given time, because they have access to fishing data in real time and the best understanding of actual fishing conditions. The companies provide support to the captains and communicate with them on a daily basis. The firms get data from SeaState, but there is a delay of a few hauls or a day, so while they can direct a captain to employ specific measures, it is most often left to the captain's discretion. The captain has a variety of incentives to, at a minimum, keep halibut bycatch mortality within the standard bycatch rates established under the HAP. For example, captains could be responsible for any fines incurred by the firm for exceeding the standard bycatch rates. Based on discussions with members of industry this has not happened to date, and would most likely only be implemented if the captain's rates were well outside the rates realized by other vessels fishing in the target fishery at a similar time.

5.3.2.3.5 Setting Standard Bycatch Rates

Among the measures used by the cooperative to maintain low bycatch rates is a HAP that establishes standard bycatch rates by target fishery. This plan uses rate standards, which if not met, result in monetary or halibut allocation penalties. The monetary fines are viewed as a deterrent to high PSC rates, but are considered less severe than reductions in a firm's annual halibut allocation within the cooperative. Annual standards are used to create incentives for vessels to maintain halibut bycatch mortality rates similar to the historical fleet average. It has not been uncommon for vessels in the fleet to be close to exceeding the standard and needing good rates at the end of the year to avoid exceeding the standard in that target fishery. A fourth quarter standard is also set to motivate vessels to continue their halibut avoidance efforts through the end of the year, regardless of whether their allocation of halibut is likely to be constraining. If a vessel does not achieve the standard rate established for the fishery, the following year they are subject to quarterly standard halibut mortality rate requirements. Because the rates must be adhered to each quarter, it creates greater pressure for the vessel not to have a tow with high halibut rates. These measures appear to be having the desired effects, as all vessels complied with the standards in the 5th year of the plan. In addition to rate standards, the HAP also recommended weekly meetings as necessary to discuss overall Bering Sea halibut PSC performance. Meetings include discussions of halibut bycatch rates and performance, success of the various bycatch avoidance strategies, ideas regarding development of additional measures to reduce bycatch, and participate in working groups to reduce halibut bycatch.

5.3.2.3.6 Communication

Improved communication between members of the A80 fleet to reduce halibut catch is a central feature of the HAP. Improved communication was designed to occur through the sharing of information between company offices and their captains, vessel captains actively fishing, and through data collected by NMFS that is provided to SeaState. All firms in the AKSC are required to join the agreement with SeaState, so that it can provide notices to the fleet if high bycatch rates are encountered. SeaState also compiles and reviews catch and bycatch data and provides information as necessary to the fleet to help avoid areas and times of high bycatch rates. Captains are also required to communicate the most up-to-date and complete information on the grounds concerning halibut bycatch rates. The HAP defines the types of information that should be shared on the grounds including:

- prevailing bycatch rates and changes in those rates,
- catch rates of O26 halibut (particularly in the 4CDE IPHC regulatory area),
- effectiveness of deck sorting in the different target fisheries under various conditions and bycatch levels,
- effectiveness of halibut excluders in the different target fisheries under various conditions and bycatch levels, and
- any factor that may be relevant to U26 bycatch rates and O26 bycatch rates, including the effects of:
    - time of day
    - fishing depth
    - water temperature
    - areas of halibut concentrations
    - effects of any gear modifications.

While sharing of information is a valuable tool in halibut avoidance, captains and firms have greater incentives to share information on fishing locations that allow the vessel to harvest more target catch under a cooperative program relative to the open access or when certain species constrain catch. In the A80 sector a firm may be less willing to share information when they find an area with low halibut bycatch in the yellowfin sole fishery, if they are concerned about taking their entire PSC limit. The other vessels in the fleet will eventually deduce a vessel has found a good location based on its consistent activity at that location. However, the vessel may be able to fish several tows before other members of the fleet converge on the location and harvest the yellowfin sole available. Once the location is fished to the point CPUE declines and halibut rates increase vessels will disperse. The longer the vessel is able to fish the area without competition, the more yellowfin sole it could harvest at relatively low bycatch rates. This strategy is beneficial to the firm with a set halibut and yellowfin sole limit, but it is not beneficial to reducing halibut mortality relative to CPUE for the sector as a whole. This behavior is not unique to the A80 sector as, for example, it has been noted in other cooperative fisheries in Alaska as well as the West Coast cooperative fisheries when rockfish have been a constraining species.

The measures implemented to improve communication are not without costs as they increase the time spent exchanging information and the costs associated with accessing the data. These measures also benefit the firms by allowing them to better coordinate the activities of their vessels and the data collected through SeaState provides information of value to their other day-to-day operations. The gross or net cost directly associated with reducing halibut mortality is not estimated in this analysis.

5.3.2.3.7 Small Test Tows

The HAP states that when appropriate, vessels will use smaller test tows to ensure that halibut bycatch rate is acceptable before fishing an area. In addition to conducting test tows the crew will pay close attention to haul composition when the codend is dumped to quickly assess the halibut bycatch rate and halibut O26 bycatch rate. Close monitoring of the codend is also designed to increase communication with deck crew concerning halibut bycatch (and halibut O26 bycatch) trends. All the A80 firms indicated that they utilize test tows to gauge halibut bycatch before fishing a new area.

Small test tows provide information to the vessel operator regarding halibut bycatch rates in the area they are considering fishing. Conducting test tows slows the rate of fishing and increases costs. Costs are expected to be greatest in fisheries where catch bycatch rates do not allow the factory to consistently operate at full capacity.

5.3.2.3.8 Reduce Night Fishing

Fishing at night is discouraged under the HAP, particularly in fisheries with historically higher nighttime halibut bycatch rates. If vessels do fish at night, they are directed to give extra attention to halibut bycatch rates (and 4CDE O26 halibut bycatch rates in particular). When a vessel cannot achieve night fishing bycatch rates that are demonstrably similar to day fishing bycatch rates, the vessel is strongly encouraged to end night fishing. This provision does not prohibit night fishing, which is not practicable in fisheries that occur in the winter or spring and fall months when operating fishing gear only during the short daylight hours would not allow the plant to operate at an efficient level. High silt levels in the water that reduce water clarity during certain times or the year or in certain areas may also reduce the impact of limiting night fishing on halibut bycatch.

5.3.2.3.9 Excluder Use

Excluders are designed to decrease the number of halibut that are caught by allowing halibut to escape through openings in the net while target catch is funneled to the codend. The use of excluders in the A80 sector have resulted in halibut PSC reductions, but have not, to date, proven to be a panacea. Some firms use excluders almost all of time. Other firms do not, as they feel that deck sorting provides lower halibut mortality and more accurate accounting of that mortality. The simultaneous use of deck sorting and excluder use does not necessarily result in additive halibut savings. Each firm makes the decision based on their perception of how well the various tools work in their fishing operation, with some firms using one tool or the other on a specific tow and other firms using both tools.

There are many different excluder designs that are used in various fisheries around the world[86] that have been developed by several different net manufacturers. Research to improve the effectiveness of these devices is ongoing. The HAP encourages the use of excluders that are designed for the various fisheries in which they operate. Data available to the analysts in the CAS and observer data do not indicate when excluders are being used in the fishery. Comparisons of bycatch rates when vessels are using excluder devices by fishery, area, or season are not possible because of this lack of data. The HAP does indicate that during the fishing season, vessels routinely experimented with new designs of excluders and tuned existing designs with a variety of modifications. These modifications over time have improved excluder effectiveness by increasing the exclusion of halibut (though not stated in the HAP they have also worked to incorporate floatation in the nets to raise the gear off the bottom, in part, to reduce injuries and unobserved halibut mortality) and decreasing loss of target catch. Research on the West Coast fisheries to use recapture nets to study the condition of halibut that have escaped through an excluder indicated that halibut were generally in excellent condition.[87]

Lomeli's work indicated that based on previous studies the mortality rates for trawl-caught Pacific halibut discarded at sea were graded as excellent (20% assumed mortality), poor (55% assumed mortality), and dead (90% assumed mortality) condition when excluders are not used (Hoag 1975, Clark et al. 1992, Williams and Chen 2004).[88] Given the lack of information on mortality rates for halibut that escape out of an excluder, he used a recapture bag to estimate condition. The viability estimates suggest that the semirigid grids of the excluders used in that study did not increase mortality, as almost all halibut that escaped were classified as being in excellent condition. Lomeli found that while research referenced above has provided more information for the fisheries on the West Coast that were part of the study, the application of flexible sorting grids also has potential uses in other fisheries nationally and internationally.

Further evaluation of excluders over various fishing conditions would provide important information to determine their true efficacy in BSAI fisheries. Individual experimentation with operation and configuration is needed to get the greatest return from an excluder. As a result, the A80 sector has stated that it continues to support excluder development and modification to existing devices to further reduce catches of halibut and losses of target catch. An EFP application, submitted on behalf of the AKSC, was reviewed by the Council at its February 2021 meeting. The EFP was issued by NMFS in April and the

[86] https://www.bycatch.org/category/reduction-technique/excluder-devices?page=1
[87] Lomeli, Mark & Wakefield, W. (2015). Testing of Pacific Halibut Bycatch Reduction Devices in Two US West Coast Bottom Trawl Fisheries. 10.4027/fbgics.2015.01.
[88] Clark, W.G., S.H. Hoag, R.J. Trumble, and G.H. Williams. 1992. Re-estimation of survival for trawl caught halibut released in different condition factors. International Pacific Halibut Commission, Report of Assessment and Research Activities 1992, pp. 197-206

one trip is to be completed between August 2021 and December 2022 to test the excluder. This EFP would enable a collaborative study with A80 fishermen of halibut excluders in the Bering Sea flatfish trawl fishery and to conduct field testing to explore improved designs.[89] The goal of the EFP is "to enable collaborative study of halibut excluders for the Bering Sea flatfish trawl fishery and to conduct scientifically robust field testing to yield data for objective assessment of excluder fishing performance, particularly focusing our test on the excluder design among the various excluders in use that flatfish fishermen feel is most likely to provide the best and most useful selectivity under today's fishing conditions." The goals of that study are focused on testing existing excluder design's functionality and not developing new excluder designs. Because the EFP is determining the effectiveness of current halibut excluder designs, its results could allow the fleet to increase use of the current excluder designs that are most effective to achieve lower halibut bycatch per mt of groundfish harvested. The results are not expected to be available until July 2022, at the earliest.

Another project is currently in the planning stages, in addition to the EFP described above. The project is focusing on using illumination on the nets to avoid halibut and is being led by the Alaska Fisheries Science Center and Pacific States Marine Fisheries Commission. This work is building off of a West Coast study by Lomeli et al.[90] Findings on the West Coast indicated that depending on the species and length of the fish, illuminating the headrope of the selective flatfish trawl could have positive or negative effects on catch. While the differences in the catch rates and catch efficiencies were not significant, there was a general tendency to catch fewer Rex Sole, Arrowtooth Flounder, and Lingcod when the head-rope was illuminated. The catches of halibut were reduced when using illumination; however, the results were not statistically significantly different between the treatment and control trawls. The scientists working on that project hope to test the designs in the BSAI flatfish fisheries to determine if reductions in halibut catch can be achieved, that are statistically significant. Several differences in the West Coast fisheries and the BSAI fisheries could impact the effectiveness of the design including catch per unit effort, fishing depth, fishing speed, seaweed and other organic matter suspended in the water, tow duration, and the size of the tow. The experiment developers are working to test the design under real world conditions in the BSAI, but those studies have not yet been conducted. The researchers hope to conduct this study in 2022, but timing is dependent on funding and access to a vessel using a twin-trawl. Results would not be available until sometime in 2023 at the earliest.

Because the proposed use of illumination has not been tested in the BSAI flatfish fisheries to verify its effectiveness, it is not currently considered a practicable option for the A80 sector to deploy to improve halibut avoidance. This statement is not intended to indicate that the new designs and studies may not ultimately provide useful tools to the A80 sector. Depending on the study results, they may be practicable solutions to reduce halibut bycatch in the future.

In addition to the work that is currently being contemplated, it is anticipated that the pressure to reduce halibut bycatch will continue to motivate the fishing industry, agency scientists, and the public to continue to develop new technologies. The speculative nature of what those may ultimately be and how effective they are makes their current use not practicable.

The utility of excluders may also depend upon the loss of target catch. Excluders must be efficient enough to limit the amount of target fishery loss to make their use cost effective.[91] The increased pressure to reduce halibut bycatch will result in the fleet being willing to be somewhat less efficient, but there is a point where the increased costs and reduced revenue would make the fishery unprofitable. The studies

[89] https://meetings.npfmc.org/CommentReview/DownloadFile?p=924c31f1-0bdf-4625-a44d-c7f643b16024.pdf&fileName=D2%20Halibut%20Excluder%20EFP%20Application.pdf

[90] Lomeli, Mark & Wakefield, W. & Herrmann, Bent. (2018). Illuminating the Headrope of a Selective Flatfish Trawl: Effect on Catches of Groundfishes, Including Pacific Halibut. Marine and Coastal Fisheries Dynamics Management and Ecosystem Science. 10. 10.1002/mcf2.10003.

[91] The EFP application also notes that the loss of target catch could result in the vessel making more tows which could increase total halibut mortality.

underway are expected to help quantify the loss of target catch under the various technologies considered and thus help determine whether the level of target catch loss would impact the cost effectiveness of these technologies. However, the studies are not expected to determine whether a change in technology allows the fleet or firms within the fleet to remain viable over the long-term.

Combined Impact of Regulations Relative to Halibut Avoidance

As fishery management has evolved in the North Pacific, regulations have been developed that require firms to balance the need to meet one objective against the impact those decisions have on other management actions and their objectives.

Balancing incidental catch of other target species

For example, as Section 3.3 states, Pacific cod is often reserved to cover bycatch needs in the flatfish fisheries. Given the current low TAC of Pacific cod, it is a potential constraining species if the incidental catch is too high. When Pacific cod is considered a constraining species, vessels operators must weigh the costs of fishing an area with low halibut bycatch if Pacific cod bycatch is too high and could limit other directed fisheries in the fall/winter. This could cause a vessel to move from an area of low halibut bycatch, trying to find an area that produces both low halibut bycatch and low Pacific cod bycatch. In years when Pacific cod TAC are higher, relative to other target species, or if excess Pacific cod is available later in the fishing year, it would have less impact on decisions to move flatfish fishing and remaining Pacific cod cooperative quota could be used in a directed fishery.

Other management actions that impact the fleet's ability to avoid halibut includes closed areas (see Section 3.3.3). Area closures have been implemented for a variety of reasons including to reduce crab bycatch and as habitat protection areas.[92] Those areas are represented in Figure 5-10. These areas could be more limiting if A80 target species migrate farther North and open areas are less productive.

[92] https://www.habitat.noaa.gov/application/efhinventory/docs/npfmc_datasheet.pdf

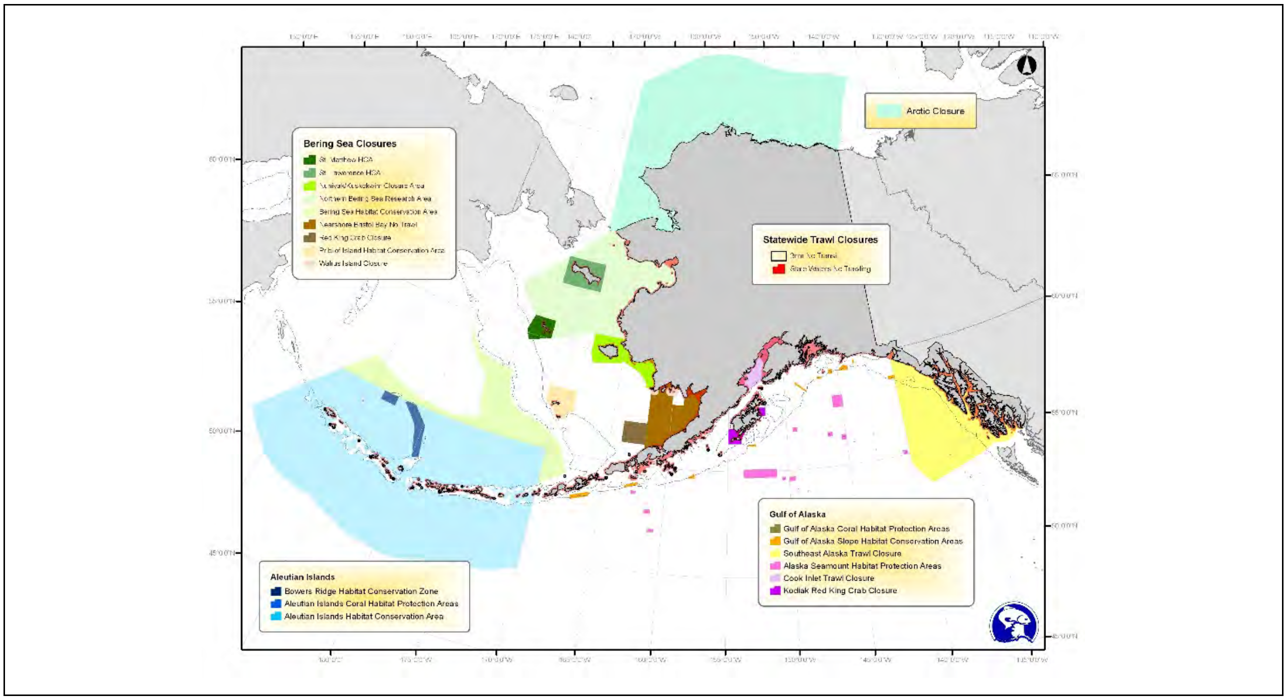

Figure 5-10 Areas closed to bottom gear

Mitigation of Halibut mortality (deck sorting)

The HAP encourages the use of deck sorting to reduce mortality of halibut (particularly O26 halibut in the 4CDE accounting area). Avoiding halibut remains the highest priority for the sector, in part because of the limited time halibut can remain on deck and survive and the increased inefficiencies associated with deck sorting halibut. When a vessel is deck sorting halibut it must close the processing plant to allow the observer to move on deck to observe the deck sorting process and make viability estimates. The factory is closed to processing and to moving fish from the deck to the plant. The plant cannot resume operating until the observer is back in the factory. This process can take about 30 minutes to complete. A80 representatives estimate that vessels make between three and seven tows per day, with an average closer to five. The result is that a vessel can lose as much as one tow per day when they are deck sorting and can add an additional day or more to a fishing trip before the vessel needs to offload product. The loss of efficiency is directly related to minimizing by bycatch mortality.

The use of deck sorting in conjunction with excluder devices varies by firm. Some firms utilize both measures on almost all tows. Recall that the observer may choose not to deck sort if the weather conditions are poor or for other reasons. Other firms tend not to utilize excluders in their nets and deck sort on tows that provide the greatest benefit. Other firms fall in-between these strategies, based on their own experiences utilizing the bycatch reduction tools.

Figures 3-40 and 3-41 indicate that deck sorting halibut was a likely factor in reducing halibut mortality in the BSAI flatfish fisheries in 2017 and 2018 and in all A80 fisheries during 2019. The analysts conclude from that data that the A80 sector's increased use of deck sorting helped yield declines in total halibut mortality in the A80 sector from 2015 through 2020.

Like the use of halibut excluders, deck sorting halibut is reported by the A80 sector to work best when halibut have different size and shape characteristics from the target species. Larger halibut are reported to remain viable longer and are easier to identify and quickly separate from the target catch. Halibut that are about the same size and shape as the target catch makes it difficult to quickly and efficiently separate halibut from the target catch. Being able to separate the halibut and return them to the water quickly and unharmed increases their viability since mortality rates appear to increase after the halibut have been out of the water for about 15 minutes. After 35 minutes, the remaining halibut are not sorted and sent to the factory where they are assigned the factory mortality rate.

AKFIN staff reviewed the data to attempt to estimate the maximum achievable reductions in halibut PSC mortality by utilizing deck sorting. The average DMR for deck sorting was fairly consistently estimated to be about 39%. The DMR varied slightly between target fisheries. DMRs also exhibited some variation by vessel, with some vessels averaging in the low 30% DMR range. The variation between vessels was thought to be a function of the harvesting capacity of the vessel and how the vessel was operated, as the DMR was reported to be fairly consistent for a vessel but varied between vessels. Some variation can also be attributed to how each observer interprets the viability of halibut during the viability grading process. Other variability could be contributed to the crew and configuration of the vessel to efficiently sort halibut from the target catch and return them to the sea.

The amount of deck sorting achieved varied during the 2016 through 2019 period and decreased in 2020. When deck sorting was reported on a vessel during any week from 2016 through 2019 the vessel was deck sorting about 70% to 80% of halibut that were brought on-board the vessel. A change occurred in 2020 that resulted in the percentage of halibut that were deck sorted falling to 61%; in 2021 (through mid-April) the percentage of halibut deck sorted was estimated to be 49%. The declines in deck sorting after 2019 have been attributed to lower overall halibut bycatch rates.

Deck sorting frequency does not vary substantially during the year for an individual vessel. As captains and firms have determined which tools work best for them to minimize halibut mortality to the extent practicable. Based on past performance in the fisheries, an estimated achievable rate for deck sorting across the fleet could be close to 80% of the halibut caught. Observer data indicates that vessels achieved a deck sorting rate of 77% of halibut when deck sorting in 2019 and 80% in 2016. One vessel was reported to have achieved a 90% deck sorting rate for several years. As stated earlier, the vessel configuration and crew capabilities directly impact the percentage of halibut that is deck sorted.

Assuming that deck sorting is utilized[93] at an 80% rate with a 39% DMR, combined with the 84% factory DMR estimate for the other 20% of halibut caught, the vessel would achieve a total DMR of 48%. The A80 sector DMR in 2019 was 47.6% (recall the NMFS estimated factory DMR was lower in 2019 75% relative to the 84% rate used by NMFS in 2020). Given the high reliance on deck sorting in 2019, because halibut were reported to be difficult to avoid, it appears the fleet was able to capture most of the benefits that can be derived from deck sorting. Members of the sector also indicated that in years when the halibut encounter rates are not as high as realized in 2019, the total DMR that would be expected from deck sorting would likely be closer to 35%. Because avoidance measures were reported to be more effective in 2020 and 2021, the fleet was less reliant on mortality reduction measures to minimize total halibut mortality.

5.3.2.4 Impacts at the Firm Level

Much of the information provided in this analysis is presented at the sector level due to confidentiality restrictions placed on releasing catch data unless it is aggregated over a minimum of three firms. These limitations make providing useful data at the firm level challenging. PSC limits are managed and enforced by NMFS at the sector level. NMFS only assigns PSC to vessels/LLP licenses to determine the amount that should be assigned to cooperatives or the limited access sector. The apportionment of PSC limits to firms is done within the cooperative. The A80 cooperative representatives provided information regarding how the cooperative distributes the PSC limit to each firm. The result is that each firm has its own PSC limit within the cooperative based on a percentage of the overall limit. Because each firm's PSC limit is

[93] The observer has the final decision whether to deck sort or not. An observer may choose not to deck sort in bad weather or for other reasons, so deck sorting every tow is not practicable.

based on a percentage of the total sector limit, it increases or decreases proportionally to the overall sector limit.

This section provides information relative to individual firm's historical PSC use relative to the proposed PSC limits being considered under the different alternatives. The intent is to provide the reader basic understanding of how the firm level division of the PSC limit has differential impacts on firms that may not be obvious from simply reviewing sector level PSC use relative to the proposed limits.

Table 5-8 shows the number of A80 firms that would have exceeded their initial cooperative PSC limit from 2017 through 2020 if the proposed alternatives had been in place that year[94]. For example, under Alternative 2, out of all the halibut abundance estimates considered only at the High EBS shelf trawl survey/High Setline Survey level would all the firms have been below their limit every year from 2017 through 2020; however, in each limit there was at least one year where no firm exceeded the limit. Under the limits in Alternative 2 from each of the other survey state combinations, either no firms were over their initial limit or up to as many as three firms would have been over their limit depending on the historical halibut usage year considered. Under Alternative 2 at least one firm would have exceeded their limit in one year over the period except under the High/High survey years and in the lowest PSC limit years as many as three firms would have been over their limit at least once during the period. Under Alternative 3, all firms would have been over their limit at least one year if the PSC limit was set at 1,309 mt or lower. At that same level there were other years when all the firms would have stayed within their limit. If the PSC limit had been set at 1,309 mt or lower there was at least one year when all firms would have exceeded their limit. Under Alternative 4, only at the 1,745 mt limit would all of the firms would not have exceeded their individual limit. Finally, under Alternative 5, all firms would have exceeded their limit at least one year if the limit were set at 1,134 mt.

Table 5-8 Firms over proposed halibut PSC limits based on past halibut mortality by firm from 2017 through 2020.

EBS Trawl Survey Setline survey	Low Very Low	High Very Low	Low Low	High Low	Low Medium	High Medium	Low High	High High
Alternative 2 PSC Limit	1,396	1,483	1,396	1,483	1,483	1,571	1,571	1,745
minimum number of firms over limit during year	0	0	0	0	0	0	0	0
maximum number of firms over limit during year	3	2	3	2	2	1	1	0
Alternative 3 PSC Limit	1,222	1,309	1,309	1,396	1,396	1,745	1,745	2,007
minimum number of firms over limit during year	1	1	1	0	0	0	0	0
maximum number of firms over limit during year	5	5	5	3	3	0	0	0
Alternative 4 PSC Limit	960	1,047	1,047	1,222	1,222	1,396	1,396	1,745
minimum number of firms over limit during year	3	3	3	1	1	0	0	0
maximum number of firms over limit during year	5	5	5	5	5	3	3	0
Alternative 5 PSC Limit	1,134	1,134	1,309	1,396	1,396	1,571	1,745	1,745
minimum number of firms over limit during year	2	2	1	0	0	0	0	0
maximum number of firms over limit during year	5	5	5	3	3	1	0	0

Source: AKFIN summary of CAS data and A80 sector supplied initial PSC limits by firm

Figure 11 provides an alternative method of considering the impacts of the proposed halibut PSC limits on the A80 firms, based on their historical usage. The stacked bar figure shows that in 2017 and 2020 not all firms would have exceeded their annual limit under the most restrictive options. During 2019 all of the firms would have exceeded their annual limit under an option that was less than 1,396 mt and at least one

[94] These years were used because they better reflect the current ownership structure of the A80 sector.

firm would have exceeded their limit under any option that was less than the current limit. The figure highlights that individual firms would be impacted differently depending on the size of the PSC limit.

Count of A80 firms that would have exceeded the proposed halibut PSC limits 2017 through 2020

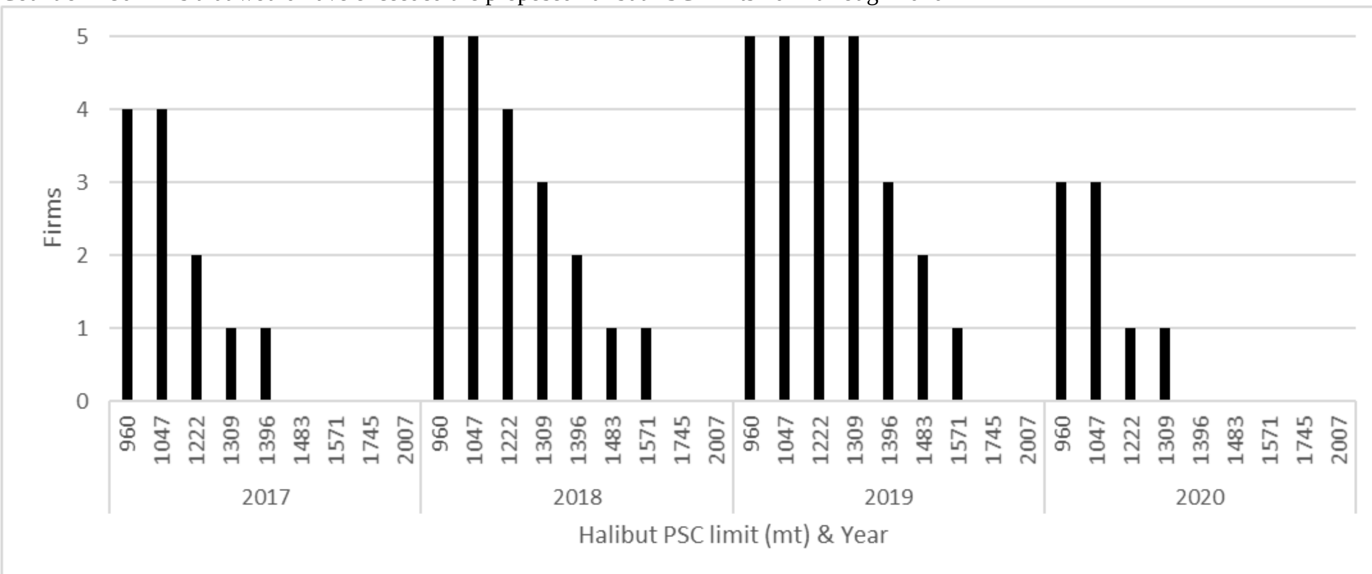

Figure 5-11 Count of A80 firms that would have exceeded the proposed halibut PSC limits 2017 through 2020

Source: AKFIN summary of CAS data and A80 sector supplied initial PSC limits by firm

When considering the impacts on firms, all firms cooperate within the cooperative structure but are competitors in the world market for A80 species. As discussed earlier in this section, firms may need to fish at times of the year that are not optimal for halibut PSC mortality minimization to meet market demand for clients, or not fish when halibut PSC is known to be low because buyers will not accept delivery at that time. Firms that are unable to provide a level of service that the clients demand, could risk losing the client to a competitor in the world whitefish market.

The structure of the A80 program allows firms to either join a cooperative or fish in the limited access fishery on an annual basis. It has been well documented in the A80 program review that firms will, in general, benefit from the cooperative structure where they do not have to race to harvest a portion of the allocated directed fisheries before the directed fishery allocations or the halibut PSC limit has been fully taken. It is assumed that members of the A80 sector will continue to participate in a cooperative. Restrictive PSC limits may create an incentive for one firm to leave the cooperative structure and fish the limited access fishery. The firm could operate in the limited access fishery because NMFS would allocate their portion of the halibut PSC limit and the directed fishery limits to the limited access fishery and they would be the only firm that could harvest the allocation. In doing so they would forfeit the ability to trade PSC species or directed fishery species with members of the cooperative. If more than one firm joins the limited access fishery, it is assumed the firms would be better off under a cooperative structure, since they would compete for a share of the harvest. When the firms are in a cooperative, the cooperative agreement is anticipated to impose penalties that would correct a firm’s behavior if they exceed their halibut mortality limit. If the penalties do not curb the unacceptable behavior, in terms of PSC usage or directed catch, the cooperative would cease to function as intended. Meaning that harvesters would disregard the cooperative rules and fish as they would have under a limited access fishery, because the short-term benefits derived would exceed the penalties imposed by the cooperative. It is not anticipated that a cooperative would allow this behavior to occur over multiple years. Either the penalties would need to be modified or the firm operating outside the rules would be prohibited from participating in the cooperative.

All the firms are different and have different business plans. These business plans and the markets they service may result in the firms operating differently throughout the year. The business plan is driven by many factors including the goals and objectives of the firm's operators, markets they serve, portfolio of fish that are available to the firms, financial reserves, and a variety of other factors. The ability of the firms to alter those annual plans and the flexibility of firms within and across years will vary. The need to change fishing plans on a short-term basis increases the uncertainty firms must address and limits longer-term financial and business planning. In addition, many firms have made substantial investments in vessels, equipment, and quota. Changes in external factors that increase uncertainty make development of a long-term business plan difficult. This is not unique to the A80 sector since the directed halibut participants have also had to deal with high quota prices, low commercial catch limits, and fluctuating halibut prices. All of which makes their planning environment difficult.

5.3.2.5 Conclusions

The A80 sector has been utilizing a variety of halibut avoidance and mortality mitigation measures for several years and continue to use those measures. Efforts to avoid halibut to the extent practicable and minimize mortality when it cannot be avoided have intensified as halibut mortality limits for the sector have been reduced. During that time, the A80 sector has invested in technology and reduced the efficiency of their operations to reduce halibut mortality. Firms use different halibut avoidance and mortality reduction strategies in different fisheries depending on their effectiveness. For example, deck sorting was reported to be more effective when halibut are a different size or shape than the target species. The analysis also notes that environmental conditions in the Amendment 80 fisheries impact halibut PSC rates and usage from year-to-year. Environmental factors complicate making direct comparisons of halibut PSC mortality across years, as the changes cannot be solely attributed to the mitigation measures implemented by the fleet.

Halibut PSC mortality mitigation efforts were undertaken to help ensure that the Amendment 80 sector will be able to harvest as much of their groundfish allocations as is economically viable given market conditions. Efforts already undertaken by the sector have shown that increases in halibut avoidance or reductions in mortality are possible with the tools that are currently available to the fleet. Additional improvements are anticipated to continue to be realized, especially if halibut limits are further reduced and the fleet forgoes some amount of profitability to reduce halibut mortality further. Reductions in halibut mortality that are realized are expected to result from the sector increasing costs or reducing efficiency. The amount of mortality reductions cannot be quantified with any certainty. If substantial reductions in halibut mortality are realized, they are likely to be derived from the development and implementation of new technologies.

Factors external to the operations are also anticipated to have an impact on A80 halibut mortality rates. Because halibut encounter rates have not been strongly correlated with halibut abundance (Section 3.4.4), external factors other than estimated halibut abundance (e.g., climate change) may impact halibut mortality rates in the A80 sector. The lack of correlation between surveyed abundance and A80 encounter rates may affect the potential impacts of the action and the ability of the fleet to avoid halibut catch, particularly in years in which the surveyed abundance is low and resulting PSC limits are low, but A80 PSC encounter rates are high.

Finally, as halibut limits become more constraining potential increased consolidation of the A80 sector could result. Consolidation would result as firms that are less efficient at addressing halibut bycatch experience less profitability and sell to A80 firms that are more efficient, derive more revenue from other fisheries to provide revenue during years halibut is a constraint or have access to more cash reserves than the sellers. In other words, as A80 firms are required to implement more measures to reduce halibut mortality their operating costs may increase and their revenue may decrease when the halibut limits constrain target catch, making annual net revenue more volatile. Firms that cannot remain viable under the new conditions would eventually exit the fishery. Consolidation was realized in 2014 when an AFA firm acquired an ownership interest and full management of the four A80 vessels. Consolidation occurred again in the A80 sector when the halibut PSC limits were reduced in 2015 and one firm left the fishery in 2017. We cannot know the ultimate cause of consolidation as those are related to proprietary business decisions. This implies a correlation but that does not equal a causal relationship.

The current A80 ownership and control limits leave room for one firm to exit the fishery, because a person may not individually or collectively hold or use more than 30% of the aggregate A80 QS units initially assigned to the A80 sector and resulting Cooperative Quota (CQ). An A80 vessel may not be used to catch an amount of species greater than 20% of the aggregate A80 sector's species ITACs. As a result the number of vessels in the fishery could be reduced to a minimum of five. While the number of vessels could decline, it is not anticipated to decrease to that level because the fleet would still need sufficient capacity to harvest the CQ that can be supported by the available halibut PSC mortality limit.

5.3.3 Discussion of Options

This section discusses potential impacts of selecting Options 1, 2 and/or 3 compared to selecting any of the action alternatives without the addition of any of the options.

5.3.3.1 Option 1

As discussed in Section 2.3.1, Option 1 employs a three-year rolling average to determine the survey state for the most recent year for the look up table. This option is to smooth potential inter-annual variability in the survey biomass values. Table 5-9 shows the resulting difference in PSC limits when employing Option 1 as opposed to the most recent value using the historical time series of both surveys (shown in Table 2-6). In this example in the years 2004, 2005 and 2018 the use of the rolling average would have established a PSC limit higher than the use of the single year survey values while in 2007 it would have resulted in a lower PSC limit than that resulting from the within year survey value.

Table 5-9 Back-calculated PSC limits based on Alternatives 2-4 with Option 1 are shown. Changes (in grey shading and red font) are highlighted where the historical use of a 3-year rolling average modified the PSC limit resulting from the single year considerations (the single year base case PSC limit is shown in parentheses). Survey values associated with these PSC limit determinations are shown in Table 2-5

Option 1: 3-yr rolling average

	PSC Limits from Look up tables		
PSC limit year	Alt 2.1	Alt 3.1	Alt 4.1
2001	1745	2007	1745
2002	1571	1745	1396
2003	1571	1745	1396
2004	1571(1483)	1745(1396)	1396 (1222)
2005	1571(1483)	1745(1396)	1396 (1222)
2006	1483	1396	1222
2007	1483(1571)	1396(1745)	1222(1396)
2008	1483	1396	1222
2009	1571	1745	1396
2010	1483	1396	1222
2011	1483	1396	1222
2012	1571	1745	1396
2013	1571	1745	1396
2014	1571	1745	1396
2015	1571	1745	1396
2016	1571	1745	1396
2017	1571	1745	1396
2018	1571(1396)	1745(1309)	1396(1047)
2019	1396	1309	1047
2020	1396	1309	1047

Option 1 could help to reduce interannual variability in PSC limits if there are large single year differences in survey indices. If there are large year to year fluctuations in survey indices in future years, Option 1 may reduce the potential impacts by maintaining more stability in PSC limits. However, the look up table limits remain the same regardless of whether Option 1 is selected. Therefore, while Option 1 may reduce the likelihood of changing survey states, the change in PSC limit if the survey state changes will remain the same.

5.3.3.2 Option 2

Option 2 constrains the new PSC limit from 1,745 mt to either 10% or 15% of the look up table value in the first year of implementation. The purpose of this option is to reduce the initial jump in the PSC limit in the first year of implementation only. Regardless of the PSC limit determined from the look up table, the PSC limit in the first year of implementation must fall within the range 1,483 to 2,006 (representing a variability of +/- maximum 15% change from status quo 1,745 mt). Following the first year of implementation this constraint would no longer be applied, and the PSC limit would be as determined by the look up table. Depending upon the survey states at the time used to determine the look up table PSC limit, application of this option could provide a step-down year before application of the regulatory PSC limit the subsequent year. For example, assuming the current survey states (as with 2019, see Table 2-6), **Table 5-10** shows what the PSC limit would be in year 1 of implementation for each alternative based upon a constraint from status quo and what year 2 would be (assuming the survey states do not change from year 1 to 2 in this example). Should the survey values increase (e.g. to values similar to 2016-2017) by the first year of implementation the constraint would be applied under this alternative but result in less variability from year 1 to year 2 for Alternative 4 and the look up table PSC limit for Alternatives 2 and 3 are close to or at the status quo limit (see **Table 5-11**).

Table 5-10 Hypothetical example of the application of Option 2 in the first year of implementation assuming survey states are similar to 2019 and remain the same in Year 2 of implementation

Alternative	Year 1 (<10%)	Year 2	Year 1 (<15%)	Year 2
2	1,570	1396	1,483	1396
3	1,570	1309	1,483	1309
4	1,570	1047	1,483	1047

Table 5-11 Hypothetical example of the application of Option 2 in the first year of implementation assuming survey states are similar to 2016-2017 (e.g. 'medium' for setline and 'high' for EBS shelf trawl surveys; see Table 2.x for more information on historical survey states) and remain the same in Year 2 of implementation

Alternative	Year 1 (<10%)	Year 2	Year 1 (<15%)	Year 2
2	1,570	1,571	1,571	1,571
3	1,745	1,745	1,745	1,745
4	1,570	1,396	1,483	1,396

The selection of Option 2 may reduce the potential impacts of a large change in PSC limits in year 1. This could allow the A80 sector more time to adjust operations and plans to adapt to a new regulatory program and potential reductions in PSC. However, after year 1, Option 2 has no effect on potential impacts.

5.3.3.3 Option 3

The purpose of the annual limit (80-90% of the PSC limit generated from the Alternatives 2-3 look up tables) is to incentivize the A80 sector to achieve halibut bycatch mortality levels that are lower than the look up table PSC limit at all times. As such, the A80 sector would be permitted to incur an amount of halibut PSC mortality that is above the annual limit but below the PSC limit generated by the look up table in 3 of any 7 consecutive years, as assessed on a rolling 7-year timeline. If the A80 sector exceeds the annual limit in 3 of 7 years, then the annual limit proportion of the PSC limit generated by the look up table is a hard cap the following year. It then reverts to an annual limit the subsequent year and remains as such until exceeded again. If exceeded the following year and within the 3 of 7-year timing it would again be applied as a hard cap the subsequent year.

In any given year, the A80 sector's PSC mortality is assessed against the annual limit to determine whether or not it has been exceeded.[95] Next, the result from that year plus the results for the six preceding years will be assessed in total to determine whether the annual limit was exceeded in 3 of 7 years. If so, the annual limit becomes a hard limit in the following year. This process is triggered only following a year where PSC mortality exceeds the annual limit. Therefore, in years where the annual limit is not exceeded, the mortality in the previous 6 years is irrelevant. The sector does not remain under a hard cap each subsequent year until the sector is out of the 3 in 7 trigger,[96] however if the next time it is exceeded is within that trigger time frame, the subsequent year will again trigger a hard cap set at the level of the annual limit. It is therefore possible historically to have more than 3 times in a 7-year period in which the annual limit is exceeded. While the Council did not select this option at final action, it is worth noting

[95] See Section 2.5 for a discussion of potential for post-season adjustments to A80 mortality and implications for imposition of a hard cap.
[96] The language in the option should be modified to clarify this.

that, had it been selected, the analysts recommended the Council clarify that the intent is not to retain the annual limit as a hard cap in subsequent years and only if triggered again following an annual limit[97] being exceeded[98]. It is therefore impossible to have the annual limit imposed as a hard cap two years in a row. For practical purposes, as currently formulated Option 3 is most likely to result in an every other year hard cap application at the annual limit level once the 3 in 7 time frame has been triggered unless the A80 sector is able to maintain multiple years in a row below the annual limit level.

As noted in Section 2.3.3, there may also be unintended negative incentives to avoid bycatch in situations where the annual limit is close to or likely to be exceeded under this option. As currently structured, once the annual limit is exceeded in a given year, based on within year PSC mortality the incentive to continue to reduce bycatch within that year is negligible until the PSC limit itself is being approached. Similarly, bycatch that remains below the annual limit is acceptable even if the annual limit is narrowly approached (e.g. 1 mt below is still counted as a 'below' year therefore the incentive to remain substantially below the annual limit may be weak). Some additional mechanisms to provide for continued PSC mortality reduction under these circumstances could be considered in conjunction with the structure of Option 3, such as evaluating whether or not an overage occurs on a rolling multi-year basis rather than only within a single year to determine a closure. Under that circumstance, PSC mortality would be assessed based on a rolling number of years to determine if the annual limit is exceeded rather than only based upon the within year PSC mortality. In that case, the overall PSC mortality in any one year remains relevant to bycatch avoidance actions that could impact the following year. This would provide incentives to continue to reduce bycatch to the extent practicable in any single year, regardless of the likelihood of exceeding the limit and even under a situation of a single year overage. This type of rolling average assessment of PSC mortality could also provide flexibility such that the impacts of a particularly high PSC year are "spread out" if it is preceded or followed by a lower PSC year. This could be particularly relevant in years where survey abundance is low and fleet encounter is high. Under these circumstances it may be more difficult for the sector to avoid halibut and remain under low limits and the option to have previous or future PSC savings in the bank to disperse impacts of particularly difficult years will help provide flexibility to the fleet and incentivize PSC avoidance in good years because any savings could be utilized in future years.

Additional modifications to Option 3 could be considered similarly to some aspects of the Amendment 91 Bycatch Management Program which was designed with both with a cap and threshold system as well as mandatory Incentive Plan requirements (similar to the HAP design components which are currently voluntary and not mandated in regulation). Some additional information on the Bering Sea Chinook Bycatch Management Program is provided below.

5.3.3.4 Chinook salmon management in the EBS pollock fishery

Amendment 91 provides an example of a PSC limit system combined with an annual threshold evaluated as a performance standard on a rolling year basis, which is similar to (but with distinct differences from) that which is being contemplated under Option 3. However, it may provide some guidance should the Council wish to consider modifications to Option 3 as currently construed. Amendment 91 established two Chinook salmon PSC limits/thresholds for the Bering Sea pollock fishery: 60,000 fish limit and 47,591 fish threshold. The PSC limit is an overarching hard cap while the threshold is an annual threshold that is evaluated as a performance standard. Both the limit and the annual threshold are applied at the sector level. The sector-level performance standard ensures that the IPA is effective and that sectors cannot fully harvest the Chinook salmon PSC allocations under the 60,000 (or 45,000) Chinook salmon PSC limit in most years. Each year, each sector is issued an annual threshold amount that represents that sector's portion of 47,591 (or 33,318) Chinook salmon. For a sector to continue to receive Chinook salmon PSC allocations under the 60,000 (or 45,000) Chinook salmon PSC limit, that sector can only

[97] For consistency with regulations at § 679.21(f)(6), had this option been selected as part of the Preferred Alternative (PA), the analysts noted that the Council may wish to redefine the term 'annual limit' as 'annual threshold'.
[98] The Council did not select this option for inclusion at final action in the PA.

exceed its annual threshold amount two times within any seven consecutive years. Under the current program, if a sector fails this performance standard, it will continue to be allocated a portion of the 47,591 (or 33,318) Chinook salmon PSC limit each subsequent year. NMFS would issue transferable allocations of the 47,591 (or 33,318) Chinook salmon PSC limit to all sectors, cooperatives, and CDQ groups, if no IPA is approved, or to the sectors that exceed the performance standard.

The PSC limits/thresholds are lowered in years of low Chinook abundance to 45,000 and 33,318 Chinook salmon (Amendment 110).[99] For each PSC limit, NMFS issues A-season and B-season Chinook salmon PSC allocations of the PSC limit to the catcher/processor sector, the mothership sector, the inshore cooperatives, and the CDQ groups. When a PSC allocation is reached, the affected sector, inshore cooperative, or CDQ group is required to stop fishing for pollock for the remainder of the season even if its pollock allocation had not been fully harvested.

NMFS issues transferable allocations of the 60,000 (or 45,000) Chinook salmon PSC limit to the sectors that participate in an Incentive Plan Agreement (IPA) and remain in compliance with the performance standard.[100] Sector and cooperative allocations would be reduced if members of the sector or cooperative decided not to participate in an IPA. Vessels, cooperatives, and CDQ groups that do not participate in an IPA would fish under a restricted opt-out allocation of Chinook salmon. If a whole sector does not participate in an IPA, all members of that sector would fish under the opt-out allocation. If a vessel, cooperative, CDQ group, or sector opts out of an IPA, NMFS allocates that entity's portion of the 28,496 opt-out cap to the opt-out allocation for that fishing year and the entity would fish under that opt-out allocation. NMFS would manage the opt-out allocation as an open access PSC limit and close the pollock fishery to opt-out vessels when the Chinook bycatch by those vessels approaches that allocation.

The IPA component was created to encourage participants to design their own agreements with incentives for each vessel to avoid Chinook and chum salmon bycatch at all times and maintain Chinook salmon bycatch at levels below the regulatory PSC limits. Each IPA entity is required to provide an annual report to the Council that evaluates whether the plan was effective at providing incentives for vessels to avoid Chinook salmon at all times while fishing for pollock. 50 CFR § 679.21(f)(13) stipulates that IPA entities report annually on the following:

- Incentive measures in effect in the previous year to avoid Chinook and chum including rolling hot spot program and salmon excluder use;
- Measures to ensure that chum salmon were avoided in areas and at times where chum salmon are likely to return to western Alaska;
- How incentive measures affected individual vessels;

[99] See Section 2.6.1 of this paper for additional information on the threshold for determination of a low abundance year.

[100] Note the definition of the performance standard is as follows (from § 679.21(f)(6)): “Chinook salmon bycatch performance standard. If the total annual Chinook salmon bycatch by the members of a sector participating in an approved IPA is greater than that sector’s annual threshold amount of Chinook salmon in any three of seven consecutive years, that sector will receive an allocation of Chinook salmon under the 47,591 PSC limit in all future years except in low Chinook salmon abundance years when that sector will receive an allocation under the 33,318 Chinook salmon PSC limit. (i) Annual threshold amount. Prior to each year, NMFS will calculate each sector’s annual threshold amount. NMFS will post the annual threshold amount for each sector on the NMFS Alaska Region Web site (http:// alaskafisheries.noaa.gov). At the end of each year, NMFS will evaluate the Chinook salmon bycatch by all IPA participants in each sector against that sector’s annual threshold amount. (ii) Calculation of the annual threshold amount. A sector’s annual threshold amount is the annual number of Chinook salmon that would be allocated to that sector under the 47,591 Chinook salmon PSC limit, as shown in the table in paragraph (f)(3)(iii)(B) of this section or the 33,318 Chinook salmon PSC limit in low Chinook salmon abundance years, as shown in the table in paragraph (f)(3)(iii)(D) of this section.. If any vessels in a sector do not participate in an approved IPA, NMFS will reduce that sector’s annual threshold amount by the number of Chinook salmon associated with each vessel not participating in an approved IPA.”

- Restrictions or penalties that target vessels that have consistently higher Chinook PSC rates relative to other vessels;
- Restrictions or performance criteria to ensure Chinook PSC rates in October are not significantly higher than other months;
- How incentive measures affected salmon savings beyond current levels;
- IPA amendments approved by NMFS since the last annual report and the reasons for amendments;
- Sub-allocation to each participating vessel;
- Number of Chinook PSC and amount of pollock (mt) at the start of each fishing season;
- Number of Chinook PSC and amount of pollock (mt) caught at the end of each season;
- In-season transfers among entities of Chinook salmon PSC or pollock among AFA cooperatives;
- Transfers among IPA vessels; and amount of pollock (mt) transferred.

5.3.3.5 Summary comparison across Options 1 and 3

Table 5-12 shows the suite of PSC limits calculated using data from 1999 through 2020 for comparative purposes across all alternatives, options 1 and 3, and suboptions. Also shown are the mortality associated with the A80 sector from 2010-2020 (pink shaded) and where the values in the look up tables for the alternatives historically would have been exceeded. The comparison of back calculated PSC limits and actual A80 PSC mortality in previous years *are for comparison purposes only*. *The analysts are not implying that the A80 sector would* <u>*necessarily*</u> *have been shut down during parts of those years* because fishery participants have the opportunity to make operational choices that might allow the sector as a whole to function under a lower limit (See Section 5.3.2.3 on the practicability of operation under lower PSC limits). This table is shown here merely to compare calculated levels historically across all of the alternatives.

The analysts note that as described in Section 5.3.2.3, using past performance as a projection of future PSC use does not account for external factors that influence PSC encounter rates and effective mortality such as halibut abundance, distribution, and comingling with groundfish target species to name only a few. Other factors that could influence future PSC use include groundfish TAC levels and catch-per-unit-effort – whereby a greater number of hauls required to meet groundfish harvest goals could result in higher levels of gross halibut encounter. In short, taking an “all else equal” approach to projecting future PSC use based on past performance is not a precise methodology; historical PSC usage years that came close to a PSC limit or annual limit (plus or minus) could easily have fallen on the other side for reasons that are not accounted for when simply looking at the annual total.

Table 5-12 Back-calculated PSC limits for Alternatives 2-4 and limits resulting from application of Options 1 and 3 and Amendment 80 PSC use (highlighted cells = A80 sector would/could have reached the limit). Note that the limits for Option 3 are calculated based on the table limits using the most recent survey year available, and not based on the Option 1, 3-year rolling average survey indices. Notations for options are as follows: Option 3 suboptions 1 X.3.1 (e.g. Alt 2.3.1). Grey shading indicated where the look up table limit using the most recent year would have resulted in a different value had Option 1 (3 year rolling average) been applied (value for Option 1 shown in red, value for most recent year in parentheses below). See Table 2-5 for details on the comparison of actual values for Option 1 as compared to the within year value.

Look up tables	Alternative			Option 3: 80% of look up table			Option 3: 90% of look up table			A80		
	2	3	4	2.3.1	3.3.1	4.3.1	2.3.2	3.3.2	4.3.2	Limit	Encounter	Mortality
2010	1571	1745	1396	1257	1396	1117	1414	1571	1256	2,425	2,823	2,254
2011	1571	1745	1396	1257	1396	1117	1414	1571	1256	2,375	2,277	1,810
2012	1571	1745	1396	1257	1396	1117	1414	1571	1256	2,325	2,469	1,944
2013	1571	1745	1396	1257	1396	1117	1414	1571	1256	2,325	2,677	2,166
2014	1571	1745	1396	1257	1396	1117	1414	1571	1256	2,325	2,667	2,178
2015	1571	1745	1396	1257	1396	1117	1414	1571	1256	2,325	2,200	1,638
2016	1571	1745	1396	1257	1396	1117	1414	1571	1256	1,745	1,965	1,412
2017	1571	1745	1396	1257	1396	1117	1414	1571	1256	1,745	1,976	1,167
2018	1571 (1396)	1745 (1309)	1396 (1047)	1117	1047	838	1256	1178	942	1,745	2,555	1,343
2019	1396	1309	1047	1117	1047	838	1256	1178	942	1,745	3,067	1,461
2020	1396	1309	1047	1117	1047	838	1256	1178	942	1,745	2,031	1,097

5.4 Impacts on BSAI halibut commercial catch

PSC reductions could indirectly lead to increases in directed halibut catch through two means. First, reductions in the U26 portion of the PSC could lead to longer term benefits to the commercial halibut fisheries throughout the distribution of the halibut stock. Benefits from reduced mortality of these smaller halibut could occur both in the Bering Sea and elsewhere as these halibut migrate and recruit into the commercial halibut fisheries. Second, the current IPHC interim harvest policy subtracts the projected O26 portion of non-directed discard mortality (bycatch) from the TCEY by IPHC Regulatory Area when calculating fishing limits. Therefore, given current harvest policy,[101] near term benefits to BSAI halibut fisheries would result from the PSC mortality reductions of halibut that are over 26 inches in length (O26). A portion of these halibut would be available to the commercial halibut fishery in the area that the PSC mortality is foregone, in subsequent years or when the fish reach the legal size limit for the commercial halibut fishery (greater than or equal to 32 inches in total length).

The magnitude of the relationship between PSC limits and directed catch limits depends on many variables. According to the IPHC interim management procedure, the non-directed discard mortality projection used when calculating catch limits is the three-year average non-directed discard mortality from the most recent year. Therefore, a change in the PSC use in a specific year will only begin to affect the trade-off with the directed halibut limit in the next year. Furthermore, as shown in Section 3.4, the relationship between the PSC limit and PSC use varies, therefore a reduction in the PSC limit may not always generate an increase in directed catch limits in the short-term and even when it does, the magnitude may vary based on the actual A80 O26 PSC mortality.

Assuming no change to IPHC harvest policy or implementation, and a constant relationship between PSC use and limit, the relationship between PSC and directed catch limit will still vary with the relative

[101] Noting that IPHC decisions may deviate above or below the harvest policy limits and may maintain or increase directed fishing opportunities given changes in the PSC with potential long-term impacts. See section 4.3 for examples of potential management departure from the interim harvest policy.

proportions at age observed in the bycatch (which could be influenced by factors such as selectivity and recruitment allocation varying over time). Because the IPHC only deducts O26 non-directed discard mortality by area when calculating catch limits (U26 are accounted for separately; see Section 4.4), an increase in halibut fishery catch is mostly a result of reducing the O26 component of the PSC limit. The length-distribution of Pacific halibut caught as bycatch in fisheries targeting other species is reported to the IPHC each year by NMFS for Alaska and Washington-Oregon-California, and DFO for British Columbia. Historically, the raw length frequencies are summarized by target fishery within gear type (i.e., trawl, hook-and-line, and pot), then aggregated to better represent the differing contributions and sampling rates for each fishery. Weighted length-frequencies of the estimated bycatch are used in the annual harvest policy calculations and catch tables specifically to delineate O26 and U26 removals (Stewart and Webster 2020).

The IPHC uses length estimates at the gear level. Given that A80 PSC accounts for ~60-82% of trawl discards (Table 4-2), a larger percentage of A80 PSC that is O26, results in a lower directed halibut fishery catch limit. Table 5-13 shows the relative percentage of A80 halibut PSC that is O26 calculated as a three-year average weighted based on observer sampling hierarchy as follows: halibut length data collected at the haul level are expanded within each level of the sampling hierarchy, within each sampling strata. Since sampling rates vary not only at each level of the hierarchy but also between sample units (e.g., proportion of halibut measured varies between hauls on a fishing trip), this weighting is important to ensure unbiased estimation. To estimate the proportion of O26 halibut discards, the estimates of the O26 proportion are weighted by the total weight of discarded halibut estimated at each level. The estimated proportion can then be multiplied by the halibut discard (or mortality) to estimate the amount of O26 halibut discarded. This methodology is similar to the one that is now used in the estimation of halibut discard mortality rates. Because the directed halibut fishery catch is the TCEY (mortality limit of O26 halibut) minus the O26 PSC use, a larger percentage of PSC that is O26, results in a lower directed halibut fishery limit. The three-year average percent of A80 PSC that are O26 has varied from 34-61% over the past 10 years depending on the methodology used (straight or weighted).

Table 5-13. Three-year average percentage of O26 Amendment 80 halibut PSC by weight from observer data as calculated by weighted average based on sampling hierarchy, 2010-2020. These results include data from deck sorting (2016 through 2020). No DMRs are applied.

Year	% O26 bycatch by weight
2010	34.2%
2011	43.0%
2012	50.9%
2013	52.4%
2014	51.5%
2015	38.4%
2016	28.2%
2017	46.3%
2018	49.6%
2019	60.6%
2020	41.5%
Average 2010-20	45.1%

Because the relationship between PSC limits and directed halibut catch limits is uncertain and varies year to year, an example of potential changes in directed halibut catch resulting from the PSC limit changes that could occur under the alternatives is provided in **Table 5-14**. These changes are calculated using ratios of 0.0, 0.25, 0.5, 0.75 and 1.0, selected to provide a broad descriptive range of potential relationships between PSC limits and directed catch limits. For example, using a ratio of 1, the entirety of the PSC limit change is transferred into the directed catch limit in the opposite direction. This scenario of a PSC limit reduction leading to an equivalent increase in directed catch represents a scenario in which 100 % of the PSC limit is taken as O26 PSC for the previous three years given that the projected PSC removal is the three-year average of recent O26 PSC usage rather than the PSC limit. A ratio of 1 is the maximum because that implies all PSC usage is composed of O26 halibut and has a direct trade-off with the directed halibut limit. Ratios less than one indicate that PSC usage occur wholly or partially on Pacific halibut less than 26 inches. Such fish would be subject to natural mortality and movement out of the region. Both of these processes, while being uncertain, lower the impact of PSC usage on potential gains to the directed Pacific halibut fishery. Given recruitment variability, variable fishing patterns resulting in annual changes to selectivity, and variable population processes such as growth and movement, the ratio may occur anywhere in this range in a given year.

Table 5-14 Change from status quo (SQ) BSAI directed catch limits (million net pounds) resulting from proposed PSC limits (mt) given an assumed ratio between the PSC limit and the directed halibut limit. The bottom four rows display change from status quo directed BSAI catch limits resulting from the PSC listed at top, calculated using the quartiles of potential ratios.

		Alternative(s)	4	4	3, 4	3	2,3,4	2	2	1,2,3,4	3
		PSC Limit (mt)	960	1047	1222	1309	1396	1483	1571	1745	2007
difference from SQ PSC Limit		(mt)	-785	-698	-523	-436	-349	-262	-174	0	262
		(mil net pounds)	-1.298	-1.154	-0.865	-0.721	-0.577	-0.433	-0.288	0	0.433
ratio (PSC limit: directed catch limit)	1.00	change in directed catch limit (mil net pounds)	1.298	1.154	0.865	0.721	0.577	0.433	0.288	0	-0.433
	0.75		0.973	0.866	0.649	0.541	0.433	0.325	0.216	0	-0.325
	0.50		0.649	0.577	0.432	0.360	0.289	0.217	0.144	0	-0.217
	0.25		0.324	0.289	0.216	0.180	0.144	0.108	0.072	0	-0.108
	0.00		0	0	0	0	0	0	0	0	0

Additionally, the ratios may have asymmetric effects that are not fully captured by reporting a range. For example, a PSC limit of 960 mt may be more congruent with one end of the range while a higher PSC may be more representative of the opposite end of the range. As noted above regarding the size (ages) taken as PSC mortality, the ratio will vary over time (Stewart et al. 2021) depending on the halibut population age-structure and the relative availability of different age groups to the directed fishery and those halibut taken as PSC. Therefore, this approach provides a thought process to understand the direction and approximate magnitude of the relationship between PSC and commercial catch in the BSAI. Given the many uncertainties, these results are best used for looking *across* the table to compare the PSC limits embedded in the alternatives to one another on a relative basis.

The IPHC analyzed the relationship between bycatch and yield in the directed halibut fishery by comparing results of the coastwide assessment with and without coastwide bycatch, concluding that "potential yield to the directed fishery was generally larger than a simple reallocation from non-directed discards (115% on average), [and] that the rate of exchange is variable over time (range of 86–139%)" (Stewart et al. 2021). Comparable results for the BSAI are likely to be smaller than these as a majority of the directed halibut fishery occurs outside of the BSAI and a majority of the PSC bycatch occurs within the BSAI and BSAI Pacific halibut are markedly smaller/younger than those from the coastwide PSC analysis. Stewart et al. focused only on the coastwide impact estimates, which is less applicable to the proposed action due to the different sizes (ages) in the BSAI PSC. In a review of their method, the IPHC's Scientific Review Board stated that this analysis should "be interpreted with caution, as there are multiple methods for evaluating how bycatch in non-directed fisheries impact stock productivity and biomass over time" and that:

'*what if' questions about past behaviour are not appropriate for stock assessment models because those analyses do not adequately reflect the information available at the time or information feedbacks to future decisions over time. An MSE analysis, on the other hand is specifically designed to answer 'what if' questions under particular future scenarios while properly accounting for stock assessment errors in response to changing information.*" (IPHC–2019–SRB015–R, IPHC-2018-SRB012-R, para. 23).

The analysis done by Stewart et al. (2021) and the analysis of outcome based on the ratios in Table 5-2 could both be enhanced by looking at long-term outcomes using closed loop simulation models. A key outcome of Stewart et al. (2021) is that the rate of exchange – sometimes referred to in the ABM context as yield gain or the PSC-to-directed-catch ratio – is variable over time.

Table 5-15, below, calculates a range of revenues associated with the potential changes in the net pounds of directed halibut catch limits reported in **Table 5-14**. The ex-vessel values are reported in 2018-dollar adjusted ex-vessel values for Area 4 as reported in Section 4. The ex-vessel value represents the amount paid to fishermen by a primary processor for raw fish. Ex-vessel prices are the most appropriate value to represent halibut fishery revenues given that this is the most common halibut supply chain in Alaska, particularly in the BSAI or Area 4 (see Section 4). In response to requests from public comments, halibut revenues are also reported in wholesale values in **Table 5-15**. The wholesale values in this table are estimates of first wholesale production values for head and gut fish as reported in the Economic SAFE report (NMFS, 2021). The wholesale values are based on COAR data that rely on the accuracy of processor reporting and are aggregated at the statewide level. COAR data for processors located in the BSAI region that primarily purchase Area 4 halibut come from a small set of reporting entities and are sometimes excluded due to identified reporting gaps. The estimates in **Table 5-15** might not be a reliably precise indicator of value-added production at the primary processing level in the BSAI/Area 4 region, or the Area 4CDE region in particular. As noted in Section 4.5.1, ex-vessel values in Area 4 consistently trail statewide values.

The analysts attempted to estimate wholesale values that are more specific to Area 4; however, this is not a straightforward calculation due to limited data sources, as alluded to above and in Section 5.3.1. Unlike for the A80 sector, there is no link from round weights to product weights by product type and processing facility for the halibut fishery. Without this link, the only available method to connect purchases and sales for each processor is to compare the annual sum of the processed product weights (sold) and the unprocessed weights (purchased) in COAR tables. Those weights will not match exactly due to volume lost during processing and year-to-year differences if a processor purchases the fish in one year and sells the fillets the next year (e.g., holdover inventory). The analysts applied a "screen" to filter out annual data from processors whose sales include too much holdover product from the previous year.[102] The screen is the ratio of the annual purchased weight divided by the annual sold product weight. Due to the fact that a majority of product in Area 4 are gutted and glazed (head-on), an additional scaling is used to adjust to "head-and-gut" prices (weight bought multiplied by 0.903 – or 0.75/0.83 – the head-and-gut to gut ratio). When setting the screen value to accept data that falls between 0.6 and 1.5 and only including processors operating in the BSAI region, the estimated wholesale value is $6.02 in 2019 (2018$) with a 5-year average of $7.90 (2015-2019). This range comes out slightly higher than the estimates taken from the Economic SAFE. These data issues and limitations are not uncommon in fishery analyses. For that reason, the analysts encourage the reader to understand Table 5-15, below, as a series of catch volumes that is multiplied through by a set of informed unit-value estimates. A reader could multiply through by a different unit-value based on information that he or she has or based on an entirely different value-scope

[102] That screen also filters out cases where data reporting gaps could skew local average weights or unit values. For example, a specific processing facility might be known to have received a substantial percentage of the Area 4 halibut catch but did not report any halibut production in its COAR submission.

if they wanted to reflect additional downstream values that are not included here due to data limitations or concerns about data quality and the appropriateness of certain cross-sector comparisons.

Setting aside the uncertainty surrounding future halibut ex-vessel and wholesale value estimates, the numbers in Table 5-15 may overestimate potential changes in revenue as they assume 100% usage of the additional catch limit. The Area 4 TAC utilization rate was roughly 91% from 2011 through 2020 and was roughly 85% in 2020. The reader can compare the values in the table to historical Area 4 ex-vessel revenues shown in Table 4-9. Area 4 gross ex-vessel revenue in 2018-dollars ranged from $32.6 million to $54.4 million from 2010 to 2012 but has been between $16.9 million (2018) and $24.9 million (2016) in more recent years. Section 4.5 highlights the reasons why recently observed per-unit values for gross ex-vessel halibut revenues might not be a reliable predictor of future value in the near term due to significant market disruptions.

PSC mortality is incorporated into the IPHC commercial limit-setting process in terms of actual PSC use, not the limit as it exists as a number on paper. In a scenario where abundance is high and the PSC *limit* is also high – e.g., 2,007 mt – one should really infer “yield gain” to the halibut fishery based on changes in PSC use. Crucially, Table 5-15 is showing negative values under the “High/High” PSC limit of 2,007 mt, but this is assuming 100% use of the limit. That is likely a poor assumption. It is possible that greater halibut abundance could increase halibut encounter, but one must also account for the pressure and incentives for constant halibut avoidance and mortality mitigation (e.g., deck sorting, excluder use, etc.). In other words, it is possible that if halibut abundance indices reach high levels, PSC use may not increase as fast as abundance, thus increases in abundance would result in increased directed limits due to both the increase in abundance and the slower increasing rate of PSC use.

Table 5-15 Potential change in revenue from status quo based on PSC limit (2018$)

			ratio	960	1047	1222	1309	1396	1483	1571	1745	2007
ex-vessel values	2019	$4.33	1.00	5,620,218	4,997,340	3,744,425	3,121,548	2,498,670	1,875,792	1,245,755	0	-1,875,792
			0.75	4,215,163	3,748,005	2,808,319	2,341,161	1,874,003	1,406,844	934,316	0	-1,406,844
			0.50	2,810,109	2,498,670	1,872,213	1,560,774	1,249,335	937,896	622,878	0	-937,896
			0.25	1,405,054	1,249,335	936,106	780,387	624,668	468,948	311,439	0	-468,948
	Average 2015-19	$5.54	1.00	7,190,764	6,393,826	4,790,789	3,993,851	3,196,913	2,399,975	1,593,876	0	-2,399,975
			0.75	5,393,073	4,795,369	3,593,092	2,995,388	2,397,685	1,799,981	1,195,407	0	-1,799,981
			0.50	3,595,382	3,196,913	2,395,395	1,996,925	1,598,456	1,199,987	796,938	0	-1,199,987
			0.25	1,797,691	1,598,456	1,197,697	998,463	799,228	599,994	398,469	0	-599,994
wholesale head and gut	2019	$6.37	1.00	8,268,080	7,351,745	5,508,543	4,592,208	3,675,873	2,759,538	1,832,670	0	-2,759,538
			0.75	6,201,060	5,513,809	4,131,407	3,444,156	2,756,904	2,069,653	1,374,503	0	-2,069,653
			0.50	4,134,040	3,675,873	2,754,271	2,296,104	1,837,936	1,379,769	916,335	0	-1,379,769
			0.25	2,067,020	1,837,936	1,377,136	1,148,052	918,968	689,884	458,168	0	-689,884
	Average 2015-19	$7.04	1.00	9,137,721	8,125,006	6,087,934	5,075,219	4,062,503	3,049,787	2,025,431	0	-3,049,787
			0.75	6,853,291	6,093,754	4,565,951	3,806,414	3,046,877	2,287,340	1,519,073	0	-2,287,340
			0.50	4,568,861	4,062,503	3,043,967	2,537,609	2,031,251	1,524,894	1,012,716	0	-1,524,894
			0.25	2,284,430	2,031,251	1,521,984	1,268,805	1,015,626	762,447	506,358	0	-762,447

5.4.1 Impacts within IPHC Regulatory Area 4

NMFS reports pacific halibut mortality from non-directed commercial fisheries (fisheries where the retention of Pacific halibut is prohibited) to the IPHC on an annual basis by IPHC Regulatory Area and gear type. Table 5-16 shows IPHC catch limits and non-directed discard mortality as well as A80 PSC by IPHC area. A80 PSC are included for comparison purposes although IPHC does not distinguish discard mortality beyond the trawl level. A80 PSC are reported in round mt however IPHC converts to net million pounds using the following calculations: net =round*0.75, lb=t/0.000453592. A80 PSC accounts for varying proportions of total non-directed discard mortality by area (Figure 5-12)

Table 5-16 IPHC catch limits and non-directed discard mortality in million net pounds and metric tons

		million net pounds				metric tons		
Year	Area	FCEY adopted	Directed Commercial Fishery Limits	Directed Commercial Total Removals	non-directed discard mortality	non-directed discard mortality	Trawl non-directed discard mortality	A80 PSC
2020	4A	1.41	1.41	1.23	0.28	170	148	98
	4B	1.10	1.10	0.93	0.10	59	49	29
	4CDE	1.73	1.73	1.69	2.45	1480	1380	969
	Area 4	4.24	4.24	3.85	2.83	1709	1577	1096
	All Areas	27.48	23.09	22.39	4.67	2827		1096
2019	4A	1.65	1.65	1.46	0.35	209	169	104
	4B	1.21	1.21	1.03	0.15	92	83	46
	4CDE	2.04	2.04	1.71	3.50	2116	2021	1309
	Area 4	4.90	4.90	4.20	4.00	2416.9	2273.2	1459.1
	All Areas	29.43	24.87	24.34	6.56	3970		1459
2018	4A	1.37	1.37	1.29	0.33	200	164	87
	4B	1.05	1.05	1.06	0.14	86	76	55
	4CDE	1.58	1.58	1.44	2.98	1800	1709	1207
	Area 4	4.00	4.00	3.80	3.45	2086	1949	1349
	All Areas	28.04	23.51	23.57	6.11	3695		1349
2017	4A	1.39	1.39	1.33	0.43	258	184	115
	4B	1.14	1.14	1.08	0.21	127	117	83
	4CDE	1.70	1.70	1.65	2.75	1662	1476	973
	Area 4	4.23	4.23	4.06	3.38	2047	1777	1171
	All Areas	31.40	26.36	26.61	6.21	3757		1171
2016	4A	1.39	1.39	1.40	0.60	362	282	131
	4B	1.14	1.14	1.14	0.15	89	83	60
	4CDE	1.66	1.66	1.53	3.24	1962	1751	1222
	Area 4	4.19	4.19	4.07	3.99	2413	2116	1413
	All Areas	29.89	28.00	25.64	7.16	4330		1413
2015	4A	1.39	1.39	1.42	0.67	404	292	140*

	4B	1.14	1.14	1.12	0.23	137	122	99*
	4CDE	1.29	1.29	1.23	3.43	2071	1816	1166*
	Area 4	3.82	3.82	3.76	4.32	2612	2230	1404*
	All Areas	29.22	24.42	25.29	7.61	4601		1404*
2014	4A	0.85	0.85	0.87	0.83	503	372	245
	4B	1.14	1.14	1.15	0.13	82	61	36
	4CDE	1.29	1.29	1.30	4.80	2901	2543	1897
	Area 4	3.28	3.28	3.32	5.76	3486	2976	2178
	All Areas	27.52	23.06	24.31	9.08	5492		2178
2013	4A	1.33	1.33	1.29	0.87	528	367	317
	4B	1.45	1.45	1.26	0.14	85	70	42
	4CDE	1.93	1.93	1.82	4.98	3010	2486	1807
	Area 4	4.71	4.71	4.36	5.99	3622	2922	2166
	All Areas	31.03	29.50	29.96	8.93	5398		2166
2012	4A	1.57	1.57	1.64	1.47	890	795	445
	4B	1.87	1.87	1.76	0.26	154	130	89
	4CDE	2.47	2.46	2.41	4.26	2576	2091	1410
	Area 4	5.91	5.90	5.80	5.99	3621	3016	1944
	All Areas	33.54	32.01	33.02	9.29	5620		1944
2011	4A	2.41	2.41	2.48	0.97	588	477	331
	4B	2.18	2.18	2.08	0.48	288	243	67
	4CDE	3.72	3.72	3.60	3.02	1829	1510	1412
	Area 4	8.31	8.31	8.16	4.47	2705	2230	1810
	All Areas	41.07	39.69	41.41	8.50	5141		1810
2010	4A	2.33	2.33	2.41	1.06	640	484	245
	4B	2.16	2.16	1.84	0.48	289	224	48
	4CDE	3.58	3.58	3.38	4.18	2529	2074	1961
	Area 4	8.07	8.07	7.62	5.72	3457	2782	2254
	All Areas	50.67	49.38	52.21	9.75	5894		2254

Source: IPHC https://www.iphc.int/data/time-series-datasets IPHC-2021-TSD-025, IPHC-2020-TSD-018

A80 PSC: AKFIN (*does not include 234t of deck sorted PSC),

trawl non-directed discard mortality reported in round mt, converted to net lb, (net lb=round t*0.75/0.000453592)

net =round*0.75

t=lb* 2204.623

lb=t/0.000453592

Figure 5-12 Proportion of non-directed discard mortality (PSC) from 2010 to 2020 for all fisheries (red), all trawl fisheries (green), and A80 trawl fisheries (blue).

NMFS methodology to apportion PSC to IPHC areas has changed in recent years. Prior to 2015, PSC was assigned to an IPHC area based on the NMFS federal reporting area, assigning an entire NMFS reporting area to an IPHC area. This method provided estimates at low spatial resolution relative to where fishing activity occurred, resulting in estimates that cross boundaries and attribute too little or too much catch to an IPHC area. In most situations, this method was acceptable given the large size of an IPHC area relative to a NMFS reporting area and the location of fishing activity. However, in Area 4 (BSAI), the boundaries of NMFS areas and IPHC areas are poorly aligned and generally have large amounts of fishing effort along their boundaries (Figure 5-13). In 2015, improvements in the Alaska Regional Office (AKRO) Catch Accounting System (CAS) improved the spatial resolution for which estimates are available in the database. Due to these improvements, since 2016, for observed fisheries such as A80, the IPHC area is determined by the observed haul retrieval latitude and longitude.

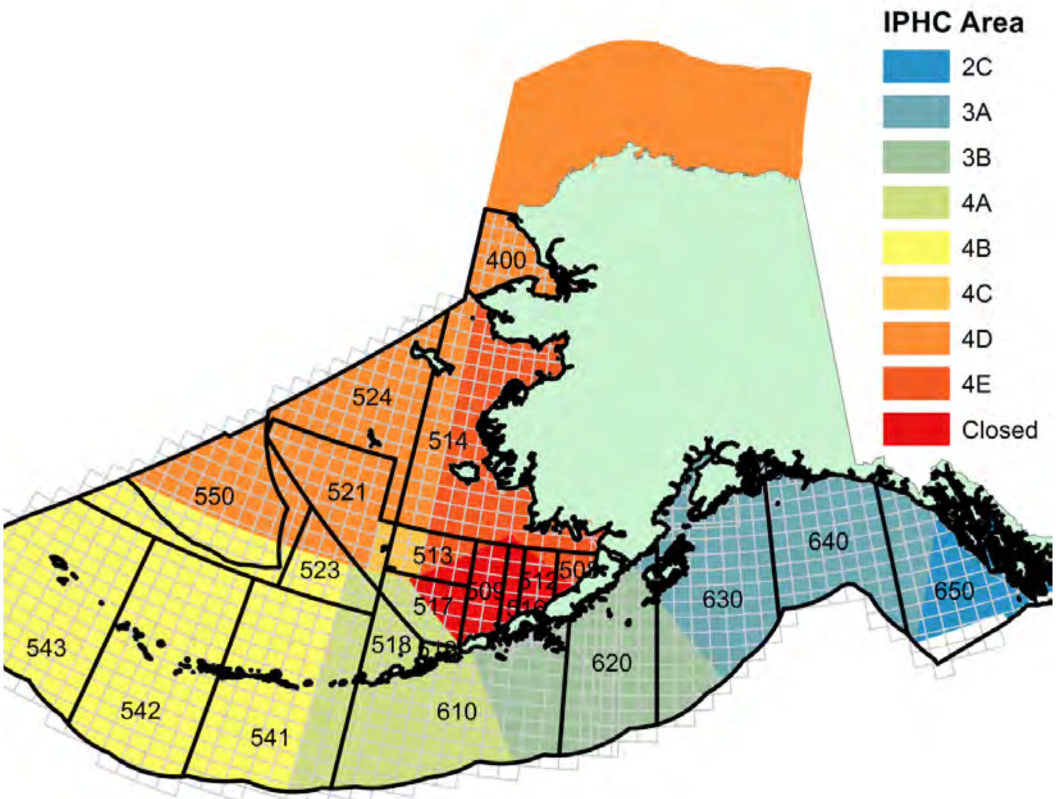

Figure 5-13 Agency reporting areas: NMFS (black lines), ADFG (small grid), and IPHC (colored blocks).

Given that IPHC catch setting policy removes O26 bycatch by IPHC regulatory area, the spatial distribution of PSC may impact the distribution of directed fishery catch limits within Area 4. Total A80 PSC has decreased since 2015 however the distribution within Area 4 has stayed fairly consistent with Area 4CDE accounting for between 83% and 90% of annual A80 PSC since 2015 (Figure 5-14). If the spatial distribution of PSC within Area 4 remains consistent in the future, the directed halibut fishery in Area 4CDE would have the greatest potential for experiencing whatever incidental reallocative effects may occur under the proposed action alternatives.

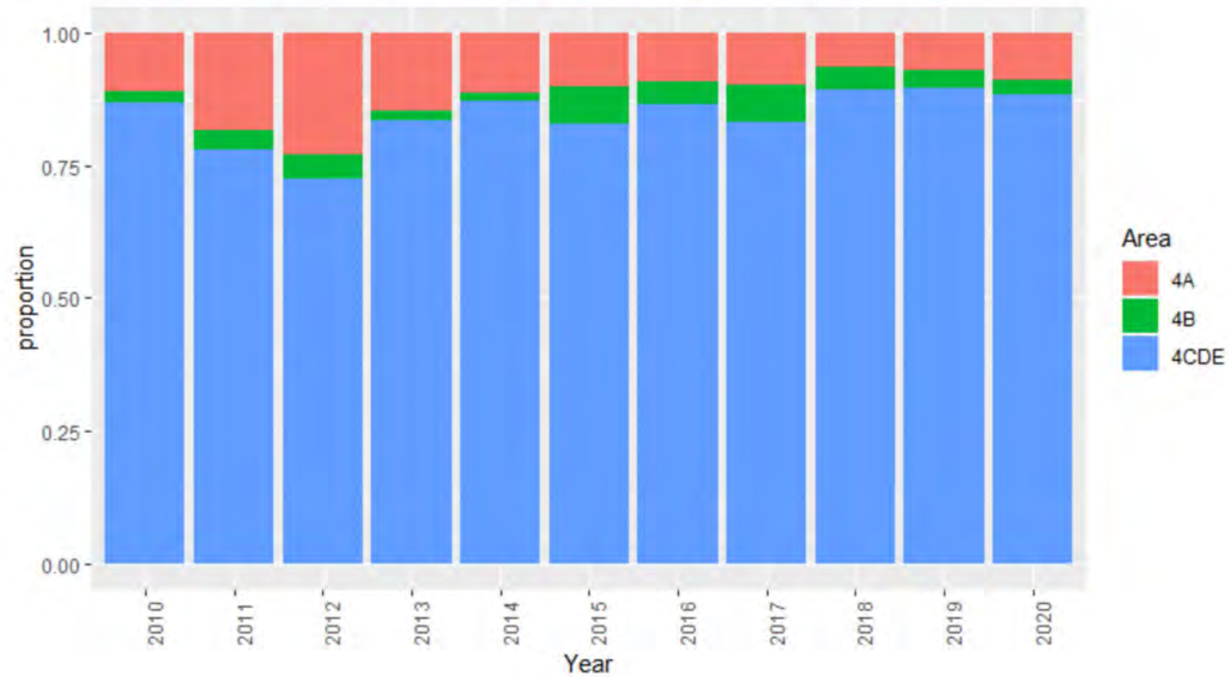

Figure 5-14 Proportion of A80 PSC by IPHC Regulatory Area from 2010 to 2020.

While total PSC has decreased since 2015, the new NMFS method for apportioning to IPHC area may have unintentionally negatively impacted 4CDE. Of the NMFS reporting areas that overlap IPHC areas, 521 and 523 apportionment changed very little with the new methodology, while 541 apportioned approximately half of the PSC that would have previously been deducted from 4B to 4A and 517 apportioned varying amounts of PSC that would have previously been deducted from 4A to 4CDE (Figure 5-15).

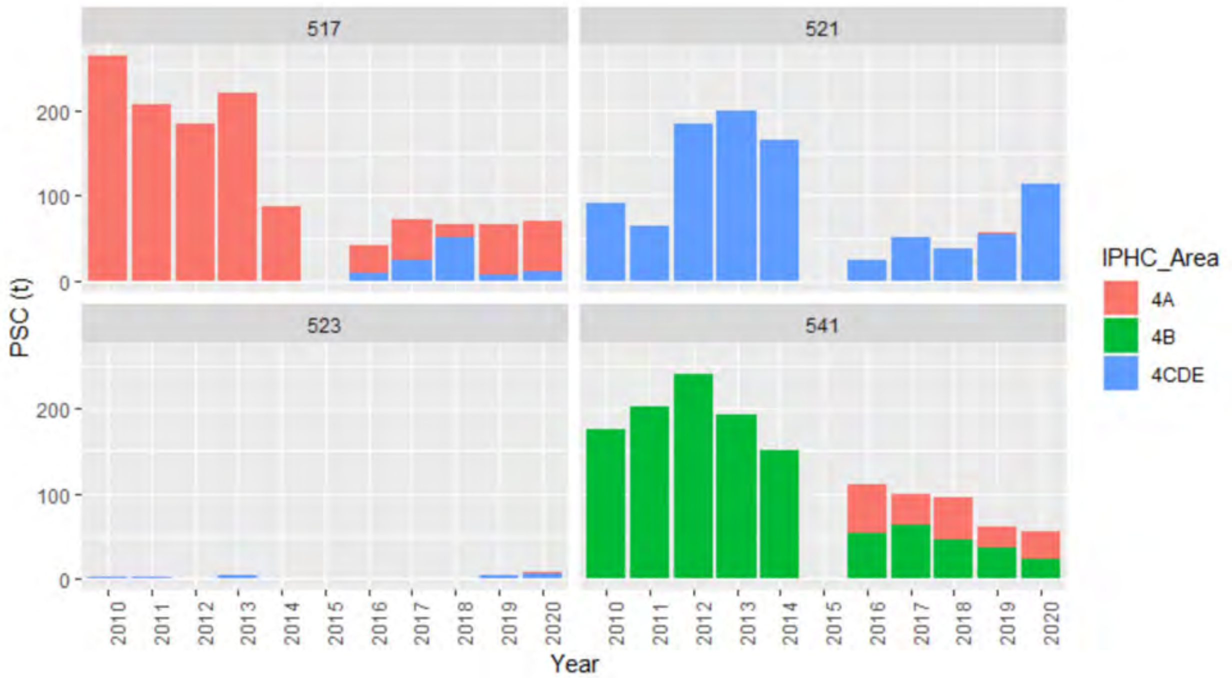

Figure 5-15 A80 PSC by NMFS reporting area and IPHC Regulatory Area

The above figures and tables include all PSC regardless of length, but IPHC only deducts O26 by area when calculating catch limits (U26 are accounted for at the coastwide level, see Section 4.4.1). Regardless, Figure 5-15 illustrates that the PSC in statistical areas that overlap two IPHC Regulatory Areas have significant amount of PSC which may occur in either IPHC Regulatory Area. With changes in the age structure of the halibut population and movement of target fish species between areas, a particular year may show a relatively higher amount of PSC, or possibly an increasing trend in PSC in an IPHC Regulatory Area. For example, area 517 showed a higher proportion of PSC in IPHC Regulatory Area 4CDE (Figure 5-15) in 2018 than other years. This type of variability can result in unexpected changes in the directed halibut catch limit since the PSC is removed from the TCEY to calculate the FCEY, and the impacts to the directed halibut fisheries in a particular IPHC Regulatory Area, such as 4CDE, may be greater than in the entire BSAI.

5.5 Social and Environmental Justice

Appendix 1, the Social Impact Assessment (SIA), evaluates community and regional participation patterns in the BSAI Amendment 80 groundfish fishery and the Area 4 halibut commercial fishery as well as potential community level impacts from (1) the no-action alternative (Alternative 1) and (2) the four action alternatives as a group (Alternatives 2-5). Potential impacts to regional subsistence and sport halibut fisheries are also evaluated. This section summarizes those SIA evaluations and provides additional evaluation of the individual action alternatives.

5.5.1 BSAI groundfish fishery engagement, dependency, and vulnerability to community-level Impacts of the proposed action alternatives

5.5.1.1 Alaska communities

The screening criteria for the selection of Alaska communities for inclusion in the BSAI groundfish component of the SIA were designed to identify Alaska communities that had at least a minimal, ongoing level of engagement in the relevant BSAI groundfish fisheries, as measured by an annual average of one or more active Amendment 80 sector groundfish trawl catcher/processor(s) with a local ownership address that participated in the BSAI groundfish fisheries 2010-2019 inclusive and/or being the location of catcher/processor product transfers. The latter criterion selected for those BSAI communities where, on an annual average basis 2010-2019, 5.0 percent or more of combined state shared fisheries tax revenue (i.e., Fisheries Business Tax revenue [associated with landings at shore-based or stationary floating processing operations] and Fisheries Resource Landing Tax Revenue [associated with product transfers by catcher/processors]) was attributable to Fisheries Resource Landing Tax revenue.

Using these screening criteria, five Alaska communities have been selected for analysis as potentially substantially engaged in, and/or potentially substantially dependent on, the BSAI groundfish Amendment 80 sector that would be directly affected by one or more of the proposed action alternatives. These Alaska communities are shown graphically in **Table 5-17**. Also shown in this table for reference is the level of engagement of these same five communities in the Area 4 halibut catcher vessel and shore-based processing sectors. Not shown in this table is the level of engagement of Pacific Northwest communities, including the greater Seattle area, which has the highest level of engagement among all communities in all categories (except being the location of Area 4 halibut shore-based processing).

Table 5-17 Graphic representation of potentially affected Alaska BSAI groundfish communities relative annual average engagement in BSAI groundfish and halibut fisheries, 2010-2019 (table legend is provided in lower panel)

Alaska Community	Relative Community Size	BSAI Groundfish Engagement: Local Ownership Address Amendment 80 CPs	BSAI Groundfish Engagement: CP Product Transfer Location	Area 4 Halibut Engagement: Local Ownership Address CVs	Area 4 Halibut Engagement: Shore-Based Processing Location
Adak		(none)		(< 0.5)	
Atka		(none)			
Sand Point		(none)		(none)	
Togiak		(none)			(< 0.5)
Unalaska/Dutch Harbor		(none)			

Table Legend

Type/Level of Engagement			
Community Size	2010 Population = less than 1,000	2010 Population = 1,000-9,999	2010 Population = 10,000 or more
BSAI Amendment 80 Participation	2010-2019 annual avg = 0.5 -- 0.9 CPs	2010-2019 annual avg = 1.0 -- 2.9 CPs	2010-2019 annual avg = 3.0 or more CPs
BSAI Product Transfer Location Tax Revenues	2010-2019 annual avg. FRLT = 5.0-24.9% of FBT+FRLT total	2010-2019 annual avg. FRLT = 25.0-49.9% of FBT+FRLT total	2010-2019 annual avg. FRLT = 50.0% or more of FBT+FRLT total
Area 4 Halibut Catcher Vessel Participation	2010-2019 annual avg = 1.0 -- 4.9 CVs	2010-2019 annual avg = 5.0 -- 9.9 CVs	2010-2019 annual avg = 10.0 or more CVs
Area 4 Halibut Shore-Based Processor Participation	2010-2019 annual avg = 0.5 -- 0.9 SBPRs	2010-2019 annual avg = 1.0 -- 1.9 SBPRs	2010-2019 annual avg = 2.0 or more SBPRs

Vulnerability of communities to adverse community-level impacts from the proposed action alternatives is in part a function of dependence of the community on the potentially affected BSAI groundfish Amendment 80 sector fisheries and the economic resiliency and diversity of the community. Dependency is influenced by the relative importance of the relevant BSAI groundfish Amendment 80 fisheries to vessels participating directly in the fisheries in comparison to all area, species, and gear fisheries in which those same vessels participate (community Amendment 80 sector vessel diversity); the relative importance of the relevant BSAI groundfish fisheries to all local ownership address catcher/processor vessels participating in all area, species, and gear fisheries combined (community catcher/processor fleet diversity); and the relative importance of the overall community fishery sector(s) within the larger community economic base both in terms of private sector business activity and public revenues (community economic diversity). Also important to adverse community-level impact outcomes and community resilience is the specific nature of local engagement in the potentially affected BSAI groundfish Amendment 80 fishery sector and alternative employment, income, business, and public revenue opportunities available within the community because of the location, scale, and relative economic diversity of the community.

The relative importance of the BSAI Amendment 80 groundfish fisheries likely to be affected by the proposed alternatives within the larger local fisheries sector and within the larger local economic base varies widely among the engaged Alaska communities. Similarly, the socioeconomic structure of the engaged communities varies widely along with the relative diversity of their respective local economies. These conditions over the period 2010-2019 are summarized by region and community in the following sections, along with potential community level impacts associated with the proposed action alternatives and associated environmental justice concerns, as relevant.

5.5.1.1.1 Unalaska/Dutch Harbor

Unalaska/Dutch Harbor, with its relatively well-developed fishery support service sector and its role as the major shipping port of the BSAI area, could experience indirect impacts from the proposed alternatives through a decline in economic activity related to the Amendment 80 catcher/processor fleet if port calls were to decline because of the proposed action. Unalaska/Dutch Harbor, unique among Alaska communities, also derives substantial public revenues from BSAI groundfish catcher/processors offloading/transferring processed product in the port. Unalaska/Dutch Harbor accounted for two-thirds of all Amendment 80 Alaska port calls during the years 2010-2019. Unalaska/Dutch Harbor could experience indirect impacts from the proposed action alternatives through a decline in economic activity related to the Amendment 80 catcher/processor fleet if product transfers and/or other port calls were to decline because of the proposed action; however, there is no straightforward way to quantitatively estimate these impacts.

Unalaska/Dutch Harbor is clearly the Alaska community most closely associated with activity of the Amendment 80 fleet and therefore potentially the most vulnerable to adverse impacts under the proposed action alternatives. It is also substantially engaged in the commercial directed BSAI/Area 4 halibut fishery, both in terms of its local catcher vessel fleet and local shore-based processing operations, and therefore potentially vulnerable to adverse impacts during halibut low abundance conditions under the no-action alternative. Although it is an Alaska Native Claims Settlement Act (ANCSA) village and is home to a federally recognized tribe, Unalaska did not qualify as a CDQ community and its local small boat fleet does have access to CDQ halibut as an underpinning of local operations, unlike most halibut-dependent local fleets in the BSAI region.

5.5.1.1.1.1 Potential Environmental Justice Concerns

The demographics of the owners and crew of the specific halibut vessels that would potentially be most likely to experience adverse impacts under the no-action alternative in halibut low abundance conditions are unknown, but a general knowledge of the fleet would suggest that its demographics are largely reflective of the general/residential population of the community. In contrast, processing workers in Unalaska/Dutch Harbor have tended to be relatively demographically distinct from the rest of the local population. Processing workers are overwhelmingly recruited from outside the community and have tended to include a high proportion of minority workers. Impacts to processing workers could occur as the result of implementation of the no-action alternative during halibut low abundance conditions in the form of reduced income or employment opportunities, depending on how specific plants and, importantly, their delivering fleets, adapt to changing conditions. It is not likely, however, that implementation of the no-action alternative would result in adverse impacts to processing workers in the form of substantial processor workforce reductions, given the relatively modest level of dependency of the shore-based processing plants in Unalaska/Dutch Harbor on BSAI/Area 4 halibut deliveries compared to those from other BSAI fisheries in which these plants are engaged.

5.5.1.1.2 Atka and Adak

Direct engagement of both Atka and Adak in the Amendment 80 fishery is limited to locally occurring product transfers, which contribute to local public revenues, and port calls of Amendment 80 vessels that generate local economic activity among support service suppliers, at least in Adak. Like Unalaska/Dutch Harbor, Atka and Adak could experience indirect impacts from the proposed action alternatives if Amendment 80 product transfers were to decline in either community and/or other port calls were to decline in Adak because of the proposed action; however, there is no straightforward way to quantitatively estimate these impacts, which could be locally important, if modest in scale in comparison to Unalaska/Dutch Harbor. Atka, as a member of the Aleutian Pribilof Islands Development Association CDQ group, benefits indirectly from the leasing of CDQ quota to the Amendment 80 sector for harvesting. Adak, in contrast, is not a CDQ community.

Both Atka and Adak were the site of locally operating shore-based processors that accepted deliveries of Area 4 halibut in most years 2010-2019. While Adak has had challenges in recruiting and retaining a local residential fleet, Atka has historically had a local halibut fleet. However, both communities have had challenges in the processing sector in recent years, with the plant in Adak closing intermittently (most recently in June 2020) and the plant in Atka not having operated since 2017. Under the no-action alternative, adverse impacts to the Area 4 directed halibut fishery under low abundance conditions could make the restart of the Atka and Adak plants and the reestablishment of active local fleets more challenging than would otherwise be the case. Adak shore-based processing has also faced, from the local perspective, several fishery management related challenges over the years, compounded by the basic logistical and economic challenges of operating in a local economy that remains in transition from that of relatively large military community to a small civilian community.

Both communities are particularly vulnerable at present to cumulative impacts related to losing working age residents as the local halibut fishery represented, especially in Atka, one of the few private sector income and employment opportunities in the community. The schools in both communities are near minimum enrollment levels needed to qualify for state funding, which complicates residential retention and increases the consequences of not being able to do so.

5.5.1.1.2.1 Potential environmental justice concerns

According to the 2010 census, Atka and Adak have populations that are 95 and 82 percent minority, respectively, and both have populations that, as of 2019, had 14.0 and 16.4 percent of their respective populations living below the poverty threshold, which are both considerably higher figure than the Alaska state-wide figure (10.7 percent). Additionally, Atka is also the location of a federally recognized Alaska Native tribe. While Adak is not home to a federally recognized tribe and is not an ANCSA village, it does have multiple ties to the Aleut Corporation, the ANCSA regional corporation for the Aleutian Pribilof region, and a number its subsidiaries. Given the nature of potential impacts to both communities summarized above, disproportionate high and adverse impacts to minority and/or low-income populations in both communities are theoretically possible, under both the action alternatives and, under halibut low abundance conditions, the no-action alternative.

Most of Adak's minority residents at the time of the census, were processing plant employees living in group housing. It is likely that processing plant employees accounted for most of the community's low-income population as well, given the unique history of Adak with its relatively recent conversion from a military installation to a civilian community. This conversion has resulted in a local economy and settlement pattern markedly different from other communities in the region. With the processing plant currently shuttered, those individuals are no longer present in the community. If the plant remains closed and the processing plant workforce has not returned by the time of the ultimate implementation of a selected alternative, both the minority population and the low-income population of Adak may more closely resemble that of the general population of Alaska, but environmental justice would likely remain an issue of a concern, particularly given Adak's ties to the Aleut Corporation.

5.5.1.1.3 Togiak

Direct engagement of Togiak in the Amendment 80 fishery is limited to locally occurring product transfers, which contribute to local public revenues, and port calls of Amendment 80 vessels. The contribution to public revenues is relatively modest compared to other sources of general fund revenue and port calls reportedly generate little in the way of support service economic activities as, like Atka, Togiak does not have facilities of the size and scale to regularly support larger vessel operations. Togiak could experience indirect impacts from the proposed action alternatives if Amendment 80 product transfers and/or other port calls were to decline because of the proposed action; however, it is assumed that any such impacts would be minor. Togiak is the home of a federally recognized tribe and, as a member of the Bristol Bay Economic Development CDQ group, benefits indirectly from the leasing of CDQ quota to the Amendment 80 sector for harvesting.

With respect to engagement in and dependency on the Area 4 commercial halibut fishery, catcher vessels with Togiak ownership addresses active in the Area 4 halibut fishery derived about 83 percent of their total ex-vessel gross revenues 2010-2019 from fisheries other than the BSAI/Area 4 halibut fishery; all commercial fishing vessels with Togiak ownership addresses derived approximately 93 percent of their total ex-vessel gross revenues from fisheries other than the BSAI halibut fishery during this same time period. Given this lack of dependence, Togiak as not as acutely vulnerable in economic terms to community level adverse impacts under the no-action alternative during periods of low halibut abundance as are several other halibut communities. This is not to say that the Area 4 halibut fishery is unimportant to Togiak harvesters and/or the shore-based processors in Togiak (and nearby Twin Hills) as resource that is available during an otherwise slow time and a diversification opportunity in an area that has otherwise been largely dependent on the herring and salmon fisheries.

5.5.1.1.4 Other CDQ communities

CDQ entities and their constituent communities could be impacted by potential changes to the BSAI groundfish Amendment 80 sector fisheries related to the proposed action alternatives in multiple ways, two of the most direct of which are (1) through revenues generated by leasing the harvest of their BSAI multispecies groundfish CDQ quota holdings to potentially affected Amendment 80 industry partners and (2) through CDQ group investments in direct participation in the potentially affected Amendment 80 sector.

Four of the six CDQ groups routinely have their BSAI multispecies groundfish CDQ quota harvested in whole or in part by industry partners in the Amendment 80 sector. These groups vary in the number of communities and residents each represent, the composition of the CDQ fishery portfolios they hold, and the relative scale of the fishery and non-fishery portions of their local economies, among other attributes. To the extent that the proposed action alternatives have the potential to reduce royalty payments by Amendment 80 entities to CDQ groups due to increased harvest expenses and/or leaving CDQ fish in the water, the harvest of which has been contracted to Amendment 80 entities, CDQ groups, and their constituent communities are at potential risk of adverse impacts under these alternatives. How effectively these risks may be mitigated by adaptive fishing behaviors on the part of the Amendment 80 partners is unknown and it is otherwise not possible to quantify these risks with available data. Amendment 80 entities have varying fishing portfolios in which leasing CDQ groundfish quota plays a part in an overall operational strategy in combination with their own cooperative quota and other CDQ fisheries quota. Given that the CDQ halibut PSC limit (315 mt) would not change under any of the proposed action alternatives (unlike the Amendment 80 halibut PSC limit, which would vary with halibut abundance under the proposed action alternatives), it is assumed that any impacts to CDQ quota leasing practices and leasing revenues accruing to CDQ groups resulting from implementation of any of the action alternatives would be indirect and would vary by contracted entity, based on multiple factors. Such factors include circumstances unique to individual Amendment 80 entities including cooperative quota portfolio holdings, CDQ fishery leasing agreement portfolios, in-season operational decision making, and strategic partnering considerations, among other factors. If a reduction in revenues to CDQ entities as the result of the implementation of a proposed action alternative did occur, the level of impact experienced by any specific CDQ group would vary based on a range of factors specific to that group, including the scale of Amendment 80 revenues relative to other CDQ fishery revenue streams, the viability of alternative revenue generation options for all or some portion of CDQ fishery portfolio leased by current Amendment 80 sector partners, either within or outside of the Amendment 80 sector, and the socioeconomic/demographic context of the communities represented by the CDQ group itself.

A fifth CDQ group holds partial ownership interest in multiple vessels in the Amendment 80 sector and thus is at some financial risk under the proposed action alternatives (similar to any other entity with Amendment 80 ownership interests), but again this risk is not quantifiable with available data. This CDQ group, as well as the sixth CDQ group, does not routinely use Amendment 80 entities to harvest their BSAI multispecies groundfish CDQ quota. While potential adverse impacts resulting from the amounts of quota at potential risk are not quantifiable with available data, they are understood to be minimal.

As noted above, individual CDQ communities may also be impacted by potential changes to the BSAI groundfish Amendment 80 sector fisheries related to the proposed action alternatives through changes in port calls, which can involve product transfers that generate tax revenue and the generation of local support sector business activity. In addition to the Amendment 80 Alaska port call CDQ communities previously discussed (Atka and Togiak). St. Paul has averaged the fourth highest number of port calls of Amendment 80 vessels among Alaska communities on an annual average basis 2010-2019. Available data suggest, however, that these port calls do not involve an amount of revenue from taxable product transfers that is substantial compared to other fishery tax revenue sources. St. Paul also does not appear to experience substantial private sector economic benefits from these port calls, based on a lack of port facilities and support service businesses of a scale capable of supporting relatively large vessels on a routine basis. As a result, no substantial adverse impacts to St. Paul related to any changes to patterns of Amendment 80 port calls resulting from implementation of any of the action alternatives are anticipated.

5.5.1.1.4.1 Potential environmental justice concerns

Amendment 80-derived revenues are an important source of income for multiple CDQ groups and are used to fund to greater or lesser degrees a range of benefits programs that, among others, include helping to address basic health, safety, and infrastructure needs in communities with limited alternative revenue sources and funding opportunities. Given that CDQ groups overwhelmingly represent communities with high proportions of Alaska Native residents, low-income residents, and communities that are home to one or more federally recognized tribal entity, adverse impacts to these CDQ entities would be of potential environmental justice concern.

5.5.1.2 Pacific Northwest communities

Given the degree of centralization of ownership of the BSAI groundfish Amendment 80 sector in the Seattle-Tacoma-Bellevue Washington Metropolitan Statistical Area (Seattle MSA), the centralization of the support services provided by Seattle-based firms, and the concentration of Amendment 80 crew member residence in the state of Washington, potential adverse economic impacts associated with proposed action alternatives described in Section 5.3.2 would largely accrue to the Seattle MSA in particular and the Pacific Northwest in general, with the limited exceptions described above.

As noted in Section 2.2, under Alternatives 2, 4, and 5 the PSC limit would remain the same as the status quo PSC limit under combined “high setline index + high trawl index” halibut abundance conditions and, in the case of Alternative 5 (only) the PSC limit would also remain the same under combined “high setline index + low trawl index” halibut abundance conditions. Under all other combinations of abundance conditions PSC limit reductions would occur. In contrast, under Alternative 3: (1) the alternative PSC limit would be higher than the status quo PSC limit under combined “high setline index + high trawl index” abundance conditions (the only circumstance under any alternative not modified by an option that this would occur); (2) the alternative PSC limit would remain the same as the status quo PSC limit under “high setline index + low trawl index” and “medium setline index + high trawl index” conditions; and (3) under all other halibut abundance conditions the alternative PSC limit would be lower than the status quo PSC limit. When reductions in PSC limits would occur, the amounts of those reductions for any combination of conditions would vary by alternative, as detailed in Section 2.2.

As noted in Section 5.3.2, numerous variables would influence the impacts of PSC limit reduction on the Amendment 80 sector, including environmental, regulatory, and behavioral variables. While sector participants cannot directly modify environmental or regulatory variables, they can alter behavioral variables through halibut avoidance strategies, all of which come with avoidance costs. Avoidance costs will be incurred under any reduction of PSC limit and cannot be quantified with available data. Other costs associated with PSC reduction include foregone groundfish revenues if halibut becomes constraining. These costs impact gross revenues but quantifying costs of foregone groundfish revenue resulting from PSC limit reductions is not straightforward. Estimates of revenue impacts within the constraints of available data are provided in Section 5.3.2.

Finally, as noted in the Section 5.3.2.3 on practicability of bycatch avoidance, if halibut PSC limits become sufficiently constraining under an ultimately implemented proposed action alternative, additional consolidation of the Amendment 80 sector could occur. Consolidation could result as firms that are less efficient at addressing halibut bycatch constraints experience less profitability and sell to firms that are more efficient. In terms of the maximum level of consolidation that could occur under existing Amendment 80 ownership and control limits (and given current participation levels), only one firm could exit the fishery. This is because a person may not individually or collectively hold or use more than 30 percent of the aggregate Amendment 80 quota share units initially assigned to the Amendment 80 sector and resulting cooperative quota. Current vessel caps are set so that an Amendment 80 vessel may not be used to catch an amount of a species greater than 20 percent of the aggregate Amendment 80 sector's species ITACs, meaning the number of vessels in the fishery could theoretically consolidate to a minimum of five under the current caps. However, that degree of consolidation is not considered a realistic possibility, as the fleet would still need sufficient capacity to harvest the cooperative quota that can be supported by the available halibut PSC mortality limit.

5.5.1.2.1 Potential Environmental Justice Concerns

While no recent information from secondary sources on sector-wide catcher/processor crew demographics is readily available, for this analysis five firms representing a total of 19 Amendment 80 BSAI groundfish catcher/processors provided employee demographic data for 2019. As shown in the supplied data, 68 percent of all employees working on the catcher/processors represented in these data are minority employees. Minority representation is substantially higher for two of the job categories (factory foreman/quality control and processing labor/galley crew/cleaning, both over 75 percent), and in all but two job categories (captains and engineers) minority employees represented greater than 50 percent of all employees in that category. Asian Americans, Native Hawaiians, and Pacific Islanders as a group accounted for over 25 percent of all employees. Given these data, if disproportionate high and adverse impacts were to accrue to the BSAI Amendment 80 catcher/processor workforce due to implementation of a proposed action alternative, environmental justice would potentially be an issue of concern.

Of potential concern would be loss of income opportunities for crew, due to increased expenses in operations with additional halibut avoidance measures (which would likely result in reduced crew compensation), and/or more time away from home with time-consuming and/or labor-intensive measures. Although there are theoretically many more alternate employment and income opportunities for Amendment 80 catcher/processor crew in a large urban area than are available in smaller communities or rural settings, there may not be comparable employment and earning potential ashore as is available to crew members aboard these vessels, even in an otherwise robust job market, especially for crew members who have worked their way up from entry level positions.

5.5.2 Area 4 halibut fishery engagement, dependency, and vulnerability to community-level impacts of the proposed action alternatives

5.5.2.1 Alaska communities

5.5.2.1.1 Overview

The initial screening criteria for the selection of Alaska communities for inclusion in this portion of the analysis were designed to identify those Alaska communities that had at least a minimal, ongoing level of engagement in the relevant BSAI/Area 4 halibut fishery, as measured by an annual average harvest engagement of 2.0 or more catcher vessels with local ownership addresses and/or communities with an annual average BSAI halibut processing engagement of 0.5 or more locally operating shore-based processors that accepted BSAI halibut deliveries over the years 2010-2019.

Using these initial screening criteria, 29 Alaska communities, 20 of which are in the BSAI region, were selected for analysis as potentially substantially engaged in, and/or potentially substantially dependent on, the BSAI/Area 4 halibut fishery sectors most likely to be directly or indirectly affected by one or more of the proposed alternatives, including the no action alternative. Ultimately, a total of 17 of these Alaska communities were considered halibut-dependent for the purposes of this analysis and are shown graphically in **Table 5-18**. Of the 17 Alaska communities shown in the table, 16 are home to federally recognized Alaska Native tribes. Not shown in this table is the level of engagement of Alaska communities outside of the BSAI region or Pacific Northwest communities.

Table 5-18 Graphic representation of potentially affected Alaska Area 4 halibut-dependent communities annual average engagement in Area 4 halibut fisheries (table legend is provided in lower panel)

Alaska Community	CDQ Group	Demographic Characteristics				Shore-Based Halibut Processing Location	Catcher Vessel Characteristics		
		Community Size	Proportion of Total Population				Number of Halibut CVs with Local Ownership Addresses	Halibut Ex-Vessel Gross Revenues as Percentage of Total Ex-Vessel Revenues	
			Alaska Native	Minority	Low-Income			Halibut CVs Only	All Local CVs
Adak	(none)						(< 1.0)		
Atka	APICDA								
Akutan	APICDA								
St. George	APICDA					(none)			
Unalaska/Dutch Harbor	(none)								
St. Paul	CBSFA								
Hooper Bay	CVRF					(< 0.5)			confidential
Kipnuk	CVRF					(< 0.5)			
Mekoryuk	CVRF					(< 0.5)			
Toksook Bay	CVRF					(< 0.5)			
Chefornak	CVRF					(< 0.5)			
Newtok	CVRF					(none)			
Nightmute	CVRF					(none)			
Quinhagak	CVRF					(none)			
Tununak	CVRF					(none)			
Nome*	NSEDC								
Savoonga	NSEDC								

*Note: Nome catcher vessel revenues combined with "all other NSEDC" (excluding Savoonga) to protect data confidentiality. Where halibut ex-vessel gross revenues are shown as lumped for more the one community, data confidentiality restrictions preclude showing data for the individual communities

Table Legend

Type/Level of Engagement	(light)	(medium)	(dark)
Community Size	2010 Population = less than 1,000	2010 Population = 1,000-9,999	2010 Population = 10,000 or more
Alaska Native and Minority Population Proportion	2010 Population = less than 50%	2010 Population = 50.0-74.9%	2010 Population = 75.0% or more
Low-Income Population Proportion	2014-2019 Population = less than 15%	2014-2019 Population = 15.0-24.9%	2014-2019 Population = 25.0% or more
Area 4 Halibut Catcher Vessel Participation	2010-2019 annual avg = 1.0 -- 4.9 CVs	2010-2019 annual avg = 5.0 -- 9.9 CVs	2010-2019 annual avg = 10.0 or more CVs
Area 4 Halibut Shore-Based Processor Participation	2010-2019 annual avg = 0.5 -- 0.9 SBPRs	2010-2019 annual avg = 1.0 -- 1.9 SBPRs	2010-2019 annual avg = 2.0 or more SBPRs
Area 4 Halibut Ex-Vessel Gross Revenue Proportion	2010-2019 annual avg = less than 25%	2010-2019 annual avg = 25.0 - 49.5%	2010-2019 annual avg = 50.0% or more

The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The potential for Area 4 halibut-related community-level impacts from the proposed action alternatives in any given community is in part a function of present and future dependence of the community on the potentially affected Area 4 halibut fisheries. Like what was described for BSAI Amendment 80 groundfish fisheries, dependency on the Area 4 halibut fishery is influenced by the relative importance of Area 4 halibut fisheries in the larger community fisheries sector(s), as well as the relative importance of the overall community fishery sector(s) within the larger community economic base (both in terms of private sector business activity and public revenues). Also important to community-level impact outcomes is the specific nature of local engagement in the potentially affected Area 4 halibut fisheries and alternative employment, income, business, and public revenue opportunities available within the community because of the location, scale, and relative economic diversity of the community.

It is assumed that the BSAI/Area 4 commercial halibut fishery would potentially benefit in low halibut abundance conditions from implementation of the action alternatives due to what could effectively (if indirectly) be a reallocation of access to halibut between the BSAI groundfish and BSAI/Area 4 directed halibut fisheries that would potentially occur to greater or lesser degrees under the different action alternatives. The beneficial impacts of these incidental allocative effects, were they to occur, could be realized in the near-term following action alternative implementation (assuming low abundance conditions relevant to the design of the alternative were occurring at the time of implementation) and potentially in the long-term, if low abundance conditions were to persist over time. As noted in Section 5.4, given that IPHC catch setting policy removes O26 bycatch by IPHC regulatory area, the spatial distribution of Amendment 80 halibut PSC may impact the distribution of directed halibut fishery catch limits within the BSAI/Area 4. Specifically, while total Amendment 80 halibut PSC mortality has decreased, the distribution of PSC occurrence within Area 4 has stayed fairly consistent, with Area 4CDE accounting for between 83 percent and 90 percent of annual Amendment 80 PSC since 2015 (when spatial resolution of PSC occurrence substantially improved). In other words, the directed halibut fishery in Area 4CDE would have the greatest potential for experiencing whatever incidental reallocative effects may occur under the proposed action alternatives.

The conditions under which the potential for incidental allocative effects beneficial to the directed halibut fishery could occur vary by action alternative. Table 5-19 provides a simplified view of the alternatives showing, by action alternative and without modifying options, the halibut abundance conditions under which the Amendment 80 halibut PSC limits would be lower than, the same as, or higher than status quo/Alternative 1 conditions (highlighted in green, yellow, and orange, respectively).

Table 5-19 Simplified look up table of Alternatives 2, 3, and 4 showing Amendment 80 halibut PSC limits lower, same as, or higher relative to status quo (Alternative 1)

	Alternative 2		Alternative 3		Alternative 4		Alternative 5 (Preferred Alternative)	
	Low Trawl Index	High Trawl Index	Low Trawl Index	High Trawl Index	Low Trawl Index	High Trawl Index	Low Trawl Index	High Trawl Index
High Setline Index	PSC Limit **LOWER** than Status Quo	PSC Limit **SAME** as Status Quo	PSC Limit **SAME** as Status Quo	PSC Limit **HIGHER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **SAME** as Status Quo	PSC Limit **SAME** as Status Quo	PSC Limit **SAME** as Status Quo
Medium Setline Index	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **SAME** as Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo
Low Setline Index	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo
Very Low Setline Index	*(Note: Alt 2 does not have a separate Very Low category)*		PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo	PSC Limit **LOWER** than Status Quo

As shown, under both Alternative 2 and Alternative 4: (1) the alternative PSC limit would not be higher than the status quo PSC limit under any halibut abundance conditions; (2) the PSC limit would remain the same as the status quo PSC limit under combined "high setline index + high trawl index" halibut abundance conditions (only); and (3) under all other halibut abundance conditions the alternative PSC limit would be lower than the status quo PSC limit. The *amount* of PSC limit reductions under all but "high setline index + high trawl index" abundance conditions (and therefore the potential *level* of incidental allocative effects beneficial to the directed halibut fishery) would vary between the two alternatives, as described in Section 2.2, but combinations of abundance *conditions* under which at least some level of incidental allocative effects could potentially occur would be the same under Alternative 2 and Alternative 4. (Under "high setline index + high trawl index" abundance conditions, Alternative 2 and Alternative 4 would both be neutral in terms of incidental allocative effects relative to Alternative 1.)

Under Alternative 5, like under Alternatives 2 and 4, the alternative PSC limit would not be higher than the status quo PSC limit under any halibut abundance conditions. Unlike Alternatives 2 and 4, however, under Alternative 5 the PSC limit would remain the same as the status quo PSC limit both under combined "high setline index + high trawl index" halibut abundance conditions and under "high setline index + low trawl index" halibut abundance conditions limit (i.e., Alternative 5 would be neutral in terms of incidental allocative effects relative to Alternative 1 under high setline index conditions independent of the state of trawl index conditions). Under all other setline index halibut abundance conditions, the Alternative 5 PSC limits would be lower than the status quo PSC limit.

The pattern is different for Alternative 3, as: (1) the alternative PSC limit would be higher than the status quo PSC limit under combined "high setline index + high trawl index" abundance conditions; (2) the alternative PSC limit would remain the same as the status quo PSC limit under "high setline index + low trawl index" and "medium setline index + high trawl index" conditions; and (3) under all other halibut abundance conditions the alternative PSC limit would be lower than the status quo PSC limit (and therefore potential incidental allocative effects beneficial to the directed halibut fishery could occur). All things being equal, the increase in the Amendment 80 PSC limit under "high setline index + high trawl index" halibut abundance conditions would result in fewer opportunities for the directed halibut fishery under these conditions than would be the case under status quo PSC limits (Alternative 1). This could be characterized as a loss to the directed halibut fishery, as the directed fishery not fully realizing otherwise expected gains under high abundance conditions, and/or as Amendment 80 halibut PSC use and directed fishery halibut opportunities both increasing based on high abundance conditions.

The provision of additional opportunities for the directed halibut fishery that may accompany PSC limit reductions would be determined by IPHC management processes, as described in Section 5.4. Additionally, the potential options that could have applied to any of the action alternatives, had the Council selected any, could have influenced the level of additional directed halibut fishery opportunities available in each year. It is also important to note that some communities are substantially engaged in or substantially dependent on both the Amendment 80 fishery and the Area 4 directed halibut fishery to varying degrees and a simple characterization of potential incidental reallocative effects to halibut dependent communities does not capture the complexity of overall impacts to those communities, much less the range of potential impacts to individual harvesters, processors, and/or fishery support businesses in those communities that may ultimately result from changes in Amendment 80 PSC limits.

It is further assumed that directed BSAI/Area 4 commercial halibut fishery could potentially benefit from implementation of the proposed action alternatives relative to the degree that the Pacific halibut stock itself would potentially benefit from the promotion of the conservation of the stock as a result of the implementation of the individual action alternatives. As discussed in Section 5.2, the IPHC's spawning biomass per recruit-based management approach, however, is expected to conserve spawning biomass across differing patterns in fishery selectivity and/or allocation among different fisheries. As such, there is likely to be little difference among the average future halibut spawning biomass under levels of PSC anticipated across all the alternatives, including the no action alternative. Whatever potential benefits of this nature, were they to occur, would not be immediately apparent in the relevant halibut fisheries and the full extent of their impact would not be realized for several years. In addition to being longer term, these potential impacts, were they to occur, would be of greater spatial extent than would the potential incidental allocative effects previously noted (i.e., they would be experienced within the coast-wide Pacific halibut stock rather than concentrated in the BSAI/Area 4).

5.5.2.1.2 Potential impacts to communities engaged in the commercial halibut fishery

Dependence of the total resident-owned catcher vessel fleet for these communities varied widely, as the fleets of some communities are more exclusively focused on the halibut fishery than are others. St. Paul, the BSAI region community with the highest 2010-2019 annual average catcher vessel Area 4 halibut ex-vessel gross revenues, was also one of three communities with virtually complete community fleet dependency on BSAI halibut ex-vessel gross revenues, along with St. George and Savoonga, which have smaller scale community fleets. Among the other communities or small groups of communities for which ex-vessel gross revenue totals can be disclosed, three other communities (Adak/Atka, Akutan, and Mekoryuk) have local ownership address catcher vessel fleets that were 85 percent or more dependent on BSAI halibut ex-vessel gross revenues on an annual average basis for the years 2010-2019, while two others were 25 percent or more dependent (Unalaska/Dutch Harbor and Toksook Bay). In terms of ex-vessel gross revenues to BSAI halibut vessels specifically, among the potentially substantially engaged or substantially dependent halibut communities for which revenues can be disclosed on an individual community or aggregated community basis, nine have dependencies of 90 percent or greater and one is more than 85 percent dependent.

In all but two cases (Adak and Unalaska/Dutch Harbor), potentially substantially engaged or substantially dependent BSAI halibut communities located in the BSAI region itself are member communities of CDQ entities. One of the CDQ entities has partial ownership interest in Amendment 80 vessels and four others routinely lease CDQ quota for harvest to Amendment 80 industry partners. These CDQ entities and their constituent communities would be vulnerable to potential decreases in CDQ groundfish revenues during low abundance halibut conditions under the proposed alternatives being considered. Ultimately, the level of direct or indirect impact to an individual CDQ entity and level of direct or indirect impact to its member communities cannot be quantitatively estimated given the role of individual entity business decision making, among myriad other factors.

While each CDQ entity pursues individual strategies, one primary goal of the CDQ program is to encourage individual entities to use the returns from their engagement in commercial fishing to support regional economic growth, including the reinvestment in commercial fisheries, the support of community development activities, and the creation/maintenance of commercial fishing support infrastructure in member communities. Different CDQ groups have faced different circumstances and pursued different strategies regarding the establishment or sustainment of an in-region small boat commercial halibut fishery. For those CDQ groups whose experience in, or assessment of, supporting an in-region small boat commercial halibut fishery would indicate that the effort is not or would not be sustainable (or equitable across all the constituent communities they serve), especially under low abundance conditions, it is unknown whether the beneficial impacts that may accrue from implementation of one or more of the proposed alternatives would be sufficient to pass a threshold whereby in-region CDQ halibut fisheries programs would be considered sustainable (or equitable) even in low abundance conditions. For this reason, it is not possible to predict whether implementation of any one of the proposed alternatives would potentially result in a different pattern of in-region CDQ community commercial small boat direct BSAI/Area 4 halibut fishery engagement than is seen at present.

5.5.2.1.2.1 Potential environmental justice concerns

In terms of minority populations in general, of the 17 Alaska communities considered BSAI halibut-dependent for the purposes of this analysis, in 2010 minority residents (including Alaska Native residents) accounted for more than 90 percent of the population in 13 communities, between 80 and 90 percent of the population in two communities, and more than 65 percent of the population in the remaining two communities. Additionally, of the 17 Alaska potentially BSAI halibut dependent communities, 16 have federally recognized Alaska Native tribes and 15 are members of CDQ groups.

In terms of low-income populations, of the 17 Alaska communities considered BSAI halibut-dependent for the purposes of this analysis, as of the 2015-2019 5-Year American Community Survey: 2 had 40 percent or more of their residents living below the poverty threshold; 5 had between 30 percent and less than 40 percent of their residents living below the poverty threshold; 2 had between 20 percent and less than 30 percent of their residents living below the poverty threshold; and 5 had a higher percentage of their residents living below the poverty threshold than the State of Alaska as a whole (10.7 percent), but less than 20 percent of their residents overall. Given these demographics and the federally recognized tribal status of all but one of the communities involved, if these communities were to experience disproportionate high and adverse impacts under the no-action alternative under halibut low abundance conditions, environmental justice would be a concern. Conversely, if these communities were to experience beneficial impacts under the proposed action alternatives, environmental justice may not be an issue of concern.

5.5.2.1.3 Potential impacts to communities engaged in the subsistence halibut fishery

Subsistence harvest of halibut would not be directly affected by the proposed action alternatives. Further, unlike the commercial halibut fishery, the subsistence halibut fishery would not directly benefit from potential incidental reallocative effects that may occur under the proposed action alternatives and provide additional opportunities for the directed halibut fishery. The IPHC accounts for subsistence and recreational halibut catches, incidental halibut removals in the groundfish fisheries, and other sources of halibut mortality before setting commercial halibut catch limits each year. While subsistence removals are accounted for in setting the commercial halibut catch limits, subsistence halibut harvests are not constrained by this process. There are no caps on removals from Area 4 in the subsistence halibut fishery analogous to quotas established annually for the commercial halibut fishery, nor are there size limits on halibut harvested for subsistence use.

Subsistence halibut harvests (and harvesters) could indirectly benefit from the implementation of the proposed action alternatives if the proposed action ultimately implemented were to result in changes to the spatial distribution of halibut stock or an overall increase in availability of halibut for subsistence harvest and/or an accompanying decrease in effort and expense in harvesting halibut for subsistence use over the long term. These indirect benefits could occur if the Pacific halibut stock itself benefits from additional promotion of conservation of the halibut under the individual action alternatives (and to the extent that whatever conservation gains that may be realized are not fully redirected into additional opportunities for the commercial halibut fishery, while recognizing that the relationship between the commercial and subsistence fisheries is complex and varies by community). As noted in Section 5.2, however, there is likely to be little difference among the average future halibut spawning biomass under levels of PSC anticipated across all of the alternatives, including the no action alternative, for multiple reasons.

The proposed alternatives could, however, have indirect adverse impacts on halibut and other subsistence pursuits, as discussed in the SIA. These types of impacts fall into two main categories: (1) impacts to halibut and other subsistence pursuits because of loss of revenue from the BSAI groundfish fishery under the action alternatives (or the BSAI halibut fishery under the no-action alternative), revenue that could have otherwise been used to purchase fuel, vehicles, or other subsistence-related gear, or otherwise offset expenses required to engage in a range of subsistence pursuits and (2) impacts to other subsistence pursuits because of the loss of opportunity to use commercial fishing gear and vessels for subsistence pursuits, including the retention of halibut from commercial catch for subsistence use, under the no-action alternative. In general, while the indirect impact of the proposed action alternatives on subsistence is difficult to assess for multiple reasons, joint production impacts are likely to be concentrated among small halibut catcher vessel owners during low abundance conditions under the no-action alternative.

5.5.2.1.4 Potential impacts to communities engaged in the sport halibut fishery

Sport harvest of halibut would not be directly affected by the proposed action alternatives. The IPHC accounts for recreational and subsistence halibut catches, incidental halibut removals in the groundfish fisheries, and other sources of halibut mortality before setting commercial halibut catch limits each year. Further, unlike the commercial halibut fishery, the sport halibut fishery would not benefit from potential incidental reallocative effects that may occur under the proposed action alternatives and provide additional opportunities for the directed halibut fishery.

Due to the relatively small volume of recreational use in Area 4 and the management under a daily bag limit rather than an area/sector allocation, IPHC accounts for recreational removals using a projection. There are no caps on removals from Area 4 in the sport halibut fishery analogous to quotas established annually for the commercial halibut fishery, but sport effort is constrained in Area 4 by a sport fishing season that extends from February 1 to December 31 and a bag limit of two halibut of any size per person per day unless otherwise specified.

Sport halibut harvests (and the guided and unguided sport halibut fisheries) could indirectly benefit from the implementation of the proposed action alternatives if reducing BSAI halibut PSC limits under low abundance conditions were to ultimately result in an overall improvement in availability of halibut for sport harvest, an accompanying decrease in effort and expense in harvesting halibut for sport use, and/or an increase in interest in halibut sport fishing in the region prompted by an increasing abundance of larger halibut. These indirect benefits could occur if the Pacific halibut stock itself benefits from additional promotion of conservation of the stock under the individual action alternatives (and to the extent that those gains are not fully redirected into additional opportunities for the commercial halibut fishery). As noted in Section 5.2, however, there is likely to be little difference among the average future halibut spawning biomass under levels of PSC anticipated across all the alternatives, including the no action alternative, for multiple reasons.

5.5.2.1.5 Potential cumulative small/rural community and cultural context issues

The SIA is largely focused on community impacts associated with the implementation of proposed BSAI halibut PSC limit revisions using quantitative fishery information and through characterizations of several Alaskan regions and communities that describe the magnitude of engagement and dependency on those fisheries. This approach provides an analysis of anticipated socioeconomic impacts that may accompany implementation of the proposed action alternatives. It should be noted, however, that fishing regulatory actions can result in a wide range of sociocultural impacts in rural fishing communities. For many residents of these communities, commercial fishing is not seen as a stand-alone socioeconomic activity, but an integral part of self-identity. This relationship is compounded for those residents who come from families with multi-generational experience in commercial and/or subsistence fishing, particularly for those Alaska Native residents for whom fishing is part of a larger, integrated traditional subsistence and economic sustenance practice rooted in thousands of years of history. The cultural importance of halibut (as a species) and halibut fishing (as a traditional activity) is documented in the anthropological literature for Alaska Native tribes and ethnic groups throughout Alaska. In addition to being a primary subsistence resource for many coastal cultures, halibut feature prominently in legends and parables. It is not uncommon to see halibut iconography in carvings, paintings, and textile handicrafts throughout the region, further suggesting its traditional cultural importance. The cultural significance of halibut for fishermen and their associated communities includes but exceeds the economic value of the fishery. Key themes include how halibut fishing provides a local source of employment in a day fishery that allows individuals to remain in their community, spend time with their family and build social networks, and engage in broader, culturally meaningful practices like subsistence. Halibut fishing is also considered a meaningful vocation and way of life.

While sustained participation of fishing communities in the BSAI groundfish or BSAI halibut fisheries would not appear to be directly at risk from implementation of the proposed action alternatives, the problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. Further, the available literature and recent NPFMC analyses underline the fact that the proposed action is not taking place in isolation. Existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the region has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products).

This flexibility is widely perceived in the communities as a key element in an overall adaptive strategy practiced in subsistence and economic contexts in the region for generations. This strategy involves piecing together individual livings (and often local economies) with an employment and income plurality approach. This plurality approach is particularly important given that the availability of non-fishing alternatives for income and employment are limited and, like the natural resources (and market factors) that underpin commercial fishing opportunities, tend to be subject to both short- and long-term fluctuations. This ongoing fluctuation in non-fishing opportunities further reinforces the importance of flexibility in the pursuit of a range of commercial fishing opportunities to enable individuals and communities the ability to successfully combine fishing and non-fishing as well as commercial and subsistence pursuits considered critical to long-term socioeconomic and sociocultural survival if not stability. To the extent that the proposed action alternatives would, if indirectly, serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure.

5.5.2.2 Pacific Northwest communities

The Seattle MSA is also substantially engaged in the Area 4 halibut commercial fishery as measured by ownership address of actively participating catcher vessels, among other indicators of engagement. Its engagement in the BSAI halibut fishery is not as dominant relative to that of Alaska communities, compared to its relative engagement in the BSAI groundfish fisheries likely to be most directly affected by the proposed action alternatives. No community level adverse impacts related to the BSAI halibut fishery are anticipated to the Seattle MSA under either the no-action alterative or the proposed action alternatives.

5.6 Summary of Analysis of Economic Benefits and Costs

Summary of Pertinent Regulatory Impact Guidance:

NEPA notes that economic effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, the environmental impact statement will discuss all of these effects on the human environment. This EIS also contains information relevant for conducting an economic impact analysis of a regulatory action as defined in Executive Order (E.O.) 12866,[103] and reaffirmed in E.O. 13563.[104] These requirements are further described in Office of Management and Budget (OMB) Circular A4.[105] Analytical guidance regarding compliance with E.O. 12866, E.O. 13563, and OMB Circular A4 has been developed by OMB to facilitate applied economic impact analysis of regulatory actions and is contained in an OMB publication titled "Regulatory Impact Analysis, A Primer."[106] Several sections of these documents are pertinent to interpretation of the impacts analysis contained within this EIS. E.O. 12866 provides the underlying philosophy and principles to be considered when conducting analysis of costs and benefits of a regulatory action as follows (emphasis added).

Section 1. *Statement of Regulatory Philosophy and Principles.*
(a) *The Regulatory Philosophy.*

"In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating ***. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental,***

[103] Available at https://www.archives.gov/files/federal-register/executive-orders/pdf/12866.pdf
[104] Available at https://obamawhitehouse.archives.gov/the-press-office/2011/01/18/executive-order-13563-improving-regulation-and-regulatory-review
[105] Available at https://obamawhitehouse.archives.gov/omb/circulars_a004_a-4/
[106] Avaible at https://www.reginfo.gov/public/jsp/Utilities/circular-a-4_regulatory-impact-analysis-a-primer.pdf

public health and safety, and other advantages; distributive impacts; and equity)*, unless a statute requires another regulatory approach."*

Thus, while much of the analytical focus of impacts on the Amendment 80 sector vs the directed halibut fisheries is on net economic benefits, the environmental, distributive, and equity effects are also to be considered even though they may not be readily quantifiable. Further, E.O. 13563 reiterates and expands on these requirements as follows:

"Section 1. General Principles of Regulation. (a) Our regulatory system must protect public health, welfare, safety, and our environment while promoting economic growth, innovation, competitiveness, and job creation. It must be based on the best available science. It must allow for public participation and an open exchange of ideas. It must promote predictability and reduce uncertainty. It must identify and use the best, most innovative, and least burdensome tools for achieving regulatory ends. ***It must take into account benefits and costs, both quantitative and qualitative.*** *It must ensure that regulations are accessible, consistent, written in plain language, and easy to understand. It must measure, and seek to improve, the actual results of regulatory requirements.*

*(b) This order is supplemental to and reaffirms the principles, structures, and definitions governing contemporary regulatory review that were established in Executive Order 12866 of September 30, 1993. As stated in that Executive Order and to the extent permitted by law, each agency must, among other things**: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its costs (recognizing that some benefits and costs are difficult to quantify); (2) tailor its regulations to impose the least burden on society, consistent with obtaining regulatory objectives,** taking into account, among other things, and to the extent practicable, the costs of cumulative regulations; (3) select, in choosing among alternative regulatory approaches, those approaches that* ***maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity);*** *(4) to the extent feasible, specify performance objectives, rather than specifying the behavior or manner of compliance that regulated entities must adopt; and (5)* ***identify and assess available alternatives to direct regulation, including providing economic incentives to encourage the desired behavior,*** *such as user fees or marketable permits, or providing information upon which choices can be made by the public.*

(c) In applying these principles, each agency is directed to ***use the best available techniques to quantify anticipated present and future benefits and costs as accurately as possible. Where appropriate and permitted by law, each agency may consider (and discuss qualitatively) values that are difficult or impossible to quantify, including equity, human dignity, fairness, and distributive impacts."***

E.O. 13563 thus reinforces the analytical focus on estimation of benefits and costs but acknowledges and expands upon the concept that some benefits and costs are not readily quantifiable. Further, the evaluation of net benefits must consider more than quantifiable or theoretical economic metrics, such as consumer and producer surpluses, to include consideration of equity, human dignity, fairness, and distributive impacts.

In addition, OMB has provided specific guidance and an important caveat regarding analysis of net benefits in their Primer on Regulatory Impact analysis as required by EO 12866, EO 13563, and Circular A4:

"C. Preparing a Regulatory Impact Analysis
Benefit -cost analysis (BCA) provides a systematic framework for evaluating the likely outcomes of alternative regulatory choices. It allows agencies to evaluate different regulatory options with a

variety of attributes using a common measure – a monetary unit. ***When important benefits and costs cannot be expressed in monetary units or quantified in any manner, the BCA can provide useful information about the relative merits of regulatory alternatives, but the "net benefits" estimate, viewed in isolation, may be incomplete and misleading."***

This last statement is particularly applicable to this analysis. This analysis provides economic impact estimates that represent the upper bound of potential impact estimates in terms of potentially foregone catch and percent of overall first wholesale value as compared to status quo revenue (Table 5-6). The economic net benefits assessment must also be considered within the greater context of all relevant factors, including distributional impacts, human dignity, and equity. The Council identified such considerations in selecting its Preferred Alternative.

Economic Net Benefits Assessment

This section addresses economic net benefits only. Therefore, cost and benefit impacts discussed in this section are economic in nature and are not meant to imply that the social, cultural, or environmental impacts and benefits discussed elsewhere throughout this EIS are not relevant or can be excluded when considering overall costs and benefits.

In this section, net benefits from each alternative are calculated by summing all producer and consumer surplus that occurs in the U.S. economy. Both costs and benefits are defined broadly to include all surpluses that accrue to direct and indirect participants in the fishery as well as to other members of society. The groups considered include those persons who harvest or process fish effected by the action, those who provide support services to the harvesting and processing sectors of the fishing industry effected by the action, consumers of the halibut and A80 fishery products (and any other substitute species whose producer or consumer surplus changes as a direct result of the action), and members of society that are non-consumptive users of halibut that value the resource.

A general evaluation of alternative bycatch management measures can be conducted even when accurate estimates and projections of all costs and benefits are not feasible. Such an evaluation considers the expected effects of a management measure on the external benefits and costs that result when fishermen make decisions concerning bycatch that do not reflect society's perspective. Based on this conceptual framework, the following conclusions can be reached: 1) for society, the optimum level of bycatch is not zero, unless the benefit of eliminating the last unit of bycatch equals or exceeds the cost, 2) bycatch is a multispecies problem, because actions to decrease the bycatch of one species can increase or decrease the bycatch of other species and because the bycatch of one species can affect the status of other species through predator, prey, or other biological interactions, and 3) it is highly unlikely that the use of management measures that limit the choices of fishermen rather than eliminate the externalities will result in cost-effective reductions in bycatch to the optimum levels.[107] Management measures that provide increased incentives for fishermen to use their knowledge and ingenuity to decrease bycatch effectively and efficiently work best to reduce bycatch without unnecessary reductions to economic net benefits. These measures tend to encourage technological improvements and were implemented under A80 placing greater emphasis on the A80 sector to internalize the costs of bycatch by directly impacting their ability to harvest their quota allocations.

It is assumed that the A80 sector fisheries are constrained by halibut mortality limits during some years under the current PSC limit and could be further constrained if the halibut PSC limit is reduced further. The reduction in the PSC limit is expected to have some positive impact on the directed users of the

[107] Gautam, Amy B.; Holliday, M; Lent, R., 1996. Our living oceans: the economic status of U.S. fisheries, 1996. NOAA tech. memo. NMFS-F/SPO; 22. https://repository.library.noaa.gov/view/noaa/3038

halibut resource. Those impacts are estimated in Section 5.5, but the authors recognize those estimates overstate the actual impact because of the assumption that the A80 sector will use their entire halibut PSC mortality limit every year. This is not an actual expected result of implementing a lower limit because the fleet operates under a hard cap, meaning the fleet will stop fishing before the limit is taken to avoid penalties. Further, it is assumed that, depending on the size of the PSC limit reduction, the conditions in the fishery will result in years when halibut mortality rates in the groundfish fishery are lower because directed fishery species are more aggregated and it is easier to avoid halibut bycatch.

The analysis in this section is qualitative and based on the calculation of net economic benefits. As such it is anticipated that, depending in the size of the halibut PSC mortality limit reduction to the A80 sector, the proposed action is expected to:

- increase costs to the A80 sector in an effort to reduce bycatch mortality;
- reduce revenue in years when the mortality limit is a constraint;
- have a positive effect on all directed halibut fisheries (commercial, guided recreational, unguided recreational, and subsistence) resource users when the limit results in lower halibut mortality by the A80 fleet than would have occurred under the current limit;
- have positive impact on some A80 suppliers (fuel, excluder manufactures, etc.) that benefit from the A80 sector's increased costs;
- have a negative impact on other A80 suppliers (e.g., suppliers of packaging material) that lose business as a result of the action;
- have a modest positive impact on suppliers to the directed halibut fisheries, if it results in increased the commercial, charter, unguided sport, or subsistence harvests;
- have little impact on halibut consumers;
- impacts on A80 species consumers will depend on whether the supply of A80 species changes and the relative cost and value of other substitute commodities.

Given the above list of impacts it is anticipated that, overall, producer surplus is expected to be negatively affected, dependent on the unknown future conditions of halibut abundance. This is because the expected reductions in the A80 producer surpluses would not be expected to be offset by increases in producer surpluses generated by harvesters, processors, and sellers of any increased catch in the directed halibut fisheries. Consumer surplus will be little changed and will depend on the relative cost and availability of substitutes in the world whitefish market. Consumer surplus would not be expected to be affected by this action, because the end product goes overseas to reprocessing and is returned to the domestic market via imports. That market is highly influenced, price-wise, by international white fish meat supply. In light of OMB guidance to consider impacts to markets in other countries, the overall economic net benefits are expected to be negative during future conditions of low abundance, as determined by the EBS shelf trawl survey and/or the Setline Survey. However, as shown in Table 5-21 and Table 5-22 (analysis of revenue impacts of the preferred alternative) there are instances when there are zero impacts estimated on Amendment 80 fleet revenue when halibut abundance, as determined by the surveys, is relatively high.

The magnitude cannot be quantified, but can be expected to fluctuate along with changes in the PSC limits. For example, in years where the PSC limit is further reduced, resulting in a reduction in the amount of Am80 species catch taken and increased costs associated with the harvest of those species, econonomic benefits are expected to be more negative. However, as noted above, the impact estimates are "upper bound" estimates due to the assumption that the Amendment 80 sector will utilize their entire PSC cap despite historic evidence that shows that they have not. Further, the estimates contained within the impact scenarios are not actual impacts, as the response of the Amendment 80 fleet in applying tools such as halibut deck sorting and spatial redeployment of effort to avoid halibut have not been modeled and will affect both halibut PSC rates and attainment of TAC, albeit with potentially reduced efficiency and increased costs of production leading to negative impacts on producer surplus. It is for this reason that the economic impacts of the action alternatives, as the SSC has noted, should be compared across action alternatives and within the Amendment 80 sector. This analysis is a form of cost effectiveness analysis whereby the action alternatives' impacts are compared to each other for their relative effect of reducing halibut mortality versus their relative scale of the potential effects on fleet revenue. Cost effectiveness analysis, the approach the Council has undertaken and reviewed in the EIS, is an economic tool, recognized in OMB Circular A4, that compares alternative actions to determine which action can achieve a desired result at the lowest cost.

Council Consideration of Benefit and Cost Assessment.

The Council weighed the potential for actual economic impacts, versus those estimated here, against the non-quantifiable conservation, social, and management benefits of the abundance based management of halibut PSC when taking final action (see Section 2.4 for the compete Council rationale for this action). In selecting a preferred alternative, the Council recognized the need to balance several factors when establishing PSC limits, including the likely impacts on the halibut stock and affected participants in the Amendment 80 and directed halibut fisheries. The Council acknowledged that halibut is fully utilized in the BSAI and that, at low and very low index states, mortality from PSC should decline in response to reduced amounts of halibut available for harvest for all users. Under those conditions, reducing in halibut mortality from PSC is likely to prevent halibut PSC from becoming a larger proportion of total halibut removals in the BSAI, consistent with the Council's purpose and need statement.

In selecting its preferred alternative, the Council has proposed to establish abundance-based halibut PSC limits for the Amendment 80 sector. This abundance-based approach is like the management approach for the directed commercial halibut fisheries off Alaska, which establishes annual catch limits that vary with established measures of halibut abundance. Thus, this action addresses an inequity and promotes fairness in halibut management such that when halibut abundance is low, both the directed fishery's allocation and the Amendment 80 fishery's PSC allotment will be adjusted based on estimated abundance. It must be noted that this action links Amendment 80 halibut PSC limits to the abundance of halibut, since it is the largest portion of halibut PSC by a considerable margin. Halibut is a highly valued fish species that supports subsistence, recreational and directed commercial halibut fisheries coastwide. A reduction of the halibut PSC limit will promote conservation of the halibut stock, consistency with the management of the directed halibut fishery, and an overall sense of fairness among competing users.

A further consideration is the potential impact that reduced halibut PSC may have on the U26 portion of the bycatch versus the O26 portion. Reduced halibut PSC limits include longer term benefits from reductions in the U26 portion of the bycatch. Reduced mortality of smaller halibut could provide benefits for the directed fishery in the Bering Sea and elsewhere as these halibut migrate and recruit to legal size. Near-term benefits to the directed fishery in the Bering Sea accrue from savings in O26 halibut. The analysis indicates that under the assumption of a 0.5 ratio for the PSC limit to the directed catch limit, which approximates the 2010-2019 average proportion of O26 halibut in PSC mortality, directed commercial halibut catch limits could increase by approximately 360,000 pounds under the 1,309 PSC limit that would be established under the Preferred Alternative at the low/low state, which is the current state of the halibut stock indices (2021). However, as noted throughout this analysis, the IPHC, not NMFS, has the authority to allocate halibut to the directed commercial halibut fisheries.

The Council also weighed applying more restrictive PSC limits under Alternative 4; however, the Council determined that the anticipated negative economic impacts to the Amendment 80 sector from the PSC limits under Alternative 4 made this alternative unattractive and potentially impracticable. Two other National Standards were particularly relevant to the Council in recommending this final action: National Standard 8 (provide for the sustained participation of fishing communities and to the extent practicable, minimize adverse economic impacts on such communities) and National Standard 4 (allocation of fishing privileges shall be fair and equitable).

In considering the totality of potential impacts in terms of both quantifiable and non-quantifiable net benefits, the Council also weighed the conservation benefits to the halibut resource, the need for management consistency to address inequities in impacts to allocations of halibut under declining abundance, and the relative “cost” in terms of potential relative impacts on revenue across the action alternatives to evaluate the effectiveness of each alternative at achieving the stated objectives of the action versus the potential for adverse impacts to the Amendment 80 fleet. After weighing and balancing the competing interests contained in the National Standards, Council members recommended the Preferred Alternative.

5.7 Impacts of the Preferred Alternative

As described in Section 2.4, the Council’s preferred alternative (Alternative 5) uses a 4x2 Look-up table to specify PSC limits annually. These limits range from the status quo limit of 1,745 mt to 35% below that (at 1,134). As shown in Table 5-20, the PSC limits specified under Alternative 5 fall within the range of limits analyzed under Alternatives 2 through 4 of this analysis. This section provides a guide for understanding how the impacts of Alternative 5 are best derived from the analysis of impacts previously described in Sections 5.2 through 5.6[108].

Table 5-20 Range of PSC limits specified under Alternatives 2 through 5 in this analysis. Note that yellow highlights provide comparison where limits are Alternative 5 are already analyzed in Alternatives 2 through 4. The lowest limit specified in Alterative 5 (1,134 mt) is best represented by interpolating between the ‘High/very low and low low’ and ‘high low and low medium’ limits within Alternative 4 of 1,047 mt and 1,222 mt respectively (values in grey highlights).

Trawl Survey	Low	High	Low	High	Low	High	Low	High
Setline survey	Very Low	Very Low	Low	Low	Medium	Medium	High	High
Alt 2	1396	1483	1396	1483	1483	1571	1571	1745
Alt 3	1222	1309	1309	1396	1396	1745	1745	2007
Alt 4	960	1047	1047	1222	1222	1396	1396	1745
Alt 5	1134	1134	1309	1396	1396	1571	1745	1745

Impacts on the halibut stock

As noted in Section 5.2, impacts to the halibut biomass under all of the alternatives are expected to be similar. Depending on the abundance level, each alternative would conserve different amounts of halibut that otherwise would been caught and killed under the current, static PSC limit. The alternatives have no measurable impact on the overall spawning stock biomass.. The IPHC’s SPR-based management approach is expected to conserve spawning biomass across differing patterns in fishery selectivity and/or allocation among different fisheries. As such, there is likely to be little difference among the average future halibut spawning biomass under the various levels of PSC anticipated across all of the alternatives including the preferred alternative.

Approach to understanding revenue impacts of preferred alternative

The preferred alternative (Alternative 5) includes five different PSC limits, four of which (1,309 mt, 1,396 mt, 1,571 mt and 1,745 mt) were previously analyzed under existing alternatives in the DEIS. The PSC limit of 1,134 mt, associated with a very low setline survey state and a low or high trawl survey state, is the only new PSC limit included in the preferred alternative (Alternative 5) that was not specifically analyzed in the DEIS, though it falls between two previously analyzed PSC limits (1,047 mt

[108] Note that Social and Environmental Justice considerations as it related to Alternative 5 have been covered previously in Section 5.5

and 1,222 mt). Therefore, to understand the likely impacts of a PSC limit of 1,134 mt, one can interpolate between the impacts as estimated for PSC limits of 1,047 mt and 1,222 mt.

The impacts in the following subsections use this approach to display potential impacts of the preferred alternative based on the PSC limits previously analyzed in the DEIS. Although the estimated impacts associated with PSC limits from only the preferred Alternative are displayed in this section, it is important to remember that the revenue estimates for the A80 fishery and the directed halibut fishery sectors are estimated separately, using different methodologies and are meant to help compare impacts across alternatives *within* each sector and should *not* be used to compare impacts across sectors. The revenue estimates reported in this section do not represent the full scope of the economic impacts associated with the proposed action alternatives. All caveats and assumptions associated with these estimates and the interpretation of results as discussed in section 5.3 and section 5.4 apply to this section as well.

Impacts to Amendment 80 groundfish

Table 5-21 shows the average estimated status quo revenues (millions wholesale $2018) and percent difference from status quo by Alternative and PSC limit based on survey states. Percent differences are calculated across the rows (comparing estimates using same methods and datasets). This is modified from Table 5-6 in the document to include the PSC limits and survey states of the preferred alternative. Estimates associated with PSC limits of 1,047mt and 1,222mt are shaded grey as the impact of the actual PSC limit of 1,134mt will likely fall somewhere within this range. The same approach can be used to gauge the impacts of the preferred alternative with any of the figures or tables in section 5.3. All of the caveats and assumptions associated with these estimates and the interpretation of results as discussed in section 5.3 apply.

E.O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant." The E.O. lists multiple definitions of a "significant regulatory action." One definition includes "any regulatory action that is likely to result in a rule that may: 1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;"

Many of the scenarios in Table 5-5 represent a difference in average estimated revenue of $100 million or more. However, theses revenue estimates do not represent stand-alone predictions of future A80 revenues under each PSC limit. Rather, these estimates are provided to inform the potential difference in direction and magnitude of impacts when comparing across alternatives. The revenue estimates do not capture behavioral adjustments such as changes in targeting, fishing location, or other halibut avoidance strategies that might be employed, or estimate the costs associated with such avoidance strategies. Additionally, the revenue estimates reported in this section do not represent the full scope of the economic impacts associated with the proposed action alternatives. Given these caveats and the uncertainty surrounding these estimates it is possible that the preferred alternative has the potential to be considered a significant regulatory action as defined in E.O. 12866.

Impacts on BSAI halibut commercial catch

Table 5-22 below is modified from Table 5-15 to display a range of revenues associated with the potential changes in the net pounds of directed halibut catch limits associated with the PSC limits of the preferred alternative (Alternative 5). Estimates associated with PSC limits of 1,047 mt and 1,222 mt are shaded grey as the impact of the actual PSC limit of 1,134mt will likely fall somewhere within this range. The ex-vessel values are reported in 2018-dollar adjusted ex-vessel values for Area 4 as reported in Section 4. The ex-vessel value represents the amount paid to fishermen by a primary processor for raw fish. Ex-vessel prices are the most appropriate value to represent directed halibut fishery revenues given that this is the most common halibut supply chain in Alaska, particularly in the BSAI or Area 4 (see Section 4). In response to requests from public comments, halibut revenues are also reported in wholesale values. The wholesale values in this table are estimates of first wholesale production values for head and gut fish as reported in the Economic SAFE report (NMFS, 2021). The ratios represent a broad descriptive range of potential relationships between PSC limits and directed catch limits as described in section 5.4. All of the caveats and assumptions associated with these estimates and the interpretation of results as discussed in section 5.4 apply.

Table 5-21. Average estimated status quo revenues (millions wholesale $2018) and percent difference from status quo by Alternative and PSC limit based on survey states. Percent differences are calculated across the rows (comparing estimates using same methods and datasets).

Estimation method					State		Limit		State	Limit	State	Limit	State	Limit	State	Limit	State	Limit	State	Limit
		EBS shelf trawl survey			Low/ High		1134		Low	1309	High	1396	Low	1396	High	1571	Low	1745	High	1745
		Setline survey			Very Low				Low		Low		Medium		Medium		High		High	
	PSC limit estimated		1745		1047		1222		1309		1396		1396		1571		1745		1745	
	GF limit (1,000 mt)	290	310		290	310	290	310	290	310	290	310	290	310	290	310	290	310	290	310
Random	2010-14	291.338	291.603	Alternative 5	-40%	-40%	-30%	-30%	-25%	-25%	-20%	-20%	-20%	-20%	-10%	-10%	0%	0%	0%	0%
Random	2010-19	335.887	345.264	Alternative 5	-38%	-40%	-28%	-30%	-23%	-25%	-18%	-20%	-18%	-20%	-8%	-10%	0%	0%	0%	0%
Random	2016-19	346.417	370.311	Alternative 5	-22%	-27%	-10%	-15%	-3%	-9%	0%	-3%	0%	-3%	0%	0%	0%	0%	0%	0%
Random	2013-14	251.137	251.123	Alternative 5	-40%	-40%	-30%	-30%	-25%	-25%	-20%	-20%	-20%	-20%	-10%	-10%	0%	0%	0%	0%
Random	2017-18	376.558	402.546	Alternative 5	-18%	-23%	-4%	-11%	0%	-4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Strat.	2010-14	313.799	313.52	Alternative 5	-38%	-38%	-31%	-31%	-27%	-27%	-22%	-21%	-22%	-21%	-10%	-10%	0%	0%	0%	0%
Strat.	2010-19	336.782	360.053	Alternative 5	-36%	-40%	-28%	-33%	-24%	-29%	-18%	-23%	-18%	-23%	-3%	-9%	0%	0%	0%	0%
Strat.	2016-19	349.034	372.499	Alternative 5	-27%	-32%	-9%	-14%	-2%	-8%	0%	-2%	0%	-2%	0%	0%	0%	0%	0%	0%

Table 5-22 Potential change in revenue from status quo based on PSC limit (2018$)

	EBS shelf trawl survey			Low/ High	1134	Low	High	Low	High	Low/High
	Setline survey			Very Low		Low	Low	Medium	Medium	High
			ratio	1047	1222	1309	1396		1571	1745
ex-vessel values	2019	$4.33	1	4,997,340	3,744,425	3,121,548	2,498,670		1,245,755	0
			0.75	3,748,005	2,808,319	2,341,161	1,874,003		934,316	0
			0.5	2,498,670	1,872,213	1,560,774	1,249,335		622,878	0
			0.25	1,249,335	936,106	780,387	624,668		311,439	0
	Average 2015-19	$5.54	1	6,393,826	4,790,789	3,993,851	3,196,913		1,593,876	0
			0.75	4,795,369	3,593,092	2,995,388	2,397,685		1,195,407	0
			0.5	3,196,913	2,395,395	1,996,925	1,598,456		796,938	0
			0.25	1,598,456	1,197,697	998,463	799,228		398,469	0
wholesale head and gut	2019	$6.37	1	7,351,745	5,508,543	4,592,208	3,675,873		1,832,670	0
			0.75	5,513,809	4,131,407	3,444,156	2,756,904		1,374,503	0
			0.5	3,675,873	2,754,271	2,296,104	1,837,936		916,335	0
			0.25	1,837,936	1,377,136	1,148,052	918,968		458,168	0
	Average 2015-19	$7.04	1	8,125,006	6,087,934	5,075,219	4,062,503		2,025,431	0
			0.75	6,093,754	4,565,951	3,806,414	3,046,877		1,519,073	0
			0.5	4,062,503	3,043,967	2,537,609	2,031,251		1,012,716	0
			0.25	2,031,251	1,521,984	1,268,805	1,015,626		506,358	0

5.8 Cumulative Effects

The 1978 regulations implementing NEPA, under which this FEIS has been developed, require an analysis of the potential cumulative effects of a proposed federal action and its alternatives. Cumulative effects are those combined effects on the quality of the human environment that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of which federal or non-federal agency or person undertakes such other actions (40 CFR §§ 1508.7, 1508.25(a) and 1508.25(c), 1978 NEPA regulations under which this analysis was developed). Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. The concept behind cumulative effects analysis is to capture the total effects of many actions over time that would be missed if evaluating each action individually. Concurrently, the Council on Environmental Quality (CEQ) guidelines recognize that it is most practical to focus cumulative effects analysis on only those effects that are truly meaningful. Based on the preceding analysis, the effects that are meaningful are potential effects to Pacific halibut, if the alternatives result in a change in the spatial or size distribution of halibut removals. The cumulative effects of many actions over time on the other resources included in this analysis have been analyzed in numerous documents. The impacts of this proposed action and alternatives on those resources are minimal and would not add to the cumulative effects previously analyzed in a way that would result in any meaningful additional cumulative effects. Therefore, there is no need to conduct an additional cumulative impacts analysis.

The FEIS is intended to analyze the cumulative effects of each alternative and the effects of other past, present, and reasonably foreseeable future actions (RFFAs). The past and present actions are described in the previous sections of this document. This section provides a review of the other RFFAs that may result in combined effects on the quality of the human environment. Actions are understood to be human actions (e.g., a proposed rule to designate northern right whale critical habitat in the Pacific Ocean), as distinguished from natural events (e.g., an ecological regime shift). CEQ regulations require consideration of actions, whether taken by a government or by private persons, which are reasonably foreseeable. This requirement is interpreted to indicate actions that are more than merely possible or speculative.

Actions are considered reasonably foreseeable if some concrete step has been taken toward implementation, such as a Council recommendation or NMFS's publication of a proposed rule. Actions only "under consideration" have not generally been included because they may change substantially or may not be adopted, and so cannot be reasonably described, predicted, or foreseen. Identification of actions likely to impact a resource component within this action's area and time frame will allow the public and Council to make a reasoned choice among alternatives.

The following RFFAs are identified as likely to have an impact on a resource component within the action area and timeframe:

- IPHC direct fishery harvests. The catch limit process for the halibut fisheries is under the authority of the IPHC. The IPHC is in the process of reconsidering harvest rates that are part of the harvest policy. Any changes to the IPHC's harvest policy, or its implementation, will have an impact the Pacific halibut stock.

Considering the conclusion from this analysis that there would be no direct or indirect impacts of the proposed action to Pacific halibut, (Section 5.2) together with the impacts of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of the reasonably foreseeable future actions listed above, the cumulative impacts of the proposed action are determined to be not significant.

5.9 Management and Enforcement Considerations

5.9.1 Cost recovery

Halibut PSC management actions recommended by the Council, and implemented by NMFS, could affect the total amount harvested by the Amendment 80 sector. Under Section 304(d) of the MSA, the Amendment 80 sector is subject to cost recovery fees (81 FR 150, January 5, 2016).[109] NMFS is required to recover the actual costs directly related to the management, data collection, and enforcement of any LAPP and the CDQ program. To calculate the cost recovery fee percentage for each fishing year, NMFS divides the direct program costs of an eligible fishery program by the total ex-vessel fishery value, then multiplies by 100 to calculate the fee percentage levied on landings. This action could change halibut PSC limits which could impact the value of fisheries subject to cost recovery by changing the total amount of fish or the amount of each species harvested. Changes to direct program costs, fishery value, or both, could alter the fee percentage due. The potential impact of this action on cost recovery fees billed to the Amendment 80 fleet is uncertain. It is not possible to quantitatively estimate the potential impact of this action on cost recovery fee percentages given the wide variety of factors that affect the direct program costs, and the value of a fishery. These factors can include, among others, TACs, ex-vessel prices, and specific fleet responses to this action which are all variable and can change simultaneously. Generally, it is reasonable to assume that the larger the change in PSC limit from status quo as a result of this action, the greater the potential impact on harvests and subsequently fishery value.

Section 304(d) limits total cost recovery fees to 3 percent of the ex-vessel value for a fishery. In 2020, the cost recovery fee percentage was 1.19 percent of ex-vessel value for the Amendment 80 sector. The

[109] See final rule published on January 5, 2016, at https://www.federalregister.gov/documents/2016/01/05/2015-33096/fisheries-of-the-exclusive-economic-zone-off-alaska-bering-sea-and-aleutian-islands-management-area#p-1

potential impact of this action on cost recovery fees will vary based on changes to fishery value and direct program costs but cannot exceed 3 percent of fishery value. A detailed description of the costs and potential fees associated with the Amendment 80 sector is available in the proposed rule (80 FR 935, January 7, 2015) and the analysis to implement cost recovery fees and is incorporated by reference.[110]

5.9.2 Vessel safety

None of the proposed alternatives or options would change safety requirements for fishing vessels. The proposed action also is not likely to affect safety for vessels that operate in a rationalized fishery (Amendment 80) since these vessels have the ability to coordinate within the sector to respond to variable PSC limits by reducing groundfish harvests or by using other methods to reduce halibut PSC use. The proposed alternatives and subsequent options provide for a gradual increase, decrease, or maintenance of PSC limits, with buffers against dramatic annual variation. In this way, if continual reductions in PSC limits became apparent, there would be time to address new vessel safety concerns before they became significant.

5.9.3 Enforcement Considerations

A reduction in halibut PSC limits may create an incentive to bias an observer's data. The prosecution of two individuals and Unimak Fisheries in 2005, and of the vessel operator and Rebecca Irene Fisheries in 2006, for biasing observer data and underreporting of halibut PSC during groundfish fisheries demonstrates this incentive. Since that time, monitoring requirements implemented with the Amendment 80 sector have reduced the likelihood of an observer's data being biased for Amendment 80 fisheries. These requirements include video and electronic bin monitoring, a prohibition on mixing hauls, a requirement to weigh all catch on an approved flowscale unless halibut decksorting as described at 50 CFR § 679.120, and an increase to 200 percent observer coverage. However, recent reporting trends identified by the Alaska Division of NOAA's Office of Law Enforcement (OLE) indicate an increase in reports of harassment, intimidation, hostile work environment, and other attempts to bias observer samples of PSC in the Amendment 80 sector (AFSC and AKRO 2020). The Amendment 80 sector has one of the highest rates of interpersonal issues report by observers (0.49 per assignment). A further reduction of the halibut PSC limit for these sectors may result in additional coercive behavior and attempts to bias observer samples. NOAA OLE continues to investigate complaints that include pressuring observers to expedite delivery of haul composition data to the vessel captain more frequently than the data are transmitted to NMFS, intimidating or coercive attempts to influence observer sample collection with the intent to lower PSC estimates, and other attempts to remove prohibited species from an observer's sample. If the proposed action results in a reduction to halibut PSC limits it will likely increase, among some operators, the economic incentives to attempt to bias halibut PSC data through whatever means may be available.

In contrast, if the proposed action results in an increase to halibut PSC limits, it may decrease the incentive to bias an observer's data and reduce reports of harassment, intimidation, and hostile work environments directed at observers.

Regardless of which ever alternative is selected, outreach from NOAA OLE will be important during implementation of this action. Successful outreach from NOAA OLE following the implementation of halibut decksorting, followed by routine boardings, served as a useful way for vessels to report problems they might be having with new regulations. Those efforts appeared to encourage communication and self-reporting by the vessel and the tactic will be continued by NOAA OLE with any new implementation.

5.9.4 Management

The groundfish fisheries in Federal waters off Alaska are managed under the BSAI FMP and the GOA FMP. In the BSAI and GOA, groundfish harvests are managed subject to annual limits on the amounts of each groundfish species or species group that may be taken. The regulations at 50 CFR part 679 and the annual harvest specifications also set or apportion the PSC limits. The annual limits are referred to as

[110] See analysis at https://www.regulations.gov/document/NOAA-NMFS-2014-0031-0002.

"harvest specifications," and the process of establishing them is referred to as the "harvest specifications process." The intended effect of these actions is to conserve and manage the groundfish resources in the BSAI in accordance with the MSA. The U.S. Secretary of Commerce approves the harvest specifications based on the recommendations of the Council. The goals of the harvest specifications process are to (1) manage fisheries based on the best scientific information available, (2) provide for adequate prior public review and comment on Council recommendations, (3) provide for additional opportunity for Secretarial review, (4) minimize unnecessary disruption to fisheries and public confusion, and (5) promote administrative efficiency.

Alternatives 2 through 5 would necessitate changing PSC limits annually for the Amendment 80 sector based on the look up table associated with the selected alternative. The look up table would be included in regulation, while each fall the survey state for each of the two survey indices will be determined and will be referenced in the look up table to establish the PSC limit for the following year. This is similar to the Bering Sea Chinook PSC limits that are specified in regulation, with an annual determination of low or high Chinook abundance indicating whether the lower or higher PSC limits are specified for the next year (see regulations at 50 CFR § 679.21(f)(6)). For this proposed halibut abundance-based management action, any of the options (1 through 3) could have also been included in regulation, had the Council selected any of the options. However, the Council did not select any options. Thus, while information on the PSC limit (and annual limit, had Option 3 been selected) would be available to the Council in conjunction with the specifications process, there would be no action required of the Council in October or December to specify the PSC limit for the following year. As shown in Figure 2-5, while information may be insufficient in October of a given year to determine the subsequent year's PSC limit (and annual limit had Option 3 been selected), that information would be available for December and may help inform TAC-setting.

As discussed in Section 1.6.1, with the exception of 2020, EBS shelf trawl survey biomass estimates are available annually for the September Groundfish Plan Team meetings. Information to assign the trawl survey state for use in the look up table would be available at that time,[111] which may provide the public some idea of whether the PSC limit is likely to change for the following year (i.e. if the EBS shelf trawl survey has increased or decreased sufficiently from the previous year to shift from a low or high threshold at 150,000 mt). However, IPHC setline survey estimates may not be available until late October or possibly late November, because the survey is typically not completed until early September and time is needed to verify and model the data. If the revised PSC limit in December is considerably lower than the one previously approved for opening the fishery (from the previous year) in January, it may be adjusted in-season as needed by NMFS. To cover the time between the opening of the groundfish fisheries and the publication of the final harvest specifications, the Regional Administrator may use the Inseason Adjustment authority under 50 CFR § 679.25 to adjust a PSC limit based on a determination that such adjustment is necessary to prevent the taking of a prohibited species that, on the basis of the best available scientific information, is found by NMFS to be incorrectly specified.

The use of the Inseason Adjustment authority may be warranted as the PSC limits may change annually based upon survey data and thus may differ substantially from the previous year.

Had Option 3 been applied to any of the Alternatives 2, 3, or 4, a determination of Amendment 80 PSC usage would be necessary before establishing whether an annual limit was exceeded. This information is generally available immediately following the close of the fishery and should be available in time for final specifications in December. Regardless, NMFS will provide a notice to the public to designate the proceeding years PSC limit prior to the start of fishing.

[111] See section 2.4 for considerations of no new survey data

Had Option 2 been selected, it would only be employed in the first year of implementation of this proposed action and is not expected to pose any additional management concerns.

5.10 Policy tradeoff and decision points

In constructing a preferred alternative (PA), the Council considered a number of Alternatives and options to select from as well as policy tradeoffs. This section describes the decision-tree for the construction of a PA as well as policy-level considerations with respect to the MSA National Standards in doing so. Up to three steps are necessary to create a PA as shown in Figure 5-16. As described previously, there are four action alternatives in this analysis, in addition to the Status quo (Alternative 1). These action alternatives, if selected, would modify the Amendment 80 PSC limit to establish an annual regulatory process for PSC limit-setting based on a look up tables framed by survey states. Next, the Council may choose to select additional options in addition to the specific action alternative to either smooth the inter-annual variability in the PSC limit (Option 1), limit the variability from Status Quo in the first year of implementation (Option 2) or add additional incentives regarding PSC usage (Option 3). Finally, Options 2 and 3, if selected, require the Council to select a specific sub-option.

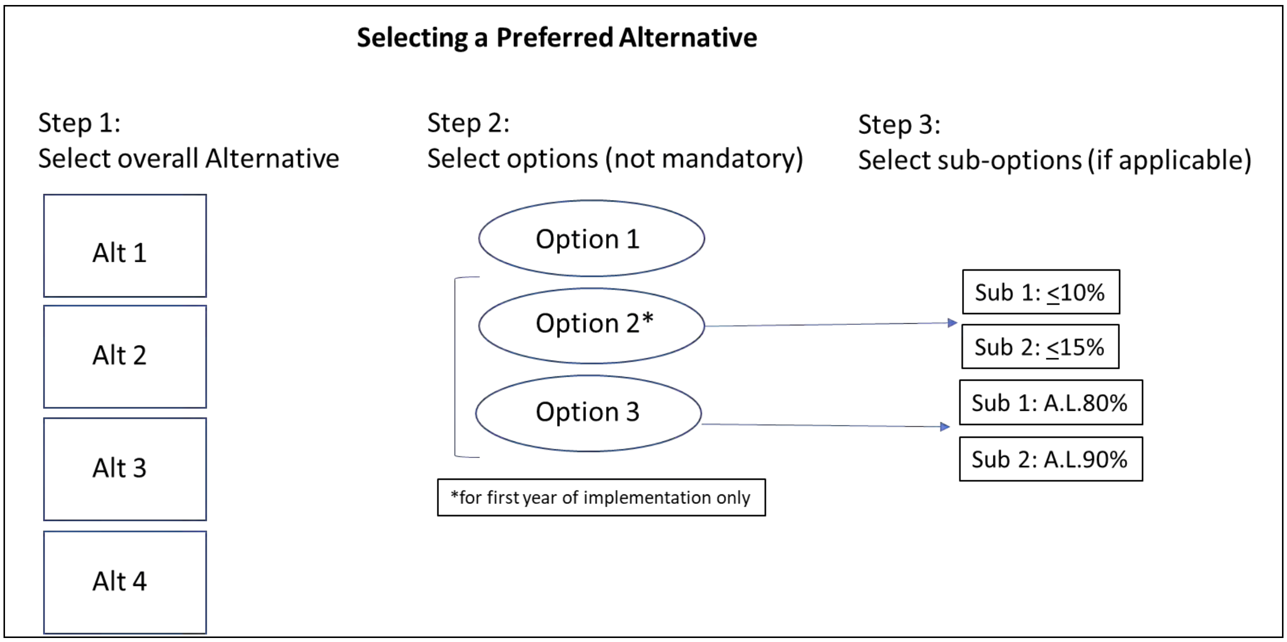

Figure 5-16 Iterative steps in selecting amongst Alternatives and Options for creating a preferred alternative. Note that Option 1 does not have additional sub-options associated with it.

One of the policy considerations of this management action involves balancing competing interests among the National Standards, which include minimizing bycatch and assessing the practicablity of doing so under National Standard 9 and factoring into account the importance of groundfish and halibut resources to fishing communities under National Standard 8, as well as others. The practicability of operation under reduced PSC limits has been extensively discussed in Section 5.3.2.3. Given their broader range of possible PSC limits and the indications that the Amendment 80 sector is more likely to be constrained by their TAC than PSC at high levels of PSC limits, Alternatives 2 and 3 provide the most flexibility for fishing operations to achieve their TAC both at lower halibut biomass levels and particularly at higher biomass survey states. Options 1 and 3 provide some mitigation of interannual variability in survey biomass estimates (Option 1) and further incentives to reduce bycatch below the regulatory PSC limit (Option 3). Policy decisions should address the ability of the fleet to catch their quota while minimizing bycatch to the extent practicable.

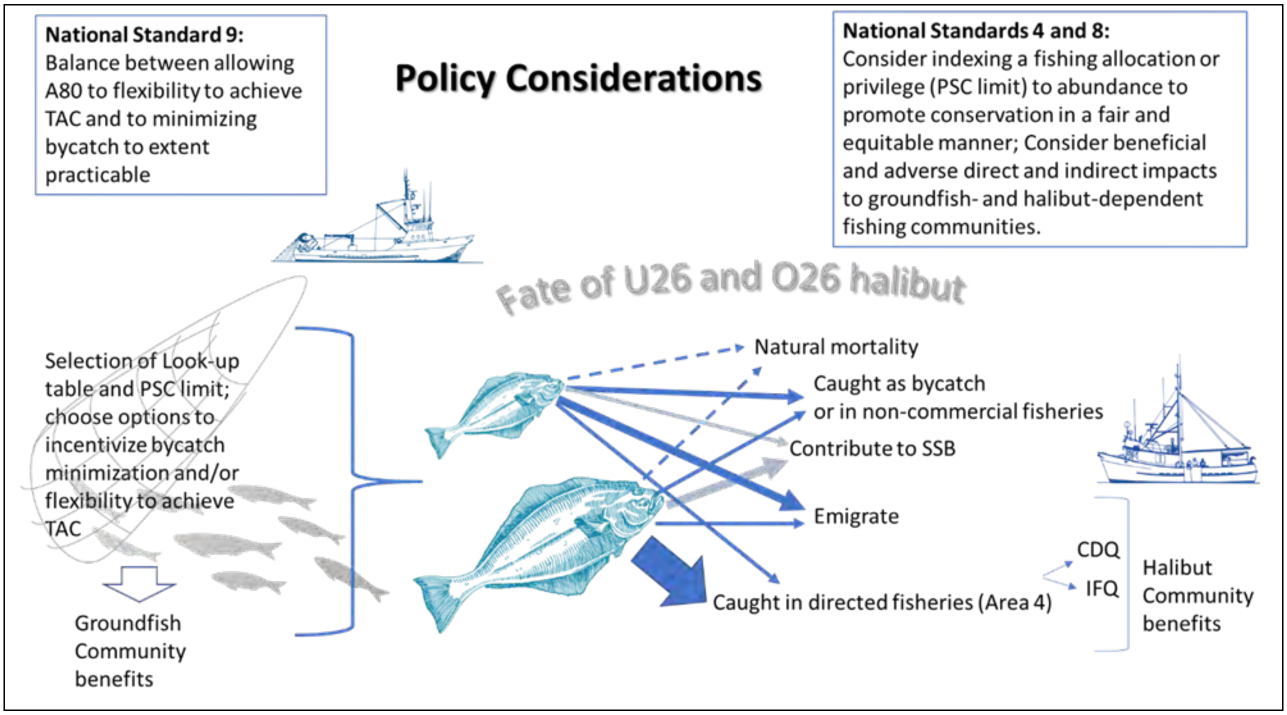

Figure 5-17 Schematic of trade-offs in considerations of some key National Standards based on the relative fate of O26 and U26 halibut. Here the width of the blue arrows represents relative magnitude of removals between O26 and U26 fish. Grey arrows show that contribution to SSB is from both sources but unknown magnitude while dotted lines for natural mortality indicate that it is considered equivalent between older and younger fish but is in fact an unknown quantity.

Another policy tradeoff stemming from the National Standards include consideration of National Standards 4 (allocate fishing privileges (in this case, a halibut PSC limit that varies with abundance) in a manner that is fair and equitable to all U.S. fishermen) (Figure 5-17). Options are provided to incentivize bycatch reduction beyond what is provided by the PSC limit itself. Additional information on how all of the alternatives under consideration address each of the ten National Standards is contained in the analysis in Section 7.1.

6 Other Resource Categories

6.1 Marine Mammals

6.1.1 Status

Alaska supports one of the richest assemblages of marine mammals in the world. Twenty-two species are present from the order Carnivora, superfamilies Pinnipedia (seals, sea lions, and walrus), Ursoidea (polar bears), and Musteloidea (sea otters), and from the order Artiodactyla, infraorder Cetacea (whales, dolphins, and porpoises). Some marine mammal species are resident in waters off Alaska throughout the year, while others migrate into or out of Alaska fisheries management areas. Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf, including inshore waters. NMFS maintains management authority for almost all marine mammal species in Alaska; the U.S. Fish and Wildlife Service (USFWS) is the designated management authority for northern polar bears, Pacific walrus, and northern sea otter.

The Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the Fur Seal Act are the relevant statutes for managing marine mammal interactions with human activities, including commercial fishing operations. The MMPA was enacted in 1972 with the purpose of ensuring that marine mammal populations continue to be functioning elements of the ecosystems of which they are a part. One of the incentives for enacting the MMPA was to reduce take of marine mammals incidental to commercial fishing operations. While marine mammals may be lawfully taken incidentally in the course of commercial fishing operations, the 1994 MMPA Amendments established a requirement for commercial fishing operations to reduce incidental mortalities and serious injuries (M/SI) of marine mammals to insignificant levels approaching a zero rate, commonly referred to as the Zero Mortality Rate Goal (ZMRG). ZMRG is considered to be met for a marine mammal stock when the M/SI level from all commercial fisheries is 10 percent or below the Potential Biological Removal level (PBR) of that marine mammal stock (69 FR 43338, July 20, 2004).

Likewise, the ESA was enacted to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threatened species, and to take such steps as may be appropriate to achieve such conservation. In practice, the ESA outlines a program to protect endangered species on the brink of extinction and threatened species that are likely to be on the brink of extinction in the near future and pursue their recovery. The ESA also requires designation of critical habitat of endangered or threatened species, which is considered to have physical or biological features essential to the conservation of the species and which may require special management considerations or protection.

Under the MMPA, a “population stock” is the fundamental unit of legally-mandated conservation and is defined as “a group of marine mammals of the same species or smaller taxa in a common spatial arrangement, which interbreed when mature.” 16 USC § 1362. Stocks are identified in a manner consistent with the management goals of the MMPA which include 1) preventing stocks from diminishing such that they cease to be a significant functioning element in the ecosystem of which they are a part or below their optimum sustainable population keeping the carrying capacity of the habitat in mind; and 2) maintaining the health and stability of the marine ecosystem. Therefore, a stock is also recognized as being a management unit that identifies a demographically isolated biological population. While many types of information can be used to identify stocks of a species, it is recognized that some identified stocks may fall short of that threshold due to a lack of information.

Marine mammal Stock Assessment Reports (SARs) are published annually under the authority of the MMPA for all stocks that occur in state and federal waters of the Alaska region [NMFS 2016]. Individual SARs provide information on each stock’s geographic distribution, population estimates, population trends, and estimates of the potential biological removal (PBR) levels for each stock. The SARs identify sources of human-caused mortality, including serious injury and mortality in commercial fishery operations, by fishery, and whether the stock has met ZMRG for all fisheries. The SARs also include the stock’s ESA listing status and MMPA depleted and strategic designations. Strategic stock SARs are updated annually (Steller sea lions, northern fur seals, bearded seals, ringed seals, Cook Inlet beluga whales, AT1 Transient killer whales, harbor porpoise, sperm whales, humpback whales, fin whales, North Pacific right whales, and bowhead whales). SARs for non-strategic stocks are updated every three years or when significant new information is available.

Under the ESA, species, subspecies, and distinct population segments (DPS) are eligible for listing as a threatened or endangered species. The ESA defines a species as ‘‘any subspecies of fish or wildlife or plants, and any DPS of any species of vertebrate fish or wildlife which interbreeds when mature.’’ 16 USC § 1532(16). The joint USFWS /NMFS DPS policy (61 FR 4722; February 7, 1996) establishes two criteria that must be met for a population or group of populations to be considered a DPS: (1) The population segment must be discrete in relation to the remainder of the species (or subspecies) to which it belongs; and (2) the population segment must be significant to the remainder of the species (or subspecies) to which it belongs.

A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: 1) it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors; or 2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the ESA. Significance determinations are made using available scientific evidence of the population's biological and ecological importance to the taxon to which it belongs. This may include, but is not limited to, one or more of the following: 1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; 2) evidence that loss of the discrete population segment would result in a significant gap in the range of the taxon; 3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or 4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics. It is important to note that the MMPA stock designations and ESA DPS designations for a given species do not necessarily overlap due to differences in the defining criteria for each.

Marine mammals have been given various levels of protection under the current fishery management plans of the Council, and several species are the subjects of continuing research and monitoring to further define the nature and extent of fishery impacts on them. A number of conservation concerns and/or management determinations may be related to marine mammals and the potential impacts of fishing. For individual species, these concerns or determinations may include—

- Protection under the ESA:
  - listed as endangered or threatened
  - placed on NMFS' list of "species of concern" or designated as a "candidate species" for ESA listings;
- Protection under the MMPA:
  - designated as depleted or strategic;
  - focus of a Take Reduction Plan;
- Other:
  - declining or depressed populations in a manner of concern to State or Federal agencies;
  - large bycatch or other mortality related to fishing activities; or
  - vulnerability to direct or indirect adverse effects from some fishing activities.

The Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement (PSEIS) (NMFS 2004) provides descriptions of the range, habitat, and diet for marine mammals found in waters off Alaska. The 2015 PSEIS Supplemental Information Report (NMFS 2015) provides updates on changes to marine mammal stock or species-related management and status, as well as new information regarding impacts on marine mammal stocks and new methods to assess impacts. The information from the PSEIS and the SARs is incorporated by reference.

Marine mammal stocks, including those currently listed as endangered or threatened under the ESA or depleted or strategic under the MMPA that may be present in the action area are listed in Table 6-1. ESA Section 7 formal and informal consultations with respect to the actions of the Federal groundfish fisheries have been completed for all of the ESA-listed species, either individually or in groups (NMFS 2010 and NMFS 2014a). Of the species listed under the ESA or stocks designated as depleted or strategic under the MMPA and present in the action area, several species may be more vulnerable than others to being adversely affected by commercial groundfish fishing. These include Steller sea lions, bearded seals, humpback whales, fin whales, and sperm whales. Stocks designated as depleted or strategic under the MMPA, but not listed as threatened or endangered under the ESA, that may be vulnerable to being adversely affected by commercial groundfish fishing include northern fur seals and harbor porpoise.

Table 6-1 Marine mammals known to occur in the Bering Sea and Aleutian Islands.

Infraorder or Superfamily	Species	MMPA Stock	ESA or MMPA Status	ZMRG Status (all fisheries)

Pinnipedia	Steller sea lion *(Eumatopias jubatus)*	Western U.S	Endangered, Depleted, Strategic	Not Met
	Northern fur seal *(Callorhinus ursinus*)	Eastern Pacific	Depleted, Strategic	Met
	Harbor seal *(Phoca vitulina)*	Pribilof Islands	None	Met
		Bristol Bay	None	Met
	Ribbon seal *(Phoca fasciata)*	Alaska	None	Met
	Bearded seal *(Erignathus barbatus nauticus)*	Alaska[a]	Threatened, Depleted, Strategic	Met
	Spotted seal *(Phoca largha)*	Alaska[b]	None	Met
	Ringed seal *(Phoca hispida)*	Alaska[c]	Threatened, Depleted, Strategic	Met
	Pacific Walrus *(Odobenus rosmarus divergens)*	Alaska[d]	Strategic	Met
Cetacea	Killer whale *(Orcinus orca)*	Eastern North Pacific Alaska Resident	None	Met
		Eastern North Pacific GOA, Aleutian Islands, and Bering Sea transient	None	Met
		Offshore***	None	Unknown*
	Pacific White-sided dolphin (*Lagenorhynchus obliquidens*)	North Pacific	None	Met
	Harbor porpoise *(Phocoena phoecena)*	Bering Sea	None	Met
	Dall's porpoise (*Phocoenoides dalli*)	Alaska	None	Met
	Beluga whale *(Delphinapterus leucas)*	Beaufort Sea	None	Met
		Eastern Chukchi Sea	None	Met
		Eastern Bering Sea	None	Unknown*
		Bristol Bay	None	Unknown**
	Baird's beaked whale (*Berardius bairdii*)	Alaska	None	Unknown*
	Cuvier's beaked whale (*Ziphius cavirostris)*	Alaska	None	Unknown*
	Stejneger's beaked whale (*Mesoplodon stejnegeri*)	Alaska	None	Unknown*
	Sperm whale (*Physeter macrocephalus*)	North Pacific	Endangered, Depleted, Strategic	Unknown*
	Bowhead whale *(Balaena mysticetus)*	Western Arctic (Also known as Bering-Chukchi-Beaufort stock)	Endangered, Depleted, Strategic	Met
	Humpback whale *(Megaptera novaeangliae)* †	Western North Pacific‡	WNP DPS-Endangered, Depleted, Strategic	Not Met
		Central North Pacific ‡‡	Mexico DPS-Threatened, Depleted, Strategic Hawaii DPS - None	Not Met
	Fin whale *(Balaenoptera physalus)*	Northeast Pacific	Endangered, Depleted, Strategic	Met
	Minke whale *(Balaenoptera acutorostrata)*	Alaska	None	Unknown*
	North Pacific right whale *(Eubalaena japonica)*	Eastern North Pacific	Endangered, Depleted, Strategic	Unknown*
	Blue whale *(Balaenoptera musculus)*	Eastern North Pacific***	Endangered, Depleted, Strategic	Met
	Sei whale *(Balaenoptera borealis)*	Eastern North Pacific***	Endangered, Depleted, Strategic	Met
Mustelidae	Northern sea otter *(Enhydra lutris)*	Southwest Alaska	Threatened, Depleted, Strategic	Unknown*
Ursoidea	Polar Bear *(Ursus maritimus)*	Chukchi/Bering Sea	Threatened, Depleted, Strategic	Unknown*

Sources: Muto et al 2020; Carretta et al 2019; List of Fisheries for 2020 (April 16, 2020 85 FR 21079)
* Unknown due to unknown abundance estimate and PBR.
** Unknown due to inadequate observer coverage or unreliable SI/M estimate.
*** This stock is found in the Pacific SAR, rather than in the Alaska SAR.

**** The PBR for the North Pacific right whale is calculated, but considered unreliable. However, there are no known fishery-related SI/M.

† On September 8, 2016, NMFS published a final decision revising the status of humpback whales under the ESA (81 FR 62259), effective October 11, 2016. In the 2016 decision, NMFS recognized the existence of 14 DPSs, classified several as endangered and one as threatened, and determined that the remaining DPSs do not warrant protection under the ESA. Three DPSs of humpback whales occur in waters off the coast of Alaska: the Asia/2[nd] Western North Pacific (WNP) DPS, which is endangered, the Mexico DPS, which is threatened, and the Hawaii DPS, which is not protected under the ESA. Whales from these three DPSs overlap to some extent on feeding grounds off Alaska. As of October 2016, the MMPA stock designations of humpback whales found in Alaska have not been updated to reflect the newly-designated DPSs. Proposed critical habitat was published on October 9, 2019 (84 FR 54354).

‡ Corresponds to the new Asia/ 2[nd] WDPS (endangered).

‡‡ Includes the new Mexico (threatened) and Hawaii DPSs (not protected under the ESA).

[a] Bearded seals: Two DPSs are identified for this subspecies, but only the Beringia DPS occurs in US waters. Therefore, the Alaska stock identified under the MMPA SAR consists entirely of the Beringia DPS. The Beringia DPS was most recently listed as threatened under the ESA in October 2016. Critical habitat for the Beringia DPS was proposed in January 2021.

[b] Spotted seals: Three DPSs are identified, but only the Bering DPS occurs in U.S. waters. Therefore, the Alaska stock identified under the MMPA SAR consists entirely of the Bering DPS.

[c] Ringed seals were listed as threatened under the ESA in December 2012. In March 2016 the U.S. District Court vacated the listing. In May 2016 NMFS appealed the March 2016 decision. Critical habitat for ringed seals was proposed in January 2021

[d] Walrus – A petition to list walrus under the ESA was determined to be warranted, but precluded by higher priorities (76 FR 7634, February 10, 2011). The USFWS is under court order to make a decision on the listing in 2017. As of October 5, 2017, NMFS determined that listing is no longer warranted for the Pacific walrus.

Table 6-2 Status of Pinnipedia and Carnivora stocks potentially affected by the action.

Pinnipedia and Carnivora species and stock or DPS	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
Steller sea lion –Western (W) Distinct Population Segment (DPS)	Endangered	Depleted & strategic	Using survey counts from 1987-2018, western Steller sea lion pup and non-pup counts in Alaska in 2018 were modeled to be 53,624. Modeled count data collected from 1978 through 2018 indicates that pup and non-pup counts of western stock Steller sea lions in Alaska were at their lowest levels in 2002 and have increased at 1.52% y-1 and 2.05% y-1, respectively, between 2002 and 2018. However, there are strong regional differences across the range in Alaska, with positive trends in the GOA and the eastern Aleutian Is region and generally negative trends to the west of Samalga Pass. Survey effort was focused in the Aleutian Is in 2018. Non-pup and pup counts in the western Aleutians have been in a steep decline overall. However, modeled realized counts show a period of stability in this region from 2014 to 2016 (and potentially an increase in pup counts), followed by a decline between 2016 and 2018.	WDPS inhabits Alaska waters from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. EDPS inhabit waters east of Prince William Sound to Dixon Entrance. Occur throughout AK waters, terrestrial haulouts and rookeries on Pribilof Islands, Aleutian Islands, St. Lawrence Island, and off the mainland. Use marine areas for foraging. Critical habitat designated around major rookeries, haulouts, and foraging areas.
Northern fur seal Eastern Pacific	None	Depleted &strategic	Recent pup counts show a continuing decline in the number of pups surviving in the Pribilof Islands. From 1998 to 2016, pup production declined 4.12% per year (SE = 0.40%; $P < 0.01$) on St. Paul Island and showed no significant trend (SE = 0.57%; $P = 0.13$) on St. George Island. Between 1997 and 2015, pup production at Bogoslof Is increased 10.1% per year.	Fur seals occur throughout Alaska waters, but their main rookeries are located in the Bering Sea on Bogoslof Island and the Pribilof Islands. Approximately 55% of the worldwide abundance of fur seals is found on the Pribilof Islands. Forages in the pelagic area of the Bering Sea during summer breeding season, but most leave the Bering Sea in the fall to spend winter and spring in the N. Pacific.
Harbor seal – Pribilof Islands, Bristol Bay and Aleutian Islands	None	None	Pribilof Is – trend unknown; Bristol Bay – approx. 2.5 % increase per year over 8 years; Aleutian Is – approx. 2% per year decrease over eight years.	Pribilof Islands - Saint Paul and Saint George Islands, Otter and Walrus Islands; Bristol Bay– range from Nunivak Island south to the west coast of Unimak Island and extending inland(east) to Kvichak Bay and Lake Iliamna; Aleutian Is - entire Aleutian chain from Attu Island to Ugamak Island;
Ribbon seal Alaska	None	None	Reliable data on population trends are unavailable.	Widely dispersed throughout the Bering Sea and Aleutian Islands in the summer and fall. Associated with ice in spring and winter and may be associated with ice in summer and fall.
Northern sea otters – SW Alaska	Threatened	Depleted & strategic	The overall population trend for the southwest Alaska stock is believed to be increasing, with except for along the western AK Peninsula and the Aleutian Is.	Coastal waters from Central GOA to W Aleutians within the 40 m depth contour. Critical habitat designated in primarily nearshore waters with few locations into federal waters in the GOA.

Sources: Muto et al 2020; List of Fisheries for 2020 (May 16, 2019 84 FR 22052)

Table 6-3 Status of Cetacea stocks potentially affected by the action.

Cetacea species/stock	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
Killer whale - Eastern North Pacific Alaska resident	None	None	The minimum population estimate (N_{MIN}) for the Alaska Resident stock of killer whales is 2,084 animals.	Alaska resident whales are found from southeastern Alaska to the Aleutian Islands and Bering Sea. Intermixing of Alaska residents have been documented among the three areas, at least as far west as the eastern Aleutian Islands.
Killer whale - Eastern North Pacific Northern resident	None	None	N_{MIN} for the Northern Resident stock is 302 whales, including whales found in Canadian waters. From the mid-1970s to the 1990s, the Northern Resident killer whale population increased at an annual rate of 2.6% (i.e., from 122 whales in 1974 to 218 in 1997). A decline was reported from 1998 to 2001 at a rate of 7% per year. The increased mortality that drove this decline coincided with a period of reduced range-wide Chinook salmon abundance, their primary prey. After 2001 growth was positive with the population increasing at an average rate of 2.9% per year from 2002 to 2014. This represents an average annual increase of 2.2% over the 40-year time series. However, annual Northern Resident killer whale population growth rates have slowed over the past five census years, from 5.1% in 2014 to -0.3% in 2018.	The Eastern North Pacific Northern Resident stock is a transboundary stock and includes killer whales that frequent British Columbia, Canada, and Southeast Alaska. They have been seen infrequently in Washington State waters. Members of the Northern Resident population have been documented in Southeast Alaska; however, they have not been seen to intermix with Alaska Residents.
Dall's porpoise Alaska	None	None	Reliable data on population trends are unavailable.	Dall's porpoise are widely distributed across the entire North Pacific Ocean (Fig. 1). They are found over the continental shelf adjacent to the slope and over deep (2,500+ m) oceanic waters (Hall 1979). They have been sighted throughout the North Pacific as far north as 65°N (Buckland et al. 1993) and as far south as 28°N in the eastern North Pacific (Leatherwood and Fielding 1974). The only apparent distribution gaps in Alaska waters are upper Cook Inlet and the shallow eastern flats of the Bering Sea.
Pacific white-sided dolphin	None	None	Reliable data on population trends are unavailable.	In the eastern North Pacific, the species occurs from the southern Gulf of California, north to the Gulf of Alaska, west to Amchitka in the Aleutian Islands, and is sometimes encountered in the southern Bering Sea.
Harbor porpoise BSAI	None	None	Reliable data on population trends are unavailable.	Primarily in coastal waters in the BSAI, usually less than 100 m.
Humpback whale – Western, Mexico, and Hawaii DPS	WNP DPS-Endangered Mexic DPS-Threatened Hi DPS-None	WNP and Mexico DPS Depleted & strategic	Increasing. The Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) abundance estimate for the North Pacific represents an annual increase of 4.9% since 1991–1993. SPLASH abundance estimates for Hawaii show annual increases of 5.5% to 6.0% since 1991–1993.	
North Pacific right whale Eastern North Pacific	Endangered	Depleted & strategic	This stock is considered to represent only a small fraction of its pre-commercial whaling abundance and is arguably the most endangered stock of large whales in	Before commercial whaling on right whales, concentrations were found in the GOA, eastern Aleutian Islands, southcentral Bering Sea, Sea of Okhotsk,

			the world. A reliable estimate of trend in abundance is currently not available.	and Sea of Japan. During 1965–1999, following large illegal catches by the U.S.S.R., there were only 82 sightings of right whales in the entire eastern North Pacific, with the majority of these occurring in the Bering Sea and adjacent areas of the Aleutian Islands. Critical habitat near Kodiak Island in the GOA.
Fin whale Northeast Pacific	Endangered	Depleted & strategic	Abundance may be increasing but surveys only provide abundance information for portions of the stock in the Central-eastern and southeastern Bering and coastal waters of the Aleutian Islands and the Alaska Peninsula. Much of the North Pacific range has not been surveyed.	Found in the GOA, Bering Sea and coastal waters of the Aleutian Islands.
Beluga whale- Beaufort Sea, Eastern Chukchi Sea, Eastern Bering Sea, Bristol Bay stocks	None	None	Beaufort Sea – unknown, but possibly stable or increasing, Eastern Chukchi Sea - unknown, Eastern Bering Sea – unknown, Bristol Bay - population increased by 65% from 1993 through 2005.	The Beaufort Sea and Eastern Chukchi Sea stocks migrate between the Bering and Beaufort seas. Beaufort Sea beluga whales depart the Bering Sea in early spring, through the Chukchi Sea and into the Beaufort Sea where they remain in the summer and fall, returning to the Bering Sea in late fall. Eastern Chukchi Sea migrate out of the Bering Sea in late spring and early summer, into the Chukchi Sea and western Beaufort Sea where they remain in the summer, returning to the Bering Sea in the fall. The Eastern Bering Sea stock remains in the Bering Sea but moves south near Bristol Bay in winter and returns north to Norton Sound and the mouth of the Yukon River in summer. Beluga whales found in Bristol Bay remain in that area throughout the year, showing only small seasonal shifts in distribution.
Minke whale Alaska	None	None	There are no data on trends in Minke whale abundance in Alaska waters.	Common in the Bering and Chukchi Seas. Not common in the Aleutian Islands.
Sperm whale North Pacific	Endangered	Depleted & strategic	Abundance and population trends in Alaska waters are unknown.	Inhabit waters 600 m or more depth, south of 62°N lat. Widely distributed in North Pacific. During summer, males are found in the Gulf of Alaska, Bering Sea, and waters around the Aleutian Islands. Females may be found in the western Aleutian Is in summer months.
Baird's, Cuvier's, and Stejneger's beaked whale	None	None	Reliable data on population trends are unavailable.	Baird's beaked whale - Bering Sea north to St. Matthew Island, Pribilof Is, and western Aleutian Is., Cuvier's, beaked whale - Aleutian Is., Stejneger's beaked whale – Aleutian Is., Bering Sea, incl Pribilof Is.

Sources: Muto et al 2020; List of Fisheries for 2020 (April 16, 2019 85 FR 21079)

The Alaska Groundfish Harvest Specifications EIS provides information on the effects of the groundfish fisheries on marine mammals (NMFS 2007), and has been updated with Supplemental Information Reports (SIRs) (NMFS 2015). These documents are also incorporated by reference. Direct and indirect interactions between marine mammals and groundfish fishing vessels may occur due to overlap in the size and species of groundfish harvested in the fisheries that are also important marine mammal prey, and due to temporal and spatial overlap in marine mammal occurrence and commercial fishing activities. This discussion focuses on those marine mammals that may interact with or be affected by the BSAI groundfish fisheries (Table 6-2 and Table 6-3).

6.1.2 Effects on Marine Mammals

Incidental Take

Marine mammals can be taken in groundfish fisheries by entanglement in gear (e.g., trawl, longline, and pot) and by ship strikes. The effects of the status quo fisheries on incidental takes of marine mammals are detailed in the 2007 harvest specifications EIS (NMFS 2007) and Allen et al. (2014). The annual Stock Assessment Report lists the species of marine mammals taken in the BSAI groundfish fisheries using observer data (Allen et al. 2014). In addition, the List of Fisheries for 2022 (87 FR 23122, May 19, 2022), describes known incidental takes of marine mammals in the groundfish fisheries. The BSAI flatfish, pollock, and rockfish trawl fisheries are listed as category II, with occasional interactions with some marine mammals. The BSAI Pacific cod longline fishery is listed as Category III, with a remote likelihood of interaction with Steller sea lion and northern fur seal. Based on the annual stock assessment reports, the potential take of marine mammals in the BSAI groundfish fisheries is well below the PBRs or a very small portion of the overall human caused mortality for those species for which a PBR has not been determined (Allen and Angliss 2014). Therefore, the incidental takes under Alternative 1 have an insignificant effect on marine mammals in the BSAI.

Some PSC limits as a result of look up tables for Alternatives 2, 3, 4, and 5 may result in no change to the status quo. Some PSC limits as a result of look up tables for Alternatives 2, 3, 4, and 5 may result in constraining PSC limits under which industry may change fishing patterns to maximize species with the greatest economic value. This could result in reduced fishing effort, as the industry chooses not to pursue less valuable fisheries to conserve halibut PSC, or it could result in greater fishing effort at lower catch per unit effort, as vessels change fisheries patterns or seasonal changes in the timing of the fishing, to increase halibut avoidance.

In contrast, PSC limits as a result of look up tables for Alternative 3 could result in increased PSC limits. This could result in a response of increased fishing effort, as industry is less constrained by halibut PSC limits. Any change to fishing effort levels or temporal or spatial shifts in harvest effort resulting from adoption of any of the alternatives and its options would not be expected to impact levels of incidental take of marine mammals, unless such change resulted in the fishery being prosecuted in a way that significantly increased exposure of marine mammals to fishing gear. However, there is already considerable interannual variability in the patterns of fishing across the BSAI groundfish sectors, as environmental conditions and avoidance of PSC species have caused vessels to adjust their fishing patterns. Any spatial or temporal shift in fishing is unlikely to occur outside of the existing spatial or temporal footprint of the groundfish fishery as none of the proposed alternatives alter the number of fishery participants or propose changing the location or timing of the fishery.

The potential for incidental take of marine mammals may change from status quo and will be dependent on the options selected by the Council. However, the fisheries are unlikely to increase their take of marine mammals above the PBR, because they are currently well below that level in BSAI groundfish fisheries, and no proposed PSC limits under Alternative 2, 3, 4 or 5 are expected to result in significant increases in total fishing effort in the BSAI. TAC and other restrictive harvest measures for the Amendment 80 sector will not be changed as a result of this action, and no marine mammal protection measures will change as a result of this proposed action. Therefore, the incidental takes under Alternatives 2, 3, 4 and 5 are not expected to have a significant effect on marine mammals and are not expected to occur beyond the scope analyzed in previous NEPA or ESA documents.

Prey Availability Effects

Harvests of marine mammal prey species in the BSAI groundfish fisheries may limit foraging success through localized depletion, overall reduction in prey biomass, and dispersion of prey, making it more energetically costly for foraging marine mammals to obtain necessary prey. Overall reduction in prey biomass may be caused by removal of prey or disturbance of prey habitat. The timing and location of fisheries relative to foraging patterns of marine mammals and the abundance of prey species may be a more relevant management concern than total prey removals.

The interaction of the BSAI groundfish fisheries with Steller sea lions, which potentially compete for prey, is comprehensively addressed in the Final Environmental Impact Statement for Steller Sea Lion Protection Measures for Groundfish Fisheries in the Bering Sea and Aleutian Islands Management Area (2014 Steller Sea Lion Protection Measures FEIS; NMFS 2014b.). The BSAI groundfish fisheries may impact availability of key prey species of Steller sea lions, harbor seals, northern fur seals, ribbon seals, and fin, minke, humpback, beluga, and resident killer whales. Animals with more varied diets (e.g. humpback whales) are less likely to be impacted than those that eat primarily pollock and salmon, such as northern fur seals. Table 6-4 shows the BSAI marine mammal species and their prey species that may be impacted by BSAI groundfish fisheries.

Table 6-4 Prey species used by BSAI marine mammals that may be impacted by the BSAI groundfish fisheries.

Species	Prey
Fin whale	Zooplankton, squid, fish (herring, cod, capelin, and pollock), and cephalopods
Humpback whale	Zooplankton, schooling fish (pollock, herring, capelin, saffron, cod, sand lance, Arctic cod, and salmon)
Beluga whale	Wide variety of invertebrates and fish including salmon and pollock
Killer whale	Marine mammals (transients) and fish (residents) including herring, halibut, salmon, and cod.
Ribbon seal	Cod, pollock, capelin, eelpout, sculpin, flatfish, crustaceans, and cephalopods.
Harbor seal	Crustaceans, squid, fish (including salmon), and mollusks
Steller sea lion	Pollock, Atka mackerel, Pacific herring, Capelin, Pacific sand lance, Pacific cod, and salmon

Several marine mammals may be impacted indirectly by any effects that fishing gear may have on benthic habitat. Table 6-5 lists marine mammals that may depend on benthic prey and known depths of diving. Diving activity may be associated with foraging. The essential fish habitat (EFH) EIS provides a description of the effects of groundfish fishing on benthic habitat (NMFS 2005). In the BSAI, estimated reductions of epifaunal and infaunal prey due to fishing are less than 1 percent for all substrate types. For living structure, overall impacts ranged between 3 percent and 7 percent depending on the substrate. In some local areas where pollock aggregate, effects are greater.

Sperm whales are not likely to be affected by any potential impacts on benthic habitat from fishing because they generally occur in deeper waters than where the groundfish fishery is conducted (Table 6-5). Harbor seals and sea otters are also not likely to have any benthic habitat affected by the groundfish fishery because they occur primarily along the coast where fishing is not conducted. Cook Inlet beluga whales also are not likely to have benthic habitat supporting prey species affected by the groundfish fishery because they do not range outside of Cook Inlet and do not overlap spatially with the trawl fisheries although other beluga whale stocks in the BSAI may have some overlap.

Table 6-5 Benthic dependent BSAI marine mammals, foraging locations, and diving depths

Species	Depth of diving and location
Ribbon seal	Mostly dive < 150 m on shelf, deeper off shore. Primarily in shelf and slope areas.
Harbor seal	Up to 183 m. Generally coastal.
Sperm whale	Up to 1,000 m, but generally in waters > 600 m.
Northern sea otter	Rocky nearshore < 75 m
Gray whale	Benthic invertebrates

Sources: Allen and Angliss 2010; Burns et al. 1981; http://www.adfg.state.ak.us/pubs/notebook/marine/rib-seal.php; http://www.afsc.noaa.gov/nmml/species/species_ribbon.php; http://www.adfg.state.ak.us/pubs/notebook/marine/harseal.php; http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm

The Harvest Specifications EIS determined that competition for key prey species under the status quo fishery is not likely to constrain the foraging success of marine mammals or cause population declines (NMFS 2007). The 2014 Steller Sea Lion Protection Measures FEIS (NMFS 2014b) provided an updated review of BSAI groundfish fishery interactions with respect to prey availability. Based on a review of marine mammal diets, and an evaluation of the status quo harvests of potential prey species in the BSAI groundfish fishery, the effects of Alternative 1 on prey availability for marine mammals are not likely to cause population level effects.

Some PSC limits as a result of look up tables under Alternatives 2, 3 4, and 5 may result in no change to the status quo or may result in constraining PSC limits under which industry may change fishing patterns to maximize species with the greatest economic value. This could result in a response of reducing fishing effort, as the industry chooses not to pursue less valuable fisheries to conserve halibut PSC, or it could result in greater fishing effort at lower catch per unit effort, as vessels change fisheries patterns or seasonal changes in the timing of the fishing, to increase halibut avoidance.

Shifts in the location or timing of fishing may change the availability of prey species to marine mammals in particular areas. However, there is already considerable interannual variability in the patterns of fishing across the BSAI groundfish sectors, as environmental conditions and avoidance of PSC species have caused vessels to adjust their fishing patterns. Any spatial or temporal shift in fishing is unlikely to occur outside of the existing spatial or temporal footprint of the groundfish fishery as none of the proposed alternatives alter the number of fishery participants or propose changing the location or timing of the fishery. Therefore, it is unlikely that Alternatives 2, 3, 4, or 5 would introduce a shift in fishing patterns to such an extent that it would constrain the availability of prey to marine mammals in such a way as to cause a population-level decline or impede recovery for more vulnerable populations. Therefore, effects on prey availability to marine mammals under Alternatives 2, 3 4, and 5 are not expected to be significant and are not expected to occur beyond the scope analyzed in previous NEPA or ESA documents.

Disturbance Effects

The Harvest Specifications EIS contains a detailed description of the disturbance of marine mammals by the groundfish fisheries (NMFS 2007). The interaction of the BSAI groundfish fisheries with Steller sea lions, which potentially compete for prey, is comprehensively addressed in the Steller Sea Lion Protection Measures EIS (NMFS 2014b). The EISs concluded that the status quo fishery does not cause disturbance to marine mammals at a level that may cause population level effects. Fishery closures limit the potential interaction between fishing vessels and marine mammals (e.g., 3-nm no groundfish fishing areas around Steller sea lion rookeries and walrus protection areas). Because disturbances to marine mammals under the status quo fishery are not likely to cause population level effects, the impacts of Alternative 1 are not significant.

The effects of the proposed reductions to halibut PSC limits under Alternative 2, 3, 4, and 5 on disturbance of marine mammals would be similar to the effects on incidental takes. If a groundfish fishery reduces fishing effort in specific fisheries to conserve halibut PSC for a more valuable fishery, then less potential exists for disturbance of marine mammals. If a groundfish fishery increases the duration of fishing in areas, there may be more potential for disturbance if this increased fishing activity overlaps with areas used by marine mammals. None of the disturbance effects on other marine mammals under Alternative 2, 3, 4, or 5 are expected to result in population level effects on marine mammals. Disturbance effects are likely to be localized and limited to a small portion of any particular marine mammal population.

Therefore disturbance effects on marine mammals under Alternatives 2, 3 4, and 5 are not expected to be significant and are not expected to occur beyond the scope analyzed in previous NEPA or ESA documents.

Cumulative Effects on Marine Mammals

Based on the preceding analysis, the impacts of this proposed action and alternatives on marine mammals are either non-existent or *de minimus*; therefore, there is no need to conduct an additional cumulative impact analysis.

6.2 Seabirds

6.2.1 Status

Alaska's waters support extremely large concentrations of seabirds. Over 80 million seabirds are estimated to occur in Alaska annually, including 40 million to 50 million individuals from the numerous species that breed in Alaska (Table 6-6; USFWS 2009). An additional 40 million to 50 million individuals do not breed in Alaska but spend part of their life cycle there. These include short-tailed and sooty shearwaters and three albatross species: the black-footed albatross, the Laysan albatross, and the endangered short-tailed albatross (Table 6-6; USFWS 2009).

As noted in the PSEIS (NMFS 2004 and 2015), seabird life history includes low reproductive rates, low adult mortality rates, long life span, and delayed sexual maturity. These traits make seabird populations extremely sensitive to changes in adult survival and less sensitive to fluctuations in reproductive effort. The problem with attributing population changes to specific impacts is that, because seabirds are long-lived animals, it may take years or decades before relatively small changes in survival rates result in observable impacts on the breeding population.

Table 6-6 Seabird species in Alaska

Type	Common name	Status
Albatrosses	Black-footed	
	Short-tailed	Endangered
	Laysan	
Fulmars	Northern fulmar	
Shearwaters	Short-tailed	
	Sooty	
Storm petrels	Leach's	
	Fork-tailed	
	Pelagic	
	Red-faced	
	Double-crested	
Gulls	Glaucous-winged	
	Glaucous	
	Herring	
	Mew	
	Bonaparte's	
	Slaty-backed	
Murres	Common	
	Thick-billed	
Jaegers	Long-tailed	
	Parasitic	
	Pomarine	

Type	Common name	Status
Guillemots	Black	
	Pigeon	
Eiders	Common	
	King	
	Spectacled	Threatened
	Steller's	Threatened
Murrelets	Marbled	
	Kittlitz's	
	Ancient	
Kittiwakes	Black-legged	
	Red-legged	
Auklets	Cassin's	
	Parakeet	
	Least	
	Whiskered	
	Crested	
Terns	Arctic	
Puffins	Horned	
	Tufted	

More information on seabirds in Alaska's EEZ may be found in several NMFS, Council, and USFWS documents:

- The URL for the USFWS Migratory Bird Management program is at https://www.fws.gov/birds/management.php
- Section 3.7 of the PSEIS (NMFS 2004) provides background on seabirds in the action area and their interactions with the fisheries. This may be accessed at https://alaskafisheries.noaa.gov/sites/default/files/pseis0604-chpt_3_7.pdf.
- Section 6.3 of the PSEIS (NMFS 2015) provides background on seabirds in the action area and their interactions with the fisheries. This may be accessed at https://www.npfmc.org/wp-content/PDFdocuments/fmp/Final_SIR_2015.pdf.
- The annual Ecosystem Status Reports have a chapter on seabird bycatch: https://access.afsc.noaa.gov/reem/ecoweb/index.php.
- The Seabird Fishery Interaction Research webpage of the Alaska Fisheries Science Center: http://www.afsc.noaa.gov/REFM/REEM/Seabirds/Default.php.

- The NMFS Alaska Region's Seabird Bycatch webpage: https://www.fisheries.noaa.gov/alaska/bycatch/seabird-bycatch-alaska.
- The BSAI and GOA groundfish FMPs each contain an "Appendix I" dealing with marine mammal and seabird populations that interact with the fisheries. The FMPs may be accessed from the Council's home page at http://www.alaskafisheries.noaa.gov/npfmc/default.htm.
- Washington Sea Grant has several publications on seabird takes, and technologies and practices for reducing them: https://wsg.washington.edu/seabird-bycatch-prevention-in-fisheries/.
- The seabird component of the environment affected by the groundfish FMPs is described in detail in Section 3.7 of the PSEIS (NMFS 2004), and updated in the PSEIS Supplemental Information Report (NMFS 2015).
- Seabirds and fishery impacts are also described in Chapter 9 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007).
- USFWS. 2015. Biological Opinion for the Effects of the Fishery Management Plans for the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fisheries and the State of Alaska Parallel Groundfish Fisheries. Anchorage, AK: 52 pp. Document available at: https://alaskafisheries.noaa.gov/sites/default/files/analyses/usfws-biop-122315.pdf
- NMFS. 2015. Programmatic Biological Assessment on the Effects of the Fishery Management Plans for the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fisheries and the State of Alaska Parallel Groundfish Fisheries on the Endangered Short-tailed Albatross (*Phoebastria albatrus*) and the Threatened Alaska-breeding Population of the Steller's Eider (*Polysticta stelleri*). Document available at: https://alaskafisheries.noaa.gov/sites/default/files/analyses/seabirdba0815.pdf
- Seabird Bycatch and Mitigation Efforts in Alaska Fisheries Summary Report: 2007 through 2015 (Eich et al. 2016). Document available at: https://repository.library.noaa.gov/view/noaa/12695
- Seabird Bycatch Estimates for Alaska Groundfish Fisheries 2016 through 2017 (Eich et al. 2018). Document available at: https://doi.org/10.25923/vb9g-s503
- Seabird Bycatch Estimates for Alaska Groundfish Fisheries: 2019 (Krieger et al. 2020). Document available at: https://www.fisheries.noaa.gov/national/bycatch/seabirds
- Biological Opinion on the Proposed Modification of the EPA General Permit AKG524000 for Offshore Seafood Processors in Alaska and on the NMFS Groundfish Fishery for the Gulf of Alaska, Bering Sea, and Aleutians Islands Consultation 07CAAN00-2020-F-0349 (USFWS 2021). Document available at: https://ecos.fws.gov/tails/pub/document/18939343.

6.2.2 Effects on Seabirds

The PSEIS identifies how the BSAI groundfish fisheries activities may directly or indirectly affect seabird populations (NMFS 2004 and 2015). Direct effects may include incidental take (lethal) in fishing gear and vessel strikes. Indirect effects may include reductions in prey (forage fish) abundance and availability, disturbance to benthic habitat, discharge of processing waste and offal, contamination by oil spills, presence of nest predators on islands, and disposal of plastics, which may be ingested by seabirds.

The impacts of the Alaska groundfish fisheries on seabirds were analyzed in the Harvest Specifications EIS (NMFS 2007) which evaluated the impacts of the alternative harvest strategies on seabird takes, prey availability, and seabird ability to exploit benthic habitat. The focus of this analysis is similar, as any changes to the groundfish fisheries in the BSAI could change the potential for direct take (death) of seabirds. Potential changes in prey availability (seabird prey species caught in the fisheries) and disruption of bottom habitat via the intermittent contact with non-pelagic trawl gear under different levels of harvest are examples of indirect effects on seabirds and are discussed in NMFS (2007). However, prey availability changes could also be closely associated with changes in seabird take levels. Therefore, all impacts to seabirds are addressed by focusing on potential changes in seabird takes (direct effects).

Of particular concern is the impact on seabirds listed under the ESA. Three species of seabirds are currently listed as either threatened or endangered; the short-tailed albatross (endangered), Alaska-breeding population of Steller's eider (threatened), and Spectacled eider (threatened). The USFWS consulted with NOAA Fisheries Alaska Region under Section 7 of the ESA on the effects of the groundfish fisheries on these species. In its 2021 biological opinion, the USFWS determined the groundfish fisheries off Alaska are likely to adversely affect short-tailed albatross, spectacled eider, and the Alaska-breeding population of Steller's eider, but they are not likely to jeopardize their continued existence (USFWS 2021). It was also determined that the groundfish fisheries off Alaska are not likely to adversely affect designated critical habitat of the Alaska-breeding population of Steller's eider and Spectacled eider. This 2021 biological opinion included an incidental take limit of six short-tailed albatross every two years, 25 spectacled eider every 4 years, and 3 Steller's eider every 4 years, in the groundfish fisheries off Alaska.

Impact Analysis

<u>Incidental Take of Seabirds in Trawl Fisheries</u>

Seabirds can interact with trawl fishing vessels in several ways. Birds foraging at the water surface or in the water column are sometimes caught in the trawl net as it is brought back on board. These incidental takes of seabirds are recorded by fisheries observers as discussed below. In addition to getting caught in the fishing nets of trawl vessels, some species strike cables attached to the infrastructure of vessels or collide with the infrastructure itself. Large-winged birds such as albatrosses are most susceptible to mortalities from trawl-cable strikes. Third wire cables have been prohibited in some southern hemisphere fisheries since the early 1990s due to substantial albatross mortality from cable strikes. No short-tailed albatross or black-footed albatross have been observed taken with trawl gear in the BSAI, but mortalities to Laysan albatrosses have been observed.

The average annual estimate of incidental take of birds in trawl gear in the BSAI was 697 birds per year from 2010 through 2019 (Krieger et al. 2020). Northern fulmars comprised the majority of this take, with shearwaters and gulls also taken in almost every year. An estimate of 93 Laysan albatross is attributed to the BSAI trawl fisheries in 2018. Storm petrels, murres, auklets, and cormorants were also taken in small number in trawling operations in the BSAI from 2010 through 2019. The estimated takes of gulls, fulmars, and shearwaters in the entire BSAI groundfish fishery are very small percentages of these species' populations, with the exception of a large number of shearwaters incidentally taken in 2019 (1,487 birds; Krieger et al. 2020). The increase in shearwater bycatch was attributed to a shearwater mortality event that occurred throughout Alaska in 2019.

Seabird takes in the BSAI trawl fisheries are relatively low, based on standard observer sampling and NMFS estimation. However, standard species composition sampling of the catch does not account for additional mortality due to gear interactions such as net entanglements or cable strikes. Special data collections of seabird gear interactions have been conducted, and preliminary information indicates that mortalities can be greater than the birds accounted for in the standard species composition sampling (Melvin et al. 2011). The probability of ESA-listed seabird collisions with third wires or other trawl vessel gear in the EEZ off Alaska cannot be assessed; however, given the available observer data and the observed at-sea locations of short-tailed albatrosses relative to trawling effort, the likelihood of ESA-listed seabird collisions are remote, but the possibility of such collisions cannot be completely discounted.

<u>Impacts under the alternatives</u>

Estimated takes in the BSAI trawl groundfish fisheries average 697 birds per year, and in the hook-and-line fishery, 5,000 birds per year; in both, they primarily consist of northern fulmars (Krieger et al. 2020). These seabird take estimates are small in comparison to seabird population estimates, and under the status quo alternative, it is reasonable to conclude that the impacts would continue to be similar. However, observers are not able to monitor all seabird mortality associated with trawl vessels. Several research projects are currently underway to provide more information on these interactions.

Various spatial restrictions on the trawl fisheries in the BSAI have been established as part of the groundfish management program, and these closures decrease the potential for interactions with seabirds in these areas. These restrictions are not anticipated to change, so this protection would continue to be provided under any of the alternatives in this analysis.

For the remainder of this section, the terms trawl and non-trawl will be used to describe gear types and groups of vessels which may impact seabirds under the described alternatives. Trawl includes vessels using both pelagic and non-pelagic trawl gear. Non-trawl includes vessels using demersal hook-and-line, and pot gear. This section does not include discussion of seabird bycatch in fisheries using gillnets, seine, troll, or jig gear because NOAA Fisheries does not have independent observer data from these fisheries.

PSC limits as a result of look up tables for Alternatives 2, 3, 4, and 5 may result in no change to the status quo or may result in constraining PSC limits under which industry may change fishing patterns to maximize species with the greatest economic value. For trawl vessels, this could result in reduced fishing effort as the industry chooses not to pursue less valuable fisheries to conserve halibut PSC, or it could result in greater fishing effort at lower catch per unit effort, as vessels change fishing patterns or seasonal changes in the timing of the fishing, to increase halibut avoidance. If a groundfish fishery reduces fishing effort in specific fisheries to conserve halibut PSC for a more valuable fishery, then less potential exists for incidental take of seabirds. If a groundfish fishery increases the duration of fishing in areas with lower concentrations of halibut, there may be more potential for seabird incidental take, compared to the status quo, if this increased fishing activity overlaps temporally and geographically with areas used by seabirds. In contrast, PSC limits as a result of look up tables for Alternative 3, could result in increased PSC limits. This could result in a response of increased fishing effort, as industry is less constrained by halibut PSC limits.

Shifts in the location or timing of fishing may occur as a result of Alternative 2, 3, 4, or 5. However, there is already considerable interannual variability in the patterns of fishing across the BSAI groundfish sectors, as environmental conditions and avoidance of PSC species have caused vessels to adjust their fishing patterns. Any shift in fishing location or timing is unlikely to occur outside of the existing footprint of the groundfish fisheries. Seabird take estimates in the BSAI groundfish fisheries are already small, compared to seabird population estimates, and are unlikely to increase to a level that would have a population-level effect on seabird species. The exception to this is incidental take of ESA-listed seabirds, but the take of these species in BSAI groundfish fisheries are already closely monitored with respect to the incidental take statements in the 2021 Biological Opinion. Therefore, effects on seabird incidental takes under Alternatives 2, 3 4, and 5 are not expected to be significant and are not expected to occur beyond the scope analyzed in previous NEPA or ESA documents.

Prey Availability Disturbance of Benthic Habitat

As noted in Table 6-7, prey species of seabirds in the BSAI are not usually fish that are targeted in the groundfish fisheries. However, seabird species may be impacted indirectly by effects of fishing gear on the benthic habitat of seabird prey, such as clams, bottom fish, and crab. The EFH EIS provides a description of the effects of the groundfish fisheries on bottom habitat in the appendix (NMFS 2005), including the effects of the commercial fisheries on the BSAI slope and shelf.

It is not known how much seabird species use benthic habitat directly, although research funded by the North Pacific Research Board has been conducted on foraging behavior of seabirds in the Bering Sea in recent years. Thick-billed murres easily dive to 100 m, and have been documented diving to 200 m; common murres also dive to over 100 m. Since cephalopods and benthic fish compose some of their diet, murres could be foraging on or near the bottom (K. Kuletz, USFWS, personal communication, October 2008).

A description of the effects of prey abundance and availability on seabirds is found in the PSEIS (NMFS 2004 and 2015) and the Harvest Specifications EIS (NMFS 2007). Detailed conclusions or predictions cannot be made regarding the effects of forage fish bycatch on seabird populations or colonies. NMFS (2007) found that the potential impact of the entire groundfish fisheries on seabird prey availability was limited due to little or no overlap between the fisheries and foraging seabirds based on either prey size, dispersed foraging locations, or different prey. The majority of bird groups feed in vast areas of the oceans, are either plankton feeders or surface or mid-water fish feeders, and are not likely to have their prey availability impacted by the nonpelagic trawl fisheries. There is no directed commercial fishery for those species that compose the forage fish management group, and seabirds typically target juvenile stages rather than adults for commercial target species. Most of the forage fish bycatch is smelt, taken in the pollock fishery, which is not included in this action.

Table 6-7 Seabirds in the Bering Sea: foraging habitats and common prey species.

Species	Foraging habitats	Prey
Short-tailed albatross	Surface seize and scavenge	Squid, shrimp, fish, fish eggs
Black-footed albatross	Surface dip, scavenge	Fish eggs, fish, squid, crustaceans, fish waste
Laysan albatross	Surface dip	Fish, squid, fish eggs and waste
Spectacled eider	Diving	Mollusks and crustaceans
Steller's eider	Diving	Mollusks and crustaceans
Black-legged kittiwake	Dip, surface seize, plunge dive	Fish, marine invertebrates
Murrelet (Kittlitz's and marbled)	Surface dives	Fish, invertebrates, macroplankton
Shearwater spp.	Surface dives	Crustaceans, fish, squid
Northern fulmar	Surface fish feeder	Fish, squid, crustaceans
Murres spp.	Diving fish-feeders offshore	Fish, crustaceans, invertebrates
Cormorants spp.	Diving fish-feeders nearshore	Bottom fish, crab, shrimp
Gull spp.	Surface fish feeder	Fish, marine invertebrates, birds
Auklet spp.	Surface dives	Crustaceans, fish, jellyfish
Tern spp.	Plunge, dive	Fish, invertebrates, insects
Petrel spp.	Hover, surface dip	Zooplankton, crustaceans, fish
Jaeger spp.	Hover and pounce	Birds, eggs, fish
Puffin spp.	Surface dives	Fish, squid, other invertebrates

Source: USFWS 2006; Dragoo et al. 2010

Seabirds that feed on benthic habitat, including Steller's eiders, cormorants, and guillemots, may feed in areas that could be directly impacted by nonpelagic trawl gear (NMFS 2004). A 3-year otter trawling study in sandy bottom of the Grand Banks showed either no effect or increased abundance in mollusk species after trawling (Kenchington et al. 2001), but clam abundance in these studies was depressed for the first 3 years after trawling occurred. McConnaughey et al. (2000) studied trawling effects using the Bristol Bay area Crab and Halibut Protection Zone. They found more abundant infaunal bivalves (not including *Nuculana radiata*) in the highly fished area compared to the unfished area. In addition to abundance, clam size is of huge importance to these birds (Richman and Lovvorn 2003). However, handling time is very important to birds foraging in the benthos, and their caloric needs could change if a stable large clam population is converted to a very dense population of small first year clams. Additional impacts from nonpelagic trawling may occur if sand lance habitat is adversely impacted. This would affect a wider array of piscivorous seabirds that feed on sand lance, particularly during the breeding season, when this forage fish is also used for feeding chicks (Bertram and Kaiser 1993, Golet et al. 2000). Therefore, effects on seabirds under Alternatives 2, 3 4, and 5 are not expected to be significant and are not expected to occur beyond the scope analyzed in previous NEPA or ESA documents.

Cumulative Effects on Seabirds

Reasonably foreseeable future actions for seabirds include ecosystem-sensitive management; rationalization; traditional management tools; actions by other federal, state, and international agencies; and private actions, as described in Sections 8.4 and 9.3 of the Harvest Specifications EIS (NMFS 2007).

Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to seabirds by considering these species more in management decisions, and by improving the management of fisheries through the restructured Observer Program, catch accounting, seabird avoidance measures, and vessel monitoring systems. Changes in the status of species listed under the ESA, the addition of new listed species or critical habitat, and results of future ESA Section 7 consultations may require modifications to groundfish fishing practices to reduce the impacts of these fisheries on ESA-listed species and critical habitat. Additionally, since future TACs will be set with existing or enhanced protection measures, we expect that the effects of the fishery on the harvest of prey species and disturbance will not increase in future years.

Any action by other entities that may impact seabirds will, if determined to be necessary through ESA Section 7 consultation, be offset by additional protective measures for the federal fisheries to ensure ESA-listed seabirds are not likely to experience jeopardy or adverse modification of critical habitat. Direct mortality by subsistence harvest is likely to continue, but these harvests are tracked and considered in the assessment of seabirds.

6.3 Habitat

6.3.1 Status

The EBS is considered essential fish habitat (EFH) to several groundfish, Pacific salmon, and crab species. Because this action encompasses several NMFS management areas that overlap the IPHC regulatory areas, and EFH maps for species cross area lines, the species list with EFH may differ depending on exact fishing location. Text descriptions and maps of EFH for each species can be found in the fishery management plans along with habitat components associated with FMP species. The FMPs also define life history stages and seasonal information if available. For example, EBS Pacific cod EFH is described for their larval, juvenile, and adult stages in summer, and adult stages in the fall, winter, and spring as well. Adult Pacific cod preferred substrate is soft sediment, from mud and clay to sand. Maps and descriptions of EFH for groundfish species are available at:
https://www.fisheries.noaa.gov/alaska/habitat-conservation/essential-fish-habitat-efh-alaska

Fishing operations may change the abundance or availability of certain EFH features used by managed fish species to spawn, breed, feed, and grow to maturity. These changes may reduce or alter the abundance, distribution, or productivity of species. The effects of fishing on habitat depend on the intensity of fishing, the distribution of fishing with different gears across habitats, and the sensitivity and recovery rates of specific habitat features.

In 2005, NMFS and the Council completed the EIS for EFH Identification and Conservation in Alaska (NMFS 2005). The EFH EIS evaluates the long-term effects of fishing on benthic habitat features, as well as the likely consequences of those habitat changes for each managed stock, based on the best available scientific information. The EFH EIS also describes the importance of benthic habitat to different groundfish species and the past and present effects of different types of fishing gear on EFH. Based on the best available scientific information, the 2005 EIS analysis concludes that despite persistent disturbance to certain habitats, the effects on EFH are minimal because the analysis finds no indication that continued fishing activities at the current rate and intensity would alter the capacity of EFH to support healthy populations of managed species over the long term. The EIS concluded that no Council managed fishing activities have more than minimal and temporary adverse effects on EFH for any FMP species, which is the regulatory standard requiring action to minimize adverse effects under the Magnuson-Stevens Act (50 CFR § 600.815(a)(2)(ii)). Additionally, the analysis indicated that all fishing activities combined have minimal, but not necessarily temporary, effects on EFH.

The Council and NMFS have updated available habitat information, and their understanding of the impacts of fishing on habitat, in periodic 5-year reviews of the EFH components in the Council fishery management plans (NPFMC and NMFS 2012) and (Simpson et al. 2017). These 5-year reviews have not indicated findings different from those in the 2005 EFH EIS with respect to fishing effects on habitat, although new and more recent information led to the refinement of EFH for a subset of Council-managed species during the previous review (Simpson et al. 2017).

6.3.2 Effects on Habitat

The Council acknowledged that considerable scientific uncertainty remained regarding the consequences of habitat alteration for the sustained productivity of certain managed species. NMFS is in the process of updating the fishing effects analysis for the next 2022 5-year review of EFH components and a discussion paper was presented to the Science and Statistical Committee and made available to the public for the February 2022 Council meeting. The 5-year reviews consider differences in gear types and habitat associations for each FMP species, thus the focus for this ABM action is on groundfish and crab species, since they are the species associated with trawl gear (salmon habitat associations are not likely impacted by bottom trawl gear).

Alternatives 2, 3, 4 and 5 may result in no change to the status quo or may result in constraining PSC limits under which industry may change fishing patterns to maximize species with the greatest economic value. This could result in a response of reducing fishing effort, as the industry chooses not to pursue less valuable fisheries to conserve halibut PSC, or it could result in greater fishing effort at lower catch per unit effort, as vessels change fisheries patterns or seasonal changes in the timing of the fishing, to increase halibut avoidance. In contrast, Alternative 3 could result in increased PSC limits. This could result in a response of increased fishing effort, as industry is less constrained by halibut PSC limits.

Shifts in the location or timing of fishing may occur as a result of Alternatives 2, 3, 4 and 5. However, there is already considerable interannual variability in the patterns of fishing across the BSAI groundfish sectors, as environmental conditions and avoidance of PSC species have caused vessels to adjust their fishing patterns. Any shift in fishing is unlikely to occur outside of the existing footprint of the groundfish fishery in the BSAI, and therefore these impacts are not likely to be substantial. To the extent that Alternatives 2, 3, 4, and 5 change effort in the BSAI groundfish fishery, those alternatives would change impacts on habitat relative to the status quo. However, effects on habitat under Alternatives 2, 3 4 and 5 are not expected to be significant and are not expected to occur beyond the scope analyzed in previous NEPA or ESA documents.

6.4 Ecosystem

6.4.1 Status

Ecosystems consist of communities of organisms interacting with their physical environment. Within marine ecosystems, competition, predation, and environmental disturbance cause natural variation in recruitment, survivorship, and growth of fish stocks. Human activities, including commercial fishing, can also influence the structure and function of marine ecosystems. Fishing may change predator-prey relationships and community structure, introduce foreign species, affect trophic diversity, alter genetic diversity, alter habitat, and damage benthic habitats.

The BSAI groundfish fisheries potentially impact the BSAI ecosystem by relieving predation pressure on shared prey species (i.e., species that are prey for both target groundfish and other species), reducing prey availability for predators of the target groundfish, altering habitat, imposing PSC and bycatch mortality, or by ghost fishing caused by lost fishing gear. Ecosystem considerations for the groundfish fisheries are summarized annually in the SAFE report (available from: https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation). These considerations are summarized according to the ecosystem effects on the groundfish fisheries, as well as the potential fishery effects on the ecosystem.

6.4.2 Effects on Ecosystem

As explained in Chapter 3, Section 3.3.1 of the Harvest Specifications EIS (NMFS 2007), NMFS and the Council continue to develop their ecosystem management measures for groundfish fisheries. The Council has created a committee to inform the Council of ecosystem developments and to assist in formulating positions with respect to ecosystem-based management. The Council's Scientific and Statistical

Committee holds regular ecosystem scientific meetings, and the Council has recently reviewed and approved a Bering Sea Fishery Ecosystem Plan (available at: https://www.npfmc.org/bsfep/). In addition to these efforts to explore how to develop its ecosystem management efforts, the Council and NMFS continue to initiate efforts to take account of ecosystem impacts of fishing activity by designating EFH protection areas and habitat areas of particular concern. Ecosystem protection is supported by an extensive program of research into ecosystem components and the integrated functioning of ecosystems, carried out at the AFSC.

Under the status quo, the BSAI groundfish fleet is constrained in the location and timing of the fishery by directed fishing allowances, PSC and bycatch limits, and Steller sea lion protection measures. PSC limits as a result of look up tables for Alternatives 2, 3, 4 and 5 may result in no change to the status quo, or may result in constraining PSC limits under which industry may change fishing patterns to maximize species with the greatest economic value. This could result in a response of reducing fishing effort, as the industry chooses not to pursue less valuable fisheries to conserve halibut PSC, or it could result in greater fishing effort at lower catch per unit effort, as vessels change fishing patterns or seasonal changes in the timing of the fishing, to increase halibut avoidance. In contrast, PSC limits as a result of look up tables for Alternative 3 could result in increased PSC limits. This could result in a response of increased fishing effort, as industry is less constrained by halibut PSC limits.

Shifts in the location or timing of fishing may occur as a result of Alternatives 2, 3, 4 and 5. However, there is already considerable interannual variability in the patterns of fishing across the BSAI groundfish sectors, as environmental conditions and avoidance of PSC species have caused vessels to adjust their fishing patterns. To the extent that Alternative 2 through 5 change effort in the BSAI groundfish fisheries, those changes are not likely to have impacts on ecosystem components and considerations beyond those summarized in the annual Stock Assessment and Fishery Evaluation report for the BSAI groundfish fisheries (NPFMC 2020).

7 Magnuson-Stevens Act, Ecosystem Policy and Northern Pacific Halibut Act Considerations

7.1 Magnuson-Stevens Act National Standards

Below are the 10 National Standards for fishery conservation and management as contained in the MSA. The Magnuson-Stevens Act requires that every fishery management plan and every regulation implementing those plans be consistent with the national standards. For any Council action, one or more of those standards can be in tension with another. Therefore, in recommending a preferred alternative, the Council must consider how to balance the national standards. For each of the national standards, a reference is provided to areas in the analysis that are particularly relevant to the consideration of the national standard, although they may not be the only information that is relevant to the issue.

National Standard 1 — Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery.

The Preferred Alternative indexes Amendment 80 halibut PSC limits annually to fluctuating levels of halibut abundance in the BSAI as estimated by the EBS shelf trawl survey and IPHC setline survey. The BSAI groundfish stocks are generally considered stable and are not at a level that would correspond to being overfished and harvest is not at a level that would correspond to overfishing under the status determination criteria used for BSAI groundfish fisheries. The rationale behind indexing the Amendment 80 sector’s PSC limit to levels of abundance is four-fold. First, when estimated halibut abundance (and therefore PSC limits) decline to very low levels, encounter rates among the A80 sector, although not strictly correlated with halibut abundance, may also be low. Although uncertain, if that were the case, the fleet may still be able to catch their full TACs even under low PSC limits. Second, when BSAI halibut abundance declines, PSC in Amendment 80 fisheries can become a larger proportion of total halibut removals in the BSAI, particularly in Area 4CDE, and can reduce the proportion of halibut available for harvest in directed halibut. Under the abundance-based approach, proportions of removal would fluctuate in sync with abundance, rather than remain constant, resolving the disproportionality of removals. Third, a program that links the Amendment 80 sector PSC limit to halibut abundance may provide incentives for the fleet to minimize halibut mortality at all times. And fourth, in reducing halibut PSC mortality, this action promotes conservation of halibut and may provide additional opportunities for the directed halibut fishery.

This action is not expected to interfere with the achievement of optimum yield on a continuing basis. As noted in Section 5.3.2.3, OY in the BSAI FMP is defined as a range over all target species (between 1.4 million mt and 2.0 million mt of groundfish in the BSAI FMP). Given that in 2021 the A80 sector's apportionment of all BSAI groundfish species was about 12% of the 2 million mt limit, it would be possible to achieve OY (as defined in the FMP) without harvesting any of the A80 allocation, based on current groundfish stock conditions. This is because not harvesting that 12 percent of 2 million mt (240,000 mt) would still yield 1.76 million mt, well within the OY range.

Annual groundfish harvest can be highly variable across years for a variety of reasons (e.g. changing ocean conditions, variability in recruitment or prey field, fisheries interactions, etc.), which may result in years where achieving OY is difficult. For example, mostly due to decrease in Pollock TACs, BSAI groundfish harvest was below 1.4 million mt in 2009 and 2010 (1.34 million mt, and 1.35 million mt, respectively). National Standard 1, however, refers to achieving OY on a continuing basis, so the failure to harvest groundfish within the OY range for two out of several years of fishing is not, in and of itself, a failure to comply with National Standard 1.In years such as the most recent ones when overall groundfish harvest levels are low, further reductions to the A80 sector's PSC limit, and possible reductions in the sectors groundfish harvest, could further limit groundfish harvest in the BSAI.

Even though the harvest of groundfish is expected to achieve OY under any of the alternatives, the halibut PSC limits identified in the Preferred Alternative look up table may prevent Amendment 80 from fully harvesting TACs. This is particularly true under conditions of extremely low PSC limits, unless fishermen can utilize available tools to minimize halibut PSC beyond what is currently being achieved (see Section 5.3.2.3 on practicability of further bycatch reduction efforts).

The cooperative structure of Amendment 80 provides tools for vessels to control their PSC. The analysis suggests there is considerable variability among the vessels and companies within the sector with respect to PSC rates. This variability, along with other flexible tools offered by the cooperative structure, may provide an opportunity for Amendment 80 vessels to maximize the groundfish harvest to the extent practicable under potentially reduced halibut PSC limits.

Additionally, the "optimum yield" from the fishery reflects ecological, social, and economic considerations. Ecological impacts of the proposed action are discussed in the FEIS in conjunction with ecological conditions in the Bering Sea among other factors in estimating halibut abundance. As noted in Section 5.3.2.3.1, the BSAI FMP also states that OY may need to be respecified in the future if major changes occur in the estimate of MSY for the groundfish complex. Likewise, OY may need to be respecified if major changes occur in the ecological, social, or economic factors governing the relationship between OY and MSY. The MSA requires Councils to "review on a continuing basis, and revise as appropriate, the assessments and specifications made ... with respect to the optimum yield."

National Standard 2 —Conservation and management measures shall be based upon the best scientific information available.

Information in this analysis represents the most current, comprehensive information available to the Council at the time of its preparation. The data from the DEIS remain the best available information for this FEIS. This analysis also recognizes that some information (such as operational costs) is unavailable. The SSC has reviewed this analysis iteratively over the course of their scientific peer review process and recommended that it be forwarded to the Council for decision-making as it includes the relevant information necessary to inform the Council's management action. Further and in acccordance with the National Standard 2 guidelines, the analysis provides a listing of relative uncertainties in population modeling of the halibut stock (Section 4.2), the methodology used to estimate impacts to groundfish fisheries and the uncertainties in estimating future PSC usage (Section 5.3.2.1), and the uncertainty in estimating relative impacts to the directed halibut fishery (Section 5.4). In sum, this document represents the best scientific information available.

National Standard 3 — To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

Section 4.1 describes the range of the Pacific halibut stock, which extends coastwide, and the analysis considers effects throughout the range. Except for sablefish, which is not subject to this action, all groundfish species in the BSAI are assessed at the scale of the BSAI FMP (Section 3.1), which is the geographic scope of the proposed action (Chapter 1, Section 1.5). The BSAI groundfish stocks will continue to be managed as single stocks throughout their range under the proposed action.

National Standard 4 — Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be: (A) fair and equitable to all such fishermen, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Nothing in the Preferred Alternative considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and the states of the Pacific Northwest, participate in the sectors that are directly and indirectly affected by the proposed action, including both groundfish and halibut fisheries. A description of participants in each fishery and sector, including vessel and LLP license ownership address by community for the Amendment 80 sector, is presented in Appendix 1 to the extent feasible within confidentiality constraints. Similar information on community and state of ownership for Area 4 halibut vessels and halibut quota is provided in that same appendix.

While the Council does not have direct authority over setting halibut catch limits, the proposed action may provide additional opportunities for directed halibut fishing if the IPHC increases the commercial catch limit for the directed halibut fishery in response to this action. However, under the current set of alternatives considered, no direct allocation or assignment of fishing privileges to the directed halibut fishery participants is considered. Thus, considerations under National Standard 4 pertain to the Amendment 80 fleet as directly affected by the proposed action. The proposed action may, however, have incidental allocative effects that, in turn, may indirectly provide additional harvest opportunities to participants in the Area 4 directed halibut fishery relative to the no action alternative. Appendix 1 contains detailed information for both the Amendment 80 and directed halibut fisheries on community engagement, dependency, and federally recognized tribal status and encompasses all states in which those communities are located, as well as an analysis of potential incidental allocative effects of the proposed action. This information and analysis are summarized in Section 5.5.

To the extent that the PSC limits imposed upon commercial groundfish sectors constitute allocations, the change to those limits here is fair and equitable. Such changes in this action apply only to the Amendment 80 sectorbecause that sector is responsible for a majority of the PSC mortality. The Council is currently considering and may consider other actions in the future that address other halibut PSC limits. Finally, the abundance-based approach promotes the conservation of halibut because it results in fewer halibut PSC mortalities under all states of abundance except when the setline survey indicates abundance is high (where the PSC limit is the same as the current one).

National Standard 5 — Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.

Efficiency in the context of the proposed action refers to economic efficiency. The analysis presents information on the relative importance of economic efficiency versus other considerations and provides information on the economic risks associated with the proposed PSC measures in Section 5.6. Economic allocation is not the sole purpose of the proposed action.

National Standard 6 — Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The analysis for the proposed action is consistent with this standard. Inter-annual variability in catch is described in Section 3.3. The look-up tables, which are part of the proposed action, take into account annual variability in halibut abundance.

National Standard 7 — Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The analysis should demonstrate that the benefits of fishery regulations are real and substantial relative to the added research, administrative, and enforcement costs, as well as costs to the industry of compliance.

The proposed action is consistent with this standard. Chapter 5 describes the potential impacts from the Preferred Alternative, including costs of PSC limits as a management measure.

National Standard 8 — Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that are based upon the best scientific information available in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

The Preferred Alternative is designed to establish variable Amendment 80 sector halibut PSC limits based on abundance-based management strategy and to minimize halibut PSC in the Amendment 80 fleet to the extent practicable. Multiple coastal communities in the BSAI, as well as coastal communities elsewhere in Alaska and the Pacific Northwest, participate in the BSAI groundfish fisheries in one way or another, such as being homeport to participating vessels, the location of processing activities or product transfer, the location of fishery support businesses, the home of employees in the various sectors, or as the base of ownership or operations of various participating entities. An analysis of community engagement in and dependency on the Amendment 80 fishery is provided in Appendix 1.

Under different halibut abundance conditions (and different alternatives), Amendment 80 halibut PSC limits could be reduced or remain the same (Alternatives 2, 4, and 5), or could be reduced, remain the same, or be increased (Alternative 3). An analysis of the alternatives suggests that reductions in PSC limits could constrain the Amendment 80 fleet under some conditions and consequently may impact the communities that depend on those fisheries.

While the Council does not currently set catch limits in the directed halibut fishery, the benefit to Alaska communities that may result from incidental allocative effects of halibut PSC reductions is discussed in Chapter 5, Section 5.5.2. The Preferred Alternative has been developed to balance the need to minimize halibut PSC in the Amendment 80 fleet, consistent with MSA section 303(a)(11) and National Standard 9, and the requirements of the other national standards.

As described in Section 5.5, reduced halibut PSC mortality may indirectly benefit fishing communities that depend on commercial and noncommercial halibut harvest relative to the status quo, though the magnitude of that effect is likely to be attenuated by multiple biological factors and policy steps that separate bycatch mortality savings from directed harvest opportunities. Communities that are engaged in the Amendment 80 sector groundfish fisheries could be adversely impacted on a more direct basis. In selecting its Preferred Alternative, the Council considered providing for the sustained participation of fishing communities and minimizing adverse economic impacts on such communities, while balancing the requirements of the MSA.

National Standard 9 — Conservation and management measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The proposed action is specifically intended to minimize bycatch, specifically halibut PSC mortality, in the Amendment 80 sector to the extent practicable. The necessary context for considering the practicability of PSC reduction relative to status quo is provided in Sections 3.4.5 and 5.3.2.3. The Preferred Alternative's PSC limits is the same as the current one under high levels of halibut abundance, while at lower levels of halibut abundance some of the PSC limits may be more difficult to achieve by the Amendment 80 fleet, despite using all tools that are currently available.

The analysis is clear that the Amendment 80 sector will incur higher costs to avoid halibut in order to maximize harvest of Amendment 80 species TACs, particularly at the low and very low setline index states in the Preferred Alternative. The precise extent to which these costs would affect groundfish harvests and negatively impact the Amendment 80 sector is unknown. However, the analysis demonstrates that the lower halibut PSC limits expected to be established under current and likely future levels of halibut may result in reduced groundfish harvests and revenues for the Amendment 80 sector. The analysis is also clear that the impacts of this action on the different Amendment 80 companies are likely to vary given the diversity of quota holdings of different target stocks (See Section 3.3). In general, indexing the Amendment 80 PSC limit to the best available metrics for halibut biomass will more closely link PSC limits with mortality of halibut, and to some extent encounters, on the fishing grounds especially at extremely low levels of biomass (and resulting PSC limits).

Under the Preferred Alternative, at the very low setline threshold, the Amendment 80 sector PSC limit would be reduced by 35% from the current limit and set at 1,134 mt. The impacts of a 30% and 40% PSC limit reduction were analyzed under other alternatives in the DEIS and a 35% reduction is estimated to fall within these analyzed impacts. The Council was aware that the estimated revenue reduction from status quo revenue using the 2016 through 2019 data set is from 9% to 15% if the PSC limit is reduced by 30% PSC and is estimated to from 22% to 32% if the PSC limit is reduced by 40%. Where the losses or costs cross a threshold and become so high that achieving PSC limits renders the action impracticable is difficult to draw; however, the estimated range of revenue losses associated with the Preferred Alternative in the very low setline state does not cross that threshold. That is, the Council and NMFS are cognizant that the potential losses are substantial; yet, they do not believe those costs render the proposed action impracticable under the MSA. The practicability of measures that address bycatch can evolve over time, and the Council and NMFS are required to revisit them to bring bycatch levels to the minimum level that a sector is capable of achieving in light of a variety of factors set forth in the National Standard Guidelines.

If the indices continue in a low/low condition as is expected for the near future, the Amendment 80 PSC limit under the Preferred Alternative would be set at 1,309 mt (a 25% reduction from the current limit) and average Amendment 80 revenues are estimated to decline by 2% to 9% using data from 2016-2019. The other PSC limits in the Preferred Alternative establish the Amendment 80 PSC limits at either status quo or reduce the PSC limit by 10% or 20%. Table 5-6 (Section 5.3.2.1) shows that PSC limit reductions of 20% are estimated to reduce the average Amendment 80 sector revenues by less than 3%. Thus, while economics are a consideration in determining practicability, "practicable" is not the same as zero cost.

The Council, in recommending its Preferred Alternative, acknowledged the efforts and expenditures already undertaken by the Amendment 80 sector to improve halibut avoidance and reduce halibut PSC mortality, including some years when PSC mortality was below most of the limits in Alternatives 2 through 5. Improvements are anticipated to continue to be realized, especially if halibut limits are further reduced and the fleet forgoes some profitability to reduce halibut mortality further. Reductions in halibut mortality are expected to result from the sector increasing costs, reducing efficiency, or improving the use of existing tools. The level of mortality reduction cannot be quantified with any certainty at this time. If substantial reductions in halibut mortality beyond the limits in the Preferred Alternative are realized, they are likely to be derived from the development and implementation of new technologies.

The Council considered the National Standard 9 guidelines requiring consideration of additional factors when determining whether conservation and management measures minimize bycatch to the extent practicable. The factors most relevant to this action include changes in the economic, social, or cultural value of fishing activities and social effects. The SIA (Appendix 1) for this action presents the myriad ways halibut are valued and utilized in halibut-dependent communities.

The SIA is largely focused on community impacts associated with the implementation of proposed BSAI halibut PSC limit revisions using quantitative fishery information. This approach provides an analysis of anticipated socioeconomic impacts that may accompany implementation of the proposed action alternatives. The SIA also notes, however, that fishing regulatory actions can result in a wide range of sociocultural impacts in rural fishing communities. For many residents of these communities, commercial fishing is not seen as a stand-alone socioeconomic activity, but an integral part of self-identity.
This relationship is compounded for those residents who come from families with multi-generational experience in commercial and/or subsistence fishing, particularly for those Alaska Native residents for whom fishing is part of a larger, integrated traditional subsistence and economic sustenance practice rooted in thousands of years of history. The cultural importance of halibut (as a species) and halibut fishing (as a traditional activity) is documented in the anthropological literature for Alaska Native tribes and ethnic groups throughout Alaska. The SIA notes that the cultural significance of halibut for fishermen and their associated communities includes but exceeds the economic value of the fishery. Key themes include how halibut fishing provides a local source of employment in a day fishery that allows individuals to remain in their community, spend time with their family and build social networks, and engage in broader, culturally meaningful practices like subsistence. Halibut fishing is also considered a meaningful vocation and way of life.

The SIA notes that existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the BSAI has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products). This flexibility is widely perceived in the communities as a key element in an overall adaptive strategy practiced in subsistence and economic contexts in the region for generations. This ongoing fluctuation in non-fishing opportunities further reinforces the importance of flexibility in the pursuit of a range of commercial fishing opportunities to enable individuals and communities the ability to successfully combine fishing and non-fishing as well as commercial and subsistence pursuits considered critical to long-term socioeconomic and sociocultural survival if not stability.

To the extent that the Preferred Alternative would serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure. The Council considered the impacts of the Preferred Alternative on the Amendment 80 sector as a whole and on individual Amendment 80 companies, along with the economic, social, and cultural impacts on BSAI halibut-dependent communities as required by the National Standard 9 guidelines. Overall, the Council believes the Preferred Alternative is consistent with the requirements of to minimize bycatch to the extent practicable.

National Standard 10 — Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The proposed action appears to be consistent with this standard. Section 5.8.2 discusses issues associated with vessel safety in conjunction with this action. The Preferred Alternative would not change safety requirements for fishing vessels. No safety issues have been identified for Amendment 80.

7.2 NPFMC Ecosystem Policy

In February 2014, the Council adopted an Ecosystem Policy that shall be given effect through all of the Council's work, including long-term planning initiatives, fishery management actions, and science planning to support ecosystem-based fishery management. The Ecosystem Policy includes three parts: a value statement, the vision statement, and an implementation strategy.

Value Statement – The Gulf of Alaska, Bering Sea, and Aleutian Islands are some of the most biologically productive and unique marine ecosystems in the world, supporting globally significant populations of marine mammals, seabirds, fish, and shellfish. This region produces over half the nation's seafood and supports robust fishing communities, recreational fisheries, and a subsistence way of life. The Arctic ecosystem is a dynamic environment that is experiencing an unprecedented rate of loss of sea ice and other effects of climate change, resulting in elevated levels of risk and uncertainty. The North Pacific Fishery Management Council has an important stewardship responsibility for these resources, their productivity, and their sustainability for future generations.

Vision Statement – The Council envisions sustainable fisheries that provide benefits for harvesters, processors, recreational and subsistence users, and fishing communities, which (1) are maintained by healthy, productive, biodiverse, resilient marine ecosystems that support a range of services; (2) support robust populations of marine species at all trophic levels, including marine mammals and seabirds; and (3) are managed using a precautionary, transparent, and inclusive process that allows for analyses of tradeoffs, accounts for changing conditions, and mitigates threats.

Implementation Strategy- The Council intends that fishery management explicitly take into account environmental variability and uncertainty, changes and trends in climate and oceanographic conditions, fluctuations in productivity for managed species and associated ecosystem components, such as habitats and non-managed species, and relationships between marine species. Implementation will be responsive to changes in the ecosystem, and our understanding of those dynamics, incorporate the best available science, including local and traditional knowledge, and engage scientists, managers, and the public.

7.3 Section 303(a)(9) Fisheries Impact Statement

Section 303(a)(9) of the MSA requires that a fishery impact statement be prepared for each FMP amendment. A fishery impact statement is required to assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for (a) participants in the fisheries and fishing communities affected by the plan amendment; (b) participants in the fisheries conducted in adjacent areas under the authority of another Council; and (c) the safety of human life at sea, including whether and to what extent such measures may affect the safety of participants in the fishery.

The FEIS prepared for this plan amendment constitutes the fishery impact statement. The likely effects of the proposed action are analyzed and described throughout the FEIS. The effects on participants in the fisheries and fishing communities are analyzed in the following sections of the analysis (Sections 5 and Appendix 1). The effects of the proposed action on safety of human life at sea are evaluated in Section 5. Based on the information reported in this section, there is no need to update the Fishery Impact Statement included in the FMP.

The proposed action directly regulates the Amendment 80 sector in the EEZ off Alaska, which are under the jurisdiction of the North Pacific Fishery Management Council. The proposed action may also affect participants in halibut fisheries, conducted both under the North Pacific Council jurisdiction, and in adjacent areas under the jurisdiction of the Pacific Fishery Management Council.

7.4 Pacific Halibut Act

The fisheries for Pacific halibut are governed under the authority of the Northern Pacific Halibut Act of 1982 (Halibut Act, 16 U.S.C. §§ 773-773k). For the United States, the Halibut Act gives effect to the Convention between the United States and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea (IPHC Convention). The Halibut Act also provides authority to the Regional Fishery Management Councils, as described in § 773c:

> *(c) Regional Fishery Management Council involvement*
>
> *The Regional Fishery Management Council having authority for the geographic area concerned may develop regulations governing the United States portion of Convention waters, including limited access regulations, applicable to nationals or vessels of the United States, or both, which are in addition to, and not in conflict with regulations adopted by the [International Pacific Halibut Commission]. Such regulations shall only be implemented with the approval of the Secretary, shall not discriminate between residents of different States, and shall be consistent with the limited entry criteria set forth in section 1853(b)(6) of [the MSA]. If it becomes necessary to allocate or assign halibut fishing privileges among various United States fishermen, such allocation shall be fair and equitable to all such fishermen, based upon the rights and obligations in existing Federal law, reasonably calculated to promote conservation, and carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of the halibut fishing privileges.*

While the modification of PSC limits as proposed in this analysis does not directly regulate halibut fishermen, there is nonetheless an indirect effect on halibut fisheries as a result of this action, and therefore it is prudent for the Council to consider the directions in the Halibut Act about the regulations that may result from this action. Much of the direction listed in § 773c(c) is duplicative with the MSA's National Standard 4, requiring that regulations not discriminate between residents of different States, and directing that if halibut fishing privileges are allocated or assigned among fishermen, such allocation shall be fair and equitable. The relationship between this analysis and National Standard 4 is discussed above in Section 7.1. The Halibut Act also directs regulations to be consistent with the limited entry criteria set forth in the MSA. These are criteria that the Council and the Secretary must take into account when establishing a limited access system for an MSA fishery. The criteria are listed below. For each of the criteria, a reference is provided to areas in the analysis that are particularly relevant to the consideration of that criterion, although they may not be the only information that is relevant to the issue.

(A) present participation in the fishery

- Section 4.5, Section 4, and the SIA (Appendix 1)

(B) historical fishing practices in, and dependence on, the fishery

- Section 4.5.1, Section 4, and the SIA (Appendix 1)

(C) the economics of the fishery

- Section 4.5, Section 4, Section 5, and the SIA (Appendix 1)

(D) the capability of fishing vessels used in the fishery to engage in other fisheries

- Section 4.5 and the SIA (Appendix 1)

(E) the cultural and social framework relevant to the fishery and any affected fishing communities

- Section 4.5.4 and the attached SIA (Appendix 1)

(F) the fair and equitable distribution of access privileges in the fishery

- Section 4.5, and the attached SIA (Appendix 1), incorporating by reference the analyses that were considered when implementing BSAI Groundfish FMP Amendment 80 and the Halibut/Sablefish IFQ Program. The Amendment 80 LAPP most recently underwent a 5-year review that was published in October 2014; the IFQ Program underwent a 20-year review published in April 2017.

(G) any other relevant considered actions (to be considered at the time of final Council review).

8 Response to Comments on the DEIS

8.1 Comment Summary Report

In September 2021, the National Marine Fisheries Service (NMFS), in conjunction with the North Pacific Fishery Management Council (Council), issued the Draft EIS. In conformance with NEPA requirements, NMFS solicited public comment on the DEIS/RIR. NMFS accepted public comments during a 60-day public comment period from September 6, 2021, to October 25, 2021. NMFS received 542 letters of comment.

A Comment Summary Report (CSR) was first prepared to provide information to the decision-makers and the public prior to the publication of the Final EIS. It was presented to the Council at the December 2021 meeting when the Council took final action to recommend Amendment 123. The CSR served as an intermediate document that informed NMFS, the Council, and the public of the issues that would need to be addressed in the Final EIS. The CSR contained summaries of the public comments. The CSR did not contain the agency's responses to those comments due to the large number of comments received and the very short timeframe between the end of the public comment period and the December Council meeting. The CSR was also used as a tool by the EIS authors to revise the documents and respond to substantive comments.

8.1.1 The Role of Public Comment in the NEPA Process

NEPA is a procedural law intended to facilitate better government decisions concerning the management of our lands and oceans. The law has an environmental emphasis. Drafters of the law believed that by requiring a process designed to provide decision-makers with the best information available about a proposed action and its various alternatives, fewer adverse impacts would occur. NEPA does not dictate protection of the environment, but instead assumes that common sense and good judgment, based on a thorough analysis of impacts of various alternatives, will result in the development of the Nation's resources in a way that minimizes adverse impacts to our environment. This is achieved by requiring an open public process whereby the responsible government agency, combined with the stakeholders associated with a particular natural resource and development project, pull together and present relevant information for use in making decisions.

8.1.2 What is the Response to Public Comments?

NEPA requires government agencies to include in a Final EIS all the comments received on the Draft. The Final EIS must include responses to the comments, and must describe any changes made to the EIS as a result of those comments.

According to the 1978 Council on Environmental Quality (CEQ) regulations for implementing NEPA, under which this EIS was promulgated, (40 CFR §1503.4), an agency preparing an FEIS shall assess and consider substantive comments both individually and collectively and shall respond by one or more of the means listed below, stating its response in the final statement. Possible responses include the following:

1. Modify alternatives including the proposed action.

2. Develop and evaluate alternatives not previously given serious consideration by the agency.

3. Supplement, improve, or modify its analysis.

4. Make factual corrections.

5. Explain why the comments do not warrant further agency response, citing the sources, authorities, or reasons which support the agency's position and, if appropriate, indicate those circumstances which would trigger agency reappraisal or further response.

NMFS and Council staff have undertaken a careful and deliberate approach to ensure that all substantive public comments were reviewed, considered, and responded to.

8.1.3 Analysis of Public Comments

The analysis of public comment on the DEIS was a multi-stage process that included reviewing and summarizing the comments within each submission, preparing responses, and reviewing the responses. The process is explained in detail below.

The NMFS Alaska Region staff copied and logged all incoming letters of comment, maintaining a comprehensive list of all public comments. Staff assigned each letter or email a unique submission ID number. Each letter of comment was reviewed by the preparers. The preparers divided each submission by its individual comments, each of which was assigned a Comment ID number. The goal was to capture each sentence and paragraph in a comment letter containing substantive content pertinent to the DEIS/RIR. Substantive content included assertions, suggested alternatives or actions, data, background information or clarifications relating to the DEIS document or its preparation. The substantive comments were summarized and organized by topic. Within the 542 letters received by NMFS, the preparers identified 173 specific substantive comments in the CSR. Similar comments from the CSR were further combined for this analysis. The preparers then wrote the response for each summarized comment.

The comment summaries and responses are presented in this section by topic. During the process of identifying statements of concern, all comments were treated equally. The emphasis is on the content of the comments. They were not weighted by organizational affiliation or other status of commenters. No effort has been made to tabulate the number of people for or against a specific aspect of the DEIS. In the interests of producing a Final EIS that both meets the mission of NMFS and best serves all stakeholders, all comments have been considered equally on their merits.

8.1.4 Quality Control and Review

All comments and responses were reviewed by the preparers and NOAA General Counsel-Alaska Region. Additionally, various procedures were established in the analysis process to prevent a submission or comment from being inadvertently omitted. Communication and cross-checking between the submissions and the comments has ensured that all submissions received during the comment period are included in the report.

8.2 General Comments on the DEIS and Purpose and Need

These comments are on Council's the purpose and need and general EIS issues. Changes were made to the EIS as noted in section 8.8 to reflect these comments.

NMFS acknowledges the following general comments that support tying halibut PSC limits to halibut abundance indices:

- We support an ecosystem-based management approach to bycatch which is responsive to the status of the stocks. Ecosystem-based management is the cornerstone of sustainable fishing and provides a pathway to maintain ecosystems in a healthy, productive, and resilient condition. The current fixed halibut prohibited species catch limits are inconsistent with management of the directed halibut fisheries, groundfish fisheries, and crab, all of which are managed based on abundance.

- We support Abundance-Based Management of halibut PSC. The purpose and need statement captures the necessity of this action. When halibut abundance declines, PSC becomes a larger proportion of total halibut removals, and thereby further reduces the proportion and amount of halibut available for harvest in directed halibut fisheries.
- We support the concept of abundance-based management for halibut bycatch for the BSAI A80 trawl fleet. The current fixed halibut prohibited species catch (PSC, or bycatch) limits are inconsistent with management of the directed halibut fisheries. Bering Sea halibut bycatch mortality under a fixed limit began to exceed halibut harvests in the Bering Sea directed fisheries in 2012. Abundance-based PSC management can mitigate some of those adverse impacts by providing some resource conservation at low abundance levels rather than resting the full conservation responsibility on the directed fishery.
- As the directed halibut fishermen and halibut fishery have adapted to reductions in catch limits and allocation to support conservation efforts and management that is based on abundance, the PSC halibut bycatch limits continue to remain static and in turn become a larger proportion of the total halibut removals.
- Development and meaningful implementation of a comprehensive and data-based scientific approach to address halibut PSC by the A-80 trawl sector in the Bering Sea region is essential for supporting the integrity of the Bering Sea and broader Gulf of Alaska ecosystem that supports all sectors our fishing economies. As a commercial halibut fisherman, subsistence fisherman, and scientist, I adamantly support Abundance-Based Management (ABM) of halibut PSC and the implementation of an ecosystem-based fishery management approach for addressing and reducing bycatch which is responsive and beneficial to the status of all stocks. Anything short of a conservative, comprehensive and enforceable ABM fisheries management structure will inevitably result in an ecosystemcascade effect and a collapse of the viability of the Bering Sea ecosystem, which is already under-going rapid ecological change from the impacts of climate change.
- The current fixed halibut prohibited species (PSC) catch limits are inconsistent with the basic principles of scientific fisheries management and the management of the directed halibut fisheries, groundfish fisheries and crab, all of which are managed based on abundance. The directed halibut fishery carried out under abundance based management resulting in fluctuations in annual harvest limits is directly and negatively impacted by the current management structure ofthe A80 fishery. The directed halibut fishery with low PSC rates is marginalized with reduced fishing opportunity and the A80 fleet with exceptionally high PSC rates of sexually immature halibut is rewarded with an arbitrary static PSC cap, despite the high PSC rates and demonstrable marine eco-system impacts.
- We support the perspective that, until surveys indicate that total halibut abundance is not declining and is stable, then the returns for PSC mitigation are necessary and worthwhile. Robust abundance based management with strong enforcement supports equitable access and opportunity for BSAI coastal communities participating in directed commercial and subsistence halibut fisheries. Concurrently supporting ecosystem integrity allows the A80 fleet to fish in congruence with the abundance based management practice of the directed halibut fishery. This is the only scientifically defensible trajectory for achieving and maintaining a sustainable optimal yield. Balanced equability, healthy coastal communities with fisheries access and opportunity and a robust, intact, and functioning marine ecosystems provide the greatest long-term netbenefit to the nation and all fishing sectors. The removal of fish from the ecosystem through fishing is a contributing factor in ecosystem dynamics and health. Therefore, conservative fishery management andPSC limits afford a path forward to minimize unintended removal of non-targeted species, which contributes to maintaining ecosystem integrity. This supports the health and viability of all stocks.

- The level of wastage in the trawl fishery is simply unacceptable, particularly when compared against the landings in other halibut fisheries that have declined greatly as stocks have dropped. Add and renumber section:

Comment 8.2-1: The fact that PSC limits do not fluctuate with halibut abundance is indefensible. Accounting for PSC halibut is deeply flawed because the IPHC is primarily focused on Over 32-inch halibut. When considering the millions of pounds of PSC halibut bycatch, it is important to remember that the fish are mostly small and would recruit into the directed and sports fisheries as larger fish. In this case the numbers of fish are a more appropriate yard stick when contemplating the theoretical trickle up effect to directed users.

Response: Please see the response to Comments 8.4.1-15, 8.4.1-16, and 8.4.1-26 for a description of the EIS discussion of impacts on juvenile halibut and impacts to the halibut spawning biomass.

8.2.1 Comments that oppose tying halibut PSC limits to halibut abundance indices

Comment 8.2-2: Abundance-based management is not supported by sound science. The ABM concept rests on the assumption that the A80 sector's ability to avoid halibut correlates with abundance as measured in the surveys. Analyses performed by stakeholders and NMFS/Council staff have repeatedly shown that survey abundance (i.e., from the indices currently under consideration) does not reflect halibut encounter rates in theA80 fisheries. ABM alternatives based on the indices under consideration do not reflect the real-world conditions encountered by the sector and do not provide a mechanism to substantively account for the variability in the sector's ability to avoid halibut.

Response: Please see the response to Comment 8.4.1-1 on how the EIS addresses A80 sector halibut encounters.

8.2.2 Comments that the DEIS is adequate

Comment 8.2-3: We believe the analysis offers Alternatives and Options that allow for practicable reductions in A80 PSC usage.

Response: NMFS acknowledges the comment.

8.2.3 Comments that the DEIS is inadequate

Comment 8.2-4: We are concerned with all alternatives in the DEIS, as they do not consider the disproportionately high and adverse impacts on direct halibut users.

Response: Potential disproportionate high and adverse impacts to fishing communities with minority populations, low-income populations, and/or federally recognized tribal entities that were considered substantially engaged in or substantially dependent on the BSAI/Area 4 directed halibut fishery are described in SIA Section 7, the contents of which are summarized in the FEIS.

Comment 8.2-5: The ABM alternatives will not promote conservation of the halibut resource. The MSA and National Standard 4 require management measures with allocative effects to be "reasonably calculated to promote conservation." 16 U.S.C. § 1851(a)(4)(B). Protection of halibut spawning stock biomass, even at lower levels of abundance, will not be achieved by any of the alternatives under consideration.

Response: NMFS notes that the analysis indicates that none of the alternatives will affect overall Pacific halibut spawning stock biomass, which is measured coastwide from Washington to Alaska. Each action alternative, however, would reduce the Amendment 80 sector's halibut PSC mortality from its current level at various states of abundance (except those where the PSC limit is the same or higher). This is particularly true when halibut abundance is low or very low. The reduction of halibut bycatch mortality is a conservation measure; by definition, lower halibut PSC limits will result in lower halibut mortality. The conservation will include the reduction of halibut PSC from fish that are less than 26 inches (U26). Benefits from reduced mortality of these smaller halibut could occur both in the Bering Sea and elsewhere as these halibut migrate and recruit into the commercial halibut fisheries.

8.3 Comments on the Alternatives

The following comments are on the alternatives. The Council recommended a new Alternative 5 and selected it as the preferred alternative at the December 2021 Council meeting. Since this was after the DEIS was released for public review and comment, there are no public comments on that specific alternative. However, that alternative was within the range of the other alternatives, and public comments on those alternatives were informative.

8.3.1 Comments supporting specific alternatives/options

NMFS acknowledges the following comment supporting Alternative 3

Comment 8.3-1: We support Alternative 3, adding Option 1 (rolling average) and some form of Option 3 that would provide a standard incentivizing A80 to perform better than the cap in turn for more flexibility. Groundfish harvest above the 1396 mt threshold tends to be constrained by Groundfish Catch Limit rather than PSC Limits and Alternative 2 offers no reductions in PSC limits below that point, effectively requiring no modification from the A80 fleet. We also believe that ABM decisions should focus on A80 performance since 2016 which captures application of current bycatch avoidance techniques. A80 PSC mortality is near or below Alternative 3 limits as they would have been applied since 2016. In correlation, the analysis finds that Alternative 3 shows only a 3%-9% potential forreduction in revenue under Alternative 3 modified PSC caps.

NMFS acknowledges the following comments supporting Alternative 4

- We support Alternative 4 with a lookup table with PSC limits that range from the current. PSC limit to 45% below the current limit at lower levels of halibut abundance. After multiple reviews and discussions, it is clear that a lookup table approach to set the PSC limit based on the status of halibut indexed to both the IPHC setline and the EBS shelf trawl surveys provide the most comprehensive data and best available science to track the halibut stock in the Bering Sea. Of the listed alternatives, Alternative 4 option 3 is closest to being acceptable, but is only a necessary first step in the right direction. Only Alternative 4 restores a measure of equity among user groups for social, environmental and cultural connections of rural, Alaskans natives and small boat fishermen to the halibut resource by: 1) reducing bycatch commensurate with declines in halibut abundance since halibut PSC limits were set; and 2) adequately incorporating social equity and the cultural connections of rural Alaskans to the halibut resource.
- Only Alternative 4 meaningfully addresses the Environmental and Social Justice equitably in relation to BSAI regional residents, subsistence harvesters, and directed halibut fishers who are

disproportionately impacted by the current A-80 PSC allowances. In the context of balancing the National Standards, Environmental Justice, Advancing Equity and Climate Change Considerations, Alternative 4 provides the only reasonable pathforward to address A80 halibut PSC. It addresses the relevant National Standards and still provides ample opportunity for the A-80 fleet to fish in a manner that limits bycatch tothe benefit of all user groups, including the A80 fleet.

- Alternative 4 provides the most equitable option for conservation of the halibut resource with the lowest possible PSC limits (45% below current) at lowest levels of halibut abundance. This will preserve more adult and juvenile halibut to contribute to the coastwide biomass and will benefit thousands of families, businesses and communities that depend on the health of the halibut resource. Option 3 provides incentives for the A80 fleet to minimize bycatch and operate under the established limits. Incentive programs have worked well in the Bering Sea trawl sector and the fleet is experienced in the collaborative efforts which make the incentive programs function. Only option 3 can preserve meaningful PSC reductions and ensure continued participation in the directed fishery for hundreds of Alaska's small-boat fishing businesses.
- Halibut bycatch must be reduced immediately to protect the resource and those who depend on it. That decision must be supported by a scientifically sound document that adequately captures biological, economic, and social coastwide impacts. The current DEIS is arbitrary in its treatment of bycatch impacts and benefits. That said, there is more than adequate data in the DEIS appended Social Impact Assessment (SIA) demonstrating substantial impacts to Bering Sea halibut dependent communities over the past decade to support Alternative 4--the highest level of bycatch reduction under consideration.
- We note that the data in the appended SIA showing significant loss of resource access for Bering Sea halibut dependent communities over the past decade is sufficient to support the highest level of bycatch reduction under analysis in Alternative 4.
- We support Alternative 4. While this is the alternative most in alignment with addressing our concerns, many of us feel that this is still not enough to prevent further decline of these populations that we are already witnessing first hand.
- We support Alternative 4 because the DEIS fails to consider the benefits of bycatch reductions to halibut fishermen and communities in the Gulf of Alaska. The DEIS uses a coast wide assessment of the halibut stock while discussing the impact of A80 bycatch on halibut users in the Bering Sea. This approach makes the impact look insignificant when comparing the revenue of the A80 fleet tothe number for commercial halibut fishermen and economic benefit they could gain in Area 4. The same document looks at the coast wide percentage of BS/AI halibut PSC compared to total removals as a relatively small percentage even though it is a huge percentage of Area 4 removals. A stakeholder in the IFQ Halibut fishery can't help but view this document as biased against the interests of Halibut users in every way. The DEIS routinely suggests that the primary cause of low halibut abundance is slow growth rates and lack of recruitment. That is an assumption that cannot be proven. A lack of consequential PSC limits in the Bering Sea has contributed to the historically low halibut abundance we now observe. If a PSC limit is never reached, it really isn't working to change behavior in fisheries encountering bycatch.
- Of the alternatives provided, we prefer Alternative 4, but it lacks sufficient analysis of the very real potential of the extinction of 10,000-year-old cultures. We are concerned with all alternatives in the Draft Environmental Impact Statement (DEIS), as they do notconsider the disproportionately high and adverse impacts on direct halibut users – most of whom represent minority and underserved populations. We call your attention to National Standards 1, 4, 5, and 8, which collectively require conservation and management measures to prevent overfishing, rebuild depleted stocks, and ensure the long-term health and sustainability of fisheries. The advancement of any one of

the Alternatives 1-3 will produce adverse economic impacts on our communities, as well as impact the overall health and well-being of fishing communities, and likely preclude continued participation in the future.

- Adoption of an appropriate abundance-based management regime that requires meaningful reductions in PSC limits at low abundance like Alternative 4 would address these inequities and help ensure continued participation in the directed fishery. It would also strongly foster conservation by creating critical shared incentives to conserve the halibut resource. When all parties share the burdens of lowabundance, and the rewards of higher abundance, all parties have an interest in protecting and conserving the shared halibut resource. This encourages cooperative and mutually beneficial efforts across all user-groups to ensure the halibut stock is conserved and levels of abundance increase. These incentives are lost entirely, however, under the current non-constraining PSC limits. In that case, Amendment 80 feels no effects from low abundance—and has no incentive to reduce halibut mortality or take steps to conserve the halibut resource—because the impacts of lowabundance are felt entirely by others.

8.3.2 Comments opposing specific alternatives/options

Comment 8.3-2: We do not support option 2, which would minimize the ability to link halibut PSC to abundance on an annual basis.

Response: NMFS acknowledges the comment.

Comment 8.3-3: The existing PSC limit (Alternative 1) and Alternatives 2 and 3 fail to provide a sufficient buffer for directed fisheries at the lowest levels of abundance. The DEIS measures the impacts of the alternatives almost exclusively in terms of how A80 companies' bycatch of halibut over 26 inches in length affects Bering Sea halibut harvest opportunities and ex-vessel values and conversely, how bycatch reductions may reduce A80 companies' wholesale revenues. The DEIS discounts social justice, ignores cultural extinction, and fails to place into context the contribution to socioeconomic health of a dollar circulating in St Paul or Metlakatla vs Seattle and the A80 corporations.

Response: The alternatives represent a range of bycatch management measures for analysis that assist the decision-makers and the public in determining the best alternative to meet the purpose and need for the action. The EIS explains the purpose and need in Section 1.2. The alternatives meet the purpose and need by presenting different ways to link A80 halibut PSC to halibut abundance indices and their impacts. Based on the EIS analysis and the public comments received, the agency will be able to make an informed decision on which alternative best meets the purpose and need for the action.

As recognized in the Council's purpose and need statement, the no action alternative is problematic for directed halibut fishery participants during low abundance conditions. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under medium and low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. The EIS and the SIA describe potential adverse impacts to BSAI directed halibut fishery communities under the no action alternative and the potential benefit to those communities under the action alternatives. The EIS and the SIA also describe the potential adverse impacts to the Amendment 80 sector and associated fishing communities under the proposed action alternatives. Both the EIS and the SIA clearly note that existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the BSAI/Area 4 region has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products). Further, both the EIS and the SIA note that to the extent that the proposed action alternatives would serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure.

The EIS and the SIA have highlighted potential environmental justice concerns where the potential for disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, and/or Alaska Native/Native American tribes associated with the no-action or action alternatives have been identified. In SIA Section 6, community institutional summaries are presented identifying ANCSA regional and village corporations and federally recognized tribal entities as are tables including demographic indicators of minority and low-income populations for relevant communities. In SIA Section 7, summaries of potential environmental justice concerns are presented for relevant communities. In addition to issues associated with the directed halibut fishery in Alaska communities, of potential environmental justice concern would be loss of income opportunities for Amendment 80 processing crew. Although there are theoretically many more alternate employment and income opportunities for Amendment 80 catcher/processor crew in a large urban area than in smaller communities or rural settings, there may not be comparable employment and earning potential ashore as is available to crew members aboard these vessels, even in an otherwise robust job market, especially for crew members who have worked their way up from entry level positions."

SIA Section 7.2.6 notes that the cultural significance of halibut for fishermen and their associated communities includes but exceeds the economic value of the fishery. Key themes include how halibut fishing provides a local source of employment in a day fishery that allows individuals to remain in their community, spend time with their family and build social networks, and engage in broader, culturally meaningful practices like subsistence. Halibut fishing is also considered a meaningful vocation and way of life.

Comment 8.3-4: The current structure and management of the fishery and Alternative 1 (No Action) Alternative 2 and Alternative 3 are not compatible with Environmental Justice E.O. 12898 which defines Environmental Justice as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income." Environmental Justice must be considered if the proposed undertaking will have an adversely high and potentially adverse human health or environmental on a minority population and low-income population.

Response: The text quoted in this comment is not a part of EO 12898; however, the EIS and the SIA have highlighted potential environmental justice concerns where the potential for disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, and/or Alaska Native/Native American tribes associated with the no-action or action alternatives have been identified. In SIA Section 6, community institutional summaries are presented identifying ANCSA regional and village corporations and federally recognized tribal entities as are tables including demographic indicators of minority populations and low-income populations for relevant communities. In SIA Section 7, summaries of potential environmental justice concerns are presented for relevant communities.

Comment 8.3-5: The current structure and management of the fishery and Alternative 1 (No Action), Alternative 2 and Alternative 3 are not compatible with EO 13985 "Advancing Racial Equityand Support for Underserved Communities Through the Federal Government" Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our Government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes, executive departments and agencies (agencies) must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity.

Response: NMFS acknowledges the comment. As noted in SIA Section 3.6.1, EO 13985, signed January 20, 2021, is recent enough that guidance for its implementation and application was not yet available. However, as also noted in the same SIA section, EO 13985 contains a section that states that “In carrying out this order, agencies shall consult with members of communities that have been historically underrepresented in the Federal Government and underserved by, or subject to discrimination in, Federal policies and programs.” As noted in responses to other comments and in Section 1.3.1 of this EIS, NMFS engaged in tribal consultation for this undertaking which involved outreach to all Alaska communities identified for the purposes of this analysis as substantially engaged in or substantially dependent on the BSAI/Area 4 directed halibut fishery, except for Adak, which is not an ANCSA community and is not home to a separate federally recognized tribal entity.

Comment 8.3-6: The current structure and management of the fishery and Alternative 1 (No Action), Alternative 2 and Alternative 3 are not compatible with Executive Order 14008 that states that "climate considerations shall be an essential element of United States foreign policy and national security. The United States will work with other countries and partners, both bilaterally and multilaterally, to put the world on a sustainable climate pathway. The United States will also move quickly to build resilience, both at home and abroad, against the impacts of climate change that are already manifest and will continue to intensify according to current trajectories."

Response: NMFS acknowledges the comment. See response to Comment 8.4.3-1.

Comment 8.3-7: We need to protect the recruitment potential of the Pacific halibut stock across its range in low abundance. We encourage the Council to choose an Alternative that caps A80 to recent past performance or better, which neither Alternative 1 nor 2 accomplish.

Response: NMFS acknowledges the comment.

Comment 8.3-8: We urge the Council to consider performance standards that allow for variability in performance across years to provide incentives for maintaining halibut avoidance efforts regardless of conditions, as opposed to caps that might be overly constraining in some years and not constraining at all in others. In response, the Council added Option 3 which fails to achieve several objectives of the purpose and need statement and the National Standards. The performance standard under Option 3 would have no impact on the sector’s efforts to achieve bycatch reductions. If the sector projects that its halibut usage will be clearly below or above the annual limit, the limit will have no impact on the halibut avoidance.

Response: NMFS acknowledges the comment. Adding a performance standard was an available option for the Council to recommend, but given the structure of that performance standard it was not deemed to provide additional incentives over the cap structure as contained in the Preferred Alternative. Therefore, the Council did not select Option 3.

Comment 8.3-9: Alternatives 2, 3, and 4 are not practicable. The proposed and final rule for Amendment 111 concluded that “larger reductions [greater than 25% for the A80 sector] are not practicable and would reduce the net benefits to the Nation because the socioeconomic benefits from the potential increase in harvest opportunities would be less than the negative socioeconomic impacts from foregone BSAI groundfish harvests.” Projected forgone harvest and likely economic losses from the Alternatives 2-4 are clearly of the magnitude that were rejected by NOAA when analyzing Amendment 111. The sector does not have any new tools to help it further reduce halibut PSC. Without any new tools, the only way to further reduce halibut PSC would be to reduce harvest of groundfish. The most likely outcomes from this action are reduced groundfish harvest which will result in reduced food production, reduce wages for A80 crew members, and place individual A80 companies on the brink of failure without any substantive benefit to the halibut spawning stock biomass or the Area 4 directed halibut fishery.

Response: When it took final action on Amendment 111 in December 2015 to reduce the PSC limits for all fishing sectors in the BSAI, the Council considered the methods available to the fisheries and the practicability of reducing halibut bycatch and mortality at that time. The preamble to the proposed rule to implement Amendment 111 noted that the Council and NMFS believed that more stringent PSC limit reductions than those proposed were not practicable for the groundfish sectors at that time. However, at the same meeting, the Council noted that additional halibut bycatch reduction would be needed in the future and initiated analysis of means to link halibut PSC limits to halibut abundance, thereby indicating that additional efforts would be required beyond those established by Amendment 111 and utilized by the fisheries to reduce halibut bycatch and mortality. From 2015 (when the Council requested the Amendment 80 sector to proactively reduce halibut mortality ahead of Amendment 111's regulatory PSC limit reductions expected to be implemented in 2016) through 2020, the Amendment 80 sector reduced its halibut mortality to levels well below the PSC limit of 1,745 mt established under Amendment 111. Those reductions resulted in halibut mortality levels close to or below the PSC limit that would be implemented by this action based on halibut abundance estimates derived from current survey indices described below (see Section 3.4.1 of the Analysis).

NMFS is cognizant of the potential harvest losses under some circumstances. For example, under the Preferred Alternative, at the very low setline state, the Amendment 80 sector's PSC limit would be reduced by 35% from the current limit and set at 1,134 mt. The Council was aware that the estimated revenue reduction from status quo revenue using the 2016 through 2019 data set is from 9% to 15% if the PSC limit is reduced by 30% PSC and is estimated from 22% to 32% if the PSC limit is reduced by 40%. We disagree that such economic losses renders the Preferred Alternative impracticable. Further, the greater than 25% PSC limit reductions apply only when halibut abundance is in the low and very low setline states (specifically, they apply in three out of a possible eight combinations in the look up table). Otherwise, the reductions are between 0 and 20%. Finally, the practicability of measures that address bycatch can evolve over time, and the Council and NMFS are required to revisit them to bring bycatch levels to the minimum level that a sector is capable of achieving.

What is practicable is determined on a case-by-case basis and is not static. According to the Merriam-Webster Dictionary, practicable means "capable of being done or carried out." The available technology and the potential costs of carrying out bycatch minimization measures are relevant to the practicability determination. The practicability of the proposed PSC reduction relative to the status quo is discussed in Sections 3.4.5 and 5.3.2.3 of the Analysis. Efforts already undertaken by the sector have shown that halibut avoidance or reductions in mortality from the current PSC limit are possible with the tools that are currently available to the fleet. Additional improvements are anticipated to continue to be realized, especially if halibut limits are further reduced and the fleet forgoes some amount of profitability to reduce halibut mortality further. Reductions in halibut mortality that are realized are expected to result from the sector increasing costs or reducing efficiency. The amount of mortality reduction cannot be quantified with any certainty. If substantial reduction in halibut mortality is realized without forgoing harvest, it is likely to be derived from the development and implementation of new technologies. While foregoing the harvest of groundfish is not a purpose of this action, in conserving halibut and achieving a more equitable approach to setting PSC limits, the Council and NMFS recognize that that is a potential and unfortunate outcome.

8.3.3 Comments on additional alternatives for the agency to consider

NMFS acknowledges the following suggestions for additional alternatives, but notes that they fall outside the scope of the Purpose and Need for this action.

Comment 8.3-10: In spite of overwhelming evidence, and a great precedent in SE Alaska, we have not prohibited the completely unacceptable practice of ground-fish trawling in most of Alaska. It is a monumental failure of our fishery management systems from the NPFMC to the BOF. The issue is not how to manage the trawl fishery to reduce by-catch. The problem is groundfish trawling is an unacceptable method of harvesting fish. It is destroying halibut, salmon, shellfish populations, and benthic habitat wherever it is conducted. The challenge is how to prohibit groundfish trawling in the rest of Alaska waters as we have already done in SE Alaska.

Response: An alternative to ban trawling or permanently close the Amendment 80 sector is outside the scope of the action, because it does not meet the action's purpose and need. The proposed action in the EIS is to link halibut PSC in the A80 fleet to halibut abundance and provide incentives to minimize halibut bycatch in the Bering Sea at all times.

Comment 8.3-11: We recommend that the A80 trawl fleet be required to reduce all bycatch below current limits.

Response: An alternative that would reduce all bycatch and PSC limits below the current levels is outside the scope of the action because it does not meet the action's purpose and need. The proposed action in the EIS is to link halibut PSC in the A80 sector to halibut abundance and provide incentives to minimize halibut bycatch in the Bering Sea at all times.

Comment 8.3-12: We recommend that the A80 trawl fleet be required to reduce bycatch to a zero bycatch limit.

Response: An alternative to reduce all A80 trawl fisheries' bycatch to a zero limit is outside the scope of the action because it does not meet the action's purpose and need. The proposed action in the EIS is to link halibut PSC in the A80 sector to halibut abundance and provide incentives to minimize halibut bycatch in the Bering Sea at all times. Reducing bycatch to a zero limit would effectively close the A80 sector.

Comment 8.3-13: Establish enforcement of quotas for the A80 fleet so that the fishery is immediately closed when the quotas are met or exceeded. The Council should consider revising the bycatch limits to a lower number given declining stocks for numerous salt water species commonly caught by the A80 fleet as bycatch and the destructive practice of bottom trawling to ocean habitat on the sea floor including sponges, coral, etc.

Response: This comment suggests adding an alternative that would lower bycatch limits for all bycatch species. An alternative to reduce all A80 sector bycatch species limits is outside the scope of the action because it does not meet the action's purpose and need. The proposed action in the EIS is to link halibut PSC in the A80 sector to halibut abundance and provide incentives to minimize halibut bycatch in the Bering Sea at all times. Regulations at 50 CFR § 679.21 stipulate required management measures, including fishery closures, when PSC limits are reached or exceeded.

Comments 8.3-14 through 8.3-22 suggest adding requirements to one or more alternatives as means to reduce bycatch through increased use of current halibut avoidance strategies.

Comment 8.3-14: Objective studies by NMFS researchers in other U.S. West Coast groundfish fisheries have found excluders to be highly effective. When used in conjunction with existing levels of deck sorting, these studies suggest that complete deployment of excluders (which the DEIS acknowledges has not occurred) would reduce overall bycatch mortality by more than 85%. Indeed, if excluders are even half as effective as NMFS research shows, their full deployment would allow A80 to easily meet the maximum potential reduction in halibut PSC mortality that could be required under Alternative 4.

Response: Excluder use is discussed in section 5.3.2.3.9 of the EIS. The use of excluders in the A80 sector has resulted in halibut PSC reductions, but have not, to date, proven to be a panacea. Some firms use excluders almost all of time. Other firms do not, as they feel that deck sorting provides lower halibut mortality and more accurate accounting of that mortality. The simultaneous use of deck sorting and excluder use does not necessarily result in additive halibut savings. Each firm makes the decision based on their perception of how well the various tools work in their fishing operation, with some firms using one tool or the other on a specific tow and other firms using both tools.

The use of deck sorting in conjunction with excluder devices varies by firm. Some firms utilize both measures on almost all tows. Recall that the observer may choose not to deck sort if the weather conditions are poor or for other reasons. Other firms tend not to utilize excluders in their nets and deck sort on tows that provide the greatest benefit. Other firms fall in-between these strategies, based on their own experiences utilizing the bycatch reduction tools.

The EIS discusses ongoing research to improve the effectiveness of excluder devices. The halibut avoidance plan (HAP) encourages the use of excluders that are designed for the various fisheries in which they operate. The HAP indicates that during the fishing season, vessels routinely experimented with new designs of excluders and tuned existing designs with a variety of modifications. The EIS discusses ongoing research on excluders in the West Coast and notes that further evaluation of excluders over various fishing conditions would provide important information to determine their true efficacy in BSAI fisheries. Individual experimentation with operation and configuration is needed to get the greatest return from an excluder.

Comment 8.3-15: The DEIS states that information sharing among A80 vessels "is central to the effectiveness of halibut bycatch minimization," but acknowledgesthat this tool is not being fully used due to competition among firms within the A80 cooperative. Given that a small group of firms has profited enormously from creation of a sector predicated on cooperation in furtherance of PSC reductions, it is not unreasonable to require them to fully implement the measures available to limit halibut PSC.

Response: Section 5.3.2.3.6 of the EIS discusses how communication among the fleet improved with the implementation of A80 and halibut avoidance plans (HAP). Improved communication among members of the A80 fleet to reduce halibut catch is a central feature of the HAP. Improved communication occurs through the sharing of information between company offices and their captains, vessel captains actively fishing, and through data collected by NMFS that is provided to SeaState. All firms in the AKSC are required to join the agreement with SeaState, so that it can provide notices to the fleet if high bycatch rates are encountered. SeaState also compiles and reviews catch and bycatch data and provides information to help avoid areas and times of high bycatch rates. Captains are also required to communicate the most up-to-date and complete information on the grounds concerning halibut bycatch rates. The HAP defines the types of information that should be shared on the grounds including:

- prevailing bycatch rates and changes in those rates,

- catch rates of O26 halibut (particularly in the 4CDE IPHC regulatory area),
- effectiveness of deck sorting in the different target fisheries under various conditions and bycatch levels,
- effectiveness of halibut excluders in the different target fisheries under various conditions and bycatch levels, and
- any factor that may be relevant to U26 bycatch rates and O26 bycatch rates, including the effects of:
    - time of day
    - fishing depth
    - water temperature
    - areas of halibut concentrations
    - effects of any gear modifications.

Sharing of information is a valuable tool in halibut avoidance - captains and firms have greater incentives to share information on fishing locations that allow the vessel to harvest more target catch under a cooperative program relative to the open access or when certain species constrain catch.

The EIS discusses specific situations in which an A80 firm may be less willing to share information when it is beneficial to the firm, but it is not beneficial to reducing halibut mortality relative to CPUE for the sector as a whole. This behavior is not unique to the A80 sector. For example, it has been observed in other cooperative fisheries in Alaska as well as the West Coast cooperative fisheries when rockfish have been a constraining species.

Comment 8.3-16: Quota share trades for constraining bycatch species within the cooperative would reduce the impacts of PSC limits for the A80 sector. They would allow firms with low PSC use and/or portfolios with larger low-PSC species allocations to make that PSC available to other cooperative members (potentially at a profit). This would allow cooperative members requiring additional PSC quota to continue operations even under more stringent PSC limits, thus reducing potential constraints from lower PSC limits and economicimpacts on the A80 sector. However, the DEIS reports that “that intra-cooperative in-season transfers of quota for constraining species – i.e., halibut PSC or Pacific cod – occur very rarely, if ever.” This option to meet reduced limits thus remains fully available and entirely unused.

Response: The structure of the A80 program allows firms to either join a cooperative or fish in the limited access fishery on an annual basis. It has been well documented in the A80 program review that firms will, in general, benefit from the cooperative structure where they do not have to race to harvest a portion of the allocated directed fisheries before the directed fishery allocations or the halibut PSC limit has been fully taken. All active members of the A80 sector currently participate in a cooperative, and NMFS assumes they will continue to do so.

The cooperative structure allows Amendment 80 vessel operators to better manage PSC rates relative to operators who must race to harvest groundfish as quickly as possible before PSC causes a fishery closure or causes companies/vessels to deviate from their optimal harvest strategy. By reducing PSC through more efficient cooperative operations (e.g., gear modifications, “hot spot” avoidance, deck sorting, or the relative flexibility afforded in the timing of fishing), Amendment 80 vessel operators may also increase the harvest of valuable targeted groundfish species and improve revenues that would otherwise be forgone.

Within the cooperative structure firms are allocated specific amounts of halibut PSC. Firms are allowed to transfer halibut PSC within the cooperative. While this does create some efficiencies for halibut PSC usage within the sector, constraining halibut PSC limits create disincentives for firms to transfer halibut PSC. Firms within the sector are competitors in the world market for Amendment 80 species sales. Transfers are less likely to occur until a firm determines that its limit will not constrain its ability to meet sales contracts during a year. Given the variability of halibut PSC usage during the year firms may not be able to find willing sellers of halibut PSC and if they do it is more likely to be late in the fishing year. These disincentives to trade of halibut PSC when it is a potential constraint to a firm limits the effectiveness of PSC transferability as a way to to reduce potential constraints from lower PSC limits and economic impacts on the A80 sector.

Comment 8.3-17: We request that the Council consider use of an index which used the catch limit for the Area 4CDE, directed fishery but that was not incorporated. Since the indices relied upon to determine the Alternatives do not correlate with the A80 sector's bycatch and cannot reasonably be expected to result in a conservation benefit or provide meaningful additional harvest opportunities for the directed halibut fisheries or communities in Area 4, we believe that NOAA must extensively revise the DEIS to highlight the impracticability of the proposed ABM action.

Response: The Council considered that halibut encounters in the Amendment 80 fishery maynot always be positively correlated with these indices. Please see the response to Comment 8.4.1-1 on how the EIS addresses A80 sector halibut encounters. The Amendment 80 sector has expressed concern about this potentially weak positive correlation and the potential impacts that may have on their ability to avoid halibut and reduce halibut mortality. As noted in Section 3.4.4 of the EIS, there are many reasons why it would not be expected for A80 halibut PSC encounters to be consistently, positively correlated with halibut survey abundance indices, including different temporal and spatial coverage, selectivity, and targeting behavior. The primary objective of this action is to link halibut PSC limits to the abundance of halibut. Pacific halibut is a highly valued fish species that supports directed subsistence, recreational and commercial halibut fisheries coastwide.

The Council, in recommending its Preferred Alternative, acknowledged the efforts and expenditures already undertaken by the Amendment 80 sector to improve halibut avoidance and reduce halibut PSC mortality, including some years when PSC mortality was below most of the limits in Alternatives 2 through 5. Improvements are anticipated to continue to be realized, especially if halibut limits are further reduced and the fleet forgoes some profitability to reduce halibut mortality further. Reductions in halibut mortality are expected to result from the sector increasing costs, reducing efficiency, or improving the use of existing tools. The level of mortality reduction cannot be quantified with any certainty at this time. If substantial reductions in halibut mortality beyond the limits in the Preferred Alternative are realized, they are likely to be derived from the development and implementation of new technologies. While acknowledging these aspects, the Council and NMFS believe that the Preferred Alternative is consistent with the requirements of the MSA, including that the adopted conservation and management measures minimize bycatch to the extent practicable.

Comment 8.3-18: The analysis needs to be modified to include additional analysis of the current performance standard provision and to include additional options or alternatives that allow for the unpredictable variability in halibut encounters that are evident in the A80 fisheries as well as other means to accommodate the uncertainties of bycatch. Examples include: applying an annual limit that considers performance over a series of years, and looking at whether cooperative or vessel-level incentives would provide additional or different benefits.

Response: The Council considered an annual limit combined with a performance standard. Discussion is provided in section 2.3.3 of the EIS on the potential for unintended consequences when applying the annual limit based on individual years rather than potentially over a series of years. The Council did not include either an annual limit, modified performance standard, or additional cooperative or vessel-level incentives in its Preferred Alternative. The Council specifically acknowledged in selecting its Preferred Alternative that the range of PSC limits chosen in the look up table was intended to reflect interannual variability in the Amendment 80 sector's encounters of halibut and resulting PSC mortality in recent years (2016-2020).

8.4 Comments on Analysis Methods and Content

8.4.1 Economic, social, and cultural considerations

8.4.1.1 Comments on the Amendment 80 trawl fleet

Comment 8.4.1-1: The ABM concept rests on the assumption that the A80 sector's ability to avoid halibut correlates with abundance as measured in the surveys. There is limited empirical support that the trawl survey biomass index and the IPCH setline survey index reflect what halibut encounter rates will be in the groundfish trawl fishery. Rather, the realized halibut encounter rates, and the associated likelihood of PSC-dependent fisheries foregoing considerable groundfish catch, are highly variable year-to-year. Analyses performed by stakeholders and NMFS/Council staff have repeatedly shown that survey abundance (i.e., from the indices currently under consideration) does not reflect halibut encounter rates in the A80 fisheries. ABM alternatives based on the indices under consideration do not reflect the real-world conditions encountered by the sector and do not provide a mechanism to account for the variability in the sector's ability to avoid halibut. Yet the DEIS improperly proceeds as if none of this information exists. Instead, the DEIS glosses over this fundamental deficiency by looking at average impacts over several years, ignoring the extremely negative impacts on the sector created in 2019 and other individual years. This masks the negative impacts on the sector from years with warm conditions when target species are either more spread out or more of their distribution is within the northern Bering Sea where the sector is not allowed to operate. These conditions may increase encounter rates by requiring more hours of fishing or because halibut overlap spatially with target species, as well as related increase in costs and decrease in revenues. The DEIS provides no insight into the magnitude of these effects. These effects are likely to be compounded by challenges of restarting a vessel, if a company is forced to shutdown a vessel early in a year. In the end, some operations might not be able to withstand such losses.

Response: Section 3.4.4 of the EIS addresses the relationship between A80 halibut bycatch and halibut survey values and factors other than halibut population size that may lead to increased encounter rates. As noted, there are many reasons why it would not be expected for A80 halibut PSC encounter to be consistently, positively correlated with halibut survey abundance indices, including different temporal and spatial coverage, mixing with target species, variable groundfish aggregation behavior across years, selectivity, and targeting of different species by the various fleets/companies within the sector. The EIS also recognizes that it is possible that higher encounter rates are at least partially attributable to environmental conditions (e.g., comingling of species in an ocean environment with less temperature variation that could help separate species and guide time/area targeting). Section 5.3.2.3.2 discusses potential impacts of changing environmental conditions on the practicability of the A80 fleet to avoid bycatch, particularly as it relates to warmer Bering Sea water temperatures and spatial patterns of target fisheries.

The Council considered that halibut encounters in the Amendment 80 fishery may not be positively correlated with these indices. The Amendment 80 sector has expressed concern about this potentially weak positive correlation and the potential impacts that may have on their ability to avoid halibut and reduce halibut mortality. While these are valid concerns, the primary objective of this action is to link halibut PSC limits to the abundance of halibut and the Council believed use of the EBS shelf trawl survey and IPHC setline survey indices presented the best means to accomplish this objective, taking into account the information presented above.

In recommending the Preferred Alternative, the Council noted that at current halibut abundance index levels, a 1,309 metric ton PSC limit would be established for the Amendment 80 sector as specified in the Low/Low states of the setline and EBS shelf trawl survey indices. This is a 25% reduction from the 1,745 metric ton limit currently in place and establishes the PSC limit 37 mt under the sector's average halibut PSC use from 2016 through 2019.

The Council considers this PSC limit, as well as those established in the look-up table, to be appropriate. The Council considered the interannual variability in the Amendment 80 sector's encounters of halibut and resulting halibut PSC mortality. This variability makes it clear that it is not sufficient to consider only average halibut PSC use over a series of years when making decisions about establishing PSC limits. The Council and NMFS recognize that, especially in years of very low or low halibut abundance, the reduced PSC limit may constrain the A80 sector's ability to fully harvest its groundfish allocation. Relying on the best information available, the EIS describes those potential costs and losses.

Comment 8.4.1-2: The DEIS does not provide explanation for why the halibut stock assessments, the most typical tool for measuring abundance for management purposes, are ignored in this proposal for gauging the general condition of the halibut stock. Consequently, it is impossible for the reader to understand whether the goals and objectives of the proposed action can be achieved through ABM, or whether those goals could be attained through other alternatives not employing ABM, perhaps through performance standards. The choice to use ABM as a basis for further reductions in A80 PSC limits must be clearly explained and rationally supported.

Response: The EIS describes how the halibut stock assessments are used for gauging the general condition of the halibut stock under the alternatives considered for this action. As stated in the analysis in Section 5.2, impacts to the coastwide halibut spawning biomass under all of the alternatives are expected to be similar. However, the intent of indexing the A80 sector's PSC limit to levels of abundance is to minimize the impact from the Amendment 80 sector when, at lower levels of BSAI halibut abundance, PSC in Amendment 80 fisheries becomes a larger proportion of total halibut removals in the BSAI, particularly in Area 4CDE. Such PSC mortality can have greater impacts on the halibut resource and potentially reduce the proportion of halibut available for harvest in directed halibut fisheries. The impact of this increase in proportion is of concern, because the majority of halibut PSC mortality in the BSAI is in the A80s sector (52% of halibut PSC on average from 2015-2020). Therefore, the Council is considering the approach described here to link the Amendment 80 PSC limit to halibut abundance.

The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The alternatives are responsive to that statement in that each action alternative considers reduced levels of A80 halibut PSC for varying levels of halibut abundance as estimated by the survey indices used. A performance standard was available for the Council to select as a preferred alternative. See response to comments 8.3-8 and 8.3-18. Section 1.2.1 of the EIS notes that the Council recognizes efforts by the Amendment 80 sector to reduce total halibut PSC in the BSAI. Concerns persist, however, about continuing low levels of halibut biomass that result in reduced directed fishery catch limits in Area 4. Based on the IPHC management objectives as well as recent projections of halibut biomass and estimates of PSC mortality, directed fishery stakeholders remain concerned that halibut catch limits will not be sufficient to provide for a directed fishery in the BSAI at the PSC limits implemented under Amendment 111. Further, an abundance-based system provides more parity since, in years of lower halibut abundance, both the PSC mortality limits and direct harvest limits would decrease.

Comment 8.4.1-3: The DEIS methods skew the analysis and drastically overstate the potential economic impacts to the A80 sector from lower PSC limits. The DEIS:

1. uses economic models that incorrectly project future impacts based on outdated A80 haul data from periods when PSC limits were substantially higher and before A80 had taken any steps to mitigate the effects of its PSC mortality. This increases the likelihood that the model will find lower PSC limits constraining and inflates the projected revenue impacts. In fact, the DEIS acknowledges that using this data "has the largest impact of any other variations between the scenarios."
2. fails to account for behaviors that A80 will implement to mitigate any potential revenue impacts from lower PSC limits, many of which the DEIS directly identifies. The DEIS does not evaluate how revenues might actually be affected if A80 implemented the measures it identifies. Instead, the economic impact analysis assumes that A80 limits will act in an economically irrational way and allow the A80 sector to be shut down.
3. fails to account for real-world experience with reduced PSC limits and A80 behavior. Prior analyses projected that PSC reductions would be constraining and that A80 would suffer substantial revenue reductions. But none of that occurred and A80 revenues have increased since the PSC limits were reduced. Yet, the economic analysis ignores this history and repeats the same mistake, resulting in grossly overstated revenue impacts yetagain.
4. distorts A80 revenue impacts by presenting scenarios that could result in large PSC reductions without any analysis of their likelihood. For example, the possible 45% reduction under Alternative 4 would not have been imposed during the current low abundance period; the actual PSC reduction that would have been imposed under Alternative 4 would have been 20% in the vast majority ofyears and average 24% overall, consistent with the 25% blanket reduction the Council imposed on the cod trawl catcher vessel sector. In contrast, the constraints that would have been imposed under Alternatives 2 and 3 would have been trivial to non-existent, providing limited to no benefits to the directed fishery.
5. acknowledges that its projected revenue effects "represent a lower bound of possible revenue estimates" and "an upper bound of revenue impacts," because "changes in fleet behavior to adapt to changing PSC limits are likely." Yet, the DEIS leaves it to the Council, NMFS, and the public to guess what the actual impacts of the action might be. This is neither reasonable nor helpful to the Council and it cannot provide the Council and NMFS with the information needed to evaluate the action under the National Standards.

Response: As stated in the EIS, the revenue estimates reported in section 5.3.2 should be read for comparison across alternatives. These results are not stand-alone predictions of future A80 revenues under each PSC limit. Harvesters are expected to make strategic choices that are different from the randomized or stratified random selection of hauls used in this analysis. The analysts estimated annual revenue, PSC use, and groundfish catch under a variety of scenarios for each of nine PSC limits identified in the alternatives. These estimates are meant to illustrate the potential impact of different variables on revenue – for example, how changing the groundfish catch limit by 20 mt or changing sector-level PSC use might affect estimated sector-level revenue. The range of estimates under each dataset (years sampled) should be considered when comparing alternatives.

The different datasets (2010-14, 2010-19, 2016-19, 2013-14 and 2017-18) represent different levels of PSC use. The relevance of the estimates resulting from each of these datasets depends on numerous variables including, but not limited to, environmental conditions (i.e., aggregation of halibut and overlap with target species) and fleet behavior (i.e., prevalence of halibut avoidance strategies such as deck sorting). The appropriate way to understand the A80 revenue estimates is to compare the estimates of different alternatives under the same scenarios to inform the reader of the relative difference in direction and magnitude of the different alternatives.

Given reductions in PSC limits and operational changes such as increased deck sorting, it is most likely that future PSC use will be similar to what has been seen in the years since 2015 – i.e., estimates using 2016-19 or 2017-18 data are most likely to represent future PSC use. Revenue data for 2020 and beyond were not available when the EIS analyzed revenue impacts.

The Council's rationale affirms that the interannual variability of the Amendment 80 sector's encounters of halibut and resulting halibut PSC mortality makes it clear that it is not sufficient to consider only average halibut PSC use over a series of years when making decisions about establishing PSC limits. The Council considered 2016 through 2020 to be the appropriate time period to evaluate halibut PSC use because it reflects Amendment 80 sector operations under the Halibut Avoidance Plan and deck sorting along with other available tools to avoid halibut and reduce halibut mortality but excludes 2021. The exclusion of 2021 is in acknowledgement that Amendment 80 fishing operations, along with other fisheries in Alaska, were affected by COVID-19 mitigation measures and international supply chains and markets were negatively affected by disruptions in harvesting, processing and shipping.

The discussion in section 5.3.2.2.3 of the EIS discusses some of the assumptions and limitations of the resampling approach and resulting revenue estimates. The assumption that 100% PSC use is possible may contribute to less uncertainty in the revenue estimates for scenarios where the PSC limit is constraining. This assumption may also lead to relatively higher PSC use estimates than are likely, given that the fleet has not used 100% of the PSC limit in any of the past 10 years (Figure 5-1). This is not an uncommon challenge in PSC limit analyses and the Council has understood that in this case the analysis are presents an estimate of the maximum adverse impact. The analysts considered other options for defining the relationship between PSC use and the limit. It makes sense to consider all types of relationships between the PSC limit and use – random, constant, or scaled (i.e. higher use-rate at a lower limit). Ultimately, for purposes of presentation, the analysts concluded that the results are most easily understood by showing 100% use as a maximum-impact and allowing the reader to adjust downward based on what is qualitatively understood.

The lack of substantial difference in estimates by sampling methods indicates that results from both the stratified and random sampling method likely represent a lower bound of possible revenue estimates (and an upper bound of revenue impacts). This is not unexpected, as any changes in fleet behavior to adapt to changing PSC limits are likely to be more efficient than a proportional reduction in effort throughout a fishing year as estimated by the random sampling method, or a repeat of previous effort that is prematurely truncated as estimated by the stratified sampling method. A limitation of this approach is that estimates only reflect the environmental conditions and fishing behavior that occurred during the past 10 years. As a result, this approach does not estimate outcomes under a changed environmental or management regime, nor does it incorporate fishing adaptations or behavioral changes that may occur in the future.

Comment 8.4.1-4: The DEIS lacks clarity for estimating A80 revenue impacts. The analysis provides a lot of information but often does not provide guidance on the appropriateness of the information. For example, under the Average Estimated Revenue A80 Revenue Impact, the analysis provides 16 different data sets for the reader to look at to gauge the estimated impacts to A80 revenue. Different impacts would result depending on the data used. The analysis should be more explicit in describing the data sets and the levels of appropriateness for use in estimating impacts. The use of the 2010-2019 data set is the most logical, as the longer time span better accounts for changes in halibut PSC encounters over the years (change brought on by changes in conditions on the fishing grounds, climate change, etc.).

Response: The revenue estimates reported in section 5.3.2 should be read for comparison across alternatives. These results are not stand-alone predictions of future A80 revenues under each PSC limit. Harvesters are expected to make strategic choices that are different from the randomized or stratified random selection of hauls used in this analysis. The analysts estimated annual revenue, PSC use, and groundfish catch under a variety of scenarios for each of nine PSC limits identified in the alternatives. These estimates are meant to illustrate the potential impact of different variables on revenue – for example, how changing the groundfish catch limit by 20 mt or changing sector-level PSC use might affect estimated sector-level revenue. The range of estimates under each dataset (years sampled) should be considered when comparing alternatives. The different datasets (2010-14, 2010-19, 2016-19, 2013-14 and 2017-18) represent different levels of PSC use. The relevance of the estimates resulting from each of these datasets depends on numerous variables including, but not limited to, environmental conditions (i.e., aggregation of halibut and overlap with target species) and fleet behavior (i.e., prevalence of halibut avoidance strategies such as deck sorting). Please see the response to Comment 8.4.1-3 for additional information

Comment 8.4.1-5: Several commenters expressed concern regarding the DEIS analysis of the impacts of the analysis relative to E.O. 12866. Concerns expressed include: 1) The DEIS should have more explicitly noted that all of the action Alternatives proposed under this action would likely result in an effect on the economy that exceeds $100M. As such, this action will require review by the Office of Management and Budget as laid out under EO 12866; 2) The DEIS fails to analyze whether the alternatives are significant regulatory action requiring OMB review. The DEIS improperly skirts the requirements of Executive Order 12866, which requires "agencies to quantify costs and benefits if an action may have an effect on the economy of $100 million or more in a single year." Executive Order No. 12866, 58 Fed. Reg. 51,735 (Sept. 30, 1993). Executive Order 12866 defines explicitly the specific monetary threshold amount of $100 million for OMB review of proposed regulations; and 3) Conclusions found in the National Standards summary are not supported by the analysis and demonstrates that the DEIS fails to analyze whether Alternatives 2 – 3 are significant regulatory actions based on EO 12866.

Response: Section 5.3.2.2.2 in the DEIS discussed the revenue estimates in relation to the EO 12866 $100 million or more threshold of significance. That discussion has been revised as follows in the FEIS and moved to section 5.7 impacts of the preferred alternative.

Presidential Executive Order 12866 (58 FR 51735, October 4, 1993) requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant." The Executive Order lists multiple definitions of a "significant regulatory action," including "any regulatory action that is likely to result in a rule that may: 1) Have an annual effect on the economy of $100 million or more or 2) adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;"

Many of the scenarios in table 5-5 represent a difference in average estimated revenue of $100 million or more. However, these revenue estimates do not represent stand-alone predictions of future A80 revenues under each PSC limit. Rather, these estimates are provided to inform the potential differences in direction and magnitude of impacts when comparing across alternatives. The revenue estimates do not capture behavioral adjustments such as changes in targeting, fishing location, or other halibut avoidance strategies that might be employed, or estimate the costs associated with such avoidance strategies. Additionally, the revenue estimates reported in this section do not represent the full scope of the economic impacts associated with the proposed action alternatives. Given these caveats and the uncertainty surrounding these estimates it is possible that the preferred alternative has the potential to be considered a significant regulatory action as defined in Executive Order 12866.

Comment 8.4.1-6: The A80 sector has reduced halibut bycatch as much as it can. This action provides no new tools for the sector to help achieve the proposed PSC reductions described in the alternatives. If adopted, Alternatives 2-4 will result in widespread and significant negative economic and social impacts to the A80 sector and overall economy at large.

Response: Efforts already undertaken by the Amendment 80 sector have shown that halibut avoidance or reductions in mortality are possible with the tools that are currently available to the fleet. Additional improvements are anticipated to continue to be realized, especially if halibut limits are further reduced and the fleet forgoes some amount of profitability to reduce halibut mortality further. Reductions in halibut mortality that are realized are expected to result from the sector increasing costs or reducing efficiency. The amount of mortality reduction cannot be quantified with any certainty. If substantial reduction in halibut mortality is realized, it is likely to be derived from the development and implementation of new technologies. The Council considered the potential negative economic and social impacts to the Amendment 80 sector and concluded that the Preferred Alternative strikes a balance between potential costs to that sector and conservation of the halibut resource.

Comment 8.4.1-7: The DEIS omits what it describes as "generally understood but poorly quantified economic multipliers" and asserts that the "broad, downstream impacts of commercial fishing can be understood" without considering these metrics. A discussion of multiplier effects is critical to understanding the relative socio-economiccontributions of the statewide halibut fishery and the A80 companies. The discussion would also help to counterbalance the bias created by analyzing the impacts of the alternatives based on A80 companies' gross wholesale revenues and the diminishing ex-vessel values generated by Alaska fishermen in the Bering Sea – diminishing values caused in large part by allowing the A80 companies to externalize the costs of bycatch.

Response: NMFS acknowledges this comment. See response to comment 8.4.1-17 for additional information.

Comment 8.4.1-8: The Council should immediately expand the halibut stock assessment analysis focused on halibut sex ratios to include those of the halibut caught by the A80 fleet.

Response: The Pacific halibut stock is solely assessed by the IPHC. The Council is provided a presentation annually by IPHC scientists on the stock status of Pacific halibut based upon results of the annual assessment but does not review or comment on the assessment. Determination of sex in the directed commercial Pacific halibut fisheries has been occurring since 2017 using genetic methods. It is possible that these methods could be used to determine sex of halibut caught in bycatch fisheries, although this would be a significant undertaking by all agencies and fisheries involved.

Comment 8.4.1-9: Regarding population effects, the DEIS needs to more fully consider the value of conserving juvenile fish and allowing them to reach maturity. Reductions in juvenile halibut mortality seem essential to the health and potential for recovery of the stock from the current low level of exploitable biomass. There has long been a concern with bycatch of juvenile fish and the "problem of foregoing the potential growth of these fish." It is impossible to substantiate a number of the findings, including those detailed under National Standard 1 findings, in the absence of more detailed analysis of the effects of juvenile fish bycatch on an optimum halibut population size.

Response: The Preferred Alternative indexes Amendment 80 halibut PSC limits annually to fluctuating levels of halibut abundance in the BSAI as estimated by the EBS shelf trawl survey and IPHC setline survey reduction efforts. The reasons for indexing the Amendment 80 sector's PSC limit to levels of abundance include: 1) when estimated halibut abundance (and therefore PSC limits) decline to very low levels, encounter rates among the A80 sector may also be low. If that is the case, then the fleet may still be able to catch their full TACs and thus achieve their proportion of OY even under low PSC limits; 2) when BSAI halibut abundance declines, PSC in Amendment 80 fisheries can become a larger proportion of total halibut removals in the BSAI, particularly in Area 4CDE, and can reduce the proportion of halibut available for harvest in directed halibut; 3) a program that links the Amendment 80 sector PSC limit to halibut abundance may provide incentives for the fleet to minimize halibut mortality at all times; and 4) this action is reasonably calcuated to promote conservation of the halibut stock and may provide additional opportunities for the directed halibut fishery. The OY referenced under the National Standard 1 is for the BSAI Groundfish fisheries.

Reductions in juvenile halibut mortality may occur as a result of the PSC limits imposed by the Preferred Alternative, particularly at low levels of abundance. Pacific halibut directed fishery mortality limits are managed using an SPR-based harvest policy, which accounts for the spawning potential of all halibut throughout their lifetime, accounting for natural and fishing mortality. Therefore, total mortality on Pacific halibut is determined to maintain a sustainable spawning potential. However, different allocations of mortality between fisheries may result in differences in yield to maintain that sustainable spawning potential. See response to comment 8.4.1-15.

Comment 8.4.1-10: The agency should also consider, and the DEIS should discuss in more detail, the considerable uncertainty about the true numbers of halibut killed by the A80 companies. The Office of Law Enforcement has noted "increased reports of harassment, intimidation, hostile work environment and other efforts to bias observer samples." Complaints include "intimidating or coercive attempts to influence sample collection with intent to lower PSC estimates" or remove halibut from observer samples. A80 companies have one of the highest rates of enforcement concerns.

Response: The quoted text is from the Enforcement Considerations Section of the *BSAI Halibut Abundance-based Management (ABM) of PSC Limits Initial Review Draft (Sep 2019).* That section indicated a *potential* increase in reports by the North Pacific Observer Program observers to OLE, should Council move forward with Halibut Abundance-based Management. Trends referenced were from 2019 documents, summarizing 2018 data. More up-to-date information on compliance trends can be found in the Observer Program 2020 Annual Report and the Observer Program 2021 Annual Report.

The *BSAI Halibut Abundance-based Management (ABM) of PSC Limits Initial Review Draft* section outlined requirements designed to mitigate potential actions by industry to bias observer data (and therefore mitigate uncertainty in halibut mortality) including "video and electronic bin monitoring, a prohibition on mixing hauls, a requirement to weigh all catch on an approved flowscale unless halibut decksorting as described at § 679.120, and an increase to 200 percent observer coverage." Additionally, in late 2019, the Halibut Deck Sorting program became regulated, increasing visibility and accounting of halibut PSC mortality. OLE has not concluded that reports of harassment, intimidation, hostile work environment and other efforts to bias observer samples necessarily impact halibut mortality estimates in the amendment 80 fleet. NMFS asserts that a *potential* future increase in industry efforts to bias observers' PSC samples would not necessarily cause increased uncertainty in halibut mortality in the Amendment 80 fleet. NMFS does not currently find "considerable uncertainty" in estimating halibut mortality in Amendment 80 fisheries.

Comment 8.4.1-11: There is some uncertainty about the "effective mortality rate" or ratio of halibut killed tothe number of halibut "encountered" by the trawl. The number of halibut "encountered" has increased in recent years, but the reported ratio of fish killed to caught has declined significantly largely due to the recent and increased use of deck sorting. The reduced effective mortality rates rely on recent efforts by observers to provide viability estimates and observer conclusions that roughly half the halibut are in "excellent" condition prior to release backinto the sea. Mortality sampling is random and often at the discretion of the observer. The DEIS needs to disclose that halibut mortalities are estimates and assess factors that may reduce the precision and accuracy of those estimates such as number of samples versus total catch or the number of complaints related to viability sampling. A fuller discussion of the effective mortality rate is essential to understanding the impacts of the alternatives – in particular which alternative limits will be most effective at constraining halibut bycatch at lower abundance levels. Halibut encounters have exceeded the 1,745 limit each of the past five years, including 3,067 mt in 2019 – the highest number of encounters over the past decade. The new effective mortality rates have reached nearly 50% each of the last three years, meaning rates are now a driving factor for effective enforcement of bycatch limits. The DEIS notes year-to-year variability in deck sorting, which raises the concern that using a previous year's mortality rate – or extrapolating observer samples too broadly - may result in the A80 companies exceeding the limit in reality, but not on paper. Available data suggests uptake in halibut encounters may be fleet choices or may be attributable to environmental conditions (species co-mingling).

Response: The total Pacific halibut mortality assessed to the A80 sector in mt defines the relationship between the PSC limit and the sector's operation, irrespective of halibut encounter and mortality rates. Section 3.2.2 of the EIS describes how the estimated catch of Pacific halibut is translated to a mortality estimate that is debited from a fishery or sector's PSC limit. This includes a subsection describing recent modifications to the discard mortality rate (DMR) estimation methodology and the resulting DMRs that have been applied to the A80 sector (BSAI non-pelagic trawl CPs, in this context) and other fisheries. Section 3.2.2 also includes a a subsection describing the methodology for estimating discard mortality when deck sorting is occurring. The EIS discusses A80 halibut encounters in section 3.4.4, stating that based on the data available, one might conclude that halibut catch rates are somewhat stochastic but may have increased in recent years as the A80 fleet has found ways to mitigate the negative consequences of halibut encounter, thus allowing the fleet to prioritize finding the right mix of groundfish slightly ahead of minimizing the number of halibut in a haul. That said, the analysts do not solely attribute the recent upward trend in halibut encounter to fleet choices; it is possible that higher encounter rates are at least partially attributable to environmental conditions (e.g., comingling of species in an ocean environment with less temperature variation that could help separate species and guide time/area targeting).

The Council considered the interannual variability in the Amendment 80 sector's encounters of halibut and resulting halibut PSC mortality when it selected the Preferred Alternative. This variability makes it clear that it is not sufficient to consider only average halibut PSC use over a series of years when making decisions about establishing PSC limits. From 2016 through 2020, halibut encounters ranged between 1,965 mt and 3,067 mt and PSC mortality ranged from 1,097 mt and 1,461 mt. The Council considered 2016 through 2020 to be the appropriate time period to evaluate halibut PSC use because it reflects Amendment 80 sector operations under the Halibut Avoidance Plan and deck sorting along with other available tools to avoid halibut and reduce halibut mortality but excludes 2021. The exclusion of 2021 is in acknowledgement that Amendment 80 fishing operations, along with other fisheries in Alaska, were affected by COVID-19 mitigation measures and international supply chains and markets were negatively affected by disruptions in harvesting, processing and shipping.

Comment 8.4.1-12: The analysis should include historical halibut harvest to bycatch ratio much further back in time with a narrower spatial focus on Area 4CDE to inform the public about the extent to which fixed PSC limits caused a shift in the historical share of the resource from the Area4CDE directed fisheries to the trawl fisheries. Area 4 quotas overall declined by two-thirds during the decade prior to Amendment 111's establishment of the current limit in 2015, while bycatch remained the same or increased year to year. The A80 fleet disproportionately kills halibut in Area 4CDE, which accounted for between 83 percent and 90 percent of the companies' halibut mortality since 2015. The National Standard 4 guidelines indicate that NMFS needs to reverse this trend. The guidelines specify that preserving an "economic status quo cannot be achieved by excluding a group of long-time participants in the fishery." Relevant FMP objectives that justify restoring the directed fisheries with their historical share of the resource include providing sustainable opportunities for recreational, subsistence and commercial fishing participants and avoiding significant disruption of existing socio-economic structures in Bering Sea communities. Measures must reflect consideration of other factors: economic and social effects, consumer interest and dependence on the fishery by present participants and coastal communities, importance of fishery resources to fishing communities in order to provide for their sustained participation and minimize adverse economic impacts to them.

Response: Table 5-16 in section 5.4.1 shows IPHC catch limits and non-directed discard mortality as well as Amendment 80 PSC by IPHC area (including Area 4CDE) from 2010-2020. Figure 5-14 shows the Proportion of Amendment 80 PSC by IPHC Regulatory Area from 2010 to 2020.

The SIA identifies and describes the fishing communities engaged in or dependent on the Amendment 80 fishery, the BSAI/Area 4 directed halibut fishery, or both using criteria from National Standard 8. The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The action alternatives contain a range of Amendment 80 halibut PSC limit reductions under medium, low, and very low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that condition proposes no change to the status quo Amendment 80 halibut PSC limit. The EIS and the SIA describe potential adverse impacts to BSAI directed halibut fishery communities under the no action alternative and the potential benefit to those communities under the action alternatives. The EIS and the SIA also describe the potential adverse impacts to the Amendment 80 sector and associated fishing communities under the proposed action alternatives. Both the EIS and the SIA clearly note that existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the BSAI/Area 4 region has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products). Further, both the EIS and the SIA note that to the extent that the proposed action alternatives would serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure.

Amendment 80 to the BSAI Groundfish FMP was not implemented until 2008. See section 3.3 for description of A80 data selection. Throughout this document the analysts focus on fishery data for the years 2010 through 2020. The analysts sought to use as much data as possible to identify trends and historical events, while relying on years for which high-quality estimates are available and during which data are comparable across years. Years were also selected to focus on the period that best represents the current state of BSAI groundfish fishery management. While efforts to collect and process better data are always ongoing, it was determined that 2010 marks the earliest year after the implementation of Amendment 80 that the benefits of the eLandings system were achieved. The eLandings system began in 2006, but it took several years for it to be fully utilized and for its benefits to be realized in catch accounting and PSC estimation. The implementation of Amendment 80 in 2008 represented much change for managers as well as for fishery participants. Improvements in data collection and estimation procedures for the A80 sector were made in 2008 and 2009. In addition to eLandings and A80 implementation, the analysts note that NMFS Catch Accounting System (CAS) was modified over the course of 2013 and 2014; the current version of CAS is best applied to the years from 2010 to present. While CAS can still be used to query data from before 2010, the catch and bycatch estimates for earlier years were generated using a different set of programming procedures than the current practice. As a result, any data "fixes" needed to retroactively tag fishing activity to a sector definition that was developed specifically for this analysis would be difficult and potentially unreliable before 2010. In consultation with the Alaska Fisheries Information Network (AKFIN) and NMFS, the analysts determined that data beginning in 2010 offers the best achievable quality and consistency of sourcing.

Comment 8.4.1-13: A80 can reinstate avoidance measures that were abandoned when they proved unnecessary to meet the current limits after halibut deck sorting was implemented. The DEIS shows that A80 halibut catch and mortality increased dramatically in recent years after deck sorting was fully implemented, because, as the DEIS recognizes, A80 realized it could "mitigate the negative consequences of halibut encounter" through deck sorting, and thus, "prioritize" groundfish catch over "minimizing the number of halibut in a haul." This response by A80 increased overall bycatch, and increased halibut mortality by 300 mt from 2017 to 2019. Simply reinstating these avoidance measures and returning to the mortality levels previously achieved would essentially supply the 20% reduction in mortality and substantially exceed the average reductions that would have been required under Alternatives 2 and 3. This step alone would also provide more than 70%of the average reduction required under Alternative 4 and almost half (42%) ofthe 40% reduction, which is the maximum back-calculated reduction that would have occurred under that alternative. And, even accepting the DEIS analysis, it would avoid more than $50 million of revenue impacts.

Response: Section 5.3.2.5 of the DEIS concludes that the A80 sector has been utilizing a variety of halibut avoidance and mortality mitigation measures for several years and continue to use those measures. Efforts to avoid halibut to the extent practicable and minimize mortality when it cannot be avoided have intensified as halibut mortality limits for the sector have been reduced. During that time, the A80 sector has invested in technology and reduced the efficiency of their operations to reduce halibut mortality. Firms use different halibut avoidance and mortality reduction strategies in different fisheries depending on their effectiveness. For example, deck sorting was reported to be more effective when halibut are a different size or shape than the target species. The analysis also notes that environmental conditions in the Amendment 80 fisheries impact halibut PSC rates and usage from year-to-year. Environmental factors complicate making direct comparisons of halibut PSC mortality across years, as the changes cannot be solely attributed to the mitigation measures implemented by the fleet.

Halibut PSC mortality mitigation efforts were undertaken to help ensure that the Amendment 80 sector will be able to harvest as much of their groundfish allocations as is economically viable given market conditions. Efforts already undertaken by the sector have shown that halibut avoidance or reductions in mortality are possible with the tools that are currently available to the fleet. Additional improvements are anticipated to continue to be realized, especially if halibut limits are further reduced and the fleet forgoes some amount of profitability to reduce halibut mortality further. Reductions in halibut mortality that are realized are expected to result from the sector increasing costs or reducing efficiency. The amount of mortality reduction cannot be quantified with any certainty. If substantial reduction in halibut mortality is realized, it is likely to be derived from the development and implementation of new technologies.

8.4.1.2 Comments on the directed halibut fisheries

Comment 8.4.1-14: The outcome of status quo bycatch management has resulted in a fisheries management system glaring with inequities. One sector, bycatch users in the A-80 fleet, flourishes and builds new boats while another sector, the directed halibut users, slowly erodes. The A-80 sector claims they will go out of business if they are not allowed to continue to utilize a significant amount of the halibut resource as bycatch in the Bering Sea. A similar claim was made in 2015 when the Council acted to reduce bycatch in the sector but none of the stated outcomes in the fleet occurred, including the inability to finish building a multimillion-dollar new boat that was under construction. The current pressure to conserve the halibut resource is borne by the directed halibut fisheries having lower catch limits at lower levels of halibut abundance. Requiring lower bycatch limits at lower levels of halibut abundance will help share the conservation mandate, and sustain economies of halibut-dependent communities.

Response: The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that condition proposes no change to the Amendment 80 halibut PSC limit. The EIS and the SIA describe potential adverse impacts to BSAI directed halibut fishery communities under the no action alternative and the potential benefit to those communities under the action alternatives. The EIS and the SIA also describe the potential adverse impacts to the Amendment 80 sector and associated fishing communities under the proposed action alternatives.

Comment 8.4.1-15: The analysis improperly omits half the halibut from the analysis, resulting in the exclusion of "downstream" impacts from the analysis. This causes highly misleading economic information regarding the benefits of bycatch reduction. On one hand the agency says lower bycatch limits will only help Bering Sea fishermen to the extent that the A80 companies kill larger fish, and on the other hand, the DEIS says juvenile mortality is irrelevant to the decision. Indeed, bycatch reductions result in greater directed halibut fishery catches at more than a 1:1 ratio according to a new IPHC analysis. The 2021 assessment of the effect of the bycatch fisheries on the coastwide directed fisheries explains that "potential yield to the directed fishery was generally larger than a simple reallocation from non-directed discards (115% on average), [and] that the rate of exchange is variable over time (range of 86-139%)." The DEIS arbitrarily dismisses this conclusion as a coastwide impact and not applicable to an action addressing Bering Sea bycatch of halibut longer than 26 inches in length. But on average, more than half the halibut killed by the A80 companies each year over the past decade are juvenile fish less than 26 inches in length.

Response: As stated in the analysis in Section 5.2, impacts to the coastwide halibut spawning biomass under all of the alternatives are expected to be similar. The IPHCs SPR-based management approach equally conserves spawning biomass across differing patterns in fishery selectivity and/or allocation among different fisheries. All sources of mortality (including both juvenile or U26 and older fish or O26) halibut are taken into account in the stock assessment model. However, even though spawning biomass is conserved, there are obvious trade-offs between different allocations to the various fisheries.

Closed-loop simulation is useful to examine these trade-offs while accounting for uncertainties, and can be used to examine downstream effects, although that was out of scope of this analysis. A draft simulation model agreed with the conclusion that there are no appreciable differences in the impact to the SSB for the alternatives examined. Additional work is needed to provide a robust analysis of these PSC alternatives using closed-loop simulation, but the impacts to the spawning biomass and various fisheries was examined in the DEIS using other methods.

The Preferred Alternative provides for lower PSC limits for the A80 fleet than Status Quo particularly at low levels of halibut abundance and this may result in lower PSC mortality and thus reduced downstream impacts. PSC reductions could indirectly lead to increases in directed halibut catch through two means. First, reductions in the U26 portion of the PSC could lead to longer term benefits to the commercial halibut fisheries throughout the distribution of the halibut stock. Benefits from reduced mortality of these smaller halibut could occur both in the Bering Sea and elsewhere as these halibut migrate and recruit into the commercial halibut fisheries. Second, the current IPHC interim harvest policy subtracts the projected O26 portion of non-directed discard mortality (bycatch) from the TCEY by IPHC Regulatory Area when calculating fishing limits. Therefore, given current harvest policy, near term benefits to BSAI halibut fisheries would result from the PSC mortality reductions of halibut that are over 26 inches in length (O26). A portion of these halibut would be available to the commercial halibut fishery in the area that the PSC mortality is foregone, in subsequent years or when the fish reach the legal size limit for the commercial halibut fishery (greater than or equal to 32 inches in total length). Overall, linking the PSC limit to the abundance of halibut provides a mechanism to reduce halibut PSC when halibut abundance is low and allow for higher PSC limits when halibut abundance is high.

Assuming no change to IPHC harvest policy or implementation, and a constant relationship between PSC use and limit, the relationship between PSC and directed catch limit will still vary with the relative proportions at age observed in the bycatch (which could be influenced by factors such as selectivity and recruitment allocation varying over time). Because the IPHC deducts only O26 non-directed discard mortality by area when calculating catch limits (U26 are accounted for separately see Section 4.4), an increase in halibut fishery catch limit is mostly a result of reducing the O26 component of the PSC limit. U26 bycatch (including U26 A80 PSC) are accounted for in the stock assessment with respect to total mortality on the halibut stock but are not part of the TCEY (the coastwide TCEY is determined by subtracting coastwide U26 non-directed discards (bycatch) from the coastwide total mortality limit). O26 non-directed discards are subtracted from the TCEY within each IPHC Regulatory Area when determining directed fishery mortality limits. The length-distribution of Pacific halibut caught as bycatch in fisheries targeting other species is reported to the IPHC each year by NMFS for Alaska and Washington-Oregon-California, and DFO for British Columbia. Historically, the raw length frequencies are summarized by target fishery within gear type (i.e., trawl, hook-and-line, and pot), then aggregated to better represent the differing contributions and sampling rates for each fishery. Weighted length-frequencies of the estimated bycatch are used in the annual harvest policy calculations and catch tables specifically to delineate O26 and U26 removals (Stewart and Webster 2020). The IPHC uses length estimates at the gear level. Given that A80 PSC accounts for ~60-82% of trawl discards (Table 4-2), a larger percentage of A80 PSC that is O26, results in a lower directed halibut fishery catch limit.

Because the relationship between PSC limits and directed halibut catch limits is uncertain and varies year to year, the EIS broadly depicts potential changes in directed halibut catch resulting from the PSC limit changes that could occur under the alternatives in Table 5-14. These changes are calculated using ratios of 0.0, 0.25, 0.5, 0.75 and 1.0, to provide a broad descriptive range of potential relationships between PSC limits and directed catch limits. For example, using a ratio of 1, the entirety of the PSC limit change is transferred into the directed catch limit in the opposite direction.

This scenario of a PSC limit reduction leading to an equivalent increase in directed catch represents a scenario in which 100 % of the PSC limit is taken as O26 PSC for the previous three years given that the projected PSC removal is the three-year average of recent O26 PSC usage rather than the PSC limit. A ratio of 1 is the maximum because that implies all PSC usage is composed of O26 halibut and has a direct trade-off with the directed halibut limit. Ratios less than one indicate that PSC usage occur wholly or partially on Pacific halibut less than 26 inches. Such fish would be subject to natural mortality and movement out of the region. Both of these processes, while being uncertain, lower the impact of PSC usage on potential gains to the directed Pacific halibut fishery. Given recruitment variability, variable fishing patterns resulting in annual changes to selectivity, and variable population processes such as growth and movement, the ratio may occur anywhere in this range in a given year.

The IPHC analyzed the relationship between bycatch and yield in the directed halibut fishery by comparing results of the coastwide assessment with and without coastwide bycatch, concluding that “potential yield to the directed fishery was generally larger than a simple reallocation from non-directed discards (115% on average), [and] that the rate of exchange is variable over time (range of 86–139%)” (Stewart et al. 2021). Comparable results for the BSAI are likely to be smaller than these as a majority of the directed halibut fishery occurs outside of the BSAI and a majority of the halibut bycatch occurs within the BSAI where Pacific halibut are markedly smaller/younger than those from the coastwide PSC analysis. Stewart et al. focused only on the coastwide impact estimates, which is less applicable to the proposed action due to the different sizes (ages) in the BSAI PSC. In a review of their method, the IPHC's Scientific Review Board stated that this analysis should “be interpreted with caution, as there are multiple methods for evaluating how bycatch in non-directed fisheries impact stock productivity and biomass over time” and that:

‘What if’ questions about past behavior are not appropriate for stock assessment models because those analyses do not adequately reflect the information available at the time or information feedbacks to future decisions over time. An MSE analysis [closed-loop simulation], on the other hand is specifically designed to answer ‘what if’ questions under particular future scenarios while properly accounting for stock assessment errors in response to changing information.” (IPHC–2019–SRB015–R paras. 10 and 11;, IPHC-2018-SRB012-R, para. 23).

The analysis done by Stewart et al. (2021) and the analysis of outcome based on the ratios in Table 5-2 could both be enhanced by looking at long-term outcomes using closed loop simulation models. A key outcome of Stewart et al. (2021) is that the rate of exchange – sometimes referred to in the ABM context as yield gain or the PSC-to-directed-catch ratio – is variable over time.

Because of the uncertainties described above, attempts to quantify potential impacts of the different proposed alternatives to downstream fishermen and specific downstream communities, including those in the Gulf of Alaska, would be speculative.

Comment 8.4.1-16: Juvenile halibut migrate extensively across the North Pacific, so that most of the juvenile halibut bycatch in the Bering Sea affects all other downstream areas – including Areas 2C and 3A in the Gulf of Alaska where most Southeast Alaska fishermen harvest halibut. Juvenile halibut taken as bycatch would otherwise grow over a period of years and recruit to the resource and fishery, supporting resource productivity and future fishery yield for Alaska fishing communities.

Response: NMFS acknowledges this comment. See response to Comment 8.4.1-15.

Comment 8.4.1-17: The DEIS needs to more fully describe directed halibut fishery socio-economic contributions and external costs imposed on Alaska by the A80 companies. The DEIS references qualitative discussions and context but ultimately relies on revenue impact to make findings under the Magnuson-Stevens Act National Standards. Flaws in the DEIS include: (1) NMFS measured bycatch fishery values in wholesale revenue and halibut fishery revenues in ex-vessel value; (2) NMFS relies on gross revenues without considering costs and (3) the DEIS did not explicitly consider other economic contributions each sector made in Alaska and the U.S. The SSC concluded that “in its current form, reporting revenue estimates for each fleet will invite readers to make inaccurate comparisons across fleets, and suggests analysts consider whether it may be better to provide no estimate thana misleading one.” The DEIS attempts to address the concern about comparing economic apples and oranges by explaining that reported revenue estimates “do not represent the full scope of the economicimpacts.” Nevertheless, there is a significant disparity between the gross wholesale value generated by the A80 companies relative to the gross ex-vessel halibut fishery revenue in the Bering Sea alone disclosed in the DEIS. The analysts rely on this disparity to draw conclusions about community impacts. To correct this implicit bias, the analysis needs to explore the socio-economic value of the Alaska commercial and sport halibut fisheries more fully.

Response: The revenue impacts are only one portion of the analysis that the Council considered in selecting the preferred alternative. The Council considered the impacts of alternative ranges of halibut PSC limit reductions on 1) the halibut stock, 2) directed halibut fishery participants and communities that are engaged in directed halibut fisheries in the BSAI and in other Areas, and 3) BSAI groundfish fishery participants and communities that are engaged in the BSAI groundfish fisheries. The Council considered the detailed information provided in the analysis for the proposed action.

In addition:

1. Revenue estimates in the EIS are reported in gross first wholesale value for A80 and ex-vessel value for BSAI commercial halibut. Total halibut revenues are also reported in terms of estimated wholesale values in the DEIS, as requested in previous reviews. This is not a straightforward calculation due to limited data sources, as described in Section 4.5.1.1. The analysts do not attempt to present an analogous conversion of A80 wholesale revenue to ex-vessel value. Section 3.3.2 described the analysts’ position on why ex-vessel values are not an appropriate unit to characterize revenues for a catcher/processor fishery. In short, there is no actual ex-vessel transaction price generated from the sale of raw fish by an A80 harvester to a primary processor. Also, the variety of species that make up A80 fishery catch – and their different value-added profiles and recovery rates – reduce the accuracy of any proxy ex-vessel value estimate that is based on a common conversion factor (multiplier).

   The ex-vessel value represents the amount paid to fishermen by a primary processor for raw fish. Ex-vessel prices are the most appropriate value to represent halibut fishery revenues given that this is the most common halibut supply chain in Alaska, particularly in the BSAI or Area 4 (see Section 4). In response to requests from public comments, halibut revenues are also reported in wholesale values in Table 5-15. The wholesale values in this table are estimates of first wholesale production values for head and gut fish as reported in the Economic SAFE report (NMFS, 2021). The wholesale values are based on COAR data that rely on the accuracy of processor reporting and are aggregated at the statewide level. COAR data for processors located in the BSAI region that primarily purchase Area 4 halibut come from a small set of reporting entities and are sometimes excluded due to identified reporting gaps. The estimates in Table 5-15 might not be a reliably precise indicator of value-added production at the primary processing level in the BSAI/Area 4 region, or the Area 4CDE region in particular. As noted in Section 4.5.1, ex-vessel values in Area 4 consistently trail statewide values.

2. The analysts attempted to estimate wholesale values that are more specific to Area 4; however, this is not a straightforward calculation due to limited data sources, as alluded to above and in Section 5.3.1. Unlike for the A80 sector, there is no link from round weights to product weights

by product type and processing facility for the halibut fishery. Without this link, the only available method to connect purchases and sales for each processor is to compare the annual sum of the processed product weights (sold) and the unprocessed weights (purchased) in COAR tables. Those weights will not match exactly due to volume lost during processing and year-to-year differences if a processor purchases the fish in one year and sells the fillets the next year (e.g., holdover inventory). The analysts applied a "screen" to filter out annual data from processors whose sales include too much holdover product from the previous year. The screen is the ratio of the annual purchased weight divided by the annual sold product weight. Due to the fact that a majority of product in Area 4 are gutted and glazed (head-on), an additional scaling is used to adjust to "head-and-gut" prices (weight bought multiplied by 0.903 – or 0.75/0.83 – the head-and-gut to gut ratio). When setting the screen value to accept data that falls between 0.6 and 1.5 and only including processors operating in the BSAI region, the estimated wholesale value is $6.02 in 2019 (2018$) with a 5-year average of $7.90 (2015-2019). This range comes out slightly higher than the estimates taken from the Economic SAFE. These data issues and limitations are not uncommon in fishery analyses.

3. The EIS notes that the revenue estimates represent gross revenues and do not attempt to estimate the costs associated with changing fishing operations to avoid halibut. The costs associated with avoiding halibut are discussed qualitatively throughout the document particularly in section 5.3.2.3 where it is stated that all of the measures that could be implemented to reduce halibut mortality would have a cost to the fleet, the increased costs limit how those tools can be implemented while keeping the fleet economically viable. The gross or net cost directly associated with reducing halibut mortality is not estimated in the analysis.
4. The EIS states that the revenue estimates for the A80 fishery and the directed halibut fishery sectors are estimated separately, using different methodologies and are meant to help compare impacts across alternatives *within* each sector and should *not* be used to compare impacts across sectors.

The EIS does not incorporate generally understood but poorly quantified economic multipliers that would allow for an estimate of the total economic contributions of the A80 fishery or the directed halibut fishery in terms of output, income, employment or other economic measures. The broad, downstream economic impacts of commercial fishing can be understood and appreciated without drawing an equivalency between metrics or existing studies that have fundamentally different scopes. Section 5.3.1 of the EIS discusses ongoing research to develop multi-regional social accounting matrix (MRSAM) that links across industries to estimate the total economic impacts for both the groundfish and halibut fisheries. However, given the preliminary state of both the AFSC (10-region SAM) and IPHC (PHMEIA) models, and pending SSC review that was requested, these models are not used to estimate regional economic impacts for this analysis.

Comment 8.4.1-18: The Pacific Halibut Multiregional Economic Impact Assessment estimates the Pacific halibut commercial fishing's total impact in 2018 is five times the 2018 fishery output value and includes direct, indirect, and induced effects from changes to the Pacific halibut fishing sector, as well as indirect and induced effects associated with forward-linked industries (Pacific halibut processing sector). The Assessment concludes that "[t]he results suggest that the revenue generated by Pacific halibut at the harvest stage accounts for only a fraction of the economic activity that would be forgone if the resource was not available to fishers in the pacific northwest. The DEIS also needs to consider economic activity that would be forgone if the resource was not available to fishers. Without considering external costs, an economic concept that refers to uncompensated social or environmental effects imposed by the A80 companies on society through bycatch of halibut and other species, habitat harm caused by bottom trawling and climate pollution, it is impossible to meaningfully assess the true costs or benefits of their products or services to society.

Response: The EIS discusses the approach to the revenue estimates in section 5.3.1 and states that: The revenue estimates reported in this section do not represent the full scope of the economic impacts associated with the proposed action alternatives. This document does not incorporate generally understood but poorly quantified economic multipliers that would allow for an estimate of the total economic contributions of the A80 fishery or the directed halibut fishery in terms of output, income, employment or other economic measures.

The Pacific Halibut Multiregional Economic Impact Assessment (PHMEIA) is also discussed in section 5.3.1 of the DEIS. The PHMEIA will describe economic interdependencies between sectors and regions with the specific purpose of assessing the economic contribution of the Pacific halibut resource to the economy of the United States and Canada (Hutniczak, 2020). The PHMEIA models impacts across six regions: Alaska, the West Coast (WA, OR and CA), British Columbia, the rest of the US, the Rest of Canada and the Rest of the world. Preliminary results were presented at the 2021 IPHC Annual Meeting[112]. However, the principal investigator notes that:

"…the current version of the model is based solely on secondary data sources. As such, the results are conditional on the adopted assumptions for the components for which data were not available. In order to improve the accuracy of the assessment, the IPHC intends to incorporate into the model primary economic data collected directly from members of Pacific halibut dependent sectors… The subsequent revisions of the model incorporating IPHC-collected data will bring improved estimates on the Pacific halibut sectors' economic impact." (Hutniczak, 2020).

The IPHC is currently conducting primary data collection in the form of surveys to commercial harvesters, processors, and charter business owners. The addition of primary data from the survey results is expected to substantially improve the accuracy of the model, particularly regarding modeling the linkages and variations between regions (B. Hutniczak, personal communication, March 1, 2021). Additionally, the in-progress PHMEIA model estimates economic impacts based on region wide shocks which may be less informative to the relative impacts of action alternatives that are specific to Area 4CDE. Given the preliminary state of the IPHC (PHMEIA) models, and pending SSC review that was requested, the model was not used to estimate regional economic impacts for this analysis.

As stated in section 5.6 of the DEIS: "Net benefits to the Nation are calculated by summing all producer and consumer surplus that occurs in the US economy. Both costs and benefits are defined broadly, from the Nation's perspective, to include all surpluses that accrue to direct and indirect participants in the fishery as well as to other members of society." The net benefits to the nation estimation is based on the best information available for consumptive and non-consumptive users of the resource, but is just one portion of the analysis that the Council considered when selecting the Preferred Alternative.

[112] "The preliminary results suggest that the region-wide Pacific halibut commercial fishery's total estimated impact in 2018 amounts to USD 281 mil. (CAD 364 mil.) in GDP, USD 176 mil. (CAD 228 mil.) in labor income (including estimated USD 21.5 mil. (CAD 27.9 mil.) in wages in the Pacific halibut fishing sector), 4,453 in jobs, and USD 179 mil. (CAD 232 mil.) in household income, and over USD 666 mil. (CAD 863 mil.) in output. This is about 5.1 times the fishery output value of USD 129 mil. (CAD 168 mil.) recorded for 2018 (DFO, 2020; NOAA, 2020a). The estimate is the total economic impact, the sum of the direct, indirect, and induced effects from changes to the Pacific halibut fishing sector, as well as indirect and induced effects associated with forward-linked industries (e.g., the Pacific halibut processing sector) … These results are based on **the current version of the model incorporating only secondary data sources**. As such, **the results are conditional on the adopted assumptions for the components for which data were not available and are subject to change"** (Hutniczak, 2020).

The Preferred Alternative is designed to establish variable Amendment 80 sector halibut PSC limits employing an abundance based management strategy and to minimize halibut PSC usage in the Amendment 80 fleet to the extent practicable. The Council considered the National Standard 9 guidelines requiring consideration of additional factors when determining whether conservation and management measures minimize bycatch to the extent practicable. The factors most relevant to this action include changes in the economic, social, or cultural value of fishing activities and social effects. The SIA (Appendix 1) for this action presents the myriad ways halibut are valued and utilized in halibut-dependent communities and other sections of the analysis provide information on the expected changes is halibut availability to those users as result of projected changes in halibut PSC usage by the Amendment 80 sector.

Comment 8.4.1-19: As the directed halibut fishermen and halibut fishery have adapted to reductions in catch limits and allocations to support conservation efforts and management that is based on abundance, the PSC halibut bycatch limits continue to remain static and in turn become a larger proportion of the total halibut removals. Subsequently, the fishermen that have invested in the directed halibut fishery, many of whom live and work in small coastal fishing communities in Alaska, have been losing access to the available biomass.

Response: The concerns associated with the status quo no-action alternative for the directed halibut fishery participants under halibut low abundance conditions are recognized in the Council's purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. This reduction may provide additional harvest opportunities in the directed halibut fisheries as discussed in Sections 1 and 7 of the EIS.

Comment 8.4.1-20: Halibut bycatch removals have exceeded the directed halibut fishery removals since 2011. Pressure to conserve the halibut resource is solely carried by the directed halibut fishery having lower catch limits based on lower levels of halibut abundance. A management plan requiring lower bycatch limits at lower levels of halibut abundance will help distribute the conservation mandate, and sustain economies of halibut-dependent communities and all regional fishing sectors.

Response: NMFS acknowledges this comment. See response to Comment 8.4.1-21.

Comment 8.4.1-21: The A80 sector is responsible for the majority of the halibut bycatch mortality in the BSAI and is concentrated to a shocking degree in Area 4CDE, with about 90% of the halibut bycatch mortality occurring in the area's waters where CBSFA members live and fish. Significant additional cuts in halibut bycatch are necessary to ensure the continued viability of the directed halibut fishery in Area 4CDE and to protect halibut-dependent communities in Alaska and the Bering Sea.

Response: The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. The EIS Section 5.4 notes that while total Amendment 80 halibut PSC mortality has decreased, the distribution of PSC occurrence within Area 4 has stayed fairly consistent in recent years, with Area 4CDE accounting for between 83 percent and 90 percent of annual Amendment 80 PSC since 2015. As noted in SIA Section 7.2.1, the directed halibut fishery in Area 4CDE would have the greatest potential for experiencing whatever beneficial incidental reallocative effects may occur under the proposed action alternatives and may have the greatest potential for experiencing adverse impacts during halibut low abundance conditions under the no action alternative, especially compared to conditions that existed before 2015 (when changes were made to the NMFS methodology for apportioning PSC mortality to IPHC areas, as described in EIS Section 5.4)

Comment 8.4.1-22: The economic impacts analysis in the DEIS is wholly inadequate. The analysis significantly understates the directed fishery benefits from PSC reductions. The DEIS addresses only A80 PSC limits in the BSAI, artificially dilutes directed fishery benefits from PSC reductions, and skews the results of each analysis in favor of the regulated sectors. This makes it impossible to fairly evaluate and balance the benefits that PSC reductions would provide. The analysis fails to analyze actual gains in directed fishery yield that would result from reductions in bycatch mortality. It understates the long-term conservation benefits that significant reductions in halibut PSC mortality would provide to the halibut stock, both from the reduction in juvenile bycatch mortality and the strong conservation incentives discussed above. Directed fishery benefits are discounted in the analysis and increased yields are deemed speculative, because the IPHC may not "pass-through" reductions in bycatch mortality. This contradicts the official IPHC management procedure, ongoing IPHC concern over low directed fishery yields, its longstanding recognition of inequities that result from current PSC limits, and repeated efforts to increase directed fishery yields in Area 4CDE to help the directed fishery survive.

Response: See response to Comments 8.4.1-15 , 8.4.1-16 and 8.4.1-26 for description of the DEIS discussion of impacts on juvenile halibut and impacts to the halibut spawning biomass.

The IPHC process for setting catch limits is described in detail in section 4.4.1 including how this process has changed in recent years as well as documenting IPHC decisions that have departed from the management procedure. The DEIS discusses impacts on the directed halibut fishery in section 5.4 given the current IPHC management procedure, noting that IPHC decisions may deviate above or below the harvest policy limits and may maintain or increase directed fishing opportunities given changes in the PSC with potential long-term impacts.

The Council states in their rationale for the preferred alternative, that though this action may result in changes to PSC usage by the Amendment 80 sector, only the IPHC can make determinations on annual catch limits for the directed halibut fisheries. There is no guarantee that this action will translate into increased opportunities for the directed fishery, since the IPHC is not obligated to alter their harvest strategies based on the outcome of this action. However, the Council and NMFS are hopeful that it would translate into increased opportunities for the directed fishery for reasons discussed in Sections 1 and 7.

Comment 8.4.1-23: The DEIS fails to consider the cumulative effects of impacts to the directed fishery in light of the devastating catch reductions and closures that have been imposed in other critical fisheries, which both increase the importance of the halibut directed fishery and jeopardize revenue streams thathave been essential to supporting and maintaining the directed fishery at current levels.

Response: In the EIS Appendix 1, SIA, Table 16, BSAI Halibut Catcher Vessels Ex-Vessel Gross Revenue Diversification by Community of Vessel Historical Ownership Address, All Communities, 2010-2019, provides information on revenue diversification of vessels participating in the BSAI/Area 4 directed halibut fishery, indicating the dependency of those vessels, as measured in ex-vessel gross revenue, on the directed halibut fishery compared to all other fisheries in which those vessels participate. SIA Table 17, BSAI Halibut Catcher Vessel and All Catcher Vessel Ex-Vessel Gross

Revenue Diversification by Community of Vessel Historical Ownership Address, 2008-2019, provides information on revenue diversification of all commercial fishing vessels with ownership addresses in the communities (including all area, gear, and species fisheries) that have any vessels participating in the BSAI/Area 4 directed halibut fishery (i.e., the local "community fleet"). This indicates the dependency of the community fleet, as measured in ex-vessel gross revenue, on directed halibut fishery revenue compared to the revenue from all other fisheries in which any of the community vessels participate. As shown, the dependency of both the halibut vessels themselves and community fleets as a whole on the BSAI/Area 4 directed halibut fishery is substantial and in multiple cases profound for BSAI coastal communities engaged in the fishery in recent years.

Comment 8.4.1-24: The analysis does not provide clarity for estimating Area 4 directed fishery impacts. The analysis tasks the reader to develop their own choices of impacts when looking at the effects on the halibut sector. The analysis provides possible impacts assuming that bycatch of halibut could all be U26 or all O26. In reality, the evidence suggests that bycatch ranges from 40 to 65% U26. Analyzing anything outside of this range is misleading and inappropriate. And then, the analysis once again invites the reader to substitute any revenue amount they want to estimate impacts on the halibut sector revenue. This allows the reader to use an extreme price to base their argument around. Instead, the analysis should have used an average over years to account for variability.

Response: Section 5.4 of the DEIS discusses the relationship between PSC limits and directed halibut catch limits. Because this relationship is uncertain and varies year to year, the analysis calculates an example of potential changes in directed halibut catch resulting from the PSC limit changes that could occur under the alternatives using ratios of 0.0, 0.25, 0.5, 0.75 and 1.0. This range of ratios was selected to provide a broad descriptive range of potential relationships between PSC limits and directed catch limits. For example, using a ratio of 1, the entirety of the PSC limit change is transferred into the directed catch limit in the opposite direction. This scenario of a PSC limit reduction leading to an equivalent increase in directed catch represents a scenario in which 100 % of the PSC limit is taken as O26 PSC for the previous three years given that the projected PSC removal is the three-year average of recent O26 PSC usage rather than the PSC limit. A ratio of 1 is the maximum because that implies all PSC usage is composed of O26 halibut and has a direct trade-off with the directed halibut limit. Ratios less than one indicate that PSC usage occur wholly or partially on Pacific halibut less than 26 inches. Such fish would be subject to natural mortality and movement out of the region. Both of these processes, while being uncertain, lower the impact of PSC usage on potential gains to the directed Pacific halibut fishery. Given recruitment variability, variable fishing patterns resulting in annual changes to selectivity, and variable population processes such as growth and movement, the ratio may occur anywhere in this range in a given year.

These ratios were selected based on SSC recommendation as noted on p. 11 of the SSC minutes from the April 2021 meeting[113]:

> "The SSC recognizes that actual ratios of change in PSC to change in halibut fishery limits will be variable over time, reflecting changing fishery selectivity (e.g., relative fraction of O26 vs. U26 in the PSC) and biological processes. Through several iterations of the ABM analysis, these factors, and the variability inherent in them, have become more clear. This variability suggests that a single most likely value cannot represent the year-to-year differences in the relationship between these two sources of fishing mortality.
>
> For this reason, the SSC recommends that the Council compare alternatives (as in Table ES-5)

[113] https://meetings.npfmc.org/CommentReview/DownloadFile?p=18a502af-a848-4c92-a7cb-9d2151dd2666.pdf&fileName=SSC%20FINAL%20Report%20April%202021.pdf

based on a range of plausible ratios (0.0-1.0) without an implicit or explicit likelihood assigned to each. The SSC suggests that since O26 is deducted at a rate of 1.0 in the annual halibut calculations, this would be a logical upper bound in the case that all PSC in a particular year was O26. U26, calculated to have an effect on halibut yield that is greater than 1.0 is deducted from individual IPHC areas in proportion to stock abundance, for which recent historical values have been in the range of 20% for the sum of the BSAI areas. Thus, ratios from 0.0-1.0 should logically encompass a sufficiently broad enough range for comparison of the alternatives that is consistent with recent management."

The analysis uses ex-vessel values reported in 2018-dollar adjusted ex-vessel values for Area 4 for 2019 and the average for 2015-2019. The ex-vessel value represents the amount paid to fishermen by a primary processor for raw fish. Ex-vessel prices are the most appropriate value to represent halibut fishery revenues given that this is the most common halibut supply chain in Alaska, particularly in the BSAI or Area 4 (see Section 4). In response to requests from public comments, halibut revenues are also reported in wholesale values. The wholesale values are reported estimates of first wholesale production values for head and gut fish as reported in the Economic SAFE report (NMFS, 2021) for 2019 and an average of 2015-2019. The assumptions and limitations associated with these revenue values are described. This approach provides a thought process to understand the direction and approximate magnitude of the relationship between PSC and commercial catch in the BSAI. Given the many uncertainties, these results are best used for looking *across* the table to compare the PSC limits embedded in the alternatives to one another on a relative basis.

8.4.1.3 Comments on Dependent Communities

Comment 8.4.1-25: The DEIS omits benefits of bycatch reductions to halibut fishermen and communities in the Gulf of Alaska – including Areas 2C and 3A in the Gulf of Alaska where most Southeast Alaska fishermen harvest halibut when identifying trade-offs between trawl bycatch and the directed fisheries. Because of this fundamental flaw and other misleading economic assumptions, the DEIS underestimates both the impacts of bycatch and the benefits of bycatch reduction to communities. The DEIS minimizes the beneficial impacts of trawl bycatch reduction to Bering Sea fishermen by relying on the coastwide aspect of the halibut stock. The analysis also omits half the halibut taken as bycatch (U26). The juvenile halibut killed in the Bering Sea as bycatch has significant adverse effects on downstream fishermen throughout Alaska. Reduced halibut PSC limits would yield significant benefits to downstream fishermen.

Response: NMFS acknowledges this comment. Please see the combined response to Comments 8.4.1-15, 8.4.1-16, and 8.4.1-26 for a description of the EIS discussion of impacts on juvenile halibut and impacts to the halibut spawning biomass. Because of the uncertainties described in that response, attempts to quantify potential impacts of the different proposed alternatives to downstream fishermen and specific downstream communities, such as those in Southeast Alaska, would be speculative.

Comment 8.4.1-26: The DEIS should consider halibut killed by the A80 companies as a significant external cost with massive impacts on Alaska community fishery outputs. The DEIS recognizes that halibut bycatch and potential bycatch reductions will have downstream impacts, but considers impacts only to Bering Sea fishing communities, vessels and crew and improperly excludes impacts to other Alaska communities. The economic analysis must fully describe the statewide value of the halibut fisheries and consider impacts to all Alaska fishermen and coastal communities. The analysis violates the Administrative Procedure Act (APA) by failing to "examine the relevant data." The conclusion that the A80 sector's prospective revenue reductions resulted in a loss of national net benefits ignores downstream fisheries, community impacts and the agency's own National Standard Guidelines thus violating the APA and the Magnuson-Stevens Act. Given National Standard 8's concern for community fishing economies, and broad explanation of net national benefits laid out in the National Standard 9 Guidelines, the DEIS needed to do a much better job of analyzing and disclosing the directed halibut fishery's influence on community socio-economic well-being throughout Alaska. The DEIS discusses downstream impacts broadly, but then relies on erroneous assumptions that minimize the regional impacts of the fishery.

Response: NMFS acknowledges this comment. See response to Comments 8.4.1-15 and 8.4.1-29.

Comment 8.4.1-27: We request more detailed analysis of the potential loss of tax revenue and respective contributions of the statewide halibut fishery and A80 companies to Alaska communities. The DEIS identifies two main sources of fishery taxes: shared taxes administered by the state, which are the Fishery Resource Landing Tax and the Seafood Marketing Assessment, and municipal taxes levied on raw fish landings - which the A80 companies do not pay. Most of the Fishery Resource Landing Tax paid by trawlers derives from pollock fisheries. The amount of taxes paid appears to be small compared to fishery taxes paid per dollar in ex-vessel value in Southeast Alaska communities. This means that halibut bycatch may impose another external cost in terms of reducing community tax revenues from halibut that would otherwise be harvested in Alaska.

Response: The SIA identifies the two most important fishery related resource taxes administered by the state and shared with communities, as measured by revenue shared are the Fisheries Business Tax and the Fisheries Resource Landing Tax. Those two taxes generated approximately $36 million and $15 million in total revenue, respectively, in 2020, as noted in the Annual Report 2022 of the Tax Division of the Alaska Department of Revenue. According to that same report, the Department of Revenue Tax Division deposits all seafood marketing assessments into the General Fund (approximately $6.3 million in total revenue in 2020); the Alaska Legislature may appropriate funds to the Alaska Seafood Marketing Institute (ASMI). Directed halibut fishery landings to shore-based and floating processors contribute to Fisheries Business Tax revenue; Amendment 80 fishery resources processed outside of and first landed in Alaska (e.g., during processed product transfers) are taxed based on the unprocessed value of the resource and contribute to Fisheries Resource Landing Tax revenue. Directed halibut landings are subject to municipal taxes levied on raw fish landings; Amendment 80 processed product landings or transfers are not. A more detailed analysis of Fishery Business Tax and/or Fishery Resource Landing tax revenue contributions by community than appears in the SIA is not possible due to data confidentiality constraints. Further, even in those few communities with three or more shore-based or floating processors in the case of the directed halibut fishery, or three or more Amendment 80 companies making product transfers on a regular basis (i.e., where data confidentiality constraints would not apply), available tax revenue information is not reported by fishery or fishing sector.

Comment 8.4.1-28: The DEIS wrongly claims that the resource "currently appears to be at a stable level"and that sustained participation of halibut communities is "more challenging" but not at risk. Because of abundance declines and the "incidental reallocation" of the resource to the A80 companies, overall Bering Sea fishery ex-vessel values have dropped in recent years. The DEIS's assumptions of stability are implausible in light of the statistics showing changes in the Bering Sea directed halibut fishery and a downward trend in fleet size throughout Bering Sea communities. The Bering Sea halibut fleet – overwhelmingly owned by residents of Alaska fishing communities - declined in a number of communities. Some of these smaller community fisheries generated up to half a million dollars in revenue, now lost to A80 company bycatch. In sum, multiple Bering Sea communities and halibut fishermen from throughout Alaska have lost direct access to the halibut fishery and others are continually in jeopardy. Bering Sea and downstream Gulf of Alaska communities rely on harvestable and younger, migrating halibut for socio-economic well-being.

Response: The EIS Table 4-8 shows total catch of Area 4 halibut IFQ and CDQ by subarea from 2010 through 2019. As noted in the text accompanying that table, "on average, the Area 4 fishery generated 6.34 million whole lbs. per year. The greatest proportion of catch occurs in Areas 4A, 4B, and 4D. The annual catch trend peaked in 2011 but currently appears to be at a stable level around 5 million whole lbs. [emphasis added]. This trend conforms to the decline in statewide TACs that is shown in Figure 4-6." Specifically, in each of the five years 2015 through 2019, Table 4.8 shows that the 4ABCDE total halibut catch (IFQ+CDQ) in Area 4 (CFEC whole lbs.) was between 4.8 million and 5.3 million pounds. In other words, the stability discussed relates to catch, not the resource as a whole.

The SIA has been revised to more clearly state that while sustained participation of fishing communities in the BSAI groundfish or BSAI halibut fisheries would not appear to be directly at risk from implementation of the proposed action alternatives, the problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. Both the EIS and the SIA clearly state that "existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the region has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products)." Further, both the EIS and SIA clearly state that "to the extent that the proposed action alternatives would serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure."

Comment 8.4.1-29: Our seafood business that is based in Sitka, Alaska is built around the ability to support small-boat fishermen harvesting halibut in the directed fishery. Although we support responsible fisheries practices, such as conservative management actions, the continued ability to support our community-based fishermen is impacted by the reduction to the available catch limits for Southeast Alaska's coastal communities. Although the SIA did not directly address the impact to communities outside the BSAI region, it is well known and stated in the previous environmental impact statement on this subject that halibut migrate and recruit into the directed halibut fishery in other regions, including Southeast Alaska. The DEIS fails to properly evaluate the social impact to these fishery-dependent communities outside of the BSAI stating too many uncertainties

Response: NMFS acknowledges this comment. Please see the combined response to Comments 8.4.1-15, 8.4.1-16, and 8.4.1-26 for a description of the EIS discussion of impacts on juvenile halibut and impacts to the halibut spawning biomass. Because of the uncertainties described in that response, attempts to quantify potential impacts of the different proposed alternatives to downstream fishermen and specific downstream communities, such as those in Southeast Alaska, would be speculative.

Comment 8.4.1-30: The current utilization of an arbitrary static cap for halibut PSC is inequitable, unscientific and irresponsible fisheries management. The current static PSC catch limit has resulted in an inequitable fisheries management system that disproportionately benefits the Seattle-based A-80 fleet. The directed halibut fishery that is managed based on halibut abundance is marginalized and reduced, based on PSC removals by the A-80 fleet to a point where rural coastal communities, that are majority Alaska Native, adjacent to the resource can no longer participate in a fishery that has been carried out in the region for over 6000 years.

Response: The concerns with the no-action alternative for directed halibut fishery participants under halibut low abundance conditions are recognized in the Council's purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under various abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

Comment 8.4.1-31: At St. Paul Island AK the only *local* commercial fishery fleet is 100% dependent on the halibut resource at this time. Our community is heavily dependent on the subsistence halibut fishery, and we are dependent on a healthy Bering Sea halibut resource to support us for generations to come. A traditional part of the island diet and culture, the halibut subsistence fishery was the basis for the successful development of the commercial halibut fishery that is now the mainstay of St. Paul's economy. The Council has a mandated responsibility to reduce halibut bycatch and to provide fairaccess to Alaska fishery dependent communities to the halibut resource.

Response: The multi-dimensional importance of the subsistence and commercial halibut fisheries to St. Paul is characterized in SIA Section 7 and elsewhere in the SIA. Additionally, as shown in the EIS Appendix 1. SIA Table 17, the fishing fleets of the communities of St. George and Savoonga have levels of dependency on the BSAI/Area 4 directed halibut fishery comparable to that of St. Paul, and three other BSAI community fleets are more than 85 percent dependent on the fishery. The concerns with the no-action alternative for directed halibut fishery participants under halibut low abundance conditions are recognized in the Council's purpose and need statement and action alternatives included in the EIS propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

Comment 8.4.1-32: Our local halibut fishery is a major source of employment and income for our tribal and community members. Each year, 70 to 100 people in our community participate in the halibut fishery, from the skippers, boat crews and young onshore baiters to support services for the fleet. In 2019, 15 vessels participated in the fishery and employed 75 people. In addition to providing harvesting opportunities for the local fleet through its CDQ halibut allocation, CBSFA also provides support services for the fishermen through its Local Fleet Support Program.

Response: The importance of St. Paul's participation in the BSAI/Area 4 directed halibut fishery as a major source of employment, income, and subsistence for the community and its members is noted in SIA Section 6.2, and the estimate of the number of people in St. Paul participating in the halibut fishery annually provided in the comment letter has been added to that section. The count of catcher vessels with St. Paul ownership addresses participating in the BSAI/Area 4 directed halibut fishery each year 2010-2019 (based on ADFG/CFEC fish tickets) is provided in SIA Table 13. Harvesting opportunities provided to the local fleet by CBSFA through its CDQ halibut allocation and support services for fishermen through its Local Fleet Support Program are also noted in the EIS Appendix 1. SIA Section 6.2.

Comment 8.4.1-33: The final analysis should include information describing what was done to inform affected communities about the proposal and the potential impacts the action will have on their communities, what input was received from the communities, and how that input was utilized in the decision making process.

Response: The EIS has been revised to include this information in Section 1.3.

Comment 8.4.1-34: A "fishing community" is "substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs" and a "social or economic group whose members reside in a specific location and share a common dependency." Lower bycatch limits will have significantly different socio-economic impacts on significantly different types of fishing communities. The status quo threatens further loss of Bering Sea communities while lower bycatch limits may prevent the A80 companies from harvesting their entire quotas in some years. Unlike many Alaska halibut fishermen, these companies at least have some capacity to adapt and prioritize their highest value target fisheries.

Response: The different types of fishing communities engaged in the Amendment 80 fishery and/or BSAI/Area 4 directed halibut fishery and the differing nature of their engagement in and/or dependency on those fisheries, is characterized in the EIS Appendix 1. SIA Section 6 (Regional and Community Context of the Fisheries). The different types of social/socioeconomic impacts that would potentially occur under the no-action and action alternatives in those communities is discussed in SIA Section 7 (Regional and Community-Level Social Impacts by Alternative). The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

8.4.1.4 Comments on Subsistence fisheries

Comment 8.4.1-35: Analysis of the time depth of regional halibut fishing practices is not present in the EIS Appendix 1. SIA rendering it methodologically flawed. The true impact of loss of access and opportunity can only be examined in relation to understanding the depth of halibut utilization of the uninterrupted BSAI directed halibut fisheries dating to 6170-6525 Years Before Present. Generations of BSAI area residents, whose descendants continue to live and fish in the region today successfully, managed halibut and ground fish fisheries for thousands of years prior to the development of the directed halibut fishery and the post-MSA American owned groundfish trawl fisheries. The success of pre-colonial BSAI regional management adaptations were grounded in adaptive technologies and fishing methods that limited encounters with non-targeted species and provide a model of long-term sustainable ABM fisheries management in the Bering Sea.

Response: The EIS Appendix 1. SIA discusses the time depth of regional halibut fishing practices in multiple places. For example, see the introductory paragraph of the EIS Appendix 1. SIA Section 6.1.2 which reads in part: "Archaeological evidence suggests that the Alaska Peninsula and Aleutian Islands have been inhabited for around 9,000 years. Excavation of kitchen-middens revealed consistent use of marine resources, including bone fishhooks and fish scrapers, stone sinkers, as well as bones of many marine species including whales, sea-lions, sea otters, seals, sea birds, fish (including halibut, cod, and sculpin) and mollusk shells (Jochelson 2002). The Native people of the region refer to themselves as Unangax̂ (Unangam tunuu in their own language) or Aleut (a name applied by foreigners in the mid-1700s) (APIA 2019). Unangax̂ subsisted on sea mammals, fish, shellfish, birds, and plants. They fashioned lines of dried, braided kelp, notched stone sinkers and large two-piece bone hooks with a curve and a barb to fish for cod and halibut while smaller rounded hooks made from a single piece of bone or shell were used to fish for sculpin and flounders (Collins *et al.* 1945)." The multigenerational social and cultural significance of halibut fishing is described in multiple subsections of SIA Section 7.2, one of which reads in part: "Fishing regulatory actions can result in a wide range of sociocultural impacts in rural fishing communities. For many residents of these communities, commercial fishing is not seen as a stand-alone socioeconomic activity, but an integral part of self-identity. This relationship is compounded for those residents who come from families with multi-generational experience in commercial and/or subsistence fishing, particularly for those Alaska Native residents for whom fishing is part of a larger, integrated traditional subsistence and economic sustenance practice rooted in thousands of years of history."

Comment 8.4.1-36: Responsible management of these resources are of paramount importance to our community, and communities across Southeast Alaska. These stocks are tremendously important for community resilience and food security, as we have been reminded over the past two years of the Covid-19 pandemic. Sitka is a rural community. Many of us practice subsistence harvesting to feed our families, and we enjoy this way of life. The word subsistence does not truly describe what it is to live this way, as it does not capture how our communities thrive directly because of that connection to these lands and waters. Halibut and salmon are especially culturally important- the indigenous people of this region have relied on these foods and have managed this resource successfully since time immemorial. We favor reducing (trawl) halibut by-catch as much as possible as soon as possible.

Response: Because of the uncertainties described in that response, attempts to quantify potential impacts of the different proposed alternatives to downstream fishermen and specific downstream communities, such as those in Southeast Alaska, would be speculative. However, the problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement, and the cultural importance of halibut and subsistence and commercial halibut fishing is noted in SIA Section 7.2. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. The Council and NMFS recognize the social and cultural importance of halibut to many communities, including those in Southeast Alaska, as well as the importance of halibut to a subsistence lifestyle. The Council took these factors into consideration in balancing the various concerns of all stakeholders when selecting the preferred alternative.

Comment 8.4.1-37: Halibut are a key traditional part of our Unangax̂ (Aleut) culture and diet, a critical commercial and subsistence resource for our community, and are shared widely by local fishermen across the island and far beyond. For generations, Unangan fishermen of St. Paul have fished for halibut from small boats in the waters of the Bering Sea surrounding the Pribilof Islands. The commercial halibut fishery on St. Paul started long before the A80 fisheries started trawling in the Bering Sea. Prior to the formation of our Western Alaska Community Development Quota (CDQ) Program group - Central Bering Sea Fishermen's Association (CBSFA), individual tribal members from St. Paul established the halibut fishery with support from the Tribal Government. This subsistence fishery experience was the basis for the successful development of our commercial halibut fishery today. The DEIS dos not adequately represent the situation in Alaska with halibut, the true impacts of trawl bycatch to all other users and the real benefits for the nation. The subsistence fishery has also taken major hits for conservation.

Response: The EIS Appendix 1, SIA Section 6.2.2 notes the local subsistence use of halibut being a part of life in St. Paul since the establishment of the community, the start of the St. Paul commercial halibut fishery in the early 1980s, the start of the CDQ pollock fishery in 1992, and the start of the CDQ multispecies groundfish fishery in 1998. The multigenerational social and cultural significance of halibut fishing and the intertwined nature of commercial and subsistence halibut fishing in BSAI communities is described in multiple subsections of SIA Section 7.2, one of which reads in part: "Fishing regulatory actions can result in a wide range of sociocultural impacts in rural fishing communities. For many residents of these communities, commercial fishing is not seen as a stand-alone socioeconomic activity, but an integral part of self-identity. This relationship is compounded for those residents who come from families with multi-generational experience in commercial and/or subsistence fishing, particularly for those Alaska Native residents for whom fishing is part of a larger, integrated traditional subsistence and economic sustenance practice rooted in thousands of years of history." SIA Section 7.2.6.3 specifically includes multiple example quotes from St. Paul residents on the cultural importance of halibut and halibut fishing. The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The action alternatives analyzed in the EIS propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions and the Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

Comment 8.4.1-38: The Department of Interior commented that the SIA discusses data that would have been useful but were not available, including current information on subsistence harvest, the use of halibut and local and traditional knowledge. The SIA states that the subsistence use of halibut (and Pacific cod) has deep roots and remains an important part of the social, cultural, and economic fabric of life in the communities of the Bering Sea Aleutian Islands region, and that now commercial and subsistence fisheries are intertwined. This section also states that data on the amounts of halibut harvested for subsistence relative to the amounts of all fish harvested for subsistence are outdated, with some more than 30 years old. The SIA also notes that baseline information on the retention of subsistence halibut from commercial fisheries harvest in some of the key commercial fishing communities is unavailable. The Section concludes by stating that the lack of data limits the ability to fully analyze potential interactive commercial and subsistence fishery impacts of the proposed DEIS alternatives. Because of the lack of Tribal consultation on the issues identified above, we are concerned that potential impacts to Tribes and their members, whether engaged in commercial or subsistence activities, have not been fully analyzed and incorporated into the DEIS alternatives analysis. Forexample, given the lack of subsistence data, it is not clear how the SIA concluded in Section 4.5.5 that there are no anticipated direct impacts to halibut subsistence from the proposedalternatives, particularly in the context of the continuous decline of the halibut fishery. We believe that tribal consultation could provide the missing and incomplete data.

Response: The EIS Appendix 1, SIA Section 4.5.5 states "It is critical to note, however, that CSIS (Community Subsistence Information System) type of data do not exist for multiple communities and that much of the available data are now dated (some of it being more than 30 years old)." Several other types of more recent halibut subsistence data are, however, available and are provided in SIA Section 5.4. The concluding sentence of Section 4.5.5 has been edited for clarity in the Final EIS.

SIA Section 3.5 has been edited for the Final EIS to state that at the December 2021 NPFMC meeting, the Council received a presentation from NMFS on the Halibut ABM tribal engagement and consultation process and its results prior to Council final action. The revisions also note the documents related to the consultation process that were available to the Council for their consideration at the December 2021 meetings prior to final action. This is also noted in Section 1.3.1 of the EIS.

The SIA concludes in Section 4.5.5 that "While there are no direct impacts anticipated to halibut subsistence because of the proposed alternatives, indirect and/or cumulative impacts could occur" [emphasis added]. As noted in SIA Section 7.2.4, the IPHC accounts for subsistence halibut catches and other sources of halibut mortality before setting commercial halibut catch limits each year. While subsistence removals are accounted for in setting the commercial halibut catch limits, subsistence halibut harvests are not constrained by this process. There are no caps on removals from Area 4 in the subsistence halibut fishery analogous to quotas established annually for the commercial halibut fishery, nor are there size limits on halibut harvested for subsistence use. None of this would change under any of the proposed alternatives.

Also as noted in SIA Section 7.2.4, subsistence halibut harvests (and harvesters) could, however, indirectly benefit from the implementation of the proposed action alternatives if the proposed action ultimately implemented were to result in changes to the spatial distribution of halibut stock or an overall increase in availability of halibut for subsistence harvest and/or an accompanying decrease in effort and expense in harvesting halibut for subsistence use over the long term. These indirect benefits could occur if the Pacific halibut stock itself benefits from additional promotion of conservation of the halibut under the individual action alternatives. The proposed alternatives could also have indirect adverse impacts on halibut and other subsistence pursuits, as discussed in SIA Section 7.2.4. These types of impacts fall into two main categories: (1) impacts to halibut and other subsistence pursuits because of loss of revenue from the BSAI groundfish fishery under the action alternatives (or the BSAI halibut fishery under the no-action alternative), revenue that could have otherwise been used to purchase fuel, vehicles, or other subsistence-related gear, or otherwise offset expenses required to engage in a range of subsistence pursuits and (2) impacts to other subsistence pursuits because of the loss of opportunity to use commercial fishing gear and vessels for subsistence pursuits, including the retention of halibut from commercial catch for subsistence use.

8.4.1.5 Comments on Alaska Natives/Tribes

Comment 8.4.1-39: The current utilization of an arbitrary static cap for halibut PSC is inequitable, unscientific, and blatantly irresponsible fisheries management. Under the current management regime,a static PSC catch limit has resulted in an inequitable fisheries management system that disproportionately benefits the Seattle based A-80 fleet, while the directed halibut fishery that is managed based on halibut abundance is marginalized and reduced based on PSC removals by the A-80 fleet to a point where rural coastal communities, that are majority Alaska Native adjacent to the resource, can no longer participate in a fishery that has been carried out in the region for over 6000 years.

Response: The concerns with the no-action alternative for directed halibut fishery participants under halibut low abundance conditions are inherently recognized in the Council's purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

As described in SIA Section 6.3.5.3, multiple factors contributed to the discontinuation participation of multiple rural BSAI coastal communities in the directed halibut fishery during the period 2010-2019 in addition to low halibut quotas. As noted in SIA Section 7.2.3.1, for those CDQ groups whose experience in, or assessment of, supporting an in-region small boat commercial halibut fishery would indicate that the effort is not or would not be sustainable (or equitable to all the constituent communities they serve), especially under low abundance conditions, it is unknown whether the beneficial impacts that may accrue from implementation of one or more of the proposed alternatives would be sufficient to pass a threshold whereby in-region CDQ halibut fisheries programs would be considered sustainable (or equitable) even in low abundance conditions. For this reason, it is not possible to predict whether implementation of any one of the proposed alternatives would potentially result in a different pattern of in-region CDQ community commercial small boat directed BSAI/Area 4 halibut fishery engagement than is seen at present.

Comment 8.4.1-40: Status quo bycatch has consumed a larger and larger proportion of total halibut removals in the Bering Sea producing large amounts of waste, which dramatically impacts indigenous and underserved communities in Alaska, and squandered this critical resource.

Response: Potential environmental justice concerns due to impacts to indigenous and underserved communities is noted in SIA Section 7. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's Preferred Alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

Comment 8.4.1-41: The EIS Appendix 1. SIA states that "subsistence harvest of halibut would not be directly affected by the proposed action alternatives (SIA page 251)." However, as the SIA also notes, many tribal members harvest subsistence halibut while commercial fishing. Information and documentation regarding the nine Alaska Native communities, represented by respective tribal governments, that have experienced a complete cessation of local vessel participation in the BSAI halibut fishery since 2013-14 and the associated impacts to subsistence activities of tribal members in those communities is noticeably limited or absent. This lack of information is of particular concern, as we have spoken about it in written and oral testimony to the NPFMC throughout this process, and points to the need for better and additional information collated prior to taking federal actions that potentially affect tribal governments. It appears as though the analysts did not make contact with the tribal governments of those nine villages that were forced out of the BSAI halibut fishery.

Response: As noted in EIS Section 4, the IPHC accounts for subsistence and recreational halibut catches, incidental halibut removals in the groundfish fisheries, and other sources of halibut mortality before setting commercial halibut catch limits each year. Each year, the IPHC estimates subsistence harvest by using the actual harvest level from the previous year as a base, and then adjusts the estimate by considering how accurate the previous year's harvest estimate was compared to actual harvest for that year. While subsistence removals are accounted for in setting the commercial halibut catch limits, subsistence halibut harvests are not constrained by this process. There are no caps on removals from Area 4 in the subsistence halibut fishery analogous to quotas established annually for the commercial halibut fishery, nor are there size limits on halibut harvested for subsistence use.

As noted in SIA Section 7.2.4, subsistence halibut harvests (and harvesters) could indirectly benefit from the implementation of the proposed action alternatives if the proposed action ultimately implemented were to result in changes to the spatial distribution of halibut stock or an overall increase in availability of halibut for subsistence harvest and/or an accompanying decrease in effort and expense in harvesting halibut for subsistence use over the long term. These indirect benefits could occur if the Pacific halibut stock itself benefits from additional promotion of conservation of the stock under the individual action alternatives (and to the extent that whatever conservation gains that may be realized are not fully redirected into additional opportunities for the commercial halibut fishery, while recognizing that the relationship between the commercial and subsistence fisheries is complex and varies by community). As noted in SIA Section 7.2.1, however, there is likely to be little difference among the average future halibut spawning biomass under levels of PSC anticipated across all the alternatives, including the no action alternative, for multiple reasons.

The proposed alternatives could, however, have indirect adverse impacts on halibut and other subsistence pursuits. As noted in SIA Section 7.2.4, these types of impacts fall into two main categories:

Impacts to halibut and other subsistence pursuits because of loss of income from the BSAI Amendment 80 groundfish fishery under the action alternatives (or the BSAI/Area 4 halibut fishery under halibut low abundance conditions under the no-action alternative). This income, typically derived from CDQ quota leasing fee revenue, could have otherwise been used to purchase fuel, vehicles, or other subsistence-related gear, or otherwise offset expenses required to engage in a range of subsistence pursuits. These types of impacts could be experienced by anyone engaged in the potentially affected fisheries who uses income derived from the fishery to help capitalize subsistence pursuits, regardless of the community of residence of the individual involved or the location of those subsistence pursuits. These types of impacts, then, could occur in areas far removed from the location of the management action itself (e.g., these types of impacts could, for example, theoretically be felt by residents of relevant CDQ communities if there were a decline in BSAI Amendment 80-related groundfish revenues that would have otherwise been used in underwriting subsistence efforts).

Impacts to halibut and other subsistence pursuits because of the loss of opportunity to use commercial fishing gear and vessels for subsistence pursuits under the no-action alternative. This would result from vessels not being ready to go as a result of being prepared for commercial fishing or from the simultaneous harvest of fish and game resources during commercial fishing forays, including the retention of halibut from commercial catch for subsistence use, where these assets are used in such a manner that commercial and subsistence catches are jointly produced, based on shared use of fixed and variable inputs.

As described in SIA Section 6.3.5.3, multiple factors contributed to the discontinuation participation of nine Alaska Native communities, each home to a federally recognized tribal entity, in the directed halibut fishery during the period 2010-2019 in addition to low halibut quotas. As further noted in SIA Section 6.3.5.3, the shift away from targeted support of in-region halibut fisheries has unavoidably had adverse effects in communities most directly benefitting from previous fisheries initiatives that facilitated the engagement of these communities in the directed halibut fishery.

With respect to contact with the tribal governments of affected communities, Section 1.3 of the EIS describes efforts made by NMFS and the Council to solicit input on this issue, including letters notifying Tribal governments of the action and offering tribal consultation under E.O. 13175.

Comment 8.4.1-42: We commend the SIA's approach regarding the impacts of this action on tribal governments and its members as an example of how federal actions and policymaking should be presented. First, we commend the SIA analysts for identifying the federally recognized Tribes representing the communities that are identified as substantially engaged in the BSAI commercial halibut harvesting and processing, as well as those substantially engaged in the BSAI Groundfish A80 Sector. This approach substantially facilitates the review of the extensive analysis by the tribal stakeholders and the broader public, regarding the impacts of this action on tribal governments and members. This is an example of how analyses of the impacts of federal actions and policymaking should be presented, and how such information can help guide the federal government and its agencies in decision-making that affects Native Americans and Alaska Natives in a manner that is consistent with constitutionally recognized protections, and the rights and obligations established in the relationship between the federal government and tribal governments. We also appreciate the clear legal framework for this action that was laid out by the analysts, including statutory authorities, agency guidance, and recent executive orders that are relevant to evaluating and balancing both tribal rights vis-à-vis this federal action, but also the various Magnuson-Stevens Act National Standards at play in this action. We also commend the analysis for its extensive documentation of the importance of halibut to tribal members of the Aleut Community of St. Paul Island Tribal Government in particular.

Response: NMFS acknowledges this comment.

Comment 8.4.1-43: The analysis lacks documentation outreach to 12 tribal entities affected by this action. Our tribal government was not contacted to engage in tribal consultation, and we question whether any tribal governments were part of this analysis, as we have not been able to locate any reference to or notice of tribal consultation by the agency. We identified twelve quotes in the DEIS attributed to St. Paul tribal fishermen. We appreciate the efforts paid to our community, but such documentation appears to be severely or totally lacking for twelve of the other tribal governments affected by this action. One tool for government-to-government timely and consistent communication on actions that may potentially impact Tribes is the formal tribal consultation process.

Response: NMFS acknowledges this comment. The FEIS has been updated to include this information in Section 1.3.

Comment 8.4.1-44: The current management scenario is inequitable regarding the treatment of directed halibut users, particularly at low to very low levels of halibut abundance. This inequity is noted throughout the DEIS and SIA. For example, we (St. Paul) are one of seventeen Alaska Native communities identified as a "halibut dependent community" in the SIA. Indeed, as noted in the SIA, St. Paul is one of three communities with "virtually complete community fleet dependency on BSAI halibut ex-vessel gross revenues (pg. xxiv)", along with St. George and Savoonga. The DEIS and associated documents indicate that the Regulatory Context (pg. 3-4) assessment of the proposed action is guided largely by National Standard 8, the National Environmental Policy Act (NEPA), and Executive Order (EO) 12898 regarding Environmental Justice in Minority and Low-Income Populations. The DEIS and associated documents do not speak to the importance of National Standard 4 – Equity in Allocations, and more specifically the National Marine Fisheries Service guidelines to National Standard 4 (Section 3 Factors in Making Allocations) which state that "[w]here relevant, judicial guidance and government policy concerning the rights of treaty Indians and aboriginal Americans must be considered in determining whether an allocation is fair and equitable." Since the current action, which is partly allocative in nature, could have a disproportionate impact on Alaska Natives, National Standard 4 is a key guide to the NPFMC's decision-making on this action.

Response: The considerations relevant to policy-level decision making with respect to National Standard 4 (and the other National Standards) are discussed in the "Magnuson-Stevens Act and Pacific Halibut Act Considerations" portion of FEIS Section 7. As noted in that section, the proposed action alternatives do not include an allocation or assignment of fishing privileges as defined in National Standard 4. As noted in SIA Section 3.2 and elsewhere, the proposed action alternatives may, however, have incidental allocative effects. The SIA contains information on community engagement, dependency, and federally recognized tribal status, where relevant, encompassing all states in which those communities are located, to support the National Standard 4 FEIS analysis as well as the analysis of potential incidental allocative effects of the proposed action alternatives.

As noted in SIA Section 7.2, it is assumed that the BSAI/Area 4 commercial halibut fishery would potentially benefit in low halibut abundance conditions from implementation of the action alternatives due to what could effectively (if indirectly) be a reallocation of access to halibut between the BSAI groundfish and BSAI/Area 4 directed halibut fisheries that would potentially occur to greater or lesser degrees under the different action alternatives. The beneficial impacts of these incidental allocative effects, were they to occur, would be realized in the near-term following action alternative implementation (assuming low abundance conditions relevant to the design of the alternative were occurring at the time of implementation) and potentially in the long-term, if low abundance conditions were to persist over time. As noted in FEIS Section 5.4, given that IPHC catch setting policy removes O26 bycatch by IPHC regulatory area, the spatial distribution of Amendment 80 halibut PSC may impact the distribution of directed halibut fishery catch limits within the BSAI/Area 4. Specifically, while total Amendment 80 halibut PSC mortality has decreased, the distribution of PSC occurrence within Area 4 has stayed fairly consistent, with Area 4CDE accounting for between 83 percent and 90 percent of annual Amendment 80 PSC since 2015 (when spatial resolution of PSC occurrence substantially improved). In other words, the directed halibut fishery in Area 4CDE would have the greatest potential for experiencing whatever beneficial incidental reallocative effects may occur under the proposed action alternatives (and may have the greatest potential for experiencing adverse impacts during halibut low abundance conditions under the no action alternative, especially compared to conditions that existed before 2015 when changes were made to the NMFS methodology for apportioning PSC mortality to IPHC areas, as described in FEIS Section 5.4). NMFS did consider the rights of treaty Indians and aboriginal Americans in determining whether the apportionment of halibut under the alternatives was fair and equitable.

Comment 8.4.1-45: The Council on Environmental Quality (CEQ) environmental justice guidance under NEPA specifically calls for consideration of potential disproportionately high and adverse impacts to Indian Tribes beyond a more general consideration of potential disproportionately high and adverse impacts to minority populations (Council on Environmental Quality 1997).

Response: As noted in the EIS Appendix 1, SIA Section 3.4, the provisions of E.O. 12898 on environmental justice and associated CEQ guidance apply to federally recognized Alaska Native tribes in the region potentially affected by the proposed action alternatives in addition to a more generalized consideration of potentially adversely impacted minority populations. The ANCSA status, ANCSA regional corporation, ANCSA village corporation, federal tribal recognition status, and CDQ membership status of each potentially substantially engaged and/or substantially dependent Amendment 80 and/or BSAI/Area 4 halibut fishing community is noted in the community institutional summary table(s) in each CDQ region's "Historical Overview" section (SIA Sections 6.1.2 [APICDA], 6.2.2 [CBSFA], 6.3.2 [CVRF], and 6.4.2 [NSEDC]). Potential environmental justice concerns are described by community or groups of communities, including those identified as home to federally recognized tribal entities, as relevant in SIA Section 7.

Comment 8.4.1-46: Of the seventeen halibut-dependent communities in the Bering Sea, more than half are no longer participating in this fishery as a result of being forced out due to dwindling access to the very resources that our ancestors stewarded for past millennia. We cannot stress enough the importance of our tribal rights that are critical to the survival of Indigenous Peoples which are currently being ignored in this process in favor of large scale industrial fishing interests that have only been a reality in our waters since 2008. The trajectory of this process contradicts both existing federal laws regarding Native Americans, Magnuson-Stevens Act and the National Standards, and the recent Presidential Executive Orders to advance racial equity and support for underserved communities through the federal government and reaffirm the federal government's commitment to tribal sovereignty and strengthening nation-to-nation relationships.

Response: As described in the EIS Appendix 1, SIA Section 6.3.5.3, multiple factors contributed to the discontinuation participation of multiple rural BSAI coastal communities in the directed halibut fishery during the period 2010-2019 in addition to low halibut quotas. The concerns with the no-action alternative for directed halibut fishery participants under halibut low abundance conditions are inherently recognized in the Council's purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. As noted in SIA Section 7.2.3.1, for those CDQ groups whose experience in, or assessment of, supporting an in-region small boat commercial halibut fishery would indicate that the effort is not or would not be sustainable (or equitable to all the constituent communities they serve), especially under low abundance conditions, it is unknown whether the beneficial impacts that may accrue from implementation of one or more of the proposed alternatives would be sufficient to pass a threshold whereby in-region CDQ halibut fisheries programs would be considered sustainable (or equitable) even in low abundance conditions. For this reason, it is not possible to predict whether implementation of any one of the proposed alternatives would potentially result in a different pattern of in-region CDQ community commercial small boat directed BSAI/Area 4 halibut fishery engagement than is seen at present.

Comment 8.4.1-47: The SIA on tribal and community impacts is well organized, yet viewed through the lens of the CDQs. While the CDQs play a critical role in Western Alaska, their objectives do not always coincide with those of the tribal governments in their regions, and their status with respect to the federal government is entirely different. CDQs are U.S. corporate entities and citizens subject to the laws of the United States. As sovereign nations, tribal governments are in an entirely different category. With a few exceptions, it appears that the analysts did not engage with the tribal governments for a direct understanding and thorough evaluation of how the loss of halibut through this and previous federal actions has impacted those Tribes, and how federal commitments to those tribes may have been already violated or may potentially be violated by the various alternatives in this action. Thus, the SIA obscures the dependence of individual Tribes on the halibut resource, as well as the commitment required of the federal government through constitutional and judicial principles to provide for the well-being of individual tribes and tribal members impacted by this action. For some Tribes within the various CDQ regions, halibut is essential to their sense of being and tribal identity and cannot be replaced with revenues that originate from the endeavors of their CDQ affiliations. The loss of halibut threatens their survival and may result in their extinction as a unique Peoples with a unique and irreplaceable culture.

Response: Part of the introduction to the EIS Appendix 1, SIA Section 6 (Regional and Community Context of the Fisheries) has been revised to clarify the multiple reasons for organizing the discussion around CDQ regions and will read as follows in the Final SIA: "The following sections provide a regional and community-by-community characterization of the local context of BSAI Amendment 80, BSAI halibut commercial, and BSAI halibut subsistence fisheries for those communities, focusing on communities substantially engaged in or substantially dependent on the Amendment 80 fishery and/or the BSAI/Area 4 directed halibut fisheries. For Alaska communities, these are organized by CDQ region as these regions provide logical units of socioeconomic analysis, covering the BSAI coastal region, and the fact that CDQ entities mediate, to varying degrees, direct engagement of local communities in the relevant fisheries (and would themselves be potentially affected in multiple ways by the proposed alternatives, including the no action alternative). For example, some local fleets in CDQ communities participate in the directed halibut fishery to greater or lesser extent using CDQ quota, with regional differences influenced, in part, by variations in percentage of halibut quota held as CDQ reserves in the different subareas of Area 4 that range from zero (Area 4A) to 100 percent (Area 4E). Further, relative to most if not all other CDQ allocations, halibut can be efficiently fished by a small boat fleet and some CDQ groups currently support (or have previously supported and may again in the future support) in-region directed halibut fishery programs designed to facilitate entry into (and continued engagement in) the fishery by the residents of their constituent communities. It is important to note, however, that the organization of this discussion by CDQ region should not be taken to imply that the specific interests or priorities of the CDQ groups themselves always mirror those of the individual sovereign tribal governments within their region, just as the specific interests or priorities of individual tribal governments do not always mirror one another."

The ANCSA status, ANCSA regional corporation, ANCSA village corporation, federal tribal recognition status, and CDQ membership status of each potentially substantially engaged and/or substantially dependent Amendment 80 and/or BSAI/Area 4 halibut fishing community is noted in the community institutional summary table(s) in each CDQ region's "Historical Overview" section (SIA Sections 6.1.2 [APICDA], 6.2.2 [CBSFA], 6.3.2 [CVRF], and 6.4.2 [NSEDC]). SIA Table 16, BSAI Halibut Catcher Vessels Ex-Vessel Gross Revenue Diversification by Community of Vessel Historical Ownership Address, All Communities, 2010-2019, provides information on revenue diversification of vessels participating in the BSAI/Area 4 directed halibut fishery, indicating the dependency of those vessels, as measured in ex-vessel gross revenue, on the directed halibut fishery compared to all other fisheries in which those vessels participate. SIA Table 17, BSAI Halibut Catcher Vessel and All Catcher Vessel Ex-Vessel Gross Revenue Diversification by Community of

Vessel Historical Ownership Address, 2008-2019, provides information on revenue diversification of all commercial fishing vessels with ownership addresses in the communities (including all area, gear, and species fisheries) that have any vessels participating in the BSAI/Area 4 directed halibut fishery (i.e., the local "community fleet"). This indicates the dependency of the community fleet, as measured in ex-vessel gross revenue, on directed halibut fishery revenue compared to the revenue from all other fisheries in which any of the community vessels participate. As shown, the dependency of both the halibut vessels themselves and community fleets as a whole on the BSAI/Area 4 directed halibut fishery is substantial and in multiple cases profound for BSAI coastal communities engaged in the fishery in recent years. This includes every community identified as substantially engaged in and/or substantially dependent on the BSAI/Area 4 directed halibut fishery, including those communities that are home to federally recognized Alaska Native tribes.

SIA Section 7.2.6 provides a discussion of potential cumulative small/rural community and cultural context issues within the larger discussion of regional and community-level social impacts by alternative. This discussion includes a detailed discussion of the cultural importance of halibut and halibut fishing.

SIA Section 3.5 has been revised to include information on the tribal consultation process. At the December 2021 NPFMC meetings, the Council received a presentation from NMFS on the Halibut ABM tribal engagement and consultation process and its results prior to Council final action. Related documents available to the Council for their consideration at the December 2021 meetings prior to final action included: Summary of Tribal Consultation Teleconference to Discuss *Bering Sea and Aleutian Islands Abundance-based Management of the Amendment 80 Prohibited Species Catch Limit* with Aleutian Pribilof Islands Association, Inc., July 16, 2021; Halibut Abundance Based Management Consultation [Draft] Summary, Aleut Community of St. Paul Island and National Marine Fisheries Service, November 24, 2021 Videoconference; and Draft for Participants Review, Halibut Bycatch Listening Session Summary, November 29th, 2021 Teleconference. Links to the documents themselves are also now provided in that SIA section. The FEIS has been updated to include this information in Section 1.3.

Comment 8.4.1-48: We remain actively engaged to plead for equitable decision-making and ensure our continued participation in the directed halibut fishery. Indeed, our participation in directed halibut fishing is guaranteed as part of our federally protected fishing rights in the Bering Sea, as explained in the letter from the Department of the Interior to the National Oceanic and Atmospheric Administration (26 May 2015, attached). This letter highlights the vital importance of each agency's role in protecting our tribal fishing rights. This letter calls for NOAA to ensure "access to the fishery resource at a level sufficient to sustain the local fishing economy and subsistence needs of the Tribe."

Response: NMFS acknowledges this comment. The FEIS has been updated in Section 1.3 to include information on efforts by NMFS and the Council to encourage participation the process and solicit input from Alaska Native entities, individuals, and Tribal governments, including Tribal consultation that took place under E.O. 13175.

The following comment was submitted by the Department of the Interior and contains suggestions for improving the analysis with regard to Tribal Consultation:

Comment 8.4.1-49: We appreciate that the DEIS recognizes the vital importance of halibut to the cultural identity and way of life of many Alaska Native Tribes. We are concerned however, that Alaska Native Tribes have not been formally consulted on a government-to-government basis during preparation of the DEIS, despite consultation with other groups, such as the Alaska Fisheries Information network. Consultation with Tribal nations must be "regular, meaningful, and robust" to facilitate true government-to-government engagement between Tribal governments and the Federal Government. *See* Presidential Memorandum on Tribal Consultation and Strengthening Nation- to-Nation Relationships; *see also* Executive Order 13175, Consultation and Coordination withIndian Tribal Governments. Executive Order 13175 specifies that each Federal agency must have an accountable process to ensure meaningful and timely input by Tribal officials in the development of regulatory policies that have Tribal implications. For this DEIS, the National Marine Fisheries Service (NMFS) is the agency responsible for carrying out Tribal Consultations. *See* SIA Section 3.5. Here, we recommend that NMFS immediately begin consultation with affected Tribal governments and that the information received from consultation be fully analyzed and addressed in the final EIS and Record Decision.

We are concerned that statements in SIA appear to leave open the possibility that consultation may not occur prior to final action by the Council. For example, Section 3.0 states, "assuming their availability prior to final action," results of Tribal consultation and collaboration processes will be incorporated into the final version of this SIA. On February 8, 2021, the Council adopted a motion that recommended, among other actions, that the Council work with NMFS to "receive and understand results of Tribal consultation meetings as early in the process as possible, preferably prior to Council final action."

Because of the lack of Tribal consultation on the issues, we are concerned that potential impacts to Tribes and their members, whether engaged in commercial or subsistence activities, have not been fully analyzed and incorporated into the DEIS alternatives analysis. To be meaningful, Tribal consultation must be conducted and its results analyzed and provided to decision makers before a final decision has been made. This is consistent with the purposes of NEPA, which requires that Federal agencies assess the environmental effects of their proposed actions prior to making decisions. Failure to account for Tribal interests in decision-making conflicts with Section 5(b)(2)(A) of Executive Order 13175 which directs that "no agency shall promulgate any regulation that hastribal implications, that imposes substantial direct compliance costs on Indian tribal governments, and that is not required by statute, unless the agency, prior to the formal promulgation of the regulation consulted with tribal officials early in the process of developing the proposed regulation." We believe that Tribal consultation with Alaska Native Tribes would provide data that should beincorporated into a final decision implementing Bering Sea and Aleutian Islands halibut abundance-based management.

Response: The EIS Sections 1.3.1, 3.5, and Appendix 1, SIA have been revised to include information on the tribal consultation process through the December 2021 NPFMC meetings. At those meetings, the Council received a presentation from NMFS on the Halibut ABM tribal engagement and consultation process and its results prior to Council final action. Related documents available to the Council for their consideration at the December 2021 meetings prior to final action included: Summary of Tribal Consultation Teleconference to Discuss *Bering Sea and Aleutian Islands Abundance-based Management of the Amendment 80 Prohibited Species Catch Limit* with Aleutian Pribilof Islands Association, Inc., July 16, 2021; Halibut Abundance Based Management Consultation [Draft] Summary, Aleut Community of St. Paul Island and National Marine Fisheries Service, November 24, 2021 Videoconference; and Draft for Participants Review, Halibut Bycatch Listening Session Summary, November 29th, 2021 Teleconference. Links to the documents themselves are also now provided in the same SIA section (as well as on the Council website under the December 2021 meetings agenda).

The FEIS has been updated in Section 1.3 to include information on efforts by NMFS and the Council to encourage participation the process and solicit input from Alaska Native entities, individuals, and Tribal governments, including Tribal consultations that took place under E.O. 13175. The EIS Appendix 1. SIA Section 4.5.6 (Local and Traditional Knowledge) has been revised to reference the

NOAA Fisheries and National Ocean Service Guidance and Best Practices for Engaging and Incorporating Traditional Ecological Knowledge in Decision-Making. As noted in that SIA section, Council's Local Knowledge (LK)/Traditional Knowledge (TK)/Subsistence Taskforce was and is aware of 2019 NOAA guidance, but ultimately recommended that LK/TK/Subsistence protocols that were more contextualized, focusing on best practices/points of consideration specific to the North Pacific and the Bering Sea, be developed for use in the region. See the Taskforce minutes at: https://meetings.npfmc.org/Meeting/Details/1223.

The following comment was submitted by the Environmental Protection Agency and contains suggestions for improving the analysis with regard to Tribal Consultation:

Comment 8.4.1-50: The DEIS refers to *Executive Order 13715 of November 6, 2000, Consultation and Coordination with Indian Tribal Governments* and the *Presidential Memorandum of January 26, 2021, Tribal Consultationand Strengthening Nation-to-Nation Relationships in relation to Tribal Consultation.* The DEIS did not, however, include documentation of the Tribal Consultation that took place during the NEPA process. We recommend that NMFS immediately engage in "regular, meaningful, and robust" government-to-government consultation with the Tribal governments to meaningfully assess potential impacts to Alaska Native Tribes who have relied on the halibut fishery to support the overall health and welfare of their communities for generations. We further recommend that the analysis describe how and when tribal consultation took place and include a discussion of the results of the meetings and how the Tribal Governments' input was utilized. We further recommend that the analysis include reference to the NOAA Policy on Government-to-Government Consultation with Federally Recognized Indian Tribes and Alaska Native Corporations and the NOAA Tribal Consultation Handbook. We also recommend that the FEIS reference NOAA's 2019 NOAA Fisheries and National Ocean Service Guidance and Best Practices for Engaging and Incorporating Traditional Ecological Knowledge in Decision-Making.

Response: See the response to Comment 8.4.1-49.

8.4.1.6 Comments on Environmental Justice and other cultural and social interests

Comment 8.4.1-51: Many Bering Sea communities and halibut fishermen throughout Alaska have lost direct access to the halibut fishery and many stand on the brink. We need healthy adult stocks and young fish that migrate from the Bering Sea downstream to the Gulf of Alaska for our coastal and culture economies. The report does not highlight these social equity issues. Thousands of Alaska Natives depend on halibut for food and culture from St. Paul to Southeast Alaska, over 2,000 halibut fishermen and their crews and families, and processors and other support businesses along the entire coast of Alaska. The small boat longline fishery has been sustainable for over 100 years. We are marginalized in the DEIS for five Seattle trawl companies. These issues must be addressed in the final DEIS.

Response: The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement, and the economic, social, cultural importance of halibut and subsistence and commercial halibut fishing is noted in SIA Section 7.2. As noted in that same section, of the 17 Alaska communities considered BSAI halibut-dependent for the purposes of the SIA: 15 have minority residents (including Alaska Native residents) accounting for more than 80 percent of the total population; 16 are home to federally recognized Tribes; 15 are member communities of CDQ groups; and 14 have a greater percentage of their population living below the poverty line than does the state of Alaska as a whole. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. It is assumed that the BSAI/Area 4 commercial halibut fishery would potentially benefit in low halibut abundance conditions from implementation of the action alternatives due to what could effectively (if indirectly) be a reallocation of access to halibut between the BSAI groundfish and BSAI/Area 4 directed halibut fisheries that would potentially occur to greater or lesser degrees under the different action alternatives. The beneficial impacts of these incidental allocative effects, were they to occur, would be realized in the near-term following action alternative implementation (assuming low abundance conditions relevant to the design of the alternative were occurring at the time of implementation) and potentially in the long-term, if low abundance conditions were to persist over time. Regarding impacts to Southeast Alaska and other Gulf of Alaska communities, please see the combined response to Comments 8.4.1-15, 8.4.1-16, and 8.4.1-26 for a description of the EIS discussion of impacts on juvenile halibut and impacts to the halibut spawning biomass. Because of the uncertainties described in that response, attempts to quantify potential impacts of the different proposed alternatives to downstream fishermen and specific downstream communities, such as those in Southeast Alaska, would be speculative.

Comment 8.4.1-52: The current SIA in Appendix 1 of this report inadequately analyzes the potential socio-cultural impacts of the proposed alternatives. This is a result of lack of meaningful community engagement to describe local values and knowledge and obtain relevant ethnographic qualitative data essential for conducting a SIA. The DEIS lacks analysis of the historic and cultural utilization of halibut by BSAI communities including traditional fishing techniques, technologies and cultural understandings of residents' relationship to and with halibut. Local and traditional knowledge is absent that would provide meaningful insights. The DEIS contains near exclusive reliance on quantitative methods, which is not adequate for evaluating the impacts of the proposed management plans. This range of issues results in a biased analysis because it fails to describe the subsistence, nutritional, social, and spiritual importance of halibut to BSAI area Alaska Native people and directed halibut fishermen. The DEIS is not adequate to evaluate the potential socio-cultural impacts of the proposed options.

Response: The EIS Appendix 1. SIA examines economic dependency of vessels and processors participating in the BSAI/Area 4 directed halibut fishery associated with individual communities described in SIA Sections 5.2 and 5.3, respectively, using quantitative indicators with appropriate caveats noted. SIA Section 5.4 provides a summary of relevant halibut subsistence information, with additional subsistence information appearing in each of the regional discussions in SIA Section 6, which also contain information on the historic use of halibut. SIA Section 7.2.6 (Potential Cumulative Small/Rural Community and Cultural Context Issues) provides descriptions of non-economic social and cultural aspects of the importance of halibut and halibut fishing for coastal Bering Sea communities for which secondary data are available. The purpose of that portion of the analysis is to convey the cultural significance of the BSAI halibut resource and to help inform the analysis of potential cumulative impacts of the no-action and proposed action alternatives, with the halibut fishing related descriptions of values and perceptions in that portion of the analysis being based on available LK, TK, and the social science of LK. This EIS uses the best available scientific information. The level of information on the subsistence, nutritional, social, and spiritual importance of halibut to BSAI area Alaska Native people and directed halibut fishermen that the commenter suggests is necessary for this EIS is incomplete or not readily available and would require undertaking original research and data development, including ethnographic research. The overall costs of obtaining such information precluded NMFS and the Council from including that level of detail in this EIS. Further, NMFS and the Council believe that the information and analysis presented in the EIS is sufficient to inform this decision-making process and provides full and fair discussion of significant environmental impacts. The Council and the halibut ABM/EIS-specific public engagement process is described in Section 1.3, as is the tribal consultation process, both of which provided input for Council and NMFS decision making.

Comment 8.4.1-53: Environmental justice is "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income." EJ must be considered if a proposed undertaking will have an adversely high and potentially adverse human health or environmental on a minority population and low-income population. Ascertaining the socio-cultural impact to BSAI communities of continued high levels of halibut PSC requires documentation of LTK based on partnership with directed halibut fishermen and dependent communities. The appropriate source of information to assess such impacts is area residents and harvesters who have lived and fished in the region for generations and who have a direct dependency on halibut for nutrition, scaled economic benefit, and socio-cultural identity. There was not an effort to engage regional communities to address LTK as part of this SIA. The purpose of an SIA is to create space for the voices of under-represented and marginalized communities to evaluate the potential impact of a proposed action. This cannot be accomplished without direct engagement with affected BSAI communities and other directed halibut fishermen or through use of existing quantitative data and a handful of phone calls to regional entities. Such work necessitates a study in partnership with the affected communities, with clear objectives and methodology. The SIA is inadequate and does not address the potential socio-cultural impacts on area residents and regional halibut fishermen, because they were not asked.

Response: The Council and the halibut ABM/EIS-specific public engagement process is described in Section 1.3, as is the tribal consultation process, both of which provided input for Council and NMFS decision making.The EIS and the SIA have highlighted potential environmental justice concerns where the potential for disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, and/or Alaska Native/Native American tribes associated with the no-action or action alternatives have been identified. In SIA Section 6, community institutional summaries are presented identifying ANCSA regional and village corporations and federally recognized tribal entities as are tables including demographic indicators of minority and low-income populations for relevant communities. In SIA Section 7, summaries of potential environmental justice concerns are presented for relevant communities. SIA Section 7.2.6 (Potential Cumulative Small/Rural Community and Cultural Context Issues) includes a section on the cultural importance of halibut and halibut fishing. The regulatory context that drives the preparation of SIAs is summarized in SIA Section 3. This EIS uses the best available scientific information. NMFS and the Council believe that the information and analysis presented in the EIS is sufficient to inform this decision-making process and provides full and fair discussion of significant environmental impacts.

Comment 8.4.1-54: The directed halibut fishery is a way of life for the people of halibut-dependent communities in Area 4. The halibut fishery provides critically needed income and economic opportunity to communities that face extraordinary challenges and obstacles to prosperity due to their remote locations, limited opportunities for economic development, and the effects of historical discrimination against predominantly Alaska Native residents. Unfortunately, these same communities have been forced to bear unfair and disproportionate burdens from A80's bycatch under the current PSC limits. Under conditions of low abundance, the current static bycatch limits allow A80 to waste the majority of halibut available in Area 4CDE, directly reducing the amount of halibut available to the directed fishery. This has reduced available directed fishery catch to levels that are neither fair and equitable nor sustainable and that jeopardizes its continued existence.

Response: The economic, social, and cultural importance of the directed BSAI/Area 4 halibut fishery to halibut-dependent communities in the BSAI region is documented in multiple sections of the SIA. The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

Comment 8.4.1-55: The marginalization of Alaska Native communities' participation in the most long standing and sustainable small scale fishery in the BSAI region clearly violates EO 12898 on environmental justice. This Executive order defines Environmental Justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income." Environmental Justice must be considered if the proposed undertaking will have an adversely high and potentially adverse human health or environmental on a minority population and low-income population." Alternative 4 is the only management option that meaningfully addresses equitable access for BSAI communities and the broader directed halibut fishing fleet. Anything less continues to perpetuate and codify colonial marginalization of Alaska Native communities and fisheries for the sole benefit of an industrial scale corporate fleet based over 1500 miles from the Bering Sea.

Response: The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The text quoted in this comment is not a part of EO 12898, rather, it is the Environmental Protection Agency's own definition interpreting that EO. The EIS and the SIA have highlighted potential environmental justice concerns where the potential for disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, and/or Alaska Native/Native American tribes associated with the no-action or action alternatives have been identified. In SIA Section 6, community institutional summaries are presented identifying ANCSA regional and village corporations and federally recognized tribal entities as are tables including demographic indicators of minority and low-income populations for relevant communities. In SIA Section 7, summaries of potential environmental justice concerns are presented for relevant communities. SIA Section 7.2.6 (Potential Cumulative Small/Rural Community and Cultural Context Issues) includes a section on the cultural importance of halibut and halibut fishing. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions, and in that case proposes no change to the Amendment 80 halibut PSC limit.

The following comment was submitted by the Department of Interior and contains suggestions for improving the analysis with regard to Environmental Justice and Alaska Native cultural interests (*Comment 1.4.1-61)*:

Comment 8.4.1-56: The SIA states that there are no known published sources of LK or TK that would inform the analysis in the DEIS. However, Council staff compiled LK data from the A80 commercial groundfish trawl fleet through interviews, correspondence, and written and oral public testimony. That information provided insight into the range of opportunities and constraints faced by A80 vessel operators over the course of a fishing year. In contrast, Council staff reached out to contacts in Bering Sea Aleutian Islands communities and Alaska Native organizations for additional data sources on LK and TK. In response they received a white paper compiled by staff of the Aleut Community of St. Paul Island Ecosystem Conservation Office that included community voices and perspectives on the cultural significance of halibut. We appreciate that the Council reached out to Tribal communities to solicit LK and TK information. We believe that formal government-to-government consultation would have been more appropriate and would have generated significantly more accurate and useful data.

Response: The EIS Appendix 1. SIA Section 4.5.6 states, in part: "There are no known peer-reviewed [emphasis added], published sources of local knowledge (LK) or traditional knowledge (TK) that would directly inform the analysis of the management actions being analyzed in this document, based in part on the nature of the proposed action alternatives." That same section goes on to state in part: "Section 7.2.6 of this SIA (Potential Cumulative Small/Rural Community and Cultural Context Issues) does, however, provide descriptions of non-economic social and cultural aspects of the importance of halibut fishing for coastal Bering Sea communities for which secondary data are available. Staff also reached out to regional points of contact connected with BSAI communities and Alaska Native organizations for identification of potential additional data sources, as noted in that discussion. The purpose of that portion of the analysis is to convey the cultural significance of the BSAI halibut resource and to help inform the analysis of potential cumulative impacts of the no-action and proposed action alternatives, with the halibut fishing related descriptions of values and perceptions in that portion of the analysis being based on LK, TK, and the social science of LK." Information from the white paper received from the Aleut Community of St. Paul was incorporated into the discussion and appropriately footnoted. This process was undertaken in addition to (and not to the exclusion of) the formal government-to-government tribal consultation process that was undertaken by NMFS. The FEIS has been updated in Section 1.3 to include information on efforts by NMFS and the Council to encourage participation the process and solicit input from Alaska Native entities, individuals, and Tribal governments, including Tribal consultation that took place under E.O. 13175.

The following comments were submitted by the Environmental Protection Agency and contain suggestions for improving the analysis with regard to Environmental Justice (*Comment 8.4.1-57 through 8.4.1-60):*

Comment 8.4.1-57: We disagree with the framing of the Seattle Metropolitan Statistical Area (Seattle MSA) as a community in the document and Social Impact Assessment, especially when used comparatively to disadvantaged, minority communities with notable EJ concerns. We recommend that this consideration be further clarified to emphasize critical context in this discussion.

Response: The EIS Appendix 1. SIA Section 4.3.3 (The Geography of Community Engagement and Dependency) has been revised to clear state that "the Seattle MSA, as a representation of the Seattle metropolitan area, is treated as a single community in this SIA based on long-standing, established practice in NMFS and Council analyses. This practice, in turn, has been based on an understanding of the interconnectedness of the fisheries and fisheries support sectors across multiple municipalities within the Seattle MSA and a desire to avoid underrepresenting the fundamental importance of the historical and contemporary role of the Seattle metropolitan area in many of the federally managed fisheries off Alaska. While there are distinct concentrations of some fishery and fishery support businesses within different portions of the Seattle MSA (e.g., in the Fishermen's Terminal area of the Port of Seattle, in the Port of Tacoma, and in the Ballard neighborhood of Seattle), many individual fishing businesses, fishing support businesses, vessel owners, and crew members are more widely dispersed throughout the larger metropolitan area."

SIA Section 7.1.2.1.1 (Potential Environmental Justice Concerns [within the larger Section 7.1.2 BSAI Groundfish Amendment 80 Fishery Dependency and Vulnerability to Community-Level Impacts of the Proposed Action Alternatives among Pacific Northwest Communities]) has been revised for clarity to underline that the potential environmental justice concerns focus on Amendment 80 catcher/processor crew, not on the Seattle MSA as a whole. The revised text reads in part as follows: "In terms of absolute numbers (based on existing participation/engagement patterns), whatever adverse impacts related to BSAI groundfish Amendment 80 catcher/processor direct employment and income that would occur as the result of implementation of the proposed action alternative ultimately selected for implementation would largely accrue to the Seattle MSA. Available data suggest, however, that BSAI groundfish Amendment 80 catcher/processor crew are not representative of the demographic composition of the general population of the Seattle MSA. . . [crew minority population statistics are then discussed with reference to SIA Table 84 and SIA Table 85]. . . Of potential environmental justice concern would be loss of income opportunities for crew, due to increased expenses in operations with additional halibut avoidance measures (which would likely result in reduced crew compensation), and/or more time away from home with time-consuming and/or labor-intensive measures such as increased deck sorting. Although there are theoretically many more alternate employment and income opportunities for Amendment 80 catcher/processor crew in a large urban area than in smaller communities or rural settings, there may not be comparable employment and earning potential ashore as is available to crew members aboard these vessels, even in an otherwise robust job market, especially for crew members who have worked their way up from entry level positions."

In a different portion of their comment letter, after citing Amendment 80 catcher/processor crew demographics as shown in SIA Table 84 and SIA Table 85 the "EPA suggest[ed] NMFS analyze the impacts to the crew member community" (United States Environmental Protection Agency, DEIS Public Comment Letter, dated 10/25/2021). SIA Section 7.1.2.1.1 now notes that catcher/processor crew may potentially also be considered a "disadvantaged community" under EO 14008 and the *Interim Implementation Guidance for the Justice40 Initiative* which defines communities as "either a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions" as noted in SIA Section 3.6.2.

Comment 8.4.1-58: We encourage NMFS to show deference in its analysis and decision-making to the needs of the CDQ groups.

Response: The portion of EIS Appendix 1. SIA Section 6 (Regional and Community Context of the Fisheries) that focuses on Alaska communities is, as described in that section, organized by CDQ region. Those regions provide logical units of socioeconomic analysis, covering the BSAI coastal region, and CDQ entities mediate, to varying degrees, direct engagement of local communities in the relevant fisheries (and would themselves be potentially affected in multiple ways by the proposed alternatives, including the no action alternative). For example, some local fleets in CDQ communities participate in the directed halibut fishery to greater or lesser extent using CDQ quota, with regional differences influenced, in part, by variations in percentage of halibut quota held as CDQ reserves in the different subareas of Area 4 that range from zero (Area 4A) to 100 percent (Area 4E). Further, relative to most if not all other CDQ allocations, halibut can be efficiently fished by a small boat fleet and some CDQ groups currently support (or have previously supported and may again in the future support) in-region directed halibut fishery programs designed to facilitate entry into (and continued engagement in) the fishery by the residents of their constituent communities. Not all communities in the BSAI coastal region are CDQ communities, but all Alaska communities considered substantially engaged in or substantially dependent on the Amendment 80 fishery and/or the BSAI/Area 4 directed halibut fisheries for the purposes of this analysis are CDQ communities with two exceptions, Unalaska and Adak, as described in the SIA. In short, the pivotal role of CDQ groups is analyzed in detail in the SIA.

It is important to note, however, that CDQ groups are not sovereign entities like the Alaska Native tribes that are the focus of NMFS's government-to-government consultation responsibilities. As noted in SIA Section 6, the organization of the discussion of Alaska communities by CDQ region should not be taken to imply that the specific interests or priorities of the CDQ groups themselves always mirror those of the individual sovereign tribal governments within their region, just as the specific interests or priorities of individual tribal governments do not always mirror one another. The Council and NMFS have had their decision-making processes informed by the EIS/SIA analysis of the pivotal role of CDQ groups in the relevant fisheries, but both the Council and NMFS in their decision-making processes must also consider their responsibilities under an array of mandates, including MSA National Standards, relevant Executive Orders, and, with NMFS specifically, the tribal consultation process, among others.

Comment 8.4.1-59: The analysis states that the majority of the vessel owners do not meet any of the criteria for a disadvantaged EJ community. We recommend that the analysis re-evaluate if these increase operation expenses would more appropriately be characterized as impact to an industry sector (e.g. not an impact to EJ community).

Response: The EIS Appendix 1. SIA Section 7.1.2.1.1 (Potential Environmental Justice Concerns [within the larger Section 7.1.2 BSAI Groundfish Amendment 80 Fishery Dependency and Vulnerability to Community-Level Impacts of the Proposed Action Alternatives among Pacific Northwest Communities]) has been revised for clarity as the text was referring to potential high and adverse impacts accruing to Amendment 80 catcher/processor crew, not Amendment 80 catcher/processor owners. Amendment 80 catcher/processor vessel owners are not considered a disadvantaged community (exclusive of CDQ ownership interests, which are described and analyzed elsewhere in the document).

The revised text reads in part as follows: "In terms of absolute numbers (based on existing participation/engagement patterns), whatever adverse impacts related to BSAI groundfish Amendment 80 catcher/processor direct employment and income that would occur as the result of implementation of the proposed action alternative ultimately selected for implementation would largely accrue to the Seattle MSA. Available data suggest, however, that BSAI groundfish Amendment 80 catcher/processor crew are not representative of the demographic composition of the general population of the Seattle MSA. . . [crew minority population statistics are then discussed with reference to SIA Table 84 and SIA Table 85]. . . Of potential environmental justice concern would be loss of income opportunities for crew, due to increased expenses in operations with additional halibut avoidance measures (which would likely result in reduced crew compensation), and/or more time away from home with time-consuming and/or labor-intensive measures such as increased deck sorting. Although there are theoretically many more alternate employment and income opportunities for Amendment 80 catcher/processor crew in a large urban area than in smaller communities or rural settings, there may not be comparable employment and earning potential ashore as is available to crew members aboard these vessels, even in an otherwise robust job market, especially for crew members who have worked their way up from entry level positions."

In a different portion of their comment letter, after citing Amendment 80 catcher/processor crew demographics as shown in SIA Table 84 and SIA Table 85, in their public comment letter on the DEIS, "EPA suggests NMFS analyze the impacts to the crew member community" (United States Environmental Protection Agency, DEIS Public Comment Letter, dated 10/25/2022).As also now noted in SIA Section 7.1.2.1.1, now notes that catcher/processor crew may potentially also be considered a "disadvantaged community" under EO 14008 and the *Interim Implementation Guidance for the Justice40 Initiative* which defines communities as "either a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions" as noted in SIA Section 3.6.2.

Comment 8.4.1-60: We recommend the DEIS consider the definition of "disadvantaged community" as referenced in EO 14008 and further described in the Interim Implementation

Guidance for the Justice 40 initiative, which direct agencies to consider a range of specific demographic and environmental variables when assessing a community.

Response: The EIS Appendix 1. SIA Section 3.6.2 (EO 14008 Tackling the Climate Crisis at Home and Abroad) in addition to the definition of disadvantaged communities provided in the EO itself (historically marginalized and overburdened), now specifically references the Interim Implementation Guidance for the Justice 40 initiative's "Interim Definition of Disadvantaged Communities" that includes several variables that may apply singly or in varying combinations to some of the fishing communities that may be directly or indirectly impacted by one or more of the proposed action alternatives or the no action alternative. As now noted in SIA Section 6 (Regional and Community Context of the Fisheries), multiple CDQ communities would also be considered "disadvantaged communities" as defined under EO 14008 and described in SIA Section 3.6.2. SIA Section 7.1.2.1.1 (Potential Environmental Justice Concerns [within the larger Section 7.1.2 BSAI Groundfish Amendment 80 Fishery Dependency and Vulnerability to Community-Level Impacts of the Proposed Action Alternatives among Pacific Northwest Communities]) Amendment 80 catcher/processor crew may potentially also be considered a "disadvantaged community" under EO 14008 and the *Interim Implementation Guidance for the Justice40 Initiative* which defines communities as "either a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions" as noted in SIA Section 3.6.2.

8.4.2 Comments on MSA National Standards and Net Benefit to the Nation

8.4.2.1 General Comments

Comment 8.4.2-1: It is important to reiterate the need to balance the National Standards in relation to this action and recognize that no one standard supersedes the importance of the others. The National Standards are principles that must be followed in any fishery management plan to ensure sustainability and responsible fishery management. Collectively, the National Standards require conservation and management measures to prevent overfishing, rebuild depleted stocks, and ensure the long-term health and sustainability of fisheries. This is mandated by the Magnuson-Stevens Act and a cornerstone of the premier marine fisheries law guiding sustainable fisheries management.

Response: NMFS agrees that the Council and NMFS must consider and weigh all National Standards when they select and approve the final action. The Council and NMFS perform that analysis when they select and approve the final action. The EIS includes relevant considerations and describes the relative impacts of the alternatives, which helps inform the Council and NMFS as they weigh the various and sometimes competing considerations of the National Standards. In short, the EIS endeavors to analyze all impacts from the alternatives in order to disclose such information to the public and provide the decision-makers with the necessary information to balance the National Standards and render a final decision. The MSA not establish any priority among the specific standards. Its purpose, however, is to give conservation of fisheries priority over short-term economic interests. The Preferred Alternative strikes the best balance among the National Standards while prioritizing conservation of the affected fisheries.

Comment 8.4.2-2: In October 2020, the Council directed staff to "shift the analytical process from a management strategy evaluation (MSE) approach" to "a more traditional impacts analysis on the affected fishing sectors and other affected resource components" so that the Council could assess "policy level tradeoffs" related to "balancing the different considerations in the National Standards, with a particular focus in balancing aspects of National Standards 1, 4, and 9." The DEIS does not present a complete, objective analysis with which to determine consistency with the National

Standards. In general, the DEIS downplays the impacts to the A80 sector and the impracticability of further reductions in A80 PSC limits, while overstating the potential benefits to the directed halibut fishery.

Response: See responses to Comments 8.4.1-1 through 8.4.1-7 and 8.4.2-1. Section 5.3 of the EIS extensively details potential impacts to the A80 sector. Section 7.1 of the EIS discusses the alternatives' consistency with the National Standards and references those areas in the analysis that are particularly relevant to the consideration of the national standards. Section 7.1 notes that the halibut PSC limits identified in the Alternative look up tables may prevent Amendment 80 from fully harvesting TACs under lower PSC limits, unless fishermen can utilize available tools or develop new ones to minimize halibut PSC beyond what is currently being achieved (see Section 5.3.2.3 on practicability of further bycatch reduction efforts).

When estimated halibut abundance (and therefore PSC limits) decline to very low levels, encounter rates amongst the A80 sector may also be low. If that occurs, the fleet may still be able to catch their full TACs despite lower PSC limits. Further, the cooperative structure of Amendment 80 provides tools for vessels to control their PSC. The analysis suggests there is considerable variability among the vessels and companies of the sector with respect to PSC rates. This variability, along with other flexible tools offered by the cooperative structure, suggest it may be possible for Amendment 80 vessels to maximize the groundfish harvest under potentially reduced halibut PSC limits with their currently available tools.

Section 5.3.2.3.1. describes how the need to balance the requirements of each national standard is addressed by the alternatives. Section 5.9 discusses the policy tradeoffs and competing interests.

With regard to overstating the benefits of the alternatives to the directed halibut fishery, the EIS includes caveats that the Council does not have authority to set catch limits for the directed halibut fishery, which is under the authority of the IPHC, and indicates that this action is not only about benefiting the directed commercial halibut fishery. Regardless, the Council sets halibut PSC limits in the groundfish fisheries, and that is one of the factors that affects harvest limits for the directed halibut fisheries. Halibut PSC in the Amendment 80 groundfish fishery is a significant portion of total mortality in the BSAI and that affects the IPHC's calculation of catch limits for the directed halibut fisheries in Area 4. While the short-term impact of halibut PSC reductions on catch limits for directed halibut fisheries is partially dependent on IPHC policy and management decisions, the EIS does note that linking the current Amendment 80 halibut PSC limit in the BSAI to halibut abundance could indirectly provide additional harvest opportunities in the BSAI directed halibut fishery, particularly at low levels of halibut abundance. Consistent with the Council's purpose and need statement, an abundance-based halibut PSC limit for Amendment 80 may provide improved harvest opportunities in the Area 4 commercial halibut fishery that meet IPHC and Council management objectives, particularly at low levels of halibut abundance.

Comment 8.4.2-3: While the DEIS frames the purpose of this action as seeking to balance the reduction of bycatch under National Standard 9 with maintaining optimum yield (OY) under National Standard 1, any plan or plan amendment issued under the MSA must balance and comply with all ten National Standards. And here, Alternative 4 is the most consistent—by far—with the National Standards.

Response: NMFS acknowledges the comment and notes that the Council's statement of purpose may focus on a key issue that the action addresses, yet, the action may nonetheless address multiple issues and concerns. NMFS also agrees that the Council and NMFS must consider and weigh all national standards and other requirements of the MSA, when they select and approve the final action. See the response to Comment 8.4.2-1. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under very low to high abundance conditions. The Council's Preferred Alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. The EIS and Appendix 1. SIA describe potential adverse impacts to BSAI directed halibut fishery communities under the no action alternative and the potential benefit to those communities under the action alternatives. The EIS and the SIA also describe the potential adverse impacts to the Amendment 80 sector and associated fishing communities under the proposed action alternatives. The Council and NMFS believe that the Preferred Alternative strikes the best balance among the competing considerations of the National Standards.

Comment 8.4.2-4: The DEIS contains crucial internal inconsistencies that compel correction: accurate information about the adverse impacts of the ABM alternatives on the A80 sector is ignored in the analysis of consistency with the National Standards of the Magnuson-Stevens Act.

Response: NMFS disagrees with the commenter's assertion that the EIS contains crucial internal inconsistencies that compel correction and that accurate information about the adverse impacts of the ABM alternatives on the A80 sector is ignored in the analysis of consistency with the National Standards of the Magnuson-Stevens Act. See responses to Comments 8.4.1-1 through 8.4.1-7 and 8.4.2-1.

8.4.2.2 Comments related to National Standard 1

Comment 8.4.2-5: OY is not meant to be achieved at the expense of other fisheries and the sustained participation of fishing communities. The National Standard guidelines describe the determination of OY as a "decisional mechanism" for, among other things, "balancing the various interests that comprise the greatest overall benefits to the Nation." The DEIS states unequivocally that "constraining halibut PSC limits set for species harvested by the A80 sector that result in reduce [sic] catch and marketing of those species are likely to result in negative impacts to net benefits to the Nation." This is despite the fact that the DEIS authors admit that the potential benefits to directed users of halibut are overstated and unsupported by the substantive and technical analyses in the DEIS. The DEIS demonstrates that even large reductions in PSC limits show very little economic benefit to the directed halibut fisheries and extremely small benefit to BS fishing communities. Further, subsistence users would not directly benefit from potential reallocations of A80 PSC. The IPHC accounts for incidental halibut removals in the groundfish fisheries and recreational and subsistence catches before setting commercial halibut catches each year. Yet the DEIS' unambiguous conclusion of negative net benefits is largely ignored and/or explained away in the discussion of National Standard 1 in section 7.1. In addition, Section 7.1 speculates further that with the use of indexing, halibut encounter rates by the sector "may also be low" – despite earlier sections that acknowledge that the proposed indices for this action do not correlate with sector halibut encounter rates. This statement is completely unsupported, thereby misleading the reader.

Response: NMFS agrees on the need to balance the National Standards, including National Standard 1. See the response to Comment 8.4.2-1 above on the need to balance the National Standards. While the analysis makes clear that all action alternatives would continue to meet OY on a continuing basis, the Preferred Alternative does not put achievement of OY above the other national standards or at the expense of other fisheries and the sustained participation of fishing communities, but rather finds a balance of the competing national standard requirements.

NMFS assumes the commenter references the EIS Section 5.6 Summary of Analysis of Economic Benefits and Cost when stating the "DEIS authors admit that the potential benefits to directed users of halibut are overstated and unsupported by the substantive and technical analyses in the DEIS." This section is included in the EIS as a required part of the integrated Regulatory Impact Review (RIR), required for rulemaking under the Regulatory Flexibility Act (RFA). The RFA and the terms used have a very narrow, economic focus. However, under NEPA, a much broader consideration of the environmental effects, beyond economic cost vs benefit is required to be analyzed with effects compared among alternatives. The 1978 NEPA regulations at 50 CFR §1508.14 stipulate that the "human environment" shall be interpreted comprehensively to include the natural and physical environment and the relationship of people with that environment. This means that economic or social effects are not intended by themselves to require preparation of an environmental impact statement.

When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment. Further, the 1978 NEPA regulations at 50 CFR §1502.23 note that "when a cost-benefit analysis is prepared, the EIS will discuss the relationship between that cost-benefit analysis and any analyses of unquantified environmental impacts, values, and amenities. For purposes of complying with NEPA, the weighing of the merits and drawbacks of the various alternatives need not be displayed in a monetary cost-benefit analysis and should not be when there are important qualitative considerations. In any event, an environmental impact statement should at least indicate those considerations, including factors not related to environmental quality, which are likely to be relevant and important to a decision."

Section 5.6 Summary of Analysis of Economic Benefits and Cost is considered to be part of the EIS economic analysis, in a format stipulated under the RFA, and must be considered together with, and in the context of, unquantified environmental impacts, values, and amenities, including social and cultural considerations. In light of this, the text in the FEIS Section 5.6 has been amended to explain more clearly the specific economic context of the section, as well as the meaning of some terms and conclusions found in that section. Section 5.5.2.1.5 of the EIS describes how "the cultural significance of halibut for fishermen and their associated communities includes but exceeds the economic value of the fishery… how halibut fishing provides a local source of employment in a day fishery that allows individuals to remain in their community, spend time with their family and build social networks, and engage in broader, culturally meaningful practices like subsistence. Halibut fishing is also considered a meaningful vocation and way of life." The SIA, Appendix A expands this discussion in a more comprehensive analysis of the non-economic effects of the alternatives. In making its decision on this action, NMFS will consider all the effects analyzed, not just the economic effects.

Section 7.1 has been revised to acknowledge that surveyed halibut abundance and Amendment 80 encounter rates are not well correlated. Finally, see the response to Comments 8.4.1-1, 8.4.1-9, 8.4.1-11, and 8.4.2-2 regarding the consideration of A80 encounter rates in the EIS.

Comment 8.4.2-6: OY is not a carte-blanche invitation to harvest a high yield of a species by one fishing sector/gear type at the expense of other fisheries and the sustained participation of small boat fishing communities. Nor is it meant to be achieved at the expense of ecosystem integrity as a result of high PSC encounter rates with the potential to result in a trophic cascade, the consequence of which would be collapse of multiple fisheries. Rather the guidelines to National Standard 1 note that OY is a decisional mechanism for resolving MSA conservation and management objectives and balancing the various objectives that comprise the greatest net benefits to the nation. Alternative 4 is therefore the best mechanism for PSC reduction to sustain viable BSAI halibut abundance and the integrity of the Bering Sea ecosystem as ecosystem integrity is the fundamental requirement sustained appropriately scaled fisheries, which does provide the greatest long term net benefit to the nation.

Response: NMFS also agrees that the Council and NMFS must consider and weigh all National Standards, when they select and approve the final action. See the response to Comment 8.4.2-1. The action alternatives contain a range of Amendment 80 halibut PSC limit reductions under very low to high abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

Comment 8.4.2-7: National Standard 1 directs the Council to achieve "the OY from each fishery for the United States fishing industry." As the DEIS makes clear, the PSC reductions in Alternative 4 have no effect on OY in the groundfish fishery, because OY would still be achieved even if the A80 sector landed no fish at all. At the same time, the PSC reductions in Alternative 4 would result in OYs for the directed halibut fishery. While NMFS has stated its belief that OY in the halibut fishery is not a factor for consideration, because halibut happen to be managed under a bilateral treaty and thus are not directly managed under the MSA, the plain text of National Standard 1 does not limit its directive to those fisheries that happen to be managed directly by the Council under the MSA. Nor does it exclude fisheries that, by virtue of fishes' unique biology and their extraordinary cultural and economic importance to multiple countries, require management under treaties with other nations. Instead, the plain text of National Standard 1 directs the Council and NMFS to achieve the OY from every fishery "for the United States fishing industry." The directed halibut fishery—which is prosecuted by U.S. fishermen and the people of halibut-dependent communities across Alaska—falls squarely within this mandate.

Response: NMFS believes the Pacific halibut commercial fisheries are achieving optimum yield. NMFS notes that Article I of the Convention between the United States and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea expressly provides that the IPHC's regulations must be "designed to develop the stocks of 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 FEIS (Section 4) explains how the IPHC manages Pacific halibut stocks and commercial fishing. Through that management, the IPHC has been preventing overfishing of Pacific halbitu and is achieving optimum yield on a continuing basis.

8.4.2.3 Comments related to National Standard 2

Comment 8.4.2-8:
National Standard 2 of the MSA requires fishery management to be diligently researched and based on "the best scientific information available." 16 U.S.C. §1851(a)(2). The agency is not required to collect new data to meet this standard, but it is required to consider and use all reliable data available at the time it is making a decision. If superior or contrary data are ignored, National Standard 2 is violated. National Standard 2 does not allow the agency to omit known informationin order to skew the results of an analysis. Similarly, NEPA requires agencies to "insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements" and to "identify any methodologies used" and the "scientific and other sources relied upon for conclusions." NEPA "envisions that program formulation will be directed by research rather than that research programs will be designed to substantiate programsalready decided upon." NEPA requires "a diligent research effort, undertaken in good faith, which utilizes effective methods andreflects the current state of the art of relevant scientific discipline."

Response: NMFS acknowledges this comment and confirms that the information presented in the EIS represents the most current, comprehensive set of information available, recognizing that some information (such as operational costs) is unavailable. It represents the best scientific information available and presents the information in a balanced, unbiased manner. The EIS identifies analytical methodologies used as well as the scientific and other sources relied upon for conclusions. Further, the EIS represents a diligent research effort, undertaken in good faith, which utilizes effective methods and reflects the current state of the art of relevant scientific discipline.

8.4.2.4 Comments related to National Standard 4

Comment 8.4.2-9: National Standard 4 addresses fair and equitable allocations to fishermen, derived from reasonable calculations to promote fishery conservation in a manner that no entity acquires an excessive and disproportionate share of such privileges. Under the current management structure halibut bycatch by the A-80 fleet is being prioritized over directed halibut fisheries. This directly violates National Standard 4 "that no particular individual, corporation, or other entity acquires an excessive share of such privilege." Under the existing management structure and Alternative 1 (no action) this standard is not equal footing with National Standard 1. In the guidance for making allocations, section 3 states: "[w]here relevant, judicial guidance and government policy concerning the rights of treaty Indians and aboriginal Americans must be considered in determining whether an allocation is fair and equitable." Alternative 4 is the only alternative that meaningfully addresses these guidelines. BSAI communities that have fished for halibut and managed halibut stocks for thousands of years are in many cases no longer able to participate in the halibut fishery. Alternative 4 is the only management option that meaningfully addresses equitable access for BSAI communities and the broader directed halibut fishing fleet.

Response: NMFS agrees that the Council and NMFS must consider and weigh all National Standards, including National Standard 4, when they select and approve the final action. See the response to Comment 8.4.2-1 and Section 7.1 of the EIS for a discussion on the consistency of the alternatives with National Standard 4. National Standard 4 provides:

Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (a) fair and equitable to all such fishermen; (b) reasonably calculated to promote conservation; and (c) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privilege.

The Preferred Alternative also considers equity between groundfish fishermen and users of the halibut resource. While the Council does not have direct authority over setting halibut catch limits, the proposed action may increase opportunities for directed halibut fishing. NMFS notes that the Halibut Act also includes a provision that there be fair and equitable distribution of access privileges in the fishery. Much of the direction listed in the Halibut Act relevant to Council action is duplicative with National Standard 4 of the MSA. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under very low to high abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. Based on that, NMFS has determined that the preferred alternative considers fair and equitable uses of halibut resources through PSC limits that are based on halibut abundance indices.

Comment 8.4.2-10: Congress clearly recognized in the MSA that unchecked, larger fishing interests with more economic power could easily capture a disproportionate and inequitable share of fishery resources. To prevent this, National Standard 4 requires that equitable considerations—not just economics, political connections, and powerful lobbies—guide the Council's and NMFS's decision-making. To that end, National Standard 4 and the Halibut Act both require that any allocation of fishing privileges be "fair and equitable" to United Statesfishermen; "reasonably calculated to promote conservation"; and "carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges." National Standard 4 guidance also requires that such allocations consider judicial guidance and government policy concerning the rights of treaty Indians and aboriginal Americans, which are clearly at stake in this action. Only Alternative 4 satisfies these requirements. Allowing excessive levels of bycatch to continue is not reasonably calculated to promote conservation. It is not fair and equitable to allow excessive PSC mortality to continue during periods of low abundance without regard to the state of the resource, especially when this choice would exclude other long-time participants in a fishery and destroy their way of life in the process. A80's PSC limits grant it an "excessive share" of the halibut resource. A80 is authorized to take an overwhelming share of the available halibut, especially in Area 4CDE. Only requiring significant reductions in PSC mortality when abundance is low can remedy this imbalance.

Response: NMFS acknowledges this comment. Please see the response to comment 8.4.2-9.

8.4.2.5 Comments related to National Standards 4 And 8

Comment 8.4.2-11: National Standard 4 addresses fair and equitable allocations to fishermen under reasonable calculations to promote conservation and carried out in a manner that no entity acquires an excessive share of such privileges. Under the current halibut bycatch management system and the prioritization of bycatch over directed fisheries, as with National Standard 8, this standard does not appear to have equal footing with National Standard 1. As noted in the guidance for making allocations, section 3 states: "[w]here relevant, judicial guidance and government policy concerning the rights of treaty Indians and aboriginal Americans must be considered in determining whether an allocation is fair and equitable." The Bering Sea communities which no longer participate in the halibut fishery and those hanging on by a bent hook are primarily Alaska Natives and the injustice must be corrected.

Response: NMFS agrees that the current halibut bycatch management system does not adequately balance halibut use among sectors. The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. This action is intended to rectify that. NMFS believes that the Preferred Alternative appropriately balances the interests embodied within the National Standards, and gives equal weight to National Standards 4 and 8.

Comment 8.4.2-12: The DEIS provides misleading analysis on community impacts and "incidental reallocations." There are significant and interrelated problems with the DEIS's analysis and findings under National Standards 4 and 8. Conclusions ignore ongoing and uncompensated "reallocation" of halibut quota from Bering Sea Alaska fishermen to the bycatch fisheries. National Standards 4 and 8 both reflect the conservation goals of the Magnuson-Stevens Act. There is no conflict between the MSA's commitments to both conservation and mitigating adverse economic impacts – decision makers "must give priority to conservation measures." National Standard 4 requires that allocations of fishing privileges be fair and equitable and are reasonably calculated to promote conservation. Bycatch limits "promote conservation of the halibut resource." While NMFS relies on the IPHC to maintain the spawning biomass, it admits that reducing the numbers of halibut killed by the A80 fleet would promote the conservation of the halibut stock itself. The DEIS recognizes that an action to reduce bycatch is neither a direct allocation nor an assignment of fishing privileges, but then identifies National Standard 4 "considerations" that pertain to the A80 companies. The analysis refers to "incidental reallocative effects" and asserts that action alternatives "could effectively (if indirectly) be a reallocation of access to halibut between the A80 companies and Bering Sea halibut fishermen." Halibut are a prohibited species, so, the A80 companies must avoid halibut, or, if "encountered," safely return them to the sea. The action before the Council is not one of reallocating halibut from A80 to the directed halibut fishery; it is reducing the *de facto* reallocation that has been allowed to occur under static PSC limits set when halibut were far more abundant. The analysis fails to adequately inform decision-making regarding either National Standard 8 or National Standard 4 to the extent it is relevant.

Response: NMFS agrees that is no inherent conflict between the MSA's commitments to both conservation and mitigating adverse economic impacts and that decision-makers must give priority to conservation measures. The analysis demonstrates that there may be economic impacts to the A80 fisheries, particularly when halibut is in some of the lower abundance states. We also agree that the action before the Council does not reallocate halibut from A80 to the directed halibut fishery.

The Council's Purpose and Need Statement addresses the concern that as halibut abundance goes down, the PSC limit for the Amendment 80 sector becomes a larger proportion of the overall PSC limit. To address the concern and carry out the Council's purpose, the action alternatives analyzed in the EIS would reduce the PSC halibut limit for the Amendment 80 sector as halibut abundance decreases. The Council's Purpose and Need Statement indicates that this reduction may provide additional harvest opportunities for directed halibut fisheries. However, as noted in Section 1.2 and elsewhere in the Analysis, only the IPHC, not the Council or NMFS, has authority to allocate halibut to the directed fisheries. That means, when considered with the numerous uncertainties discussed in the EIS regarding the ultimate disposition of halibut not caught by the Amendment 80 sector as a result of this action, that there is no direct regulatory link between this action and what may occur under the aegis of the IPHC. Section 7 of the EIS includes discussion on how the action alternatives address each of the national standards.

Comment 8.4.2-13: The analysts' conclusions of consistency with National Standards 4 and 8 fail to inform the public and decision makers regarding the glaring social equity issues involved – on one side, over 2,000 halibut fishermen, rural coastal communities, indigenous dependence and a small-scalefishing industry that is one of the few long-term success stories in fisheries management versus five Seattle trawl companies and their 18 – 20 industrial fishing factories. Thousands of families, businesses, and fishing communities from Ketchikan to St. Paul depend on the health of the halibut resource.

Response: Please see the response to Comments 8.4.2-9,8.4.2-10 and 8.4.2-16.

8.4.2.6 Comments related to National Standard 8

Comment 8.4.2-14: National Standard 8 requires management and conservation actions to consider effects on fishing communities; consider how to ensure sustained participation of fishing communities; and to the extent practicable, minimize adverse economicimpacts on such communities. Under the current use of halibut bycatch, fishing communities in the Bering Sea are dropping out of the fishery with 9 out of 17 Bering Sea communities no longer participating in the fishery. The Social Impact Analysis (SIA) reports many Alaska Native and Alaska coastal communities have been negatively impacted and are facing closures to their halibut fisheries and adverse economicand social impact to minority populations. It is impossible to quantify the magnitude of loss to a community when access to the halibut resource is lost. The importance of cultural heritage and community well-being is captured in the wisdom of National Standard 8, and policies must recognize the equal importance of this standard.

Response: The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. As described in the EIS Appendix 1. SIA Section 6.3.5.3, multiple factors contributed to the discontinuation of participation of nine Alaska Native communities, each home to a federally recognized tribal entity, in the directed halibut fishery during the period 2010-2019 in addition to low halibut quotas. As further noted in SIA Section 6.3.5.3, the shift away from targeted support of in-region halibut fisheries has unavoidably had adverse effects in communities most directly benefitting from previous fisheries initiatives that facilitated the engagement of these communities in the directed halibut fishery. The cultural importance of halibut and halibut fishing is discussed in SIA Section 7.2.6.3. The action alternatives contain a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's Preferred Alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit.

Comment 8.4.2-15: The DEIS's findings under National Standard 8 suffer from a failure to grasp the relationship between the bycatch fisheries and socio-economic harms to Alaska fishermen. National Standard 8 requires that conservation and management measures consider the importance of fishery resources to fishing communities in order to provide for their sustained participation and minimize adverse economic impacts to them. A "fishing community" is "substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs" and a "social or economic group whose members reside in a specific location and share a common dependency." Lower bycatch limits will have significantly different socio-economic impacts on significantly different types of fishing communities. The status quo threatens further loss of Bering Sea communities while lower bycatch limits may prevent the A80 companies from harvesting their entire quotas in some years. Unlike many Alaska halibut fishermen, these companies at least have some capacity to adapt and prioritize their highest value target fisheries.

Response: The EIS Appendix 1 (SIA) identifies and describes the fishing communities engaged in or dependent on the Amendment 80 fishery and/or the BSAI/Area 4 directed halibut fishery using the cited criteria from National Standard 8. The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. The action alternatives contain a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council's Preferred Alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. The EIS and the SIA describe potential adverse impacts to BSAI directed halibut fishery communities under the no action alternative and the potential benefit to those communities under the action alternatives. The EIS and the SIA also describe the potential adverse impacts to the Amendment 80 sector and associated fishing communities under the proposed action alternatives. Both the EIS and the SIA clearly note that existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the BSAI/Area 4 region has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products). Further, both the EIS and the SIA note that to the extent that the proposed action alternatives would serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure.

Comment 8.4.2-16: While the current SIA included in this DEIS is inadequate in describing the importance of halibut and Bering Sea ecosystem integrity for BSAI communities and the broader directed halibut fleet that relies on the health and reproductive viability of Bering Sea halibut, National Standard 8 does highlight these factors as important considerations in management decisions.

Response: National Standard 8 requires the consideration of the importance of the fishery resource to fishing communities, and this has been done the for both the Amendment 80 fishery and the BSAI/Area 4 directed halibut fishery for the no action alternative and the proposed action alternatives. The Council considered this important in the crafting and selection of the Preferred Alternative. See Section 7.1 for discussion with consistency of the national standards, including National Standard 8.

Comment 8.4.2-17: National Standard 8 requires these management and conservation actions to consider effects on fishing communities; consider how to ensure sustained participation of fishing communities (section 1); and, to the extent practicable, minimize adverse economic impacts on such communities (section 2). This failure to properly manage the groundfish fisheries responsible for halibut bycatch to the detriment of our communities, as exemplified by the more than half of the identified seventeen communities no longer participating, may have already violated federal trust responsibilities and treaty rights towards Alaska Natives. Further, the identification of such an effect should heighten agency attention to Alternatives, mitigation strategies, monitoring needs, and preferences expressed by the affected communities or populations, but does not seem to be fully or appropriately considered here.

Response: The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement. Both the EIS and its Appendix 1. SIA clearly state that "existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the region has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products)." As described in SIA Section 6.3.5.3, multiple factors contributed to the discontinuation participation of nine Alaska Native communities, each home to a federally recognized tribal entity, in the directed halibut fishery during the period 2010-2019 in addition to low halibut quotas. As further noted in SIA Section 6.3.5.3, the shift away from targeted support of in-region halibut fisheries has unavoidably had adverse effects in communities most directly benefitting from previous fisheries initiatives that facilitated the engagement of these communities in the directed halibut fishery.

The action alternatives contain a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. Further, both the EIS and SIA clearly state that "to the extent that the proposed action alternatives would serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure." The Council took these factors and similar themes heard during public testimony into consideration in the selection of the preferred alternative, which proposes Amendment 80 sector PSC limit reductions under all but high setline index conditions (and in that case proposes no change to the Amendment 80 halibut PSC limit). See Section 1.3.1 for discussion of Tribal Consultations that were conducted under E.O. 13175.

Comment 8.4.2-18: National Standard 8 requires the adoption management measures that account for the importance of fishery resources to local fishing communities and that ensure their continued participation in fisheries. In short, the halibut fishery is of extraordinary importance to St. Paul and other halibut-dependent communities across Area 4. They have invested heavily in the halibut resource and have few other alternatives. Their continued participation in the fishery is threatened, however, by the inequities that existing PSC limits and low abundance create—inequities that can only be remedied by the meaningful reductions in PSC mortality that Alternative 4 includes. This dependence on halibut, and the degree to which this action will affect thevery future of their communities, stands in stark contrast to Seattle, Washington, where all of the A80 fleet is based. Simply put, Seattle has thriving, broad-based economies that are many orders of magnitude largerthan the halibut dependent communities in the Bering Sea. Any effects of reduced PSC limits on that community would be virtually imperceptible.

Response: The EIS Appendix 1, SIA identifies and describes the fishing communities engaged in or dependent on the Amendment 80 fishery and/or the BSAI/Area 4 directed halibut fishery using criteria from National Standard 8. The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council's purpose and need statement and the importance of the halibut fishery to St. Paul and multiple other communities in the BSAI/Area 4 region is documented in the EIS and the SIA. The action alternatives contain a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The EIS and the SIA describe potential adverse impacts to BSAI directed halibut fishery communities under the no action alternative and the potential benefit to those communities under the action alternatives.

The Council took this information into consideration in the selection of the Preferred Alternative, which proposes reductions under all but high setline index conditions (and in that case proposes no change to the Amendment 80 halibut PSC limit). The EIS and the SIA also describe the potential adverse impacts to the Amendment 80 sector and associated fishing communities under the proposed action alternatives. While no community-level impacts are anticipated in the case of the Seattle MSA, the SIA did note that of potential concern would be loss of income opportunities for crew, due to increased expenses in operations with additional halibut avoidance measures (which would likely result in reduced crew compensation), and/or more time away from home with time-consuming and/or labor-intensive measures. Although there are theoretically many more alternate employment and income opportunities for Amendment 80 catcher/processor crew in a large urban area than are available in smaller communities or rural settings, there may not be comparable employment and earning potential ashore as is available to crew members aboard these vessels, even in an otherwise robust job market, especially for crew members who have worked their way up from entry level positions.

Comment 8.4.2-19: The DEIS notes that less bycatch "might benefit" fishing communities that depend on halibut harvests, but then minimizes those potential benefits as "likely attenuated by the several biological and policy steps that separate bycatch mortality savings from directed harvest opportunities" and notes communities engaged in the groundfish fisheries could be adversely impacted on a more direct basis. The analysis then implies that decision-makers should select an action alternative that does the least harm to communities that participate in the bycatch fisheries. The SIA shows that the main affected "community" (Seattle) is not that much of a fishing community, but a physical residence for the A80 companies. In contrast, other communities such as St. Paul, Adak, and Atka have either complete or mostly complete community dependency on halibut revenues. Despite the significant differences between Seattle and Alaska's many remote coastal fishing communities, NMFS' National Standard 8 findings rely on "simple" financial conclusions. The DEIS ignores the difference between the loss of a half million dollars in annual halibut fishing revenue from several smaller Bering Sea fishing communities and an equivalent or even much larger decline in corporate profit margins.

Response: The action alternatives analyzed would change Amendment 80 PSC levels in response to changes in halibut abundance as measured by two indices. Direct impacts of the action alternatives would accrue to the directly regulated entity, the Amendment 80 sector, and associated communities. As noted in the Council's purpose and need statement, "this action could also promote conservation of the halibut stock and may provide additional opportunities for the directed halibut fishery" [emphasis added]. But as described in the analysis, there are several biological and policy steps that separate bycatch mortality savings from directed harvest opportunities that would determine actual outcomes.

Under National Standard 8, conservation and management measures shall, consistent with the conservation requirements of the Magnuson-Stevens Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities by utilizing economic and social data that are based upon the best scientific information available in order to: (1) provide for the sustained participation of such communities; and (2) to the extent practicable, <u>minimize adverse economic impacts on such communities</u> [emphasis added]. Under National Standard 8, the term "fishing community" means a community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and fish processors based in such communities. As noted in the SIA, Seattle is the community most substantially engaged in the North Pacific groundfish fisheries in general (and the Amendment 80 fishery in particular) and is among the least substantially dependent of the engaged communities on those fisheries based on the relative number of fishing jobs and economic value of those fisheries when compared to the size of the overall Seattle metropolitan labor pool and the scale, diversity, and resilience of its economy. The SIA also clearly identifies the very high level of dependency of multiple BSAI fishing communities on the BSAI directed halibut fishery (e.g., in SIA Table 17) and discusses the social and cultural importance of halibut fishing to those same communities (e.g., in SIA Section 7.2.6). In its deliberations, the Council weighed those factors under National Standard 8, the other national standards, and other MSA requirements in its selection of a Preferred Alternative.

8.4.2.7 Comments related to National Standard 9

Comment 8.4.2-20: National Standard 9 emphasizes that conservation and management measures shall, to the extent practicable, minimize bycatch and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. There have been positive strides forward to reduce mortality with deck sorting in the A-80 fleet, and we appreciate ongoing efforts to reduce mortality. Subjective understanding of "to the extent practicable" is the most problematic language with different interpretations by various user groups. From our perspective, "to the extent practicable" does not mean limiting bycatch reductions only to a level which does not constrain the target fishery. It means balancing all the National Standards equally and in the context of all the standards determining what is practicable. The bycatch users clearly have a different understanding of this National Standard, and policy makers must balance this stakeholder input in the context of the whole.

Response: NMFS agrees with the comment. See response to comment 8.4.2-1. The action alternatives contain a range of Amendment 80 halibut PSC limit reductions under very low to high abundance conditions. The Council's preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. In particular, the preferred alternative seeks to reduce halibut PSC use at lower abundance levels.

Comment 8.4.2-21: The analysis conclusively demonstrates that it is not practicable for the A80 sector to make further reductions in PSC usage without impacting the sector's ability to catch its targets. There is ample support in the DEIS to conclude that the A80 sector has already minimized PSC usage to the extent practicable using all of the tools available to it (e.g. excluders and deck sorting in fisheries where conditions allow this to be practicable). It is unreasonable to assume that the sector can make further substantial reductions without impacting the sector's ability to catch its targets. Yet the discussion of National Standard 9 fundamentally ignores the findings in the DEIS as to practicability, veering off into a vague discussion of a purported "choice" between National Standards 1, 8, and 9. This subsection must be re-written to accurately reflect the results of the analyses and information in the DEIS.

Response: NMFS recognizes that compliance with PSC limits will be challenging at lower levels and, unless improvements are made in existing technologies, new technologies are developed, or most or all of the sector can fish with as little bycatch as experienced by some of the firms in the sector, the A80 sector may not be able to catch all of its harvest allocations, particularly in years when halibut abundance is below the high setline index condition. The analysis estimates revenue reductions of 9% to 15% from status quo using the 2016 through 2019 data if the PSC limit is reduced by 30% PSC and revenue reductions of 22% to 32% from status quo if the PSC limit is reduced by 40%. We do not believe that this range of potential revenue losses from the minimization of bycatch in the very low halibut abundance conditions renders the action impracticable, even though the potential economic losses are substantial.

The EIS analyzed costs of meeting the alternatives' PSC limits with the need to and benefits from minimizing halibut bycatch. NMFS and the Council recognize that the A80 sector may realize greater costs, including, but not limited to leaving some fish unharvested. However, with halibut being fully utilized in the BSAI, a more equitable balance between users must be struck and greater conservation of the halibut resource by the A80 sector must be achieved. As static A80 PSC limits become a greater proportion of the halibut at lower abundance levels, the balance between sectors becomes skewed toward the A80 sector. This action seeks to improve that balance. It could provide the IPHC leeway to offer greater opportunity to directed fisheries, and it takes into consideration social and cultural importance of halibut to directed fishery-dependent communities, as well as supporting higher levels of subsistence use.

Comment 8.4.2-22: The DEIS needs to discuss how the alternatives respond to the precautionary principle. The National Standard 9 guidelines require decision makers to adhere to the precautionary approach when faced with uncertainty regarding, among other things, population effects for the bycatch species, changes in the economic, social, or cultural value of fishing activities, and social effects. There are significant uncertainties regarding "population effects" for the halibut stock and future changes in biomass and stock condition, warranting a precautionary approach aimed atlimiting bycatch well below a threshold at which there is a risk of contributing to further decline. The precautionary approach provides that "[t]he absence of scientific information should not be used as a reason for postponing or failing to take measures to conserve … non-target species and their environment." The rationale reflects the understanding that scientific certainty often arrives too late to design effective policy responses to environmental concerns. The Bering Sea FMP policy also incorporates a precautionary approach. There are numerous uncertainties about population effects and other biological factors that warrant discussion of how the precautionary approach related to this action.

Response: The preferred alternative strikes a balance among requirements of the National Standards, as described in Section 7, including incorporating the Council's precautionary approach (as stated in the BSAI Groundfish FMP policy objectives) in the face of uncertainty regarding, among other things, population effects for the bycatch species, changes in the economic, social, or cultural value of fishing activities, and social effects. The preferred alternative addresses the purpose and need for this proposed action by linking the A80 halibut PSC limits to halibut abundance.

Comment 8.4.2-23: National Standard 9 emphasizes that conservation and management measures shall, to the extent practicable, minimize bycatch and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. Under the current cap the A80 fleet is allowed to harvest and waste exorbitant quantity of sexually immature halibut that negatively impacts the coast wide halibut biomass. National Standard 9 requires equal consideration of all the National Standards, and in the context of all the standards developing limitations that support ecosystem integrity, and to not remove non-target species to such a degree that long standing sustainable directed fisheries cannot be conducted, to the detriment of regional coastal communities. The A-80 user group clearly has a different understanding of National Standard 9, and policy makers must balance stakeholder input in the context of the directed fisheries, ecosystem integrity and equitable access and opportunity for the BSAI Alaska Native fishing communities, who are most directly and immediately impacted by excessive halibut by catch and have been living and fishing in the effected waters the longest. Alternative 4 is the only available option that meaningfully addresses these issues, and allows the A80 fleet fishing opportunity based an abundance based management structure congruent with long standing directed halibut fishery abundance based management practices. Restrictive bycatch management during times of low halibut abundance supports conservation of the resource and recognizes the needs of directed halibut users and halibut-dependent communities which have been negatively impacted by status quo bycatch management. Alternative 4 is the only equitable option for conservation of the halibut resource with the lowest possible PSC limits (45% below current) at lowest levels of halibut abundance. This will preserve more adult and juvenile halibut to contribute to the coastwide biomass. Reduction of halibut bycatch will benefit thousands of fishing families, businesses and communities that depend on the health of the halibut resource that live in and fish throughout the Bering Sea and Gulf Alaska.

Response: NMFS believes that the preferred alternative demonstrates a balanced approach that meets the directive of National Standard 9. See Section 2.4 for the Council's rationale for choosing this alternative.

Comment 8.4.2-24: National Standard 9 requires the adoption of practicable measures to minimize bycatch and, where bycatch cannot be avoided, to minimize the resulting mortality. The "priority" under this standard "is first to avoid catching bycatch species where practicable." The practicability requirement under National Standard 9 does not prohibit expensive measures to avoid bycatch and minimize mortality, and even highly burdensome and extremely costly area closures have been upheld as reasonable exercises of agency authority. The costs here are likely to be small, because demonstrated and practicable, cost-effective technologies and behaviors that would allow A80 to meet the Alternative 4 limits are readily available today. National Standard 9 requires their adoption.

Response: NMFS agrees that the practicability requirement under National Standard 9 does not prohibit expensive measures to avoid bycatch and minimize mortality, and even highly burdensome and extremely costly area closures have been upheld as reasonable exercises of agency authority. As noted in Section 5.3 of the FEIS, under the Preferred Alternative some costs will be realized by the A80 sector in reducing bycatch when halibut abundance is medium to very low. Section 5.3.2.2 outlines the expected costs under various scenarios, which the Council took into consideration when selecting and recommending the preferred alternative to NMFS. NMFS believes the preferred alternative reflects a balance among National Standard requirements and the conflicting interests of the A80 sector and directed halibut users.

8.4.2.8 Comments related to the Summary of Analysis of Economic Cost and Benefit (Titled Net Benefits to the Nation in the DEIS).

Comments 8.4.2-25 through 8.4.2-27 are separate, but interrelated, comments. Therefore, NMFS has provided a common response that applies to all three comments. Section 5.6 of the DEIS, previously identified as "Net Benefits to the Nation" has been renamed as "Summary of Analysis of Economic Benefits and Cost" in the FEIS to clarify the focus of the analysis in that section. Additionally, this section has been revised in the FEIS to provide additional context for the analysis as it applies to E.O. 12866 and the requirement under the Regulatory Flexibility Act to develop a Regulatory Impact Review.

Comment 8.4.2-25: The misleading analysis in the DEIS results in a flawed finding of Net Benefits to the Nation. The DEIS states that the range of alternative limits aim to provide a choice in balancing "competing" requirements of the National Standards - particularly standards 1, 8 and 9. It proposes a national net benefits conclusion based on a broad-based consideration of producer and consumer surplus in the U.S. economy that included all direct and indirect participants in the fishery. The DEIS's conclusion anticipates revenue declines to the A80 companies that are disproportionate to any benefits conferred upon Bering Sea halibut fishermen and fishing communities. The analysis identified increased operating costs, reduced revenue in some years, negative effects on some suppliers, and some potential impacts on A80 seafood consumers. NMFS believes that any economic surpluses for fishermen, consumers and fishery suppliers generated by the Bering Sea halibut fisheries will not offset negative impacts to the bycatch fisheries. The DEIS concludes that "[o]verall, net benefits to the Nation are expected to be negative" and alternatives that save the most halibut for Bering Sea fishermen, communities and consumers will cause the net benefits to be even "more negative." This conclusion reflects a flawed economic analysis that excludes half the halibut (U26), among other concerns. Additionally, economic losses to the bycatch fisheries do not alone drive the National Standard 9 practicability standard; they are just "one of the factors that determine the extent to which it is practicable to reduce bycatch … in a particular fishery." The National Standard 9 guidelines indicate that net benefits to the Nation are much broader than potential revenue losses to the A80 companies. The determination of whether a measure "minimizes bycatch or bycatch mortality to the extent practicable, consistent with other national standards and maximization of net benefits to the Nation" involves consideration of multiple factors – population effects for the bycatch species, changes in the economic, social or cultural value of fishing activities, non-consumptive uses, and social effects.

Comment 8.4.2-26: Asserted economic impacts and the DEIS's suggestion that the action will result in negative net benefits to the nation are no bar to adopting Alternative 4. The determination of net benefits to the nation is unsupportable under the current analysis and lacks a basis in the data. Regardless, National Standard 9 does not require that a measure result in net benefits. The guidelines make clear that net benefits is just one of many factors that must be balanced in determining whether a measure is practicable, including the economic, social, or cultural value of fishing and other social effects that will result. Where those other factors unambiguously weigh in favor of stringent PSC reductions and the meaningful relief to the directed fishery, a measure is practicable regardless of the net benefits calculation.

Comment 8.4.2-27: The DEIS measures the impacts of the alternatives almost exclusively in terms of how Amendment 80 companies' bycatch of halibut over 26 inches in length affects Bering Sea halibut harvest opportunities and ex-vessel values and conversely, how bycatch reductions may reduce Amendment 80 companies' wholesale revenues. It identifies near-term benefits to Bering Sea halibut harvesters that would occur in subsequent years when IPHC harvest policy incorporates the lower bycatch numbers into its harvest policy and catch limits for the area. Ultimately, as described in our discussion of the National Standards findings in the DEIS, the agency asserts that bycatch reductions result in negative net benefits to the Nation. This conclusion is arbitrary, andin addition to improperly balancing social effects, it ignores downstream fisheries and the massive external costs imposed on Alaska communities by the bycatch fisheries. In short, the DEIS discounts social justice, ignores cultural extinction, and fails to place into context the contribution to socioeconomic health of a dollar circulating in St Paul or Metlakatla vs Seattle andthe Amendment 80 corporations.

Response to Comments 8.4.2-25 through Comment 8.4.2-27: See response to comments 8.4.1-15, 8.4.1-16, and 8.4.1-26 for description of the DEIS discussion of impacts on U26 halibut.

As stated in section 5.6 of the EIS: “Net benefits to the Nation are calculated by summing all producer and consumer surplus that occurs in the US economy. Both costs and benefits are defined broadly, from the Nation's perspective, to include all surpluses that accrue to direct and indirect participants in the fishery as well as to other members of society.” The net economic benefits estimation is based on the best information available for consumptive and non-consumptive users of the resource. That estimate fulfills the analytic requirements of Executive Orders 12866 and 13563 and provides relevant information, but it is only one portion of the analysis that the Council considered when selecting the Preferred Alternative. Note that the MSA’s definition of “optimum” with respect to the yield from a fishery includes providing “the greatest overall benefit to the Nation.” 16 USC § 1802(33)(A). The economic net benefits analysis under the executive orders is not the same, and as already noted, NMFS may implement conservation measures which have negative economic consequences. And the analysis indicates that the Council would achieve OY under each of the action alternatives under consideration. Congress and the Council set OY for the BSAI groundfish fisheries as a range between 1.4 and 2.0 mt. As long as the overall harvest of those fisheries falls within that range on a continuing basis, the Council and NMFS’s management would, by definition, provide the greatest overall benefit to the Nation.

The Preferred Alternative is designed to establish variable Amendment 80 sector halibut PSC limits employing an abundance based management strategy and to minimize halibut PSC in the Amendment 80 fleet to the extent practicable. The Council considered the National Standard 9 guidelines requiring consideration of additional factors when determining whether conservation and management measures minimize bycatch to the extent practicable. The factors most relevant to this action include changes in the economic, social, or cultural value of fishing activities and social effects. The SIA (Appendix 1) for this action presents the myriad ways halibut are valued and utilized in halibut-dependent communities and other sections of the analysis provide information on the expected changes is halibut availability to those users as result of projected changes in halibut PSC usage by the Amendment 80 sector.

The problematic nature of the no-action alternative for directed halibut fishery participants under halibut low abundance conditions is inherently recognized in the Council’s purpose and need statement. The action alternatives propose a range of Amendment 80 halibut PSC limit reductions under low abundance conditions. The Council’s preferred alternative proposes reductions under all but high setline index conditions and in that case proposes no change to the Amendment 80 halibut PSC limit. The EIS and the SIA describe potential adverse impacts to BSAI directed halibut fishery communities under the no action alternative and the potential benefit to those communities under the action alternatives. The EIS and the SIA also describe the potential adverse impacts to the Amendment 80 sector and associated fishing communities under the proposed action alternatives. Both the EIS and the SIA clearly note that existing trends suggest that sustained participation in a range of commercial fisheries by residents of small communities in the BSAI/Area 4 region has become more challenging in recent years, with less inherent flexibility to adjust to both short- and long-term fluctuations in resource availability (as well as to changing markets for seafood products). Further, both the EIS and the SIA note that to the extent that the proposed action alternatives would serve to provide for more opportunities for the success of small-scale commercial halibut fisheries during periods of low resource abundance, overall sustained participation in a range of local fisheries by residents of the smaller communities would be more secure.

The EIS and the SIA have highlighted potential environmental justice concerns where the potential for disproportionately high and adverse human health or environmental effects on minority populations, low-income populations, and/or Alaska Native/Native American tribes associated with the no-action or action alternatives have been identified. In SIA Section 6, community institutional summaries are presented identifying ANCSA regional and village corporations and federally recognized tribal entities as are tables including demographic indicators of minority and low-income populations for relevant communities. In SIA Section 7, summaries of potential environmental justice concerns are presented for relevant communities. In addition to issues associated with the directed halibut fishery in Alaska communities, of potential environmental justice concern would be loss of income opportunities for Amendment 80 processing crew. Although there are theoretically many more alternate employment and income opportunities for Amendment 80 catcher/processor crew in a large urban area than in smaller communities or rural settings, there may not be comparable employment and earning potential ashore as is available to crew members aboard these vessels, even in an otherwise robust job market, especially for crew members who have worked their way up from entry level positions.

SIA Section 7.2.6 notes that the cultural significance of halibut for fishermen and their associated communities includes but exceeds the economic value of the fishery. Key themes include how halibut fishing provides a local source of employment in a day fishery that allows individuals to remain in their community, spend time with their family and build social networks, and engage in broader, culturally meaningful practices like subsistence. Halibut fishing is also considered a meaningful vocation and way of life.

In selecting their Preferred Alternative, the Council considered how changes in Amendment 80 halibut PSC usage, in the context of halibut fishery management for all users, would impact the sustained participation of fishing communities and minimizing adverse economic impacts on such communities, while balancing the requirements of the national standards.

8.4.3 Comments on Climate change/Greenhouse gas emissions

Comment 8.4.3-1: The DEIS does not adequately address climate change or evaluate the practicability of the proposed action in a reasonably foreseeable future where warming temperatures in the BSAI are the norm. For example, the DEIS acknowledges that the presence or absence of the Bering Sea "cold pool" has important implications for the A80 sector, but inconclusively states that "[t]o the extent that fishery participants must reckon with this change,historical fishery data on catch, location, bycatch encounter rates, and CPUE might become less representative of the future state of the fishery." The analysis should at a minimum evaluate the impacts of a future in which 2019 conditions are the norm. Climate impacts are real and increasing, and their cumulative impacts on fisheries should be analyzed. NEPA requires the analysis to disclose the likely effects of climate change to give the Council and the public an accurate picture of the impacts and practicability of the proposed action. The cumulative impactanalysis in the DEIS needs to be substantially revised to include the impacts of this and other reasonably foreseeable future actions, including changes in location and availability of target species (such as yellowfin sole) and non-target species (including cod) in response to climate change. The agency must do more to analyze the impacts of climate change in the BSAI as it relates to the practicability of further halibut PSC reductions and cumulative impacts.

Response: Climate change uncertainties are not explicitly addressed in the methodology used for the impact analysis for this action, but can be inferred by different time frames used in the analysis as well as the discussion of uncertainties in halibut population dynamics. The analysis did not use a modeling framework and did not do a management strategy evaluation to encompass different uncertainties such as those due to climate change. That was outside the scope of what was covered in impact analysis, but information exists on the various uncertainties in the assessment and management of halibut population and PSC usage. As noted in the response to Comments 8.4.3-7, in October 2022 the Council initiated a review of the 2004 PSEIS, which will in part review the impacts of climate change to commercial groundfish fisheries managed under FMPs in Alaska.

Comment 8.4.3-2: Uncertainties related to climate merit further consideration, whether the uncertain timing of Pacific Decadal Oscillation (PDO) events or serious climate changes that significantly reduce the ability to predict species distribution shifts or other biological behaviors of Bering Sea fish stocks. The DEIS suggests that warmer conditions may worsen halibut bycatch by dispersing yellowfin sole, causing the A80 companies to kill more halibut in pursuit of their target species or because warmer bottom temperatures themselves increase halibut bycatch. A major concern of the SSC was that the analysis may have missed the potential for even lower future stock sizes, heightening the need for caution about future bycatch volumes.

Response: NMFS believes the range of alternatives takes into consideration lower future stock sizes, since each alternative includes a bottom threshold, which would include abundance levels below that threshold. If future circumstances warrant additional consideration, the Council and NMFS may revisit the issue.

The following eight comments were submitted by the Environmental Protection Agency and contain suggestions for improving the analysis with regard to climate change and greenhouse gas emissions (Comment 8.4.3-4 through 8.4.3-11*)*:

Comment 8.4.3-3: We believe Executive Order 13990 (Protecting Health and the Environment and Restoring Science to Tackle the Climate Crisis) and Executive Order 13754 (Northern Bering Sea Climate Resilience) should be incorporated into the analysis. Inclusion of directives of these Executive Orders into the analysis will support both the Council's and IPHC's decision-making by more robustly and holistically analyzing the A80 sector's impacts.

Response: Executive Order 13990 was introduced in 2021 and the Agency is still working to interpret how best to address this executive order. Executive Order 13754 is addressed in Comment 8.4.3-6.

Comment 8.4.3-4: We recommend NMFS clarify how the economic and fisheries models incorporate climatic change uncertainties into the impact chain.

Response: Section 5.3.2.3.2 of the EIS discusses potential impacts of changing environmental conditions on the practicability of the A80 fleet to avoid bycatch, particularly as it relates to warmer Bering Sea water temperatures and spatial patterns of target fisheries.

For the A80 revenue analysis described in section 5.3.2.1 analysts subset haul data into five datasets drawing from different time periods that represent different PSC use. These time periods encompass different periods of historical PSC usage, stock status of the halibut stock, environmental conditions (i.e., aggregation of halibut and overlap with target species) and fleet behavior (i.e., prevalence of halibut avoidance strategies such as deck sorting). These time periods also encompass different environmental conditions in the Bering Sea. Climate change uncertainties are not explicitly addressed in the methodology used for impact analysis, but can be inferred by different time frames used in the analysis as well as the discussion of uncertainties in halibut population dynamics. The analysis did not use a modeling framework and did not do a management strategy evaluation to encompass different uncertainties such as those due to climate change. That was outside the scope of what was covered in impact analysis, but information exists on the various uncertainties in the assessment and management of halibut population and PSC usage.

The analysis also notes that environmental conditions in the Amendment 80 fisheries impact halibut PSC rates and usage from year-to-year. Environmental factors complicate making direct comparisons of halibut PSC mortality across years, as the changes cannot be solely attributed to the mitigation measures implemented by the fleet.

Comment 8.4.3-5: We recommend that NMFS consider how the alternatives incorporate and reflect different climate change scenarios. We suggest NMFS explain how catch, thermal habitat availability, trade, pricing, and consumption will vary under different climate change scenarios. Because of the changing increase in thermal habitats that directly impact the stocks within the Bering Sea, we recommend more robust summary of analyses discussing habitats and ecosystems that may be impacted by the alternatives in the FEIS. We encourage NMFS to consider mitigation measures to avoid, mitigate, or alleviate these impacts.

Response: See response to Comment 8.4.3-6 for further information.

Comment 8.4.3-6: As directed by E.O. 13754, we recommend NMFS discuss how the changing climate and rising average temperatures are reducing the occurrence of sea ice; thereby changing the ecosystem dynamics that encompass the A80 groundfish fishery. We encourage NMFS to consider adaptive management practices that allow for the preservation of a healthy and resilient Bering Sea ecosystem. We believe this should include its migratory pathways, habitat, and breeding grounds, which area essential for the survival of marine mammals, fish, seabirds, other wildlife, and the subsistence communities that depend on them.

Response: The Agency is aware of the rapid ecosystem changes in the Bering Sea Ecosystem, including the reduction of sea ice and the impacts this has on the spatial extent of the Amendment 80 fishery. Section 5.3.2.3.2 of the EIS provides a brief summary of the potential impact of warming Bering Sea waters on flatfish CPUE and resultant halibut PSC. The analysis also includes a section (Section 6.4) on the status of the ecosystem. Ecosystem considerations for the groundfish fisheries are summarized annually in the SAFE report (available from: https://www.fisheries.noaa.gov/alaska/population-assessments/north-pacific-groundfish-stock-assessments-and-fishery-evaluation). Finally, in reference to consideration of adaptive management practices that allow for the preservation of a healthy and resilient Bering Sea ecosystem, the Council's Ecosystem Policy has been added to the analysis. The Council adopted an Ecosystem Policy that shall be given effect through all of the Council's work, including long-term planning initiatives, fishery management actions, and science planning to support ecosystem-based fishery management. Finally, as noted in Section 10 of E.O. 13754, the area of the Northern Bering Sea Climate Resilience Area is currently closed to non-pelagic trawl gear under FMPs for the BSAI and Arctic Management Areas. Amendment 80 vessels do not operate in that area, nor would they under any of the proposed alternatives.

Comment 8.4.3-7: We recommend that the FEIS include a detailed discussion of the proposed actions and alternatives' greenhouse gas emissions in the context of national and international greenhouse gas emissions reduction goals , including the U.S. 2030 Paris GHG reduction target and a 2050 net-zero pathway. We recommend that discussion address the increasing conflict over time between continued GHG emissions and GHG emissions reduction goals. This would provide decision makers and the public essential context regarding the A80's GHG emissions and how to correlate that information with essential emissions reduction policies. This would also assist NMFS in its determination of the significance of the potential impacts, whether alternative options should be selected. We encourage NMFS to clearly disclose any assumptions made in the analysis.

Response: NMFS does not believe that this type of analysis would add value to decision making for this proposed action, as it is would necessitate a wholesale evaluation of the entire Amendment 80 sector's GHG emissions for all operations. It is, therefore, beyond the scope of the proposed action. Such an analysis may be useful to include in a review of the 2004 Alaska Groundfish Fisheries Programmatic Supplemental EIS (PSEIS). The Council initiated a discussion paper for beginning such a review at their October 2022 meeting and indicated that the impacts of climate change will be included.

Comment 8.4.3-8: Life cycle analyses may incorporate discussion of impacts of the proposed action and alternatives (i.e.,which alternatives allow for the most vessel transits), production technology (e.g., capture fishing via trawling), product form (e.g., fresh gutted or frozen fillet), market destination, and transport mode to awholesaler (i.e., truck, air, ship). We recommend that the FEIS analysis focus on the main drivers of production-related emissions including:

- Activities at sea: vessel transits between the port to fishing ground(s); and fishing operations
- Activities on land: transportation of fish from port to a fish processing plant; and transportationfrom the fish processing port to market destination.

We recognize that post-harvest analyses are often not included in lifecycle analyses for these fisheries but find that this is inappropriate in this case. This is because the post-harvest emissions will likely not be negligible due to emission intensive transport modes required to return to port from the A80 groundfish fishery since it is a geographically remote area. It may be helpful to clarify these emissions by calculating the fuel use intensity in the A80 fishery per year per fleet segment. We find it would be useful to the public to compare the fuel use intensity to total production/catch.

Response: See response to Comment 8.4.3-7.

Comment 8.4.3-9: We recommend that NMFS use estimates of the social cost of greenhouse gases to disclose and consider the climate damages from net changes in direct and indirect greenhouse gas emissions resulting from the A80 Sector.

Response: See response to Comment 8.4.3-7.

Comment 8.4.3-10: We suggest NMFS make climate adaptation and resilience a priority consideration when preparing the final analysis and to consider climate resilience by requiring the A80 vessels to incorporate measures that support climate resiliency goals.

Response: NOAA's draft National Mitigation Policy was released in 2021 and directs the agency to consider climate change and climate resilience when evaluating and developing mitigation measures. Implementation of mitigation measures are to be proportional to impacts to NOAA trust resources and fully offset the impacts. The Agency is currently working on how best to address this policy. NMFS is developing policies to incorporate climate-related effects to NMFS trust resources EFH assessments if the best available information indicates climate change may cause the action to have an adverse effect, or exacerbate the adverse effect of the action. The EFH assessment should include climate projections and assessments of effects to habitats and species in the project area from climate change. See response to Comment 8.4.3-7.

8.5 Consistency with NEPA and Administrative Procedures Act Requirements

Comment 8.5-1: Neither the economic nor biological analyses in the DEIS objectively incorporate all of the available reliable data and information necessary to make an informed choice among the alternatives under consideration.

Response: NMFS disagrees. The FEIS contains a robust analysis of the best available relevant data and information.

Comment 8.5-2: The DEIS does not allow the reader to evaluate objectively whether or how the alternatives under consideration meet the goals of the MSA. While much useful information is accurately presented in the substantive sections of the DEIS, the DEIS taken as a whole does not objectively and impartially present the information necessary for the Council and the public to evaluate whether an alternative is consistent with the National Standards. The summary sections of the DEIS, particularly the Executive Summary and sections 5.9 and 7.1, appear to be based on several unsubstantiated assumptions at odds with conclusions and information in the technical analyses, ignore readily obtainable information, and consequently are not based on the best available scientific information as required by National Standard 2 as well as NEPA.

Response: NMFS disagrees. Section 7.1 discusses consistency with the MSA National Standards. NMFS believes the analysis provides a robust analysis based on the best information available.

Comment 8.5-3: The DEIS ignores readily obtainable information, and consequently are not based on the best available scientific information as required by National Standard 2 as well as NEPA.

Response: NMFS disagrees. NMFS believes the analysis provides a robust analysis based on the best information available.

Comment 8.5-4: The DEIS needs to consider impacts to all Alaska fishermen and coastal communities. The DEIS contemplates impacts only to Bering Sea fishing communities, vessels and crew and improperly excludes impacts to other Alaska communities. NEPA requires that federal agencies disclose sufficient information as needed to ensure two functions: "informed decision-making and informed public participation." "Misleading economic assumptions can defeat the first function of an EIS by impairing the agency's consideration of the adverse environmental effects" and "can also defeat the second function ofan EIS by skewing the public's evaluation of a project. The DEIS concludes that potential revenue losses to A80 companies outweigh the adverse ecological and socio-economic impacts to Alaska's marine resources and coastal fishing communities to such a degree that an action reducing the numbers of halibut killed by theA80 fisheries is bad for the United States. The failure of the DEIS to adequately consider the socio-economic contributions by all halibut harvesters in Alaska violates NEPA.

Response: NMFS disagrees that that the EIS concludes that potential revenue losses to A80 companies outweigh the adverse ecological and socio-economic impacts to Alaska's marine resources and coastal fishing communities to such a degree that an action reducing the numbers of halibut killed by theA80 fisheries is bad for the United States. Socio-economic considerations are well described in Sections 5.5 and 5.6 as well as in the Social Impact Assessment found in Appendix 1. The rationale for the preferred alternative describes how the needs of the various sectors affected are balanced under the preferred alternative. See also response to comments in Section 8.4.2.8.

Comment 8.5-5: When evaluating net benefits to the nation under the National Standards, the DEIS relies in part on the absence of a pound for pound linkage between halibut bycatch and Bering Sea halibut fisheries. The impacts analysis focuses exclusively on the extent to which cutting A80 halibut bycatch would have the short-term potential to affect catch limits for the commercial halibut fisheries in Area 4. As noted by the North Pacific Fishery Management Council's Science and Statistical Committee, the analysis "narrowly focused on the fisheries and communities directly engaged in the BSAI groundfish and halibut fisheries" even though "potential direct and indirect effects of the alternatives also impact fisheries outside the BSAI." This narrow focus fails to meet NEPA's requirements; an EIS needs to describe “the area(s) to be affected … by the alternatives under consideration” and discuss indirect effects, which mean effects “caused by the action and are laterin time or farther removed in distance, but are still reasonably foreseeable” and may be ecological, cultural, economic, or social.

Response: The analysis of the economic impacts is only a part of the overall analysis of impacts of the alternatives. Direct and indirect ecological,cultural, economic, and social effects are analyzed throughout the document. Socio-economic considerations are well described in Sections 5.5 and 5.6 as well as in the Social Impact Assessment found in Appendix 1. The rationale for the preferred alternative describes how the needs of the various sectors affected are balanced under the preferred alternative.

Comment 8.5-6: NEPA requires the agency to discuss “downstream” impacts which, depending on fishery selectivity and other biological processes, may be even larger than impacts to Bering Sea fisheries. The DEIS improperly excludes half the halibut from its impacts analysis (U26). The DEIS acknowledges that reducing the numbers of juvenile halibut killed by the A80 fleet could yield “longer term benefits to the directed halibut fisheries … throughout the distribution of the halibut stock. The two main reasons why reductions in juvenile halibut bycatch will have impacts “later in time” or “farther removed in distance” are simple and identified in the DEIS: Bering Sea halibut migrate to other areas and killing juvenile halibut can affect the overall productivity of the stock. The 2021 assessment of the effect of the bycatch fisheries on the coastwide directed fisheries explains that “potential yield to the directed fishery was generally larger than a simple reallocation from non-directed discards (115% on average), [and] that the rate of exchange is variable over time (range of 86-139%).” The DEIS arbitrarily dismisses this conclusion as a coastwide impact and not applicable to an action addressing Bering Sea bycatch of halibut longer than 26 inches in length. But on average, more than half the halibut killed by the A80 companies each year over the past decade are juvenile fish less than 26 inches in length.

Response: See response to Comments 8.4.1-15, 8.4.1-16, and 8.4.1-26 for more information on how NMFS considered downstream impacts as related to juvenile halibut.

Comment 8.5-7: This DEIS does not provide a scientifically sound analysis of biological, economic, or social coastwide impacts and fails to adequately inform balancing these impacts under the Magnuson-Stevens Act National Standards. An EIS must include “a discussion of adverse impacts that does not improperly minimize side effects.” This DEIS has failed in that regard. A foundational premise of NEPA is that the agency's "hard look" at the environment consequences is "almost certain to affect the agency's substantive decision." We find the DEIS arbitrary in its treatment of impacts to the halibut resource and in its treatment of the socioeconomic impacts to the directed halibut fisheries and fishing communities.We fully expect the inadequacies identified in these comments to be addressed prior to publication of the Final EIS.

Response: NMFS disagrees. NMFS believes the EIS does provide a robust and scientifically sound analysis of biological, economic, and social impacts, and takes the required “hard look” at the environmental consequences of the proposed action. The commenter does not specify what he or she finds arbitrary in the analysis of impacts to the halibut resource and in its treatment of the socioeconomic impacts to the directed halibut fisheries and fishing communities. The effects of the alternatives relative to the MSA National Standards are described in section 7.1. Direct and indirect ecological,cultural, economic, and social effects are analyzed throughout the document. Socio-economic considerations are well described in Sections 5.5 and 5.6 as well as in the Social Impact Assessment found in Appendix 1. The rationale for the preferred alternative describes how the needs of the various sectors affected are balanced under the preferred alternative.

Comment 8.5-8: NEPA requires careful consideration of impacts to the directed fishery and halibut-dependent communities in Area 4CDE. While the Halibut ABM process is the result of action by the Council, NMFS retains ultimate responsibility for ensuring that the Environmental Impact Statement is sufficient and that all requirements under the National Environmental Policy Act (NEPA) are satisfied. These "requirements are to be strictly interpreted to the fullestextent possible in accord with the policies embodied in the Act." NEPA requires federal agencies to take a "hard look" at the environmental consequences of their actions. To that end, "[e]very EIS must provide a full and fair discussion of significant environmental impacts of the proposed agency action." The agency's failure to adequately consider an important aspect of the problem renders an EIS legally deficient. Every EIS must include a purpose and need statement, specifying "the underlying purpose and need for the proposed action." The purpose and need statement is critical to the EIS and NEPA process because it defines the scope of the agency's analysis. Here, the purpose and need statement specifically identifies the unique and disproportionate impacts to Area 4CDE fisheries and communities as an important consideration to be addressed, stating: "When BSAI halibut abundance declines, PSC in Amendment 80 fisheries can become a larger proportion of total halibut removals in the BSAI, ***particularlyin Area 4CDE***, and can reduce the proportion of halibut available for harvestin directed halibut fisheries."
Given this recognized problem and clear statement of need, the analysis in the EIS must adequately consider and evaluate impacts to Area 4CDE specifically. As explained above, impacts from excessive halibut PSC mortality are concentrated to an extraordinary degree in Area 4CDE, with more than 90% of halibut removals by the Amendment 80 sector occurring there. Analyses that look at broader regional impacts—whether on a BSAI or even Area 4 basis—improperly dilute and mask the real and significant impacts to Area 4CDE that occur due to trawl sector bycatch in the waters surrounding the Pribilof Islands.

Response: See response to Comments 8.4.1-21, 8.4.1-37, 8.4.1-44, 8.4.1-47, and 8.4.1-49

Comment 8.5-9: The analysis violates the Administrative Procedure Act (APA) by failing to "examine the relevant data." The analysis and analysts' conclusion that the Amendment 80 sector's prospective revenue reductions resulted in a loss of national net benefits ignored downstream fisheries, community impacts and the agency's own National Standard guidelines thus also violating the APA.

Response: NMFS disagrees. See responses to Comments in Section 8.4.2.

8.6 Document Format

The following five comments were submitted by the Environmental Protection Agency and contain suggestions for improving the document format. (Comment 8.4.5-1 through 8.4.5-5*)*:

Comment 8.6-1: We recommend revising the analysis to be more concise, clear and to the point. The current analysis is difficult for readers to understand and navigate. We recommend adjusting the FEIS format to be consistent with the recommended format in the NEPA Implementing Regulations §1502.10 or justifying the inconsistency with that recommended format.

Response: NEPA Implementing Regulations §1502.10 lay out a preferred format for an EIS. That section also specifies that an alternate format may be used, as long as the document includes a cover sheet, summary, Table of Contents, List of preparers, List of agencies, organizations, and persons to whom copies of the statement are sent, and an index. This EIS includes all of those sections. CEQ regulations §1502.10 further specify that when an alternate format is used, it must also include the substance of required sections Purpose of and Need for Action, Alternatives including proposed action, Affected environment, Environmental consequences, and Appendices (if any). This EIS also includes those elements. Where this EIS deviates from the preferred format, it includes the elements of and follows the general template of NEPA Environmental Assessment (EA) analyses typically prepared for North Pacific Fishery Management Council actions.

Comment 8.6-2: When incorporating material by reference, we recommend providing sufficient background information on the material so that the analysis can serve as a standalone document to support public comprehension.

Response: The documents incorporated by reference are very complex and lengthy. Including enough detail for them to be standalone document would be burdensome and add unnecessary length to this document. Additionally, those documents are foundational documents for this and many of our fishery actions. A general understanding of their contents by stakeholders affected by this action is assumed by the analysts and decision-makers for this proposed action. Those documents are readily available using the links provided.

Comment 8.6-3: We recommend that the analysis include a clear description of how each alternative was developed and that the alternatives section should be revised to improve public approachability. Specifically, the document should show how the percentages of allowable PSC were determined for each alternative and its associated criteria from the IPHC setline survey index and the Eastern Bering Sea (EBS) trawl survey index. Alternatives should also be presented in a comparative form.

Response: Section 2 of the FEIS describes the evolution of the analytical process and the development of the alternatives. Alternatives are presented in a comparative form in Section 2.

Comment 8.6-4: We recommend NMFS offer a preferred alternative in the final analysis that allows for the most flexibility, allowing for the Council to utilize adaptive management strategies bolstered by iterative data collection and analyses. We encourage NMFS to be considerate of EPA's understanding that a central theme common to Executive Order 12866, Regulatory Flexibility Act, and Magnuson–Stevens Fishery Conservation and Management Act is the requirement to analyze the direct and indirect effects of regulations to demonstrate that regulations will result in net benefits to society, and to explain why a chosen regulatory measure is superior to other alternatives. We note that most of the alternatives illustrate means by which to lower the PSC limit, which we find this reasonable.

Response: The Council developed a new alternative (Alternative 5), and selected it as the preferred alternative. Alternative 5 has the same format as Alternatives 2 through 4 with a range of A80 halibut PSC levels linked to the same two survey abundance indices (AFSC BSAI trawl and IPHC setline surveys) as the other alternatives. The range of PSC limits in the preferred alternative (Alternative 5) are within the limits analyzed for Alternatives 2-4. Per requirements of Executive Order 12866, Regulatory Flexibility Act, and Magnuson–Stevens Fishery Conservation and Management Act, the direct and indirect effects of all alternatives are analyzed in the document in Section 5.6. The Council's rationale for selecting Alternative 5 as their preferred alternative is included in Section 2.4 of the EIS.

Comment 8.6-5: We recommend the final analysis include descriptions of the habitat and benthic environment in the project area and describe any essential fish habitat occurring in or around the project area. We also recommend discussion of ecosystems found in Area 4 and how that interconnect to other parts of the BSAI and ocean in general.

Response: Section 6.3 of the EIS has been updated to include discussion of the habitat, benthic environment, and essential fish habitat in the project area. Section 6.4 of the EIS describes the ecosystem.

8.7 Comments Outside the Scope of the Purpose and Need for the Action

8.7.1 General Bycatch Concerns

NMFS acknowledges the following comments expressing concerns regarding perceived excessive bycatch in the trawl fisheries in general. Due to the general nature of the concerns expressed, NMFS has determined that they are outside the scope of the Council's purpose and need statement for this action.

- Please rein in regulations on trawling. Trawling is not selective enough with the type of fish caught. We can't afford the massive and useless loss in wildlife they cause. We request that the practice of "trawler by catch" be studied and reviewed with the purpose of determining what impact this practice is having on the sustainability of sea life. Information provided by sport fishing guides in Alaska and other concerned individuals indicates this practice may be negatively impacting several species of fish and other sea animals. A proper study needs to be effected and policies enacted based on data gathered.

- The presence of any factory ship towing mid water or especially bottom trawl is messy. Any percent (of bycatch) is too much, but the amount of halibut bycatch could feed America for a year.

- The by-catch numbers are astounding and if people really knew the levels, they would be sickened. I believe that both the allowed harvest and by-catch numbers for these off giant shore trawlers is just way too high. Bycatch by trawl fleet for ALL species, it comes out to close to 100 million pounds per year.

- All trawl bycatch needs to be reduced substantially. We acknowledge that this will be hard for the trawl fleet to deal with but the situation we currently find ourselves in is the result of one fishery putting their own needs over what keeps things sustainable for the state as a whole. The data is astounding; the numbers don't lie, our fish and crab populations are in trouble, and if this is allowed to continue there will be no turning back on this. Drastic action needs to be taken now.

- It is tough to find violations with by-catch because the vast amount of it is legal. If the law isn't being broken, but there are still unacceptably negative results, then the limits needs to be changed because where it is now just isn't working. The halibut charter fleet believes that they are being ripped off by the commercial trawlers. If the trawlers were substantially restricted it would make the subsistence, personal use, and sport fishing halibut communities happy and hopefully more inclined to follow the law. If the trawlers were restricted then the current sport and charter restrictions would not be so bad.

- The amount of allowable bycatch of King Salmon as well as other important species such as Halibut, Sablefish, and Crab is out of control. It should not be up to the small boat fleet to carry the burden of the trawl fleet's inability to catch their target species without collateral damage.

- To allow these large industrial scale interests to take such a large amount of fish as bycatch, as waste, impacts us directly in terms of how much ofthe annual take of these species, (particularly Halibut and King Salmon), is left to spread around amongst the rest of us. In times of low abundance it should not be the people that need this resource the most that should have to pay the price for the industry's wasteful practices. Yet that is what is happening. As a resource becomes more scarce the conflicts over that resource become greater. As representatives of our local AC, we see the impacts of this first hand as we as a community are left to work out these conflicts, and fight over the remaining scraps amongst ourselves. The current practices and degree of waste as bycatch of these species represents an egregious failure of this system and our fisheries management. Allowing these practices to continue damages the reputation of Alaskan seafood, the reputation of this region for fisheries management, and works counter to ensuring the longevity of these species. Trawlers should not be allowed to continue the senseless destruction of fisheries so important to the livelihoods and subsistence lifestyles of the peoples and communities like ours, that rely on this resource across Alaska.

8.7.2 Other Concerns

Comment 8.7.2-1: To date there has been no evidence of any ocean bottom recovery in or near Alaskan waters in the North Pacific after being trawled by a bottom trawling vessel, even after decades of research. The Department of Commerce and NOAA must take immediate action to stop the environmental destruction of these areas and the immoral waste of fish/crab that the present system perpetuates. We are witnessing the collapse of the bottom ecosystem and numerous fish/crab stocks inthe Gulf of Alaska and the Bering Sea. Destruction of the marine environment by bottom trawls destroys the habitat that many of these fish stocks require for their survival. Multiple types of corals, sponges, anemones, crab, halibut and other marine life and other marine life vital for the survival of bottom dwelling fish and crab are decimated. They will take decades or centuries to recover, if they even are able to. An unconscionable and immoral result of the failure of theNPFMC to effectively manage to minimize this waste. Suggested actions:

1. Trawling in these areas should be stopped until such time that significantly reduced bycatch levels have been established with no exceptions or revisions of bycatch limits.

2. Trawling should not resume until a thorough review and understanding of the impacts to the ecosystem of the ocean floor in any area open to bottom trawling has been completed.

3. 100% observer monitoring must be initiated and maintained on any vessel conducting trawl operations in the western Gulf of Alaska and the Bering Sea. Additionally, the companies responsible for the operation of these trawl vessels must be require to fund allcosts of monitoring.

4. Reporting of all non-targeted fish bycatch must be made readily accessible to the general public in a simple format on the NPFMC website. It must also include birds, marine mammals and other incidental catch that occurred during the reported timeframe.

5. Appointment process of NPFMC members by the governors of Alaska, Washington and Oregon must be changed to stop the ‘selling of seats’ and include a broad public participation process to insure unbiased selection of highly qualified board members. Additionally, board seats representing indigenous and conservation interests must be added to the board.

Response: NMFS acknowledges the comments, but notes that they are outside the scope of this action.

The following comment was submitted by the Department of Interior and contains suggestions for improving the analysis with regard to Alaska Native Tribal interests:

Comment 8.7.2-2: Given the increasing decline of the halibut fishery and the importance of this fishery to Tribal subsistence users as well as to the well-being of Alaska Native communities, we believe that Alaska Native Tribes must be part of Council membership. With the inclusion of Tribal representatives on bodies such as the Council, Tribal interests can be fully and thoroughly incorporated into the decision-making process. The result will lead to improved decisions as envisioned by Executive Order 13175 and NEPA. We recommend that Secretary of Commerce Raimondo consider appointing a minimum of twoTribal representatives to the Council. Tribal representation on the Council will also assist the Council in conducting meaningful and productive consultation with Tribes prior to making decisions and recommendations that will impact Tribal communities. We understand that requiring the appointment of two Tribal representatives to the Council would require an amendment to the Magnuson-Stevens Fishery Conservation and Management Act Section 302(a)(l)(G), 16 U.S.C § 1852 (1976), and we hope that the National Oceanic and Atmospheric Administration would support such an amendment to ensure that the perspectives of Tribes are fully heard and considered.

Response: NMFS acknowledges the comment, but notes that it is outside the scope of this action.

8.8 Changes in the Final EIS from the Draft EIS

The following changes to the draft EIS have been made in this final EIS to update information, clarify discussion, or in response to public comments.

Throughout the document the terms draft Environmental Impact Statement and DEIS have been changed to reflect that this is the final Environmental Impact Statement, or FEIS. Additionally, edits have been made throughout the document for clarification and in response to public comments, not all of which are covered in detail here. In general, these changes include:.

Document Cover Page, Navigation, and Executive Summary:

The document title on the cover page was revised to reflect the new proposed BSAI FMP Amendment number 123 and the change from the document as the draft EIS to the final EIS.

The document Tables of Contents, Tables, and Figures were updated to reflect revised pagination and section numbering.

The Executive Summary was updated to reflect relevant changes in the body of the document, as detailed below.

Chapter 1:

Section 1.3.1 - This section was added to include information on Tribal consultation and opportunities for input from Tribal members, Alaska Native organizations, and representatives.
Section 1.4 - Figure 1.3 was updated to include approximate timeframes for the publication of the proposed and final rules and implementation.
Section 1.6.1 - An EBS shelf trawl survey data point was added to Table 1.4 to add a 2021 value.
Section 1.6.2 - Table 1.5 was updated to add space time model and 2021 data, text was also updated and table 1.6 was replaced with the one available to the Council (addendum) at final action.

Chapter 2:
The new Alternative 5 was added as the preferred alternative selected by the Council. The general text was revised to accommodate the addition and describe it.

Section 2.5 - The description and rationale for selecting the preferred alternative was added.
Section 2.6 - Added the new Alternative 5 (preferred alternative) and accompanying text.
Tables 2.8 and 2.9 - Added new Alternative 5 (preferred alternative).
Section 2.7 - Clarified that new Alternative 5 (preferred alternative) established that the most recent year data point would be used in the absence of a survey.

Chapter 3:

Section 3.3 - Added a paragraph regarding cooperation in the Amendment 80 sector in response to public comment.

Chapter 5:

Section 5.2.2.2 - Removed paragraph discussing EO12866 $100M threshold.
Section 5.3.2.3.9 - Added clarifying text on simultaneous use of deck sorting and excluder use in response to public comments.

Section 5.3.2.5 - Amended text to more clearly describe conclusions and clarify some issues in response to public comments.

Section 5.5 - Revised the use of the terms "direct" and "indirect" to improve consistency of application of the terms. Added the new Alternative 5 (preferred alternative) and updated analysis where relevant.

Section 5.5.2.1.1 - Clarified existing language in response to EPA comment on potential EJ concerns and deleted an unneeded reference to closed loop model

Section 5.5.2.1.3 - Added clarifying detail regarding potential indirect impacts to subsistence use of halibut.

Section 5.5.2.1.4 - Clarified IPHC management process with regard to potential impacts halibut recreational fishing.

Section 5.5.2.1.5 - Added a clarifying note on the problematic nature of status quo under low abundance conditions

Section 5.6 - Revised title and text of section to include introduction of the Regulatory Impact Review analysis and clarify the context of the economic analysis within the FEIS.

Section 5.7 - Added the new Alternative 5 (preferred alternative) and footnote (#105) that notes Environmental Justice and Social impacts for the new Alternative 5 are covered in section 5.4. Added new paragraph that qualitatively discusses E.O.12866 to better describe uncertainty and assumptions associated with revenue estimates.

Section 5.9.4 – Included mention of Alternative 5

Table 5.9 - Fixed an error in the 2019 limits.

Table 5.12 - Fixed an error in the 2020 limit mortality encounter row.

Chapter 6.

Section 6.1.2 - Added new Alternative 5 (preferred alternative) to the description of impacts.

Section 6.3 - Added current EFH status.

Section 6.4.1.2 - Added new Alternative 5 (preferred alternative) and updated text where relevant.

Section 6.4.2 - Added new Alternative 5 (preferred alternative).

Chapter 7.

Added the word "Ecosystem" to the section title.

7.1 - National Standards revised to include new Alternative 5 (preferred alternative) and updated text where relevant.

7.2 - Added Ecosystem Policy section in response to a comment from the Environmental Protection Agency on the draft EIS.7.4 – Changed the section number associated with The Halibut Act due to adding Ecosystem Policy section

Chapter 8.

This chapter was added to include summaries of 1.) substantive public comments on the draft EIS and NMFS responses and 2.) changes in the final EIS from the draft EIS.

Appendix 1. Social Impact Analysis (SIA)

The new Alternative 5 (preferred alternative) was added and relevant was updated text where appropriate. Throughout this Appendix 1 the use of the terms "direct" and "indirect" has been revised to improve consistency in the application of the terms. Additionally, the formatting of a number of tables was revised to improve clarity.

Section 1.1.2.1.1 - Clarified existing language in response to EPA comment on the draft EIS on potential Environmental Justice concerns.

Section 1.2.1.1 - Deleted unneeded reference to the closed loop model.

Section 1.2.1.3 - Added detail regarding potential indirect impacts on subsistence use of halibut.

Section 1.2.1.4 - Clarified IPHC management process for recreational halibut fishing.
Section 1.2.1.5- Added note problematic nature of status quo under low abundance conditions in a rural/cultural context.
Section 3.5 - Added a summary of information on Tribal consultation available to Council prior to final action.
Section 3.6.2 - Added two footnotes with additional information on EO 14008 discussion in response to EPA comments on the draft EIS.
Section 4.3.2 - Expanded footnote on why an analysis of impacts to specific downstream halibut communities would be speculative.
Section 4.3.3 – Added text to footnote #30 on Seattle MSA in response to EPA comments on the draft EIS.
Section 4.4 - Added text to footnote #32 on Environmental Justice thresholds in response to EPA comments on the draft EIS.
Section 4.4.5 - Clarified availability of subsistence data in response to public comments on the draft EIS.
Section 4.5.6 - Added information on local and traditional knowledge and the Local Knowledge/Traditional Knowledge/Subsistence Task Force and footnote #38 in response to EPA comments on the draft EIS.
Section 5.4.5 – Clarified text on halibut in the context of other subsistence resources.
Section 6 – To improve clarity, added subheadings in introduction of this section and provided rationale for organizing discussion by CDQ region in text and footnote in response to public comments on the draft EIS.
Section 6.1.2 – Added archaeological information in response to public comments on the draft EIS.
Section 6.2.5.1 - Added footnote #102 with information provided in public comment on the draft EIS discussion on halibut catcher vessel communities.
Section 7.1.2.1.1 - Clarified existing language on potential Environmental Justice and added footnote 146 in response to EPA comment on the draft EIS.
Section 7.2.4 - Added detail in text and in new footnote #153 regarding potential indirect impacts to subsistence use of halibut.
Section 7.2.5 - Clarified IPHC management process of recreational halibut fisheries.
Section 7.2.6 - Added a reference to food security in the rural and cultural context and text on the problematic nature of status quo under low abundance conditions in response to public comment on the draft EIS.

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[114] Contributing does not imply endorsement by the contributor's associated agency

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Index

11 Appendix 1: Social Impact Assessment

Appended separately