DRAFT FOR INITIAL REVIEW

Environmental Assessment/Regulatory Impact Review for Proposed Regulatory Amendment

Allow Longline Pot Gear in the Bering Sea Greenland Turbot Fishery

September 14, 2022

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Abstract: This Environmental Assessment/Regulatory Impact Review analyzes proposed management measures that would authorize the use of longline pot gear when directed fishing for Greenland turbot in the Bering Sea management subarea. The action would apply to any holder of a groundfish License Limitation Program license that is endorsed for non-trawl gear. An optional measure would exempt longline pots used in the directed fishery for Greenland turbot from the 9-inch maximum tunnel opening restriction. The purpose of the action is to provide the non-trawl sector with options to effectively prosecute the Greenland turbot fishery in the context of whale depredation on hook-and-line gear.

List of Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
AAC	Alaska Administrative Code
ABC	acceptable biological catch
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
CV	catcher vessel
DPS	distinct population segment
E.O.	Executive Order
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	endangered species unit
FMA	Fisheries Monitoring and Analysis
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
IRFA	Initial Regulatory Flexibility Analysis
IPA	Incentive Plan Agreement
JAM	jeopardy or adverse modification
lb(s)	pound(s)
LEI	long-term effect index
LLP	license limitation program
LOA	length overall
m	meter or meters
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act

Acronym or Abbreviation	Meaning
MMPA	Marine Mammal Protection Act
MSST	minimum stock size threshold
t	tonne, or metric ton
NAICS	North American Industry Classification System
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fishery Service
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
NPPSD	North Pacific Pelagic Seabird Database
Observer Program	North Pacific Groundfish and Halibut Observer Program
OMB	Office of Management and Budget
PBR	potential biological removal
PSC	prohibited species catch
PPA	Preliminary preferred alternative
PRA	Paperwork Reduction Act
PSEIS	Programmatic Supplemental Environmental Impact Statement
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
Secretary	Secretary of Commerce
SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpbacks
SRKW	Southern Resident killer whales
TAC	total allowable catch
U.S.	United States
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system

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Executive Summary

This Environmental Assessment/Regulatory Impact Review analyzes proposed management measures that would authorize the use of longline pot gear when engaged in directed fishing for Greenland turbot in the Bering Sea management subarea. The action would apply to any holder of a groundfish License Limitation Program license that is endorsed for non-trawl gear. An optional measure would exempt longline pots used in the directed fishery for Greenland turbot from the 9-inch maximum tunnel opening restriction. The purpose of the action is to provide the non-trawl sector with options to effectively prosecute the Greenland turbot fishery in the context of whale depredation on hook-and-line gear.

Purpose and Need

The Council drafted the following purpose and need statement in February 2022:

> Whale depredation is precluding directed fishing for Greenland turbot by commercial hook-and-line (HAL) gear vessels in the Bering Sea. Participation in this fishery has been a significant source of income for a number of HAL CP vessels that primarily target Pacific cod. The importance of turbot fishing increased for these vessels as Pacific cod TACs in the Bering Sea saw major declines between 2012 and 2021. Although single pot gear is currently authorized for Greenland turbot, single pots have not been deployed because of their inefficiency in the depth and location where the fishery occurs. A regulatory amendment that would allow vessels to use longline pots when fishing for Greenland turbot would likely resolve the depredation problem and allow this fishery to resume. Other benefits of reduced whale depredation on Greenland turbot could include improved catch accounting for managers, and data quality for the Greenland turbot stock assessment.

Alternatives

Alternative 1: No Action. (longline pot gear is not authorized for Greenland turbot in the Bering Sea subarea

Alternative 2: Authorize the use of longline pot gear when directed fishing for Greenland turbot in the Bering Sea subarea

Option 1: Exemption from the 9-inch maximum tunnel opening restriction. (The 9-inch maximum tunnel opening requirement does not apply to longline pots used to directed fish for Greenland turbot in the Bering Sea subarea.)

Alternative 2 bases the gear authorization on *directed fishing* for Greenland turbot, which is defined as retention above the maximum retainable amount (MRA) as defined in regulations at §679.20. Gear limitation regulations at §679.24 do not permit the retention of *any* groundfish in longline pot gear that does not have an explicit exception. This means that if an exception for Greenland turbot is added under Alternative 2 then the only species that could be retained are Greenland turbot and – if IFQ or CDQ is possessed onboard – sablefish and halibut. All other groundfish would have to be discarded. Pacific cod and other groundfish would be considered prohibited species in longline pot gear and could not be retained even up to the MRA limits.

The Council has not contemplated restricting the authorization of longline pot gear within the directed fishery for Greenland turbot to a particular operational type (e.g., CP or CV) or a set of LLP licenses. As such, this analysis presumes that any vessel named on an LLP license with BS and non-trawl endorsements could utilize longline pot gear in the Greenland turbot directed fishery. Based on historical participation in the BS Greenland turbot fishery, this analysis is largely focused on the CP sector.

Fishery Description and Economic/Social Impacts

Section 3 of the document provides contextual information and interpretation on the prosecution of the BS Greenland turbot fishery, NMFS management, voluntary inter-cooperative management between historical non-trawl and trawl participants, catch, gross revenues, ties to fishing communities, and a market summary. That section also provides the best available evidence to gauge the prevalence and impact of whale depredation on the Greenland turbot hook-and-line fishery. Section 4 provides a narrative summary of impacts relative to the No Action alternative.

Under current regulation, any vessel named on an LLP license with BS and non-trawl endorsements may currently fish for Greenland turbot with HAL or single-pot gear. Under Alternative 2, this same pool of vessels could also engage in the same fishery using longline pot gear. The number of licenses with BS and non-trawl endorsements is far greater than the number of non-trawl vessels that have historically targeted BS Greenland turbot (Table ES-1). Historical participation in the non-trawl segment of the BS turbot fishery has come from the Freezer Longline Coalition (FLC) cooperative of vessels that primarily focus on the Pacific cod hook-and-line (HAL) fishery. A subset of those vessels/licenses target BS Greenland turbot as a complementary fishery in the late-spring or summer. Of the LLP licenses that could directed fish for BS turbot with non-trawl gear and are not part of the FLC cooperative or the Amendment 80 (A80) trawl cooperative, there are seven CP LLP licenses that have been recently active in the BSAI; four of those licenses are attached to vessels that were predominantly engaged in the BS Pacific cod pot CP sector. Table ES-1 shows that a subset of the HAL CP fleet had made BS Greenland turbot a part of their annual fishing plan even as non-CDQ TAC declined, but the non-trawl sector withdrew from targeting in 2018 and ceased completely in 2021. Non-trawl CPs that had targeted turbot relied on the fishery for around 10% to 17% of their annual gross revenue, on a per vessel average, from 2010 through 2017 before revenues declined with participation in the context of whale depredation and other complications (flatfish markets and logistics related to COVID-19). Table ES-2 shows total gross first wholesale revenues for BSAI Greenland turbot.

Table ES-1 Bering Sea Greenland turbot non-CDQ ITAC and catch by HAL CPs (mt) and number of vessels, 2010-2022 ('C' denotes confidential data)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022*
BS Non-CDQ ITAC	*3,587*	*2,975*	*5,296*	*1,369*	*1,410*	*2,081*	*2,272*	*3,719*	*4,356*	*4,356*	*4,356*	*4,356*	*4,709*
Total Catch Retained	1,281	1,631	1,369	555	610	1,042	943	922	249	519	272	0.3	C
Retained in Target	1,177	1,503	1,293	548	600	1,032	889	815	166	474	221	0	0
% in Target	92%	92%	94%	99%	98%	99%	94%	88%	67%	91%	81%	0%	0%
#Vessels Retaining	23	17	16	11	12	9	11	16	17	12	13	4	1
#Vessels Targeting	9	8	7	3	3	3	5	4	3	3	4	0	0
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022***
Total Catch Discarded	18	12	14	15	19	23	40	53	15	19	10	9	0.3
Discarded in Target	6	5	7	12	15	9	13	14	1	4	1	0	0
% in Target	32%	40%	54%	82%	82%	42%	33%	27%	8%	23%	7%	0%	0%

* 2022 data through June 15. Amount discarded YTD 2022 is not confidential because more than 3 vessels have discarded turbot.
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Table ES-2 Total gross first wholesale revenues from BSAI Greenland turbot for HAL CPs, 2010-2021 ($millions, real-dollar adjusted to 2021)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Target	6.1	9.2	8.4	1.5	2.2	3.8	4.4	3.9	1.0	2.3	1.0	0.0
All Retained	7.2	11.1	8.8	2.1	2.3	3.9	4.5	4.3	1.1	2.4	1.1	< 0.01

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

CVs rarely targeted Greenland turbot during the analyzed period, likely due to the remoteness of the area where fishing occurs and characteristics of Greenland turbot flesh that would degrade value in the time required to make a shoreside landing. Since 2003, only eight non-trawl CVs recorded catch in the

Greenland turbot target; six of those records occurred in 2003, one in 2006, and one in 2014. In all cases, the catch was made with HAL gear and was delivered to shore-based processing facilities in Unalaska, AK.

Section 3.3.4 (Figure 3-1) and the Appendix to this document respond to the Council's request for information on the spatial and temporal overlap of trawl and non-trawl (HAL) effort in the Greenland turbot target fishery. The document acknowledges that the timing and location of non-trawl effort could shift as longline pot gear is introduced and tested. Significant changes in the spatial distribution of effort are not expected. Non-trawl vessels using longline pot gear could distribute effort earlier in the year to minimize the challenges of handling pots on deck in the fall but that hypothesis cannot be tested prior to authorization of the gear type. Moreover, the Appendix shows that targeting of Greenland turbot tapers to a low level towards the end of the summer months. It has been relatively uncommon for vessels from the trawl and non-trawl sectors to target Greenland turbot in the same week and ADFG Statistical Area. In instances when this did occur, the maximum number of active vessels was three. Typically, vessels were alone in a week/area combination or fishing alongside other vessels from within their own cooperative.

Section 3.3.5 provides the best available information to understand which species, other than Greenland turbot, might be expected to occur in a longline pot fishery. Because pot gear has not been used for turbot in the western portion of the BS and has not been used extensively for other species in that area, this document relies on data from similar gear/species combinations to gauge which non-turbot species occur at similar depths and in pot versus HAL gear (Table 3-6 and Table 3-7). A notable difference that could occur with the introduction of pot gear to the turbot fishery is a decrease in bycatch of unmarketable grenadier. Relying on Pacific cod pot gear as a proxy for what species might occur in turbot pots is complicated by the difference in depth at which the gear is expected to be set. The Council may be interested in non-retainable bycatch of Kamchatka and arrowtooth flounder, which could affect the timing of directed fishing closures for those species that might impact the A80 trawl sector. Those flatfish species occurred the most in the turbot HAL fishery; they did occur in existing pot fisheries but at relatively lower rates. Depth-specific catch data from the turbot HAL fishery demonstrate a clear delineation in where turbot and Pacific cod are encountered, which affects expectations about the amount of non-retainable cod that could occur in a turbot pot fishery. Expectations about which PSC species would occur in turbot pots are obscured by a lack of pot fishing data in the area where the turbot fishery would occur. The available data suggest that longline pots could catch fewer halibut. The sparse pot data show relatively few golden king crab, but the directed fishery for that crab species is the one that spatially overlaps the turbot grounds the most.

Evidence of trends in killer whale depredation on longline catch is presented from observer data and from the AFSC's biennial longline survey. The Bering Sea was the area where the greatest proportion of survey stations experienced depredation and the proportion of survey gear skates that were depredated has been between 40% and 50% since 2009. Observer data show that turbot is the species that is most depredated upon, and that the percentage of gear in the turbot HAL fishery where marine mammal interactions were recorded reached a higher plateau beginning in 2016 (estimated at 5.4% to 8.5% of HAL gear hauls from 2016-2021).

<u>Alternative 1</u>

The No Action alternative would likely prolong the drop in non-trawl participation and revenues shown in Tables ES-1 and ES-2. Non-trawl vessels that resume targeting BS Greenland turbot with HAL gear in the presence of effective depredating whales would likely be subject to higher operating costs and lower CPUEs, which decreases the overall efficiency of the fleet and has adverse economic impacts that flow down to crew members who are paid for their time based on revenue shares. The complementary nature of the Greenland turbot fishery means that the absence of a turbot opportunity is less likely to eliminate vessels entirely from the Alaska fleet, but certain individuals are affected on the margin. Turbot dependency varies across individual vessels. Two non-trawl CPs recorded an average of roughly 20% of annual gross revenues in the Greenland turbot target during the analyzed period, with short individual peaks in the range of 35% to 45% of annual revenue. Aside from those vessels, few others generated more than 5% of annual gross revenue from turbot in any year. It is reasonable to assume that the 2021 and 2022 fisheries reflect how the BSAI HAL CP sector will deploy effort in years with no turbot fishing; the total number of active HAL CPs was 17 in 2021 and was at 15 in mid-summer 2022. The size of the fleet is more likely determined by the state of the Pacific cod fishery and further efficiencies that might come with new-build vessels – both unrelated to this action. On a percentage basis, the economic impact of an inactive non-trawl turbot fishery is small for the communities (and State tax levies) that are linked to the formerly active vessels through self-reported homeport or ownership residency (< 0.5% of gross revenues annually).

Alternative 2

Alternative 2 would directly benefit the subset of non-trawl CPs that had historically targeted BS Greenland turbot with HAL gear but stopped doing so due to operational challenges posed by killer whale depredation that made fishing uneconomical. The authorization of longline pot gear could restore the participation and catch levels in the non-trawl segment of the directed fishery from roughly 2010 through 2017. The efficacy of longline pot gear at great depths in the western portion of the BS cannot be assumed, but the option to test it represents a clear benefit to non-trawl participants relative to the No Action alternative. The Option to remove the 9-inch tunnel opening restriction is viewed as a clear benefit to those who would target turbot with longline pots.

History shows that a turbot fishery with a non-regulatory trawl/non-trawl TAC-split supported three to five non-trawl CPs at TAC levels that were lower than they are currently. Nothing under existing regulations or the action alternative would prevent a larger number of vessels from participating, but at a certain point each additional vessel would dilute expected per-vessel revenues to the point where vessels that have other fishing or tendering options would choose those over the opportunity cost of fishing off the western BS slope in the late spring or summer. For the purpose of discussion, this analysis estimates a "likely" number of longline pot participants in the range of four to nine vessels, with nine representing a rebound to participation from the 2010-2012 period and very limited expectation of non-FLC vessels entering the fishery. It is not known whether the entry of non-FLC non-trawl vessels would upend the existing non-regulatory TAC-splitting agreement between FLC and the A80 cooperative. Given the relatively small scale of the fishery and the strong organization of the historical participants from both gear sectors, it is reasonable to expect that non-regulatory solutions can be found for complications that might arise from one or two new independent participants. The likelihood of many new entrants from within the FLC cooperative is limited by the fact that commercially affiliated vessels would be competing down the economic efficiency of a relatively small fishery. Participation in a longline pot fishery would incur up-front costs for vessels (mostly gear-related); some vessels might have to make modifications to comply with monitoring requirements for pot gear.

Retention of all non-turbot (and non-IFQ) species would be prohibited when using longline pot gear, which may limit the fishery's attractiveness for some and would result in regulatory discards. Catch of non-retainable species like Pacific cod, Kamchatka flounder, or arrowtooth flounder would affect commercial users of those directed fishing allowances in that year and also influence the level of ICAs set for the following year, which in turn affects TAC allocations.

It is possible that the timing of the non-trawl turbot fishery could shift or be redistributed under Alternative 2 as whale avoidance becomes less of a driving factor. The overall economic effect would be based around flexibility. Non-trawl operators might experiment with fishing earlier in the year, allowing a gap between cod seasons when vessels could return to port for service or where vessels might pursue other sources of fishing revenue. If vessels use heavy groundfish pots, operators might shift effort earlier in the year to reduce safety risks associated with deck-loads and pot handling in harsher weather later in the year. From an economic impact perspective, removing the timing constraint of depredating whale prevalence provides options to the fleet to make decisions that are optimized on an individual level.

Environmental Impacts

Table ES-3 shows the components of the human environment and whether the proposed action and its alternatives have the potential to impact that resource component and thus require further analysis. No effects are expected on habitat and the ecosystem because the potential allowance of longline pot gear to fish for Greenland turbot would not result in changes in the harvest season or location of fishing, and does not authorize a gear type that is not already allowed for other fisheries managed by the NPFMC in the same areas.

Table ES-3 Resources potentially affected by the proposed action and alternatives

Potentially affected resource component							
Groundfish	Prohibited Species	Ecosystem Component Species	Marine Mammals	Seabirds	Habitat	Ecosystem	Social and economic
Y	Y	N	Y	Y	N	N	Y

The effects of the Greenland turbot fishery on the Greenland turbot stock is assessed biennially in the BSAI SAFE report, the Greenland turbot stock assessment and was also evaluated in the Alaska Groundfish Fisheries Harvest Specifications EIS. Impacts on Greenland turbot under Alternative 1 are determined not to be significant. Under Alternative 2, the Greenland turbot fishery would remain constrained by existing regulations concerning the location and timing of the fishery, PSC and bycatch limits, and all other accountability measures currently in place so increase in vessel participation would be de minimis for the Greenland turbot stock. Similarly, it is not expected that the fishing footprint for the harvest of Greenland turbot would change under Alternative 2.

The effects of the Greenland turbot fishery on fish that are caught incidentally have been comprehensively analyzed in the annually BSAI SAFE reports and was also evaluated in the Groundfish PSEIS (NMFS 2004), and Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). These analyses concluded that under the status quo, neither the level of mortality nor the spatial and temporal impacts of fishing on fish species or prey availability are likely to jeopardize the sustainability of the target and ecosystem component fish populations. As a result, impacts on incidental catch of groundfish under Alternative 1 are determined not to be significant. Based on the comparison of catch between gear types in the western portion of the Bering Sea, the analysts can make presumptions about how a switch from HAL to longline pot gear might affect incidental catch of groundfish. It is likely that introducing longline pot gear to the turbot fishery would reduce the incidental catch of grenadier and skates, which appear less prevalent in pots. It is also likely that the incidence of Pacific cod in the Greenland turbot fishery will remain a presence but a relatively small one due to the depth at which turbot are targeted. The effect of Alternative 2 on incidental catch of sablefish and halibut is unclear. Sablefish are targeted at similar depths to Greenland turbot and the proportion of sablefish incidental catch was higher in the turbot HAL fishery than in Pacific cod fisheries. However, it is unknown whether the use of pot gear with escape rings will mitigate some sablefish bycatch in ways that are not possible when fishing with hooks. Any vessel that possesses unused halibut IFQ onboard would be required to retain the halibut if the IFQ season is open. In terms of gross incidental catch, pots caught fewer halibut than HAL gear in the western BS Pacific cod target fishery – though both were at low proportions of total average catch. In the sablefish target, pots caught more halibut than HAL but sample sizes in the relevant area were small and co-targeting of IFQ species may be a confounding factor. In the Greenland turbot HAL fishery, halibut was encountered at a much lower rate than sablefish, perhaps signaling the significant difference in the depth fished. Halibut caught in pots are currently assessed a higher DMR (33%) than HAL-caught halibut (10%). For crab species, examination of bycatch in other pot fisheries shows that golden king crab would have the highest likelihood of interacting with a Greenland turbot longline pot fishery but that overall bycatch would not be expected to be high. Other species of crab, such as bairdi Tanner crab, opilio Tanner crab, and red king crab generally occur shallower and closer to the mainland than where the Greenland turbot fishery would operate and it is not likely that high numbers of crab would interact with the BS turbot fishery. While it is not possible to project how fishing effort may change under Alternative 2, it is reasonable to assume that effort is not likely to increase to a level that would jeopardize the continued sustainability of groundfish, halibut, and crab species. If actions under Alternative 2 result in greater incidental catch of those species, certain fisheries or areas would still be closed to directed fishing or be placed on non-retention status once existing limits are reached. NMFS's inseason management authority would remain in place to prevent impacts on groundfish or other stocks beyond the impacts that have already been evaluated in the Groundfish PSEIS (NMFS 2004) and the Harvest Specifications Environmental Assessment (NMFS 2007).

Under Alternative 1, there would be no expected changes in incidental take, prey availability, or disturbance effects on marine mammal species. The main threat to marine mammals from the Greenland turbot fishery is the risk of entanglement. Entanglement for marine mammals generally occurs with vertical lines that attach gear to a surface buoy and not the lines that lay at depth. With the threat of depredation removed or significantly minimized and all else equal, the active fleet may be able to harvest the same amount of Greenland turbot more efficiently with fewer sets and vertical lines. Effects of Alternative 2 on prey availability for marine mammals are not likely to cause individual or population level effects and are therefore not significant. Alternative 2 is not expected to significantly disturb marine mammal species.

Under Alternative 1, there are presumed to be no impacts to the benthic habitat enough to decrease seabird prey base to the extent that it would impact survival rates or reproductive success. By allowing longline pot gear in the BS Greenland turbot fishery, a decrease in HAL gear use is expected and there would likely be an overall decrease in the number of seabird takes attributable to the Greenland turbot fishery. Alternative 2 is not considered to have a significant impact on prey availability or disturbance of benthic habitat for seabirds.

The potential increase in fishing effort as a result of changes under Alternative 2 are not likely to have impacts on habitat beyond those previously considered in preceding analyses. As a result, impacts on habitat under Alternative 2 are determined not to be significant.

Management Considerations

Monitoring

CP vessels operating in the BS or AI are typically in the full observer coverage category. Full coverage CPs carry at least one fishery observer at all times regardless of which gear type is being deployed. The potential action considered in this analysis would not directly affect observer coverage levels, though the number of deployed days could increase if total non-trawl effort increases. The FLC cooperative that comprises all of the non-trawl CP turbot effort during the analyzed period is subject to specific monitoring requirements that are defined in regulation and would be applied to any longline pot fishing. The operator of a vessel participating in Greenland turbot fishery using longline pot gear would need to comply with requirements for electronic logbooks at all times. Catch must be reported by gear type, even if a vessel fishes multiple gear types on the same trip. No vessel may fish both pots and hooks on the same longline set.

Roughly five active HAL CP vessels are set up for pot fishing and compliance with observer protocols for pot gear due to participation in other pot fisheries. Vessels with no previous participation in pot fishing could elect to use pot gear and would thus need to coordinate with NMFS and comply with the monitoring protocols that are specific to pot gear.

NMFS has previously indicated its intent to modify monitoring requirements for CPs using pot gear to improve data quality and timeliness. FLC member vessels are already required to follow these requirements. The specific requirements are described in Section 6.1.

Management

Aside from an amendment to gear limitation regulations at §679.24, the action alternative would not alter management of the BS Greenland turbot fishery. Existing regulations would continue to define the location and timing of the fishery.

This action would not alter other aspects of management for the Greenland turbot fishery and the fishery will still be constrained by existing regulations concerning the location and timing of the fishery, PSC and bycatch limits, and all other accountability measures currently in place. The management consideration is a change to regulations that would authorize an additional gear type for the fishery. Retention of non-turbot species in longline pot gear would be prohibited, absent further regulatory amendments under 'Gear limitations'. Retention of halibut or sablefish would be allowed if the required IFQ or CDQ is held onboard.

Enforcement

The action alternative would not dictate the type of pot that is used or the manner in which gear is set (number of pots, pots per string, etc.). NOAA Office of Law Enforcement (OLE) prefers consistency between fisheries – including both BSAI and GOA – in terms of gear regulations that address the number of anchor lines and required markings.

The retention of IFQ species (halibut and sablefish) in non-trawl gear is contingent upon the IFQ season being open and the vessel possessing an IFQ permit and quota onboard. IFQ landings require a prior notice of landing (PNOL); further consideration is needed to determine how mixed landings of IFQ species and Greenland turbot would be recorded. Vessels with unfished halibut IFQ onboard are already exempted from the maximum 9-inch pot tunnel opening restriction that is proposed for modification under the Option to Alternative 2.

Comparison of Alternatives

Table ES-3 Summary of alternatives

Alternative 1	Alternative 2	Alternative 2 – Option
No action (status quo)	Authorize longline pot gear	Remove 9-inch pot tunnel opening restriction
Authorized gear for Bering Sea Greenland turbot directed fishery is: hook-and-line, single pots, trawl. Vessel must be named on an LLP license with a Bering Sea area endorsement and a non-trawl gear endorsement. Single pots may not have a tunnel opening greater than 9 inches.	Longline pot gear is authorized when directed fishing for Bering Sea Greenland turbot. Retention of all species except IFQ/CDQ halibut and sablefish is prohibited. Halibut or sablefish may be retained if the vessel possesses halibut IFQ or CDQ for the area fished. If a vessel possesses unused halibut or sablefish IFQ/CDQ they are prohibited from discarding halibut or sablefish (679.7(f)(11)). Retention of other groundfish up to maximum retainable amounts (set in regulations Table 11 to Part 679) would require regulatory amendment at §679.24(b).	The maximum pot tunnel opening is not restricted so long as the vessel meets the definition of "directed fishing" for Greenland turbot.

Table ES-4 Summary of environmental impacts

	Alternative 1	Alternative 2	Alternative 2 – Option
Groundfish	Under the status quo, neither the level of mortality nor the spatial and temporal impacts of fishing on target stocks are likely to jeopardize the sustainability of groundfish. Loss of catch due to killer whale depredation would continue.	Fishery participation would likely be restored to historical levels and allow for a more fully utilized TAC. A significant increase in fishery participation from non-historical users is possible but not anticipated. Overall footprint of the fishery is expected to remain the same. Effort could be spread more evenly across the regulatory season. Wastage of Greenland turbot depredated by killer whales would be avoided.	Changes in size selectivity, as a larger tunnel opening could allow catch of larger Greenland turbot.
Non-target species	No changes	Greenland turbot fishery participation would likely be restored to historical levels; it is reasonable to assume that effort is not likely to increase to a level that would jeopardize the continued sustainability of groundfish, halibut, and crab species given the location and depth at which the Greenland turbot fishery occurs. Non-turbot species could not be retained but discard estimates would be applied based on observer data.	Changes in size selectivity for groundfish, halibut and crab may occur, but overall impacts are unknown.
Marine mammals	No changes	Interactions between marine mammals and Greenland turbot fishery are likely to decrease as opportunity to depredate is removed. No substantial change in prey availability is expected under either alternative and overall impacts are expected to be negligible.	No substantial effect expected
Seabirds	No changes	Effects on seabird takes are not likely to increase and are most likely to decrease. Overall, impacts are expected to be negligible.	No substantial effect expected
Habitat	No changes	Neither alternative is likely to result in adverse effects to habitat.	No substantial effect expected
Ecosystem	No changes	No anticipated population-level impacts to marine species or change ecosystem-level attributes beyond the range of natural variation.	No substantial effect expected

Table ES-5 Summary of economic impacts

	Alternative 1	Alternative 2	Alternative 2 – Option
Fishery participation	Status quo. Low near-term participation by non-trawl CPs and CVs. Steady participation by non-pollock trawl CPs.	Likely rebound in participation by non-trawl CPs with history of BS turbot catch. The maximum potential for participation is much greater than the likely amount. A full rebound by historical participants plus a small number of new participants would put fishery participation near the peak for the analyzed period (7-9 CPs). Will be influenced by TAC and markets for Greenland turbot and Pacific cod.	Marginal increase in attractiveness of the fishery if size selectivity for turbot increases relative to 9-inch maximum opening. No data available to assess.
Harvest volume and value	Status quo. Low levels of Greenland turbot target catch or retained non-target catch in non-trawl sector.	TAC utilization likely to remain less than 100%, similar to period before non-trawl sector ceased targeting turbot, but substantially increased over the two most recent years (zero non-trawl targeting). Portion of total non-CDQ TAC that is internally allocated to non-trawl is private through FLC/A80 agreement and cannot be assessed.	Potential for marginal increase if Option results in larger, more valuable fish and a more attractive fishery.
Effect on trawl segment of turbot fishery	Status quo. No non-trawl vessels targeting turbot on fishing grounds; no competition for TAC but voluntary TAC agreement still in place.	An unexpectedly large increase in non-trawl participation (esp. by non-FLC vessels) could require reconsideration of private A80/FLC TAC agreement. Likely increase in non-trawl gear on turbot fishing grounds relative to Alt. 1. Higher expected catch of turbot later in the year could affect directed fishing closure date, limiting retention of trawl-caught turbot to MRA limit in some situations. Incidental catch of other A80 flatfish species in non-trawl gear could affect ICAs and directed fishing allowances for some A80 species (e.g., Kamchatka flounder, Pacific cod).	No effect expected unless tunnel opening greatly increases the number of flatfish in pot gear, which could marginally affect directed fishing closure dates or future ICAs for species targeted by A80 trawl vessels. No data available to assess.
Community and crew	Status quo. Small adverse impact of reduced BS Greenland turbot relative to broader fishery economy in communities of vessel ownership and/or homeport. Reduced revenues to CDQ partners. Reduced opportunity for crew on subset of non-trawl CPs that were partially reliant on BS turbot	Additional fishing and wage opportunity to crews on a subset of BS CP vessels. Impact on involved communities relative to their overall fishing economies is small (< 0.5%). Several non-trawl CPs with a low amount of Greenland turbot HAL history are owned by CDQ groups. Restarting the non-trawl turbot fishery increases opportunities to harvest CDQ, but CDQ turbot quota has not been heavily utilized.	No effect expected
Bycatch	Status quo. Pot gear is not subject to existing PSC hard caps.	No economic effect on longline pot participants. Non-turbot groundfish would be considered prohibited species so encounter of all non-target species is economically disincentivized.	Potential that larger non-target flatfish (e.g., halibut) could more easily enter pots. Available data and depth of turbot fishing suggest pot gear may catch halibut at a lower rate than HAL gear.
Safety at sea	Status quo	No direct effect since no adoption of longline pot gear is required. Vessels may experiment with different fishery timing to minimize deck handling of pots in poor weather conditions. All CP vessels that are likely to utilize this gear adhere to enhanced safety and inspection standards under ACSA (see Section 6.4).	No effect expected

1. Introduction

This Environmental Assessment/Regulatory Impact Review analyzes proposed management measures that would apply exclusively to individuals who hold Groundfish License Limitation Program (LLP) licenses that are endorsed for non-trawl gear in the Bering Sea (BS) management subarea, or any future holders of such licenses. The measures under consideration include authorizing the use of longline pot gear when engaged in directed fishing for Greenland turbot (*Reinhardtius hippoglossoides*) in the BS, and an option to exempt vessels directed fishing for Greenland turbot in the BS from the 9-inch maximum pot tunnel opening restriction. The purpose of this action is to provide non-trawl vessels with additional options to effectively target Greenland turbot in a setting of increased whale depredation that has substantially reduced participation in the non-trawl component of the fishery.

This document is an Environmental Assessment/Regulatory Impact Review (EA/RIR). An EA/RIR provides assessments of the environmental impacts of a proposed action and its reasonable alternatives (the EA), the benefits and costs of the alternatives, the distribution of impacts, and identification of the small entities that may be affected by the alternatives (the RIR). This EA/RIR addresses the statutory requirements of the Magnuson Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act, 16 U.S.C. 1801, *et seq*.), the National Environmental Policy Act, Presidential Executive Order 12866, and some of the requirements of the Regulatory Flexibility Act. An EA/RIR is a standard document produced by the North Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) Alaska Region to provide the analytical background for decision-making.

Under the Magnuson-Stevens Act, the United States has exclusive fishery management authority over all marine fishery resources found within the exclusive economic zone (EEZ). The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the regional fishery management councils. In the Alaska Region, the North Pacific Fishery Management Council (Council) has the responsibility for preparing fishery management plans (FMPs) and FMP amendments for the marine fisheries that require conservation and management, and for submitting its recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the Federal mandates of the Department of Commerce with regard to marine and anadromous fish.

The Greenland turbot fishery in the EEZ off Alaska is managed under the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands (BSAI). The proposed action under consideration would amend Federal regulations at 50 CFR 679. The BSAI Groundfish FMP would not be amended under the proposed action alternative. Actions taken to implement regulations governing this fishery must meet the requirements of applicable Federal laws, regulations, and Executive Orders.

1.1. Purpose and Need

The Council adopted the following purpose and need statement to originate this action in February 2022.

> *Whale depredation is precluding directed fishing for Greenland turbot by commercial hook-and-line (HAL) gear vessels in the Bering Sea. Participation in this fishery has been a significant source of income for a number of HAL CP vessels that primarily target Pacific cod. The importance of turbot fishing increased for these vessels as Pacific cod TACs in the Bering Sea saw major declines between 2012 and 2021. Although single pot gear is currently authorized for Greenland turbot, single pots have not been deployed because of their inefficiency in the depth and location where the fishery occurs. A regulatory amendment that would allow vessels to use longline pots when fishing for Greenland turbot would likely resolve the depredation problem and allow this fishery to resume. Other benefits of reduced whale depredation on Greenland*

turbot could include improved catch accounting for managers, and data quality for the Greenland turbot stock assessment.

1.2. History of this Action at the Council

In April 2021, the Council tasked staff to prepare a discussion paper considering the authorization of longline pot gear as legal gear for Greenland turbot in the BS management subarea. The Council's request was responsive to the Advisory Panel's recommendation that longline pot gear could be an effective mitigation measure to address killer whale depredation of Greenland turbot on hook-and-line (HAL) gear. The Council reviewed that discussion paper (NPFMC 2022a) at its February 2022 meeting and developed a purpose and need statement as well as the alternatives that are analyzed in this document.

It is noted throughout this document that the regulatory change that would follow the selection of the action alternative (Alternative 2) would apply to any vessel named on a Groundfish LLP license with BS non-trawl endorsements. However, this document largely focuses on the catcher/processor (CP) vessel sector because that is the sector that has historically targeted BS Greenland turbot. Participation by catcher vessels (CV) is unlikely due to the remote location of the fishing grounds relative to shore-based processing and support services. The Council was made aware of this selective approach to describing the affected fishery and fishery participants when it reviewed the February 2022 discussion paper, and the Council did not suggest a different scope. Historical participation data supporting this approach is included in Section 3.3.6.

1.3. Description of Management Area

Figure 1-1 shows the NMFS reporting areas within the Bering Sea and Aleutian Islands FMP area. The considered action pertains only to the Bering Sea, which is described by all numbered areas except for the Aleutian Islands (AI; Areas 541, 542, 543) and international or foreign waters (Areas 550 and 300). The FMP does not apply to International Waters (Area 550). These areas are defined in Figure 1 to Title 50 in the Code of Federal Regulations, Part 679.

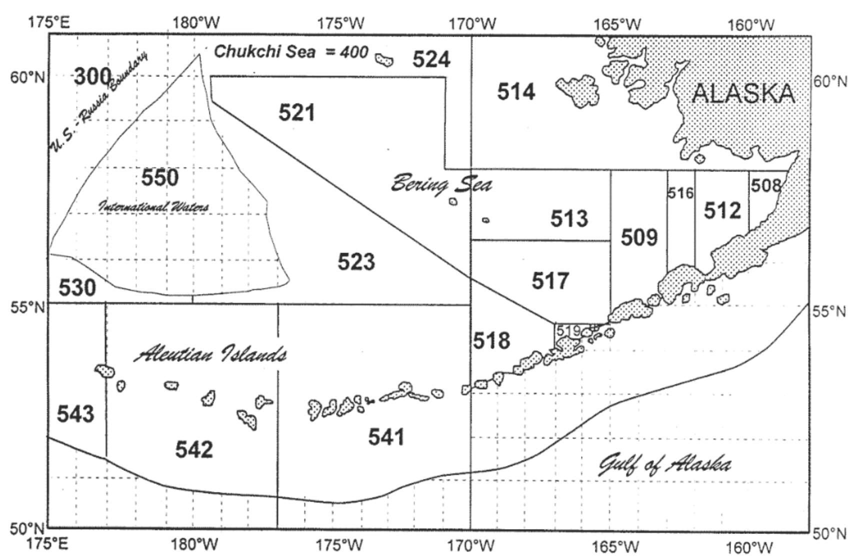

Figure 1-1 Bering Sea and Aleutian Islands reporting areas (Figure 1 to 50 CFR Part 679)

1.4. EA and RIR requirements

Environmental Assessment

There are four required components for an environmental assessment. The need for the proposal is described in Section 1.1 and the alternatives are described in Section 2. The probable ecological impacts of the proposed action and alternatives are addressed in Section 5, and social and economic impacts are described in Section 4. A list of agencies and persons consulted is included in Section 8.

Regulatory Impact Review

The preparation of an RIR is required under Presidential Executive Order (E.O.) 12866 (58 FR 51735, October 4, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following Statement from the E.O.:

> *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, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

As part of the RIR analysis, the need for the proposal is described in Section 1.1, and the alternatives in Section 2. Section 3 provides a description of the fisheries affected by this action, Section 4 analyzes the economic and social impacts of the proposed alternatives, including the impacts on small entities, and Section 6 addresses the management considerations relevant to the alternatives under consideration.

E.O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be “significant.” A “significant regulatory action” is one that is likely to:

- 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;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in E.O. 12866.

1.5. Documents Incorporated by Reference in this Analysis

This impact assessment 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 document.

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 Gulf of Alaska (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 FMP for Groundfish of the Gulf of Alaska, the FMP for Groundfish of the BSAI, and the Magnuson-Stevens Act. These strategies are applied using the best available scientific information to derive the total allowable catch (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 https://alaskafisheries.noaa.gov/fisheries/groundfish-harvest-specs-eis.

Stock Assessment and Fishery Evaluation (SAFE) Reports for the Groundfish Resources of the BSAI (NPFMC 2021a)

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 Bering Sea/Aleutian Islands (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. A Supplemental Information Report (NPFMC and NMFS 2015) was prepared in 2015 which considers new information and affirms that new information does not indicate that there is now a significant impact from the groundfish fisheries where the 2004 PSEIS concluded that the impact was insignificant. The PSEIS document is available from https://alaskafisheries.noaa.gov/node/33552, and the Supplemental Information Report (2015) from https://alaskafisheries.noaa.gov/sites/default/files/sir-pseis1115.pdf.

2. Description of Alternatives

NEPA requires that an EA analyze a reasonable range of alternatives consistent with the purpose and need for the proposed action. The alternatives in this section were designed to accomplish the stated purpose and need for the action. The action alternative is designed to provide flexibility in the gear types deployed within the non-trawl category and how that gear is configured. The Council's stated purpose (Section 1.1) refers to the goals of restoring the non-trawl fishery to viability, reducing waste in the form of whale depredation off of hook-and-line gear, and lowering uncertainty in total estimated Greenland turbot removals for the purpose of stock assessment.

The Council adopted the following alternatives for analysis in February 2022.

2.1. Alternative 1, No Action

Under the No Action alternative, longline pot gear would not be authorized for the BS Greenland turbot directed fishery. Authorized gear types would continue to include hook-and-line gear, single pots, and trawl gear. Federal Regulations at '§679.24(b) Gear Limitations (1) Pots' state that any person using longline pot gear must treat any catch of groundfish – which includes Greenland turbot – as prohibited species, with four exceptions (paraphrased): (i) fishing in the AI subarea; (ii) directed fishing for IFQ sablefish in the BS subarea; (iii) directed fishing for IFQ sablefish in the GOA; (iv) fishing for IFQ or CDQ halibut in the BSAI.

Currently, any vessel with a Federal Fisheries Permit (FFP) for groundfish and the necessary gear (non-trawl) and area (BS) endorsement on its License Limitation Program (LLP) license may fish *single* pots for Greenland turbot in the BS. The FFP must have a pot gear endorsement as well; that endorsement is free to obtain. Any Pacific cod caught with single pot gear or HAL gear by an FFP vessel while targeting Greenland turbot must be retained if Pacific cod directed fishing is open for the vessel because Pacific cod is an "improved retention/improved utilization" (IR/IU) species, as defined in regulation at §679.27. If Pacific cod directed fishing is closed for a vessel then cod must be retained up to the maximum retainable amount (MRA). A vessel that is not named on an LLP license with a CP Pacific cod pot gear endorsement may not retain more than the MRA of Pacific cod. Any Pacific cod caught by a non-trawl vessel targeting turbot when Pacific cod directed fishing is closed would accrue to the BSAI HAL/Pot Pacific cod incidental catch allowance (ICA). Even if a vessel has a Pacific cod pot endorsement but the haul is assigned a Greenland turbot "target," then any Pacific cod catch still accrues to the HAL/Pot ICA. The HAL/Pot ICA is set annually in harvest specifications based on anticipated incidental catch for those two gear types in directed fisheries for species other than Pacific cod. The ICA is deducted from the aggregate portion of the BSAI Pacific cod TAC that is allocated to all of the HAL and pot sectors that are defined by Amendment 85.[1] If a CP vessel using single pot gear has a haul assigned to the Pacific cod target then the cod accrues to the BSAI Pot CP sector TAC. The latter case might occasionally occur if a vessel intending to fish for Greenland turbot retains over a certain threshold of Pacific cod relative to its total catch in the haul. Historical data on the encounter of Pacific cod in the Greenland turbot target fishery is presented in Section 3.3.5.1.1 of this document; due to the depth and areas where turbot are fished, large amounts of Pacific cod encounter are not anticipated.

Trip target species for CPs and CVs are assigned in the NMFS Catch Accounting System (CAS) based on definitions of the prevalence of catch by species.[2] Trips are easily defined for CVs from the time that the harvesting of groundfish begins to the time of offload. For CPs, however, a trip begins when harvesting begins but will end when any of five things occur: (1) directed fishing is closed; (2) vessel offload; (3) a vessel enters or leaves an area where a different directed fishing prohibition applies; (4) begins fishing with a different type of authorized gear; or (5) the end of a weekly reporting period – whichever comes first. The permutations that could occur within that list of CP trip target determinations highlight the inherent difficulty in forecasting how many Pacific cod (or other non-turbot species) might be caught in a given target definition based solely on historical data.

Vessels using single pots for directed fishing for BS Greenland turbot or other groundfish species are not limited in the number of pots they can deploy. Examples of other BS groundfish pot fisheries include Pacific cod and IFQ sablefish. As noted in Section 2.1 of the February 2022 discussion paper (NPFMC 2022a) and in testimony provided to the Council in February 2022, single pots have not been utilized in the directed fishery for Greenland turbot due to their inefficiency at the depths and locations where the

[1] The 2022 Pacific cod HAL/Pot ICA is 400 mt (see Table 8 in 2022/23 BSAI Harvest Specifications). Footnote 2 to that table explains the process of setting the ICA based on anticipated incidental catch and then taking that amount of the total TAC that would be allocated across all HAL and pot sectors.
[2] See 679.2 *Definitions* for "Fishing trip"

fishery has historically occurred. Due to the drag from strong currents and the great depths from which turbot are caught, hauling single pots would be a slow and uneconomical process. Historical participation in, and performance of, the non-trawl directed fishery for Greenland turbot under existing regulations is described in Section 3.3 of this document. Section 3.3 also provides the best available evidence of the trend in killer whale depredation on hook-and-line gear in the Bering Sea as well as the species that appear to attract the greatest amount of killer whale interaction.

2.2. Alternative 2 – Authorize Longline Pot Gear for Greenland Turbot in the Bering Sea

Alternative 2 would authorize the use of longline pot gear when directed fishing for Greenland turbot in the Bering Sea. Implementation of this alternative would require an amendment to Federal regulations. The most likely regulatory amendment would be at 50 CFR Part 679.24(b), adding a fifth exception to the instances where a "person using longline pot gear must treat any catch of groundfish as a prohibited species" (see Section 6.2 for potential regulatory language). As written, Alternative 2 would not require an amendment to the BSAI Groundfish FMP (NPFMC 2020). The BSAI FMP addresses gear authorization in Section 3.4 of the plan. The FMP states that authorized gear types are "trawls, hook-and-line, pots, jigs, and other gear as defined in regulations. Further restrictions on gear which are necessary for conservation and management of fishery resources and which are consistent with the goals and objectives of the FMP are found at 50 CFR Part 679." Aside from clauses about the use of trawl gear in the pollock fishery and the use of non-pelagic trawl gear in directed flatfish fisheries (Section 3.4.2 in NPFMC 2020), the FMP delegates gear authorizations to Federal regulations.

The language of Alternative 2 bases the gear authorization on *directed fishing* for Greenland turbot. "Directed fishing" is defined at §679.2: "Unless indicated otherwise, any fishing activity that results in the retention of an amount of a species or species group onboard a vessel that is greater than the maximum retainable amount [MRA] for that species or species group as calculated under §679.20." Here, in simple language, it would need to be obvious to any observer or enforcement officer that a vessel using longline pot gear was retaining Greenland turbot in excess of the MRA. (MRAs for the BSAI are defined in Table 11 to Part 679.) However, it is crucial to note that the gear limitation regulations at §679.24 do not permit the retention of *any* groundfish in longline pot gear that does not have an explicit exception. This means that if an exception for Greenland turbot is added under Alternative 2 then the only species that could be retained are Greenland turbot and – if IFQ or CDQ is possessed onboard – sablefish and halibut. All other groundfish would have to be discarded. Pacific cod and other groundfish would be considered prohibited species in longline pot gear and could not be retained even up to the MRA limits.[3] If the Council wishes to allow retention up to the MRAs for other groundfish in longline pots used to directed fish for Greenland turbot, the gear limitation exception at §679.24(b)(1) would need to be amended to reflect that. Any Pacific cod that are discarded from longline pot gear (as would be required under the current regulations) or retained up to an MRA (if regulations are amended to allow it) could accrue to the HAL/Pot ICA based on rates generated from observer data. Catch from a haul that is assigned a Pacific cod target could accrue to the CP pot cod TAC if more than a threshold amount of the catch in the haul was Pacific cod; this could occur on specific hauls even if the vessel is within its trip-based MRA limit. Section 3.3.5.1.1 and Section 4.3 consider the extent to which vessels would be interested in, or benefit from, retaining Pacific cod when directed fishing for Greenland turbot. For the purpose of understanding the regulations and crafting alternatives, the Council should be aware of how "topping off" on Pacific cod MRAs might affect catch accounting in terms of TAC and ICA. CP hauls that have more than a certain proportion of Pacific cod would accrue to the BS Pot CP Pacific cod TAC, which is relatively small, relied upon by a small number of vessels, and tends to be fished quickly. Hauls where Pacific cod is retained but are deemed to be in the Greenland turbot target would accrue to the ICA

[3] See IR/IU regulations at §679.27(c)(2)(i and ii)(C).

and, at a certain point, could lead to a higher ICA being set in the subsequent year's harvest specifications.

The Council has not contemplated restricting the authorization of longline pot gear within the directed fishery for Greenland turbot to a particular operational type (e.g., CP or CV) or a set of LLP licenses. As such, this analysis presumes that any vessel named on an LLP license with BS and non-trawl endorsements could utilize longline pot gear in the Greenland turbot directed fishery. This conclusion informs the scope of the maximum participation levels discussed in Sections 3, 4, and 5 of this document. That said, the analysts rely on historical participation patterns and previous testimony to the Council to focus the analysis on non-trawl CP vessels as the most likely to adopt longline pot gear for Greenland turbot in the future.

2.2.1. Option – Remove 9-inch Pot Tunnel Opening Restriction for Vessels Directed Fishing for Greenland Turbot in the Bering Sea

The option under Alternative 2 would allow non-trawl vessels directed fishing for BS Greenland turbot to use a pot tunnel opening greater than 9 inches. Regulations at §679.2(15)(ii) state that "Each pot used to fish for groundfish must be equipped with rigid tunnel openings that are no wider than 9 inches (22.86 cm) and no higher than 9 inches (22.86 cm), or soft tunnel openings with dimensions that are no wider than 9 inches (22.86 cm)." The purpose of the option is to allow vessels targeting BS Greenland turbot with longline pot gear to remove a potential impediment to selecting for larger targeted flatfish in pots. Because Greenland turbot have not historically been targeted with pot gear, size selectivity data are not readily available. The best available information on how this option might affect the performance of the turbot fishery is included in Section 4.3.

Implementation of this option would likely entail an exception similar to the '*Halibut retention exception'* defined at §679.2(15)(iii) that applies to vessels fishing halibut or sablefish IFQ or CDQ from the BSAI or halibut regulatory areas that are within the BSAI. That exception reads: "If required to retain halibut when harvesting halibut from any IFQ regulatory area in the BSAI, vessel operators are exempt from requirements to comply with a tunnel opening for pots when fishing for IFQ or CDQ halibut or IFQ or CDQ sablefish in accordance with §679.42(m)."[4] In simple language, the halibut exception means that the 9-inch maximum tunnel opening restriction does not apply when the vessel is fishing for halibut or fishing for sablefish *while* halibut IFQ is onboard. Greenland turbot is not an IFQ species, so an exception as written in the Council's option would hinge on the definition of *directed fishing*, which was described above.

Another analogy to this option is the Council's April 2022 "IFQ Omnibus" motion to – among other things – recommend removing the 9-inch maximum pot tunnel opening restriction in the GOA IFQ fishery as long as the vessel begins its trip with unfished halibut IFQ onboard. A proposed rule to implement that action is expected to be published in late 2022.

[4] §679.42(m) defines additional requirements for vessel operators fishing IFQ or CDQ halibut or sablefish in the BSAI or halibut areas therein. The regulations define the need to have sufficient IFQ or CDQ quota onboard when retaining halibut, as well as logbook, VMS, and reporting requirements for submitting a prior notice of IFQ landing (PNOL).

2.3. Comparison of Alternatives

Table 2-1 through Table 2-3 summarize the alternatives and potential environmental or economic impacts at a high level.

Table 2-1 Summary of alternatives

Alternative 1	Alternative 2	Alternative 2 – Option
No action (status quo)	Authorize longline pot gear	Remove 9-inch pot tunnel opening restriction
Authorized gear for Bering Sea Greenland turbot directed fishery is: hook-and-line, single pots, trawl. Vessel must be named on an LLP license with a Bering Sea area endorsement and a non-trawl gear endorsement. Single pots may not have a tunnel opening greater than 9 inches.	Longline pot gear is authorized when directed fishing for Bering Sea Greenland turbot. Retention of all species except IFQ/CDQ halibut and sablefish is prohibited. Halibut or sablefish may be retained if the vessel possesses halibut IFQ or CDQ for the area fished. If a vessel possesses unused halibut or sablefish IFQ/CDQ they are prohibited from discarding halibut or sablefish (679.7(f)(11)). Retention of other groundfish up to maximum retainable amounts (set in regulations Table 11 to Part 679) would require regulatory amendment at §679.24(b).	The maximum pot tunnel opening is not restricted so long as the vessel meets the definition of “directed fishing” for Greenland turbot.

Table 2-2 Summary of environmental impacts

	Alternative 1	Alternative 2	Alternative 2 – Option
Groundfish	Under the status quo, neither the level of mortality nor the spatial and temporal impacts of fishing on target stocks are likely to jeopardize the sustainability of groundfish. Loss of catch due to killer whale depredation would continue.	Fishery participation would likely be restored to historical levels and allow for a more fully utilized TAC. A significant increase in fishery participation from non-historical users is possible but not anticipated. Overall footprint of the fishery is expected to remain the same. Effort could be spread more evenly across the regulatory season. Wastage of Greenland turbot depredated by killer whales would be avoided.	Changes in size selectivity, as a larger tunnel opening could allow catch of larger Greenland turbot.
Non-target species	No changes	Greenland turbot fishery participation would likely be restored to historical levels; it is reasonable to assume that effort is not likely to increase to a level that would jeopardize the continued sustainability of groundfish, halibut, and crab species given the location and depth at which the Greenland turbot fishery occurs. Non-turbot species could not be retained but discard estimates would be applied based on observer data.	Changes in size selectivity for groundfish, halibut and crab may occur, but overall impacts are unknown.
Marine mammals	No changes	Interactions between marine mammals and Greenland turbot fishery are likely to decrease as opportunity to depredate is removed. No substantial change in prey availability is expected under either alternative and overall impacts are expected to be negligible.	No substantial effect expected
Seabirds	No changes	Effects on seabird takes are not likely to increase and are most likely to decrease. Overall, impacts are expected to be negligible.	No substantial effect expected
Habitat	No changes	Neither alternative is likely to result in adverse effects to habitat.	No substantial effect expected
Ecosystem	No changes	No anticipated population-level impacts to marine species or change ecosystem-level attributes beyond the range of natural variation.	No substantial effect expected

Table 2-3 Summary of economic impacts

	Alternative 1	Alternative 2	Alternative 2 – Option
Fishery participation	Status quo. Low near-term participation by non-trawl CPs and CVs. Steady participation by non-pollock trawl CPs.	Likely rebound in participation by non-trawl CPs with history of BS turbot catch. The maximum potential for participation is much greater than the likely amount. A full rebound by historical participants plus a small number of new participants would put fishery participation near the peak for the analyzed period (7-9 CPs). Will be influenced by TAC and markets for Greenland turbot and Pacific cod.	Marginal increase in attractiveness of the fishery if size selectivity for turbot increases relative to 9-inch maximum opening. No data available to assess.
Harvest volume and value	Status quo. Low levels of Greenland turbot target catch or retained non-target catch in non-trawl sector.	TAC utilization likely to remain less than 100%, similar to period before non-trawl sector ceased targeting turbot, but substantially increased over the two most recent years (zero non-trawl targeting). Portion of total non-CDQ TAC that is internally allocated to non-trawl is private through FLC/A80 agreement and cannot be assessed.	Potential for marginal increase if Option results in larger, more valuable fish and a more attractive fishery.
Effect on trawl segment of turbot fishery	Status quo. No non-trawl vessels targeting turbot on fishing grounds; no competition for TAC but voluntary TAC agreement still in place.	An unexpectedly large increase in non-trawl participation (esp. by non-FLC vessels) could require reconsideration of private A80/FLC TAC agreement. Likely increase in non-trawl gear on turbot fishing grounds relative to Alt. 1. Higher expected catch of turbot later in the year could affect directed fishing closure date, limiting retention of trawl-caught turbot to MRA limit in some situations. Incidental catch of other A80 flatfish species in non-trawl gear could affect ICAs and directed fishing allowances for some A80 species (e.g., Kamchatka flounder, Pacific cod).	No effect expected unless tunnel opening greatly increases the number of flatfish in pot gear, which could marginally affect directed fishing closure dates or future ICAs for species targeted by A80 trawl vessels. No data available to assess.
Community and crew	Status quo. Small adverse impact of reduced BS Greenland turbot relative to broader fishery economy in communities of vessel ownership and/or homeport. Reduced revenues to CDQ partners. Reduced opportunity for crew on subset of non-trawl CPs that were partially reliant on BS turbot	Additional fishing and wage opportunity to crews on a subset of BS CP vessels. Impact on involved communities relative to their overall fishing economies is small (< 0.5%). Several non-trawl CPs with a low amount of Greenland turbot HAL history are owned by CDQ groups. Restarting the non-trawl turbot fishery increases opportunities to harvest CDQ, but CDQ turbot quota has not been heavily utilized.	No effect expected
Bycatch	Status quo. Pot gear is not subject to existing PSC hard caps.	No economic effect on longline pot participants. Non-turbot groundfish would be considered prohibited species so encounter of all non-target species is economically disincentivized.	Potential that larger non-target flatfish (e.g., halibut) could more easily enter pots. Available data and depth of turbot fishing suggest pot gear may catch halibut at a lower rate than HAL gear.
Safety at sea	Status quo	No direct effect since no adoption of longline pot gear is required. Vessels may experiment with different fishery timing to minimize deck handling of pots in poor weather conditions. All CP vessels that are likely to utilize this gear adhere to enhanced safety and inspection standards under ACSA (see Section 6.4).	No effect expected

2.4. Alternatives Considered but not Analyzed Further

The Council has not considered any management alternatives that are not described in this document.

3. Fishery Description

This section describes the existing management of the BSAI Greenland turbot fisheries (3.1), defines the maximum and likely set of LLP license holders that could be affected by the action alternative (3.2), and provides background on the sectors that have participated in the BS turbot fishery (3.3). Section 3.3 provides data on historical vessel counts, catch, TAC utilization, and revenues during the analyzed period. Catch and revenue data is generally focused on the non-trawl sector, which is the sector that would be potentially modified under the action alternative. Section 3.3.4 responds to the Council's request for information on the spatial and temporal distribution – and overlap – of fishing effort in the BS Greenland turbot fishery. Section 3.3.5 provides historical data on non-target groundfish and PSC species that have occurred in the BS Greenland turbot HAL gear fishery and other directed fisheries that are similar in terms of gear used or areas/depths fished. The purpose of that section is to provide a basis for understanding which species are more or less likely to occur in a longline pot turbot fishery that has never existed. Section 3.3.6 summarizes the sparse history of non-CP participation in the BS Greenland turbot fishery. Section 3.4 provides the best available evidence from longline survey data and fishery observer data to substantiate the public testimony heard by the Council that whale depredation is significantly impacting the turbot fishery. Section 3.5 links the BS Greenland turbot fishery to communities to the extent that CP data allow. Section 3.6 calculates estimated tax revenue benefits to the State of Alaska from the turbot fishery. Section 3.7 describes the market for Alaska Greenland turbot and the factors that might influence its near-term or medium-term resilience, and its relative attractiveness to potential new entrants.

3.1. Description of Management

Directed fishing for Greenland turbot in the BS and the AI is authorized from May 1 through December 31 (§679.23(e)(1)). Greenland turbot opens for vessels fishing Community Development Quota (CDQ) on January 1. Section 2.1 of this document described existing regulations on the LLP license requirements to participate in the BS Greenland turbot fishery, authorized uses of longline pot gear (which do not include directed fishing for Greenland turbot), and gear regulations for the use of single pots (currently authorized for BS Greenland turbot directed fishing).

Annual harvest specifications do not apportion the non-CDQ TAC between the trawl and non-trawl sectors. With respect to directed fishing for Greenland turbot, the trawl component of the fishery consists exclusively of the BSAI non-pollock trawl CPs of the Amendment 80 (A80) cooperative; the non-trawl component of the fishery is comprised of vessels associated with the Freezer Longline Coalition voluntary cooperative, which are HAL CPs that primarily target BSAI Pacific cod. In 2012 the Council reviewed a discussion paper based on a stakeholder proposal to allocate Greenland turbot TAC between the trawl and non-trawl sectors (NPFMC 2012). At that time, the Council received testimony that competition between sectors may have been responsible for early directed fishing closures during the preceding years. When the BS Greenland turbot TAC was low and not voluntarily apportioned through a non-regulatory agreement, NMFS needed to manage conservatively due to incidental catch of turbot in the trawl fisheries targeting arrowtooth and Kamchatka flounder. The need to manage conservatively was not the result of competition between two gear sectors that were both targeting turbot early in the year. Ultimately, the Council chose not to develop sector allocations for turbot and instead encouraged the two sectors to reach a non-regulatory agreement for the BS area, which they did. That agreement for sharing the BS TAC has been in place since 2013.[5] The terms of the agreement are not public and are not known to the analysts. The agreement is specifically between the FLC cooperative and the A80 cooperative. The FLC cooperative and the A80 cooperative do not encompass all vessels that *could* target Greenland turbot but, to date, they do encompass all the vessels that *have* targeted the species during the period analyzed in this document.

The FLC-A80 agreement includes a set-aside for Greenland turbot caught incidentally in other directed fisheries. In most cases, including the current management of BS Greenland turbot, NMFS sets an ICA during the fishing year when a species TAC that is open for directed fishing is determined to be reached (see 679.20(d)). An ICA may also be set as part of annual harvests specifications. That use of an ICA is typically for cases when a species TAC is fully allocated in a catch share program or in other specific cases (i.e. BSAI hook-and-line and pot Pacific cod). For ICAs set in the harvest specifications, NMFS may reallocate TAC from the ICA to the directed fishing allowance (DFA) through actions published in the Federal Register as the amount of fishing remaining in the incidental catch fisheries draws to a close.

The purpose of the ICA is to ensure that the TAC will not be exceeded. The size of the ICA, which affects the amount of the TAC that is available for directed fishing (DFA), is determined annually based on incidental catch amounts in previous years and the size of TACs for other species that are likely to include incidental catch of a species (e.g., turbot) in the current year. If an ICA was not set in harvest specification, NMFS would simply extend the period of open directed fishing as the need to account for incidental catch in other fisheries diminishes later in the year. The ICA process is somewhat unique for BS Greenland turbot because of how turbot is encountered by the trawl sector and due to the existence of the FLC-A80 agreement. The management component of the agreement that NMFS can share calls for any turbot caught in the trawl target fisheries for turbot, arrowtooth flounder, and Kamchatka flounder to accrue to the turbot DFA, and thus the trawl portion of the TAC-sharing agreement. Turbot caught by trawl CPs targeting other species, like yellowfin sole or flathead sole, accrues to the ICA. As noted above, incidental catch in one year can influence the size of the ICA – and thus the DFA – in future years. The same is true for non-trawl catch of turbot that occurs outside of the turbot target fishery. However, the amount of turbot caught incidentally in the non-trawl sector outside of the directed fishery is small relative to the trawl sector.

As noted in Section 2.1, any vessel named on an LLP license with the proper area and gear endorsements may engage in directed fishing for BS Greenland turbot with non-trawl gear when directed fishing is open. Section 3.2 provides some detail on the licenses that are authorized to participate in this fishery but historically have not been used to do so. The stakeholders associated with those licenses, and the vessels to which they are named, are not party to the existing FLC-A80 voluntary TAC agreement. The associated, non-participatory vessels are, broadly, CPs that fish for Pacific cod with pot gear and CVs that fish for Pacific cod with pot gear and/or pollock with trawl gear.[6] That set of licenses represents both a population of potential entrants to the BS Greenland turbot fishery and a group that could be impacted by spill-over effects if significant amounts of non-turbot species are caught in longline pots (see further discussion of Pacific cod in Section 3.3.5.1). The preceding statement is not meant to imply that all FLC and A80 members are currently or historically engaged in the Greenland turbot directed fishery. Section 3.3.1 and Table 3-1 illustrate the minority position that turbot holds within the overall operations of the FLC and A80, when looked at as groups. Members of FLC or A80 who have not recently or historically fished for Greenland turbot could also “enter” the fishery with the proper license endorsements or be affected in other ways if they rely non-trawl fisheries for Pacific cod.

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[5] See summary on page 4 of the June 2012 Council Newsletter: www.npfmc.org/wp-content/PDFdocuments/newsletters/NEWS612.pdf.

[6] AFA (pollock trawl) vessels are closed to the BSAI Greenland turbot fishery by AFA sideboard limits unless they are engaging in directed fishing for CDQ Greenland turbot (Tables 54 and 55 to CFR 50 Part 679).

Table 3-1 in Section 3.3 shows the annual non-CDQ Greenland turbot TAC and the amount that was harvested by non-trawl vessels (FLC HAL CPs). The total percentage of the non-CDQ TAC that has been utilized since 2013 – including both trawl and non-trawl catch – was at 90% or above in 2016 and years prior but has declined to less than 50% in the most recent years.[7] To illustrate the need at the time for a non-regulatory inter-sector agreement to share the BS TAC – and its effectiveness in keeping the fishery open until the onset of more severe killer whale depredation in recent years (see Section 3.4) – NMFS reviewed the "Status of Fisheries" notices and Information Bulletins posted to the Alaska Region website dating back to 2010. From 2010 through 2012, the BS and AI Greenland turbot directed fisheries opened on the May 1 regulatory date for all sectors, except for the BSAI trawl limited access sector (TLAS) which has not been allocated halibut PSC limits to support a directed fishery for turbot since 2008[8]. In 2013 and 2014, all BS and AI sectors were closed to Greenland turbot directed fishing until opened to non-TLAS fishing on September 1 – the point at which NMFS determined that expected catch would not exceed the TAC that remained after incidental catches the arrowtooth/Kamchatka flounder fisheries had been largely completed. Those directed fisheries remained open until December 12 in 2013 and October 12 in 2014 when they closed under the TAC limit. The reason for starting those years on "closed" status was that total incidental catch of Greenland turbot (all gear types) from 2010 through 2013 had ranged from 770 mt to 1,275 mt, and that initial TACs of less than 2,000 mt could not support a directed fishery without risk of exceeding the catch limit. Beginning in 2015, the BS directed fishery has been open on May 1 for all non-TLAS sectors as a result of both higher TAC levels and the presence of the voluntary TAC-sharing agreement that allows NMFS to better apportion expected catch between what the trawl fishery catches incidentally to the arrowtooth/Kamchatka flounder fisheries and what the non-trawl fishery will take when targeting Greenland turbot.[9]

Existing regulations relating to the 9-inch maximum tunnel opening are identified in Sections 2.2.1 and 6.3 of this document. Vessels that have unfished halibut IFQ onboard are not restricted to a maximum 9-inch pot tunnel opening (BSAI Groundfish FMP Amendment 118).

A vessel targeting Greenland turbot with longline pots that has a halibut or sablefish IFQ permit holder or a hired master onboard and is holding unused halibut of sablefish IFQ for that vessel category and the IFQ regulatory area in which the vessel is operating would be required to retain those species up to the amount of their quota during the IFQ season (§679.7(f)(11)). Incidental catch of halibut may not be retained if the catch occurs outside of the IFQ season, or occurs on a vessel that does not have available halibut IFQ, or is catch of halibut that are under the legal size limit. Non-retainable halibut must be released with a minimum of injury. Sablefish caught with fixed gear on a vessel without available IFQ may not be retained unless the vessel is fishing on behalf of a CDQ group.[10]

3.2. LLP Licenses Endorsed for Bering Sea Non-Trawl Groundfish

As stated in Section 2.1, any vessel named on an LLP license with BS and non-trawl endorsements may currently fish for Greenland turbot with HAL or single-pot gear. Under Alternative 2, this same pool of vessels could also engage in the same fishery using longline pot gear. The number of licenses with BS and non-trawl endorsements is far greater than the number of non-trawl vessels that have historically targeted BS Greenland turbot, which has not surpassed five vessels in any year since 2012 (Table 3-1).

[7] Refer to "Annual Catch Report without CDQ" on NMFS Alaska Region Catch & Landings Reports website (accessed July 2022). Total non-CDQ TAC utilization was 70% in 2017, 38% in 2018, and 61% in 2019. The utilization rate was 38% in 2020 and 26% in 2021. The declining rate reflects less participation and catch by the non-trawl sector, and in the most recent years likely also reflects some of how the COVID-19 pandemic and international trade barriers have affected flatfish fishing effort across gear sectors.
[8] Since 1996 for all trawl gear. BSAI TLAS was created in 2008 under Amendment 80.
[9] Directed fishing for Greenland turbot in the AI subarea has been closed either at the start of the season through harvest specifications or by inseason action due to low TAC apportionments for the area.
[10] §679.7 Prohibitions (f)(3)(ii)

For comparison, the trawl component of the Greenland turbot fishery has comprised an average of roughly three vessels per year since 2013, peaking at seven trawl vessels targeting turbot in 2019.

There are 77 total LLP licenses that possess a BS non-trawl endorsement *and* a CP endorsement. This makes up the maximal range of possible participants in the Greenland turbot directed fishery. (Note that any vessel named on a CP-endorsed license may operate as a CV delivering shoreside or to a mothership if it chooses to do so.) The FLC cooperative of HAL CPs that predominantly fish for Pacific cod comprises 36 of those licenses. Of the 41 non-trawl CP licenses that are not part of the FLC cooperative, only four have Pacific cod endorsements; the vessels associated with those licenses typically operate as Pacific cod pot CPs. This is a noteworthy fact because Greenland turbot has traditionally been a complementary fishery for non-trawl vessels that focus on Pacific cod; in other words, it may be less likely that a non-trawl vessel with no access to cod would establish a turbot-only operation in the BS.

Of the 41 non-FLC LLP licenses with non-trawl CP endorsements, 37 were attached to a vessel that was active from 2013 through 2021. Only 13 of those 37 were used on CPs that were active in the BSAI. Six of those 13 licenses were used on A80 CPs and did not use non-trawl gear, while four were used on Pacific cod pot CPs.

Six of the 77 BS non-trawl CP-endorsed LLP licenses have some history of fishing halibut/sablefish IFQ or CDQ in the BSAI. One of those licenses is associated with the FLC cooperative and fished halibut IFQ. The other five are in the non-FLC category of 41 LLPs. Of the five non-FLC licenses, only two are associated with currently active vessels, and only one of those two fished halibut IFQ. The other three last operated in 2018, 2016, and 2013, respectively. All three of those licenses were named on vessels that fished sablefish IFQ but only one fished halibut IFQ.

Another aspect to consider when determining the maximum amount of possible participation – as opposed to the *likely* amount – is the number of LLP licenses that have both trawl and non-trawl endorsements but have not historically been used for non-trawl fishing. When the License Limitation Program was established under BSAI Amendment 39, licenses were granted non-transferrable endorsements based on historical vessel utilization that, in some cases, dates back to more than 30 years prior to the present date. As a result, some vessels fish with LLP licenses that hold gear or operational type (CP/CV) endorsements that the current vessel has never used. Under Alternative 2, a vessel that has used trawl gear throughout the relevant historical period but holds a trawl/non-trawl LLP licenses could, theoretically, use any authorized non-trawl gear to enter the Greenland turbot fishery. There are 45 trawl/non-trawl endorsed LLP licenses for the Bering Sea area. However, only 10 of those LLPs are endorsed to operate as a CP, which the analysts presume to be the most likely mode of directed fishing for Greenland turbot. Three of those 10 CP licenses have been used on A80 trawl vessels and the others are used on American Fisheries Act (AFA) pollock CVs, which are sideboarded. The A80-affiliated licenses are not likely entrants to a longline pot turbot fishery because, in addition to the full annual fishing plans of A80 vessels, their cooperative is a party to the TAC-sharing agreement described previously in Section 3.1.

Only 20 of the 45 trawl/non-trawl licenses have been actively fished since 2010, so it is possible that a potential entrant could purchase a license to enter the turbot fishery. However, the small number of CP-endorsed licenses that are utilized and their relative high value makes it unlikely that a seller would relinquish them and give up their current use in fisheries that are much larger-scale and more revenue-producing than BS Greenland turbot. The dormant licenses that are not CP-endorsed (and which do not have Pacific cod endorsements) would have relatively little value in the western Bering Sea.

3.3. Participation and Harvest

This section describes the non-trawl and trawl CP sectors that have historically targeted BS Greenland turbot. Additional focus is given to the non-trawl sector since the action alternative under consideration would directly regulate the use of non-trawl gear. The data in this section is limited to CP activity, as CVs have not targeted BS turbot in a significant manner (see Section 3.3.6 for information on historical CV participation). The data presented on BS CP participation and harvest generally begin in 2010 – aside from some historical trends cited from the most recent full stock assessment (Bryan et al. 2020). Starting in 2010 provides a sufficient sample of years before the non-trawl sector decreased effort in response to low TACs and whale depredation, and also captures the years that best reflect the current, cooperatively managed state of the two most engaged sectors: HAL CP (FLC cooperative) and trawl (A80 non-pollock trawl cooperative).

Given the nature of the action alternative, this section is primarily focused on the BS area. Although longline pot gear is currently authorized in the Aleutian Islands (AI), a significant Greenland turbot fishery has not developed there for two primary reasons: relatively low TAC due to lower local abundance, and less value due to poorer fish quality and higher operating costs. As an example of relative area availability, the 2021 TAC for Greenland turbot was 4,904 mt in the BS and 765 mt in the AI (BS is inclusive of CDQ allocations).[11] The TACs for 2022 increased by 8% in the BS (5,302 mt) and 14% in the AI (877 mt), but the BS TAC is still more than six-times the TAC for the AI. Individuals familiar with BSAI fixed gear also noted that fishing pot gear at the depths necessary to target Greenland turbot would be more challenging in the AI due to strong currents relative to the BS. Directed fishing for Greenland turbot in the AI was has been closed from 2013 to 2022 by inseason action in April and in the harvest specifications in 2022. It was open in 2011 and 2012 from May 1 to Dec 31 for the A80 cooperatives and HAL CPs.[12] Greenland turbot may be retained up the MRA in the AI area.

3.3.1. Fleet Description

This section focuses on data from 2010 to present, which best reflects the current, cooperatively managed states of the two most relevant sectors: the FLC (HAL CPs) and Amendment 80 (non-pollock trawl CPs). The recent catch trends by sector are occurring in the context of the voluntary TAC-splitting agreement between the FLC and A80 cooperatives that was described in Section 3.1.

Historical data on Greenland turbot catch by gear sector dating back to 1977 is available in the SAFE report (see Table 5.1 in Bryan et al. 2020, p.27). That table is not reproduced here; it shows the changing nature of the Greenland turbot fishery in terms of biomass, catch limits, and participation by gear sector. As noted in the previous section, the Greenland turbot stock was at much higher levels in the 1970s and 1980s. The ABC peaked at 90,000 mt in 1979 and was only below 20,000 mt once (1988) prior to 1990 when the ABC fell from 20,300 mt to 7,000 mt. Total catch (including discards) was never less than 23,000 mt from 1977 to 1984. Until the early 1990s, total catch was dominated by the trawl sector. Then, from 1992 through 2007 the non-trawl (HAL) sector caught more Greenland turbot in every year except one. The trawl sector's catch rebounded around the time that A80 cooperatives were implemented in 2008 and directed fishing for Greenland turbot by the A80 sector was allowed. Catch by the FLC and A80 sectors was roughly equivalent – to within 100 to 500 mt – from 2010 through 2016. Catch by HAL CPs has been substantially lower since 2017.

[11] Initial TAC, or ITAC, is the remainder after 15% of certain species' TAC is apportioned to the "non-specified reserve" that NMFS uses for inseason management. From the non-specified reserves, 10.7 percent of the BSAI TACs for Bering Sea Greenland turbot is established for the CDQ reserve.
[12] See 2022/23 BSAI Harvest Specifications Table 19 for inclusion of AI Greenland turbot in directed fishing closures.

3.3.1.1. Hook-and-Line Catcher/Processor

The BS and AI non-trawl sector that targets Greenland turbot has historically comprised HAL CPs that are all members of the FLC cooperative.[13] FLC is a trade association organized around the membership's harvest of Pacific cod in the BSAI and GOA. Non-trawl vessels (CP or otherwise) that harvest Greenland turbot would not necessarily be FLC members, but those that have targeted BS turbot in the recent past have been. FLC vessels primarily harvest Pacific cod but some members also rely on Greenland turbot and/or sablefish as secondary sources of the revenue they generate in the BSAI. The FLC cooperative is made up of the 36 LLP licenses that are endorsed for BS or AI HAL CP fishing for Pacific cod. Of note, three of those LLPs are also endorsed for Pacific cod pot fishing in the BS area – accounting for three of the eight total LLP licenses endorsed for BS and/or AI Pacific cod pot fishing as a CP.

Since the formation of the FLC cooperative in 2010 the sector has operated what could be considered a "year-round" Pacific cod fishery as compared to most other Federal fisheries off Alaska. The Pacific cod target fishery provides the best count of total annual FLC vessel participation. Activity in the Greenland turbot fishery, in particular, is described in the next subsection, 3.3.2. The HAL CP vessel count in the Pacific cod target peaked at 36 in 2010. The number of FLC vessels has been in the low-20s in recent years but only 17 fished in 2021. Through June 2022, 15 FLC vessels had fished Pacific cod. Between 11 and 15 FLC vessels have fished CDQ Pacific cod in recent years, though only a small number have fished CDQ Greenland turbot (see Table 3-3). Total gross revenues for FLC vessels have ranged between $182 million and $265 million since 2010. BSAI Pacific cod accounts for roughly 60-75% of total annual gross revenues during that period, as estimated by AKFIN (NPFMC 2021b, p.111). Revenues from BSAI Greenland turbot ranged from $1.0 million to $10.4 million since 2010 (nominal dollars, not adjusted for inflation), though they have not surpassed $4 million since 2016 and have averaged $2.6 million since 2013. Addition information on HAL CP revenues from targeting Greenland turbot or retaining Greenland turbot is provided in Section 3.3.3.

Five (of six) CDQ groups hold ownership interests in 17 of the 36 LLP licenses in the FLC cooperative. Four (of six) CDQ groups hold ownership interests in 11 of the vessels actively fishing in the sector.[14]

According to the most recent Stock Assessment and Fishery Evaluation (SAFE) report that included a Greenland turbot assessment, the HAL fleet "generally targets pre-spawning aggregations of Greenland turbot [from] June to August in the BS to avoid killer whale predation" (Bryan et al. 2020, p.5). In addition to the reported preference for targeting Greenland turbot between May and August, the later opening of the fishery dates back to the period before the BSAI HAL CP Pacific cod fishery was managed with a voluntary cooperative (FLC cooperative). Prior to cooperative management, the HAL CP sector was engaged in a race for Pacific cod during the first several months of the fishing year due to its relatively higher value and greater volume of available catch.

[13] The U.S. Congress defined the "Longline Catcher Processor Subsector" as the holders of an LLP license that is endorsed for BS or AI fishing as a CP that can target Pacific cod with HAL gear in a 2010 bill titled the Longline Catcher Processor Subsector Single Fishery Cooperative Act. This legislation was never implemented because the sector participants reached a private, voluntary agreement to form a cooperative (FLC cooperative). The HAL CP sector that encompasses the vessels that have directed fished for BS Greenland turbot has been defined in statute twice: the Act cited above and also in the 2005 Department of Commerce and Related Agencies Appropriations Act (Section 219(a)(6) of Public Law 108-447; 118 Stat. 2886). This statutory definition that has not been directly applied to regulations for the fisheries off Alaska (or the BSAI FMP) would only be relevant if the Council sought to limit the authorization of longline pot gear for BS Greenland turbot fishing to a subset of all the vessels that possess BS non-trawl groundfish LLP license endorsements.
[14] See NPFMC 2021b, pp. 152-153.

3.3.1.2. Trawl Catcher/Processor

Except for CDQ Greenland turbot, the A80 sector is the only BSAI trawl sector that can have a directed fishery for Greenland turbot because the A80 cooperative allows vessels to utilize halibut and crab prohibited species catch (PSC) in any target fishery. Harvest specifications do not currently apportion PSC to support directed fishing of Greenland turbot, arrowtooth flounder, Kamchatka flounder, or sablefish by BSAI trawl limited access sector (TLAS) CVs. The CPs in the BSAI TLAS are also AFA CPs and are prohibited from directed fishing for non-CDQ Greenland turbot by AFA sideboard limits.

The A80 sector comprises 27 CP LLP licenses. All of those licenses are endorsed for trawl gear in the BS area. During the analyzed period there were typically 18 to 20 A80 vessels active in a given year. Half or fewer fished CDQ, and even fewer of those fished CDQ Greenland turbot (Table 3-3).

The A80 sector is allocated quotas for several BSAI flatfish, Atka mackerel, Pacific cod, AI Pacific ocean perch, and PSC quotas for halibut and crab. Greenland turbot is not allocated to the sector, thus it is taken as a secondary species under area-based limited access TAC. Since the implementation of the A80 program, most of the trawl sector's Greenland turbot catch occurred while targeting arrowtooth and Kamchatka flounder, although from 2017 through 2019 most of the sector's catch was reported in the Greenland turbot "target" according to NMFS CAS (see Table 5.3 in Bryan et al. 2020, p.29). Other trawl targets where turbot is often retained include rockfish, flathead sole, and Atka mackerel. Greenland turbot are also caught incidentally to yellowfin sole but in smaller numbers, likely due to the difference in the areas and depths at which the species are most commonly found.

The A80 sector consists of five companies, each operating multiple vessels. Companies vary in the portfolio of species for which they have initial quota allocations. The first segment of the annual A80 operation is dominated by yellowfin sole and rock sole. Around the beginning of May, when the yellowfin sole fishery winds down, some A80 vessels move out of the BS area to fish in the AI or in the Gulf of Alaska. Vessels that do not have fishing opportunities in those areas tend to remain in the western BS to fish arrowtooth and Kamchatka flounder before moving into the Greenland turbot directed fishery starting in June or July. Those vessels might fish turbot until the yellowfin sole fishery picks up again in August or September. In years when the yellowfin sole fishery is not as productive – in terms of catch or market value – BS-oriented vessels might move into arrowtooth flounder earlier, often encountering Greenland turbot as they do.

The A80 sector began catching more of its total Greenland turbot within the Greenland turbot target in recent years for several reasons. The primary reason was a change in inseason management strategy afforded by the existence of the voluntary FLC-A80 TAC-splitting agreement. The agreement provided some confidence that directed fishing could be opened on the May 1 regulatory start date and that the ABC/TAC buffer did not need to be as large (pers. comm. Alaska Seafood Cooperative). Prior to the agreement, NMFS had to determine whether turbot caught incidentally by A80 vessels targeting arrowtooth and Kamchatka flounder would leave enough turbot available to have A80 vessels fishing for species that have turbot incidental catch while some non-trawl vessels also targeted turbot. The ability to open the directed fishery was also aided by higher Greenland turbot TACs starting in 2015. A80 vessels might also have become more likely to have a turbot trip target as the sector's Pacific cod allocation decreased alongside the overall cod TAC decline, meaning that trawl vessels moved into deep-water fisheries to minimize cod catch until later in the summer when cod CPUE tends to be lower.

Twelve different A80 vessels have targeted Greenland turbot in the BS since 2010. The number of trawl vessels targeting BS turbot in a given year ranged from one to seven. Typically, around three-quarters of the active A80 vessels catch and process some BS Greenland turbot, but not necessarily as a target species as determined by NMFS CAS. No A80 vessel has targeted AI Greenland turbot since 2010, but typically between four and 10 vessels will retain and process some AI turbot while targeting other species. Overall, Greenland turbot accounts for a small proportion of total A80 catch. The 2021 NMFS Annual Inseason Management Report graphically depicts 2017-2021 BSAI trawl catch of Greenland turbot as compared to other flatfish species (refer to slides 29 and 31). For the A80 vessels that targeted BSAI Greenland turbot, as a group, the species accounted for between 1.1% and 11.8% of annual gross wholesale value in a given year. Those figures are volatile due to the small number of vessels deemed to have targeted turbot in each year. Aggregated over the analyzed period, A80 vessels that processed BSAI Greenland turbot derived roughly 6.4% of their total gross revenue from the species.

3.3.1.3. Community Development Quota

While not a vessel fleet in the manner of HAL CPs and A80 CPs, CDQ groups are stakeholders in the harvest of Greenland turbot.[15] CDQ groups receive allocations of the BS Greenland turbot TAC that may be fished by either trawl or non-trawl vessels. CDQ groups might arrange for TAC to be fished by companies or on vessels in which they have an ownership stake, or they might make TAC available to be fished by any permitted vessel and receive a royalty payment in return. The terms of those partnership agreements and the royalty revenues generated are unavailable to the analysts at the species level, though total leasing revenues are reported in CDQ group tax filings.

The CDQ Program is allocated 10.7% of the TAC for Bering Sea Greenland turbot along with other BSAI groundfish species. In 2022, this amounted to 593 mt out of a 5,540 mt BS TAC. The 593 mt is then divided between the six CDQ groups as follows: APICDA – 16%; BBEDC – 20%; CBSFA – 8%; CVRF – 17%; NSEDC – 19%; YDFDA – 20%. In metric tons, that translated to between 47.4 mt (CBSFA) and 118.6 mt (BBEDC and YDFDA).[16] CDQ harvest of BS Greenland turbot by gear sector is shown in Table 3-3, below.

Utilization of the CDQ reserve depends on demand for Greenland turbot TAC by trawl and non-trawl vessels, which are typically interacting with the turbot fishery as a secondary species to HAL Pacific cod, key A80 flatfish species, or pollock (in the case of AFA CPs). The BS Greenland turbot CDQ reserve has been lightly harvested in recent years. Table 3-3 reports the size of the CDQ reserve and harvest utilization from 2013 through 2021, which is the full range of years reported on the NMFS Catch and Landings Reports web page (catch and vessel count by gear sector was queried separately by AKFIN and is reported only for FLC and A80). Low utilization of the CDQ reserve by FLC vessels might be attributed to the impact of whale depredation on efficiency and productivity, but the ultimate driver is the fact that the non-CDQ TAC is not being fully utilized and thus there is no demand for additional harvest quota. The annual reports published by CDQ groups show that partial ownership stakes include FLC vessels that could conceivably increase their participation in the BS Greenland turbot fishery if the authorization of longline pot gear makes the fishery more effective in the context of whale depredation, and/or if the BSAI Pacific cod fishery becomes less productive.

3.3.2. Greenland Turbot Catch

Table 3-1 reports the initial TAC (ITAC) for non-CDQ Greenland turbot, harvest (retained and discarded) by HAL CPs both within and outside of the target fishery as defined by NMFS CAS, and the number of HAL CPs that retained Greenland turbot either within or outside of the target fishery. ITAC is the remainder after 15% of certain species' TAC is apportioned to the "non-specified reserve" that NMFS uses for inseason management. Note that the BS non-CDQ TAC is not allocated solely to the HAL CP sector and, in fact, that the trawl CP sector has increased its catch since the implementation of Amendment 80 (Bryan et al. 2020). The difference between total catch and target catch represents turbot

[15] A 2018 summary of the CDQ program is available on the NMFS Alaska Region website, here.
[16] 2022 CDQ Program Allocations

that were retained incidental to catch of other groundfish. HAL CP catch of Greenland turbot largely occurs on hauls where turbot was the target species as designated by NMFS CAS. Table 5.3 in the most recent full stock assessment shows that the balance of non-trawl turbot catch occurs in the Pacific cod target fishery and, to a lesser extent, the sablefish target (Bryan et al. 2020, p.29).

Declining catch is not correlated to the TAC level. The proportion of catch taken in the target fishery, which generally declines beginning around 2017, might indicate that the fishery has become less attractive. There could be many reasons for this; whale depredation is likely one (see Section 3.4). Other reasons could include lower market values, international trade policies, and costs or disruptions associated with the COVID pandemic in 2020 and 2021 (see Section 3.7). Whatever the reasons, the reduction in HAL CP catch and participation in 2021 is remarkable and appear to have extended to 2022 based on the most recent available data.

The vessel counts in Table 3-1 show that BS Greenland turbot was never prosecuted or relied upon by the entirety of the HAL CP fleet, but a subset of the FLC sector has targeted turbot throughout the analyzed period. The "vessel targeting" trend reflects that a core group of FLC vessels continued to make BS Greenland turbot a consistent piece of their annual fishing plans throughout the last decade as total catch declined, but even those vessels ceased targeting in 2021 and 2022. Those vessels would be the most likely to benefit from a change in gear authorization that might improve the fishery's viability in the context of whale depredation. That said, the number of vessels that could potentially benefit includes the total set that possesses Bering Sea non-trawl gear endorsements on their LLP licenses (see Section 3.2).

Table 3-1 Bering Sea Greenland turbot non-CDQ ITAC and catch by HAL CPs (mt) and number of vessels, 2010-2022 ('C' denotes confidential data)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022*
BS Non-CDQ ITAC	*3,587*	*2,975*	*5,296*	*1,369*	*1,410*	*2,081*	*2,272*	*3,719*	*4,356*	*4,356*	*4,356*	*4,356*	*4,709*
Total Catch Retained	1,281	1,631	1,369	555	610	1,042	943	922	249	519	272	0.3	C
Retained in Target	1,177	1,503	1,293	548	600	1,032	889	815	166	474	221	0	0
% in Target	92%	92%	94%	99%	98%	99%	94%	88%	67%	91%	81%	0%	0%
#Vessels Retaining	23	17	16	11	12	9	11	16	17	12	13	4	1
#Vessels Targeting	9	8	7	3	3	3	5	4	3	3	4	0	0
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022***
Total Catch Discarded	18	12	14	15	19	23	40	53	15	19	10	9	0.3
Discarded in Target	6	5	7	12	15	9	13	14	1	4	1	0	0
% in Target	32%	40%	54%	82%	82%	42%	33%	27%	8%	23%	7%	0%	0%

* 2022 data through June 15. Amount discarded YTD 2022 is not confidential because more than 3 vessels have discarded turbot.
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Table 3-2 shows the results of the 2021 fishing year as a snapshot of the recent breakdown of non-trawl versus trawl catch, and low TAC utilization overall. Total catch includes both retained and discarded Greenland turbot. Table 3-1, above, shows that the majority of 2021 non-trawl catch was discarded, likely indicating that the catch was incidental to Pacific cod harvesting and not desired by the at-sea processing platforms on which it was encountered. Table 3-1 showed that throughout the analyzed period most HAL CP discards of BS Greenland turbot occurred on trips that were not assigned a turbot target in NMFS CAS. For 2022, through August 6, total catch of non-CDQ BS Greenland turbot was 561 mt out of a 4,709 mt ITAC (12% utilization). As with 2021, 2022 year-to-date total catch is almost entirely in the trawl gear sector.

Table 3-2 2021 BSAI Greenland turbot total catch

	ITAC (mt)	HAL (mt)	Trawl (mt)	Total Catch (mt)	Total Catch as % TAC
Bering Sea Non-CDQ	4,356	11	1,116	1,128	26%
Bering Sea CDQ	548	0	2	2	0%
Aleutian Islands*	765	1	465	467	61%

* Directed fishing was closed in Aleutian Islands: Source: NMFS Information Bulletin 21-23, April 22, 2021.

Table 3-3 reports the size of the Greenland turbot CDQ reserve and the amount that was harvested. HAL CPs accounted for only around 1% of all CDQ Greenland turbot retained in the BS during the analyzed period; A80 vessels accounted for around 5%. Where there are discrepancies between the total CDQ harvest and catch by the HAL CP and trawl sectors, it reflects CDQ turbot retained in a different sector – typically AFA CPs. AFA CPs accounted for 93% of the total retained CDQ turbot during the analyzed period (over 400 mt). That catch mostly occurred in the arrowtooth flounder and Greenland turbot targets.

Table 3-3 Bering Sea Greenland turbot CDQ harvest (metric tons) by gear type (2013-2022); 'C' denotes confidential data

					Retained G. turbot in mt; (#vessels)	
Year	BS TAC (mt)	CDQ Reserve (mt)	CDQ Harvest (mt) †	% CDQ Utilized	HAL CP	Am. 80
2013	1,610	172	76	44%	-	3.2 (5)
2014	1,659	178	73	41%	C (1)	2.5 (4)
2015	2,448	262	29	11%	C (1)	3.5 (4)
2016	2,673	286	79	28%	C (1)	C (1)
2017	4,375	468	122	26%	2.8 (6)	C (1)
2018	5,125	548	37	7%	0.7 (5)	7.3 (3)
2019	5,125	548	40	7%	0.4 (3)	C (2)
2020	5,125	548	9	2%	1.1 (3)	C (1)
2021	5,125	548	2	< 1%	-	C (1)
2022*	5,540	593	2	< 1%	-	C (1)

† Catch amounts in this column are not confidential because they are published by NMFS (see source note). They do not reveal confidential data in the right-hand columns because total CDQ harvest includes catch by sectors other than HAL CP and Am. 80.
* 2022 data through June 25.
Sources: NMFS AKRO SF Annual Catch and Landings Reports. https://www.fisheries.noaa.gov/alaska/commercial-fishing/fisheries-catch-and-landings-reports-alaska, and NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

3.3.3. Revenue

Table 3-4 reports average annual per-vessel gross first wholesale revenues for all HAL CPs that retained and sold Greenland turbot (bottom panel) and the subset of HAL CPs that recorded a turbot "target" as defined by NMFS CAS (top panel). The table compares gross wholesale revenues derived from Greenland turbot to the total revenues that those vessels generated in all Alaska fisheries ("GT%). The vessel counts are the same as those reported in Table 3-1. In aggregate, the vessels that targeted Greenland turbot derived around 12% of their total revenues from the species; that calculation includes 2021 when no vessels targeted turbot. The median targeting vessel was generating around $750,000 from turbot compared to total annual gross revenue of around $6.6 million. Total gross revenues from the Greenland turbot target fishery can be calculated by multiplying "BSAI GT Wholesale Value" by the number of vessels targeting turbot (Table 3-5). Total gross revenues from Greenland turbot during the analyzed period were highest from 2010 to 2012 ($6.1 million to $9.2 million, in 2021 dollars) and lowest in 2018 and 2020 ($1.0 million, both). If all retained and sold Greenland turbot are included in the total annual revenue calculation, the 2010 through 2012 species value would have ranged from $7.2 million to $11.1 million while the 2018 and 2020 values would have been around $1.1 million.

Table 3-4 Average "per vessel" gross first wholesale revenues from BSAI Greenland turbot catch relative to total Alaska revenues for HAL CPs that targeted turbot (top) and *all* HAL CPs that retained turbot (bottom); $millions, real-dollar adjusted to 2021

Targeting GT	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Avg.	Median
# Vessels Targeting	9	8	7	3	3	3	5	4	3	3	4	0		
BSAI GT Wholesale Val.	0.67	1.15	1.21	0.49	0.73	1.26	0.87	0.98	0.34	0.75	0.25	-	0.73	0.74
Total Wholesale Val.	4.92	6.86	6.91	4.76	6.40	7.24	7.71	8.31	7.83	4.82	5.62	-	5.95	6.63
GT %	*14%*	*17%*	*17%*	*10%*	*11%*	*17%*	*11%*	*12%*	*4%*	*16%*	*5%*	*0%*	*12%*	*11%*
Retaining GT	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**Avg.**	**Median**
# Vessels Retaining	23	17	16	11	12	9	11	16	17	12	13	4		
BSAI GT Wholesale Val.	0.31	0.65	0.55	0.19	0.19	0.44	0.41	0.27	0.07	0.20	0.08	< 0.01	0.28	0.23
Total Wholesale Val.	6.06	9.18	8.28	5.16	8.40	8.89	7.26	11.10	10.63	8.67	7.53	6.63	8.15	8.34
GT %	*5%*	*7%*	*7%*	*4%*	*2%*	*5%*	*6%*	*2%*	*1%*	*2%*	*1%*	*< 1%*	*3%*	*3%*

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

Table 3-5 Total gross first wholesale revenues from BSAI Greenland turbot for HAL CPs, 2010-2021 ($millions, real-dollar adjusted to 2021)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Target	6.1	9.2	8.4	1.5	2.2	3.8	4.4	3.9	1.0	2.3	1.0	0.0
All Retained	7.2	11.1	8.8	2.1	2.3	3.9	4.5	4.3	1.1	2.4	1.1	< 0.01

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

Additional information on Greenland turbot revenues at the community level and a qualitative assessment of vessel dependency is provided in Section 3.5.

3.3.4. Spatial and Temporal Effort Patterns for Trawl and Non-Trawl

The Council requested information on where and when trawl and non-trawl gear has been used to fish for BS Greenland turbot and whether that effort has overlapped in both time and space. The Council's interest is in whether authorizing longline pot gear might result in a higher likelihood of gear conflict or grounds preemption. The analysts are not aware of documented inter-gear conflicts in the BS Greenland turbot fishery in the recent past. This section (and the Appendix to this document) is focused on when and where gear has been deployed in the past, the intensity of fishing effort (catch) in areas, and any substantive and predictable differences in how longline pot gear would be utilized as compared to HAL gear.

The data in this subsection are limited by what has occurred under trawl or HAL gear effort since pot fishing for turbot has not occurred in the area of interest. Historical HAL effort is the best available indicator of future longline pot effort but may not provide a perfect analogy. The analysts presume that the most likely non-trawl vessels to participate in a longline pot fishery are those that have previously participated in that same fishery as HAL CPs. Nevertheless, the reader should bear in mind that participation in a turbot longline pot fishery is not limited to past HAL CP participants, and that the implementation of a new gear type is likely to require a period of experimentation to optimize effectiveness, safety, and efficiency.

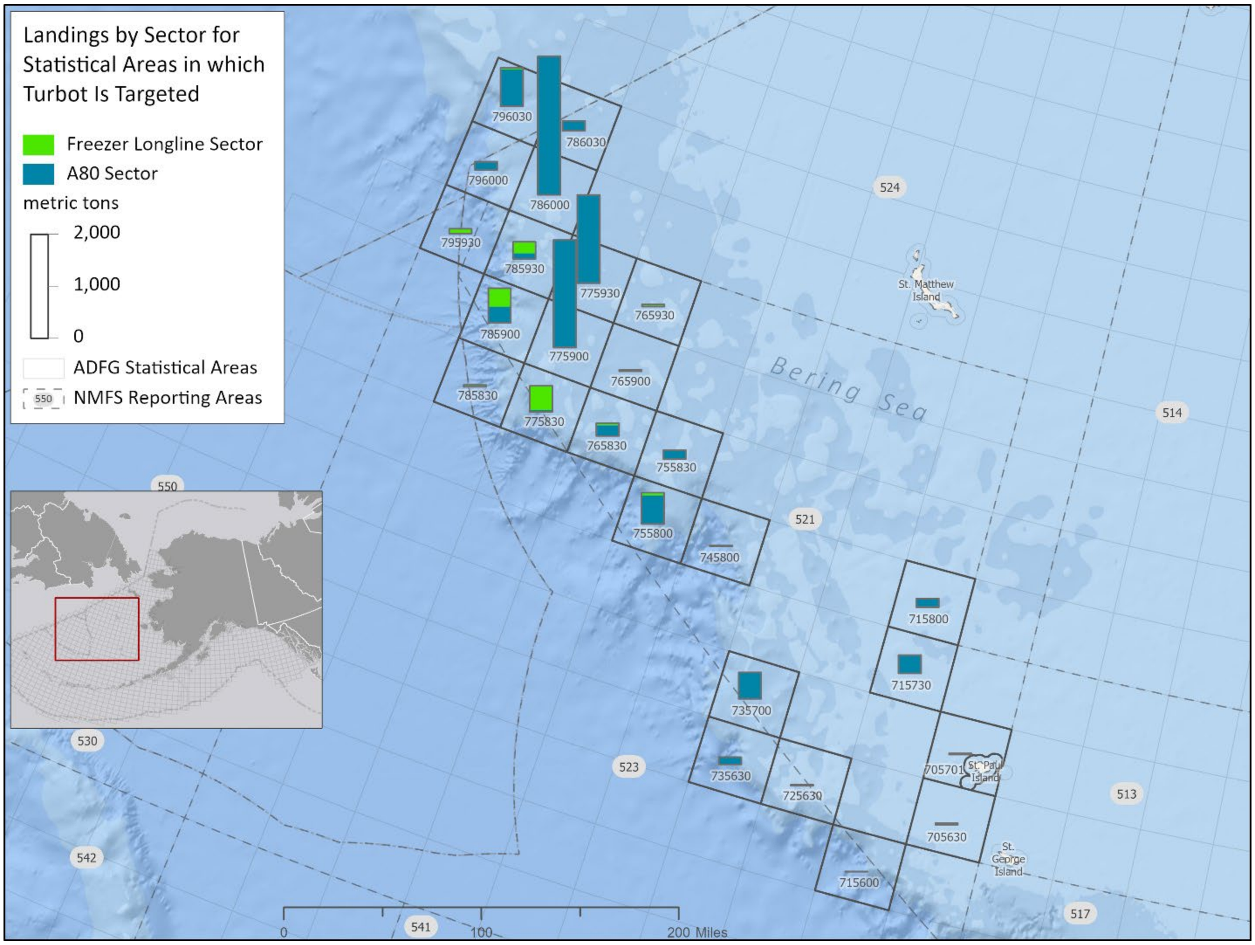
Factors that might change after a new gear authorization could include depth, timing, and location, which encompass most of what one would want to know to predict the coincidence of different gear types in the future. Those three factors might be different for a variety of gear-specific reasons. For example, longline pot gear could have a different selectivity for market-size turbot as well as for other FMP or PSC species that could be either desired or undesired/prohibited. The presumed efficacy of pot gear in mitigating whale depredation might allow the non-trawl sector to choose different times at which to fish – being less dictated by historical depredation patterns. (As noted in Section 3.1, the existence of a voluntary TAC-sharing agreement between the trawl and non-trawl sectors generally ensures that inter-sector competition for TAC is not a primary driver of when directed fishing occurs.) It remains to be seen what type of pots non-trawl vessels might use and whether there is an advantage in terms of operational safety and efficiency to fishing earlier in the year when sea conditions tend to be less adverse. Vessels carrying a deck of heavier conventional groundfish pots might fish earlier than vessels fishing lightweight collapsible pots (additional information on pot configurations is provided in Section 3.3.5.2.1). Also, the spatial and temporal patterns of both the trawl and non-trawl sectors could change in the medium- to long-term if the Greenland turbot biomass becomes distributed differently due to environmental factors or if the fisheries for the other species that these sectors pursue change in timing and nature. Greenland turbot has not historically been a primary sustaining species for either sector, as noted in Section 3.3.1. Non-trawl vessels are likely to craft their annual fishing plan around the most advantageous times to target Pacific cod. Trawl vessels are at least partly catching their portion of the turbot TAC as a secondary species to arrowtooth and Kamchatka flounders and the timing of those targets, themselves, is often dictated by the timing of fishing for yellowfin sole, rock sole, and fishing opportunities for some A80 vessels in the Aleutian Islands or the Gulf of Alaska.

Figure 3-1 illustrates the location of HAL CP and trawl effort in the BS Greenland turbot target fishery from 2017 through 2021. The data are cumulative over the period, which weights total catch toward the trawl sector because the non-trawl sector did not target Greenland turbot in 2021. Each roughly-square unit in the figure represents an ADFG statistical area, and the three-dimensional vertical bars represent groundfish catch by gear type in metric tons.[17] This figure addresses the location of catch but not its timing.

The figure shows that areas higher up on the shelf (eastward) were mainly fished by A80 trawl CPs – presumably targeting turbot alongside arrowtooth and Kamchatka flounder. Both HAL and trawl gear was deployed in statistical areas that encompass deeper water along the BS slope. Historical catch data at the statistical area level, aggregated across multiple years, is not a perfect way to forecast whether and where non-trawl and trawl gear might conflict in the future, but it does allow the reader to visualize the relative scope of crowding on the fishing grounds – or lack thereof.

In addition to the visual depiction, the analysts looked at the temporal overlap between HAL and trawl effort in each ADFG statistical area where BS Greenland turbot was targeted with non-trawl gear. That information is less easily mapped but is provided in table format in the Appendix to this document. The Appendix tables provide a more granular look at the coincidence of multiple vessels from the two most relevant sectors operating in the same ADFG statistical area during the same week, again from 2017 through 2021. These data are restricted to areas where non-trawl CPs targeted turbot to capture only what is most likely to be relevant to the considered action alternative. While all future circumstances under which inter-sector gear conflict and/or grounds preemption might occur cannot be forecast using historical data, the analysts propose that the most likely scenarios would be those in which vessels from different gear sectors are operating in the same week and area. Given the size of an ADFG statistical area, it is reasonable to assume that vessels that are part of the same fishing cooperative (FLC cooperative or A80 cooperative) possess the tools to avoid physical interaction. That assumption might not apply to any "new entrants" that are not part of those existing cooperatives, but there is no basis to expect they would operate outside of the times/areas defined in the Appendix tables.

[17] ADFG statistical areas are based on latitude and longitude, thus their size/area change slightly with latitude. ADFG areas are roughly 30 nm x 30 nm in the Bering Sea.



Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA
Figure created by B. Holycross, PSMFC, August 2022.

Figure 3-1 Cumulative catch (mt) by gear sector in the Greenland turbot target fishery; ADFG Statistical Areas, 2017-2021. Dashed borders show NMFS Reporting Areas. "Freezer Longline Sector" is analogous to Freezer Longline Coalition or HAL CP sector; "A80 Sector" is analogous to trawl CP sector.

Appendix Tables A-1 and A-2 show that it has been relatively uncommon for vessels from the two different sectors to operate in the same area/week combination, and that such instances occurred in only six of the 26 weeks that were analyzed across the 2017-2021 period. There were three statistical areas where this was most likely to occur, and they were all located along the BS slope in the northwestern portion of the area depicted in Figure 3-1 (Areas 755800, 775900, and 785900). The areas where both sectors coincided during the same weeks were a mix of areas that were dominated by effort from one sector and areas that were more of an even split in terms of total harvest volume during the analyzed period. That is to say, areas where both sectors coincided might not necessarily be indicative of high probabilities of inter-gear conflict. Table A-2 gauges the gross number of vessels in the same area/week and finds that the maximum number of vessels was four. The maximum number of vessels where both sectors were active was three.

Part of assessing the likelihood of gear conflict and grounds preemption is understanding the physical footprint of one gear type compared to another. That information can be added, qualitatively, to historical data on the density and coincidence of effort with multiple gear types in the same area.[18]

As a "mobile" gear type, describing the footprint of trawl effort requires specific fishery-dependent observations that are beyond the scope of this document and would be difficult to display at any meaningful level within the restrictions on data confidentiality. Trawl skippers may lengthen or shorten tows for a variety of reasons (e.g., high/low CPUE, test tows, unintended catch, presence of other gear), change the location of tows for similar reasons, or increase/decrease the number of tows based on total harvest goals as well as CPUE. For those reasons, retrospective data on trawl presence is informative in terms of preferred areas (i.e., Figure 3-1) but are not necessarily more predictive of the future at a fine spatial/temporal scale.

The future timing and location of non-trawl effort has similar uncertainties – other than the accepted understanding that Greenland turbot tend to be targeted in deeper waters along the BS slope. For example, the analysts are not equipped to state whether longline pot gear would be set to soak for longer than the historically utilized HAL gear. On one hand, pot gear can "sort" fish on the bottom through the use of escape rings, though this may be less applicable in the case of a flatfish target. Longer soaks with escape rings might reduce catch of non-target fish that would be discarded anyway, and could carry the disadvantages of slowing the pace of effort and also exposing target fish to sea lice or other factors that diminish catch quality.

One question that can be approached, albeit with anecdotal information that has some limitations, is whether the replacement of HAL gear with longline pot gear would require a greater footprint on the fishing grounds to catch the same volume of fish that were harvested before the HAL CP sector essentially chose to shut down its own turbot fishery in 2021 due to depredation. Previous Council discussion papers and analyses have included anecdotal estimates of how HAL and longline pot footprints compare (NPFMC 2013; NPFMC 2016; NPFMC 2021c). Those estimates were vetted through the public comment process at multiple Council meetings. The main shortcoming of those estimates, for use in this context, is that they were provided with CVs directed fishing for Gulf of Alaska sablefish in mind. CPs operating in the western subareas of the BS are likely to set more total gear, and the different bathymetry and target species of the considered fishery could affect gear spacing along a longline. The most recently updated summation of these gear-comparison anecdotes was provided in the GOA sablefish longline pot 3-year review (NPFMC 2021c, Section 8). That document characterized the general GOA sablefish longline pot string as being between 30 and 50 pots spaced 25 to 50 fathoms apart (150 to 300 feet). Observer data corroborates that the average number of pots per string in the Central and Western Gulf of Alaska was between 30 and 53 pots from 2017 through 2020.[19] That would place the length of a string around 1.5 miles. Several sources or testifiers estimated that rotating around 180 pots, or 8 to 12 miles of pot gear including spacing between strings, would be equivalent to the catch capacity and footprint of a HAL CV. The analysts welcome additional estimates provided through the Council's advisory process that might be more specific to the BS CP sector.

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[18] Though outside of the Council's initial request, the analysts are aware that Pribilof Islands golden king crab are fished with longline pot gear in the spring and summer. Figure 3-5 shows the general location of golden king crab bycatch in 2021, and the Pribolof Islands area is farther east than the focal areas shown in Figure 3-1. Nevertheless, subsequent versions of this analysis could consider any increased possibility of gear conflict with that fishery. To the analysts' knowledge, longlined crab pots have not been involved in entanglements with trawl or non-trawl Greenland turbot gear. Fishery participants may advise the Council as to whether the golden king crab fishery requires vessels to targeting turbot or similar groundfish species to alter their fishing time and location.

[19] NMFS AFSC Observer Program sourced through NMFS AKR, data compiled by AKFIN in Comprehensive_OBS.

3.3.5. Non-target Catch in Target Fishery

This section provides the best available information to understand which species, other than Greenland turbot, might be expected to occur in a Bering Sea longline pot fishery. This section correlates to the information and discussion provided in the "Non-target Species" subsection of *Environmental Impacts – Non-target species* (Section 5.3). The analysts cannot rely completely on historical data since a directed fishery for Greenland turbot with longline pot gear type has never existed. The closest possible analogy – a single pot fishery for BS Greenland turbot – is also not available as a guide because single pots have not been used to target turbot even though they are authorized.

For FMP species, the analysts identified the next-best approach as catch-by-species data from non-trawl fishing that targeted three species: HAL gear targeting Greenland turbot, pot gear targeting sablefish, HAL gear targeting sablefish, pot gear targeting Pacific cod, and HAL gear targeting Pacific cod. Those data are drawn from 2017 through 2021, but only run through 2020 for HAL Greenland turbot since no non-trawl targeting of that species occurred in 2021. The analysts limited the scope of the data to fishing that occurred in BS NMFS management areas 521, 523, 524, and 530. A map of the BS statistical areas is published in regulation as Figure 1 to Part 679 (Figure 1-1 in this document). Those areas encompass both the Bering Sea slope, where the current HAL CP Greenland turbot fishery largely occurs, and other statistical areas that might be more relevant to the Greenland turbot fishery than, for example, non-trawl fishing that occurred in the eastern Bering Sea and elsewhere on the shelf. Greenland turbot are not targeted on the shelf because the turbot that are found in shallower waters tend to be young and smaller than market size (Bryan et al. 2018 & 2020).

For prohibited species catch (PSC) species – specifically crab, halibut, and salmon – the analysts looked at all non-IFQ HAL and pot gear effort in the four identified NMFS areas from 2013 through 2021. AKFIN recommends using PSC data starting in 2013 due to changes in the Observer Program implemented at that time and the fact that data revisions based on changes in estimation methodologies are not always applied to years prior.

3.3.5.1. FMP Species

Table 3-6 shows the distribution of catch by species in five target fisheries using data only from fishing in the NMFS areas defined above as the "western Bering Sea" where the Greenland turbot fishery typically occurs (521, 523, 524, 530). For each target fishery, the table lists species in descending order of proportional average annual weight of combined retained and discarded catch. The table lists the species that made up a significant proportion of total catch and also lists species that may be of special interest. Species of special interest include PSC species (e.g., halibut and crab), species that the Council identified for various reasons when reviewing the February 2022 discussion paper (e.g., Pacific cod and octopus), and species whose own target fisheries in the trawl sector historically result in significant secondary catch of Greenland turbot (e.g., arrowtooth flounder and Kamchatka flounder). "Other" species are aggregated in the final row of each target fishery and listed by name in descending order of annual average catch weight in this footnote.[20] All species are reported in metric tons; AKFIN imputes weights for crab which

[20] [a] Greenland turbot HAL – eelpouts, sea star, sculpin, miscellaneous crab, non-Chinook salmon, urchins/dollars/cucumbers, sea anemone, shark, Chinook salmon, jellies, snails, sea whips, sponges, yellowfin sole, bivalves, brittle star.
[b] Pacific cod Pot – Pacific cod Pot – snails, sea star, miscellaneous crab, jellies, hermit crab, rock sole, eelpouts, flathead sole, Alaska plaice, skates, bivalves, other flatfish, sea anemone, benthic urochordata.
[c] Pacific cod HAL – eelpouts, sea anemone, snails, shark, sea whips, benthic urochordata, jellies, bivalves, Atka mackerel, corals, Pacific ocean perch, sponges, brittle star, non-Chinook salmon, greenlings, Alaska plaice.
[d] Sablefish Pot – miscellaneous crab, rougheye rockfish, shark, Kamchatka flounder.
[e] Sablefish HAL – sea anemone, flathead sole, sculpin, sea star, brittle star, pollock, Kamchatka flounder.

are normally reported in number of animals. Note that weights for PSC halibut represent raw catch estimates with no discard mortality rate (DMR) applied.

The reported weight for each species within a target fishery is the annual average of the five-year period from 2017 through 2021 (“Greenland turbot HAL” is a four-year average from 2017 through 2020 because there was no targeting in 2021). Using an annual average avoids situations where some yearly data would be redacted for confidentiality. Also, the use of an annual average smooths some volatility in yearly data that can be caused by extrapolation of large catch events for certain non-target species during observed fishing onto unobserved hauls. This was particularly the case for grenadier. That smoothing effect did not change the ordinal rankings of species within the target fisheries, and thus maintains a useful reflection of the relative proportion of species that were encountered during the reported period.

Table 3-6 Average annual catch (mt) by species in western Bering Sea pot and HAL gear target fisheries for Greenland turbot, Pacific cod, and sablefish, 2017-2021*

Target	Species	Retained	Discarded	% Total	Target	Species	Retained	Discarded	% Total
G. Turbot	Grenadier	0.0	2,107.1	46.3%	**P. Cod**	Pacific cod	8,163.4	21.5	96.2%
HAL*	Greenland turbot	1,665.4	20.2	37.0%	**Pot**	Yellowfin sole	0.0	162.3	1.9%
	Skates	22.7	260.5	6.2%		Sculpin	0.0	62.1	0.7%
	Sablefish	94.2	69.5	3.6%		Tanner crab	0.0	52.1	0.6%
	Pacific cod	105.9	1.7	2.4%		Snow crab	0.0	15.0	0.2%
	Kamchatka fl.	17.4	66.7	1.8%		Octopus	1.4	5.3	0.1%
	Rockfish	54.0	5.8	1.3%		Pollock	1.9	1.3	0.0%
	Arrowtooth	12.3	16.7	0.6%		Blue king crab	0.0	1.8	0.0%
	Pollock	11.6	4.2	0.3%		Arrowtooth	0.0	0.7	0.0%
	Flatfish (other)	0.0	5.2	0.1%		Halibut	0.0	0.7	0.0%
	Flathead sole	0.0	4.0	0.1%		Kamchatka fl.	0.0	0.2	0.0%
	Halibut	0.0	3.1	0.1%		Greenland turbot	0.0	0.2	0.0%
	Octopus	0.0	0.1	0.0%		Red king crab	0.0	0.1	0.0%
	RKC/GKC/Snow	0.0	0.02	0.0%		Golden king crab	0.0	0.01	0.0%
	Other[a]	0.0	6.0	0.1%		Other[b]	0.0	20.2	0.2%
P. Cod	Pacific cod	324,817.9	4,729.5	76.3%	**Sablefish**	Sablefish	27.5	0.8	73.8%
HAL	Skates	26,708.1	37,033.7	14.8%	**Pot**	Halibut	8.5	0.0	22.2%
	Pollock	20,187.1	2,284.4	5.2%		Grenadier	0.0	0.8	2.0%
	Sculpin	0.1	6,720.0	1.6%		Arrowtooth	0.0	0.4	1.1%
	Yellowfin sole	122.6	2,593.0	0.6%		Pacific cod	0.0	0.2	0.6%
	Arrowtooth	631.2	1,059.8	0.4%		Golden king crab	0.0	0.03	0.1%
	Flathead sole	48.0	1,378.1	0.3%		Greenland turbot	0.0	0.02	0.0%
	Grenadier	0.0	690.8	0.2%		Tanner/Snow crab	0.0	0.01	0.0%
	Sea star	0.0	667.2	0.2%		Other[d]	0.02	0.1	0.3%
	Greenland turbot	290.4	94.1	0.1%	**Sablefish**	Grenadier	0.0	92.8	70.9%
	Halibut	0.0	285.8	0.1%	**HAL**	Skates	0.7	16.4	13.1%
	Flatfish (other)	19.8	254.0	0.1%		Sablefish	12.6	0.6	10.1%
	Kamchatka fl.	71.0	173.1	0.1%		Pacific cod	2.4	0.1	1.9%
	Sablefish	28.7	143.4	0.0%		Rougheye rockfish	1.0	0.3	1.0%
	Rockfish	138.0	36.6	0.0%		Halibut	1.1	0.03	0.9%
	Rock sole	2.3	56.2	0.0%		Greenland turbot	1.1	0.03	0.8%
	Octopus	1.8	47.3	0.0%		Rockfish (other)	0.7	0.02	0.5%
	Tanner crab	0.0	44.6	0.0%		Flatfish (other)	0.0	0.4	0.3%
	Snow crab	0.0	13.2	0.0%		Arrowtooth	0.1	0.3	0.3%
	RKC/BKC/GKC	0.0	7.1	0.0%		Tanner crab	0.0	0.01	0.0%
	Other[c]	0.8	763.2	0.2%		Other[e]	0.0	0.4	0.2%

* Greenland turbot HAL data are averaged over four years: 2017-2020
RKC = red king crab; BKC = blue king crab; GKC = golden kind crab; Snow = snow crab
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA

Table 3-6 allows the reader to sketch a rough picture of what a longline pot fishery might look like for Greenland turbot, absent any direct experimentation that would be more informative. Each target fishery for which data are available has aspects that are similar and dissimilar to a longline pot turbot fishery. The Greenland turbot HAL fishery pursues the same target with a gear that selects for different non-target species. Sablefish target fishing likely occurs at a similar depth to the Greenland turbot target fishery, but the sample of data is less robust in this portion of the BS. Pacific cod targets generally occur at depths shallower than where Greenland turbot are targeted and entail the same “pot vs. hook-and-line” discrepancies in which non-target species are encountered. Data supporting the notion that vessels targeting turbot and those targeting Pacific cod operate at different depths are provided later in this subsection.

The Greenland turbot HAL fishery was the least selective for its target, at 37%. The species that accounted for the plurality of turbot HAL catch, grenadier, also made up a significant component of target fisheries for the Pacific cod HAL target and the sablefish HAL target. This observation – and the fact that grenadier is also prevalent in trawl catch when targeting BS Greenland turbot – suggests that grenadier is a ubiquitous nuisance species that might be mitigated through the use of pots. Grenadier was relatively less prevalent in sablefish pots as compared to sablefish HAL and did not occur in the Pacific cod pot fishery (shallower depth). The analysts note that a 2021 paired-study of experimental survey catch with hook-and-line gear versus collapsible “slinky” pots in the West Yakutat district of the Gulf of Alaska showed a significant reduction in the amount of grenadier when using pots (see Table 2 in Sullivan et al. 2022). Future analysis could consider the bycatch species that occur in longline pots deployed in the Pribilof Islands golden king crab fishery. The analysts would consider whether that fishery is an appropriate analogue for Greenland turbot longline pots based on area and depth fished; that golden king crab fishery generally occurs in the spring and summer, which is a better match for the turbot fishery than most other crab fisheries.

For comparison, AKFIN also computed average annual catch by species for the trawl sector’s hauls that targeted Greenland turbot in the selected western BS areas. From 2017 through 2021, Greenland turbot ranked first – by virtue of the target designation – at around 3,370 mt per year. The next most prevalent species was grenadier (2,050 mt), indicating that the “problem” of unmarketable grenadier is not unique to non-trawl gear at the depths where turbot are fished. The next two species were Kamchatka flounder and arrowtooth flounder (1,436 mt and 1,050 mt), which are species for which turbot often turns up in their own target trawl hauls. The other notable species in the Greenland turbot trawl target were flathead sole (700 mt), pollock (689 mt), sablefish (437 mt), Pacific ocean perch (347 mt), and rex sole (221 mt).

The sablefish pot target fishery provides the best analogy for whether a deep-water pot fishery would increase the rate of Pacific cod bycatch. The amount of Pacific cod in the sablefish pot fishery was relatively low, although the sample size was small compared to total catch in other targets. A greater proportion of Pacific cod was recorded in the sablefish HAL fishery, which presumably operated at a similar depth (1.9% of catch for HAL versus 0.6% for pot).

When reviewing the February 2022 discussion paper (NPFMC 2022a), the Council flagged an interest in potential rates of octopus bycatch in Greenland turbot longline pots. The incidence of octopus at turbot and sablefish depths appears quite low, acknowledging the limited sample size. At Pacific cod depths, the incidence of octopus was slightly higher in pots than with HAL gear on a percentage basis, but not remarkably so.

By weight, the prevalence of crab bycatch was substantially higher in the Pacific cod pot and HAL targets compared to the deeper-water targets of Greenland turbot and sablefish. Setting aside the possibility that longline pot gear targeting turbot might be equipped with sock tunnels or other crab deterrents, there exists some evidence that crab bycatch might not be a primary concern in a turbot fishery.

Refer to the following section, 3.3.5.2, for the best available data on crab bycatch in the BS areas of interest for this action.

HAL gear was more likely to capture skates than pot gear. Commercially valued non-turbot flatfish like arrowtooth, Kamchatka flounder, and other soles were present in all targets, but the prevalence was not consistent across gear and depth (i.e., turbot/sablefish vs. Pacific cod). It is likely that a Greenland turbot pot fishery would encounter arrowtooth and Kamchatka flounder, though perhaps at a lower percentage compared to a HAL gear fishery.

The information in Table 3-6 does not give a clear picture as to whether a turbot longline pot fishery would capture more halibut than was recorded in the HAL fishery from 2017 through 2020.[21] Halibut were encountered at a relatively high rate in the sablefish pot fishery in this area, but the total sample size is small and vessels targeting sablefish while retaining halibut clearly possessed halibut IFQ, meaning that they were setting in areas or at depths where halibut were likely and desired. Comparing records where Pacific cod was the target, pots caught fewer halibut than HAL gear, but not on a percentage basis. The fact that no halibut were retained in western BS areas Greenland turbot and Pacific cod target fisheries is some indication that the vessels engaged in these target fisheries are not likely to use the maximum tunnel-width flexibility (Alt. 2, Option) to intentionally fish for halibut. However, vessel operators directed fishing for turbot are likely to take advantage of tunnel-width flexibility if they think it will select for more turbot or larger sizes, which could conceivably increase incidental catch of halibut if no other factors are taken into consideration. Relatively few halibut are processed-at-sea and there is low availability of shoreside processing near this fishing area, so incentives to catch and retain halibut are expected to be low.[22] Also, as noted in Section 3.2, only two active CPs that would have the ability to participate in the BS non-trawl turbot fishery have recorded any halibut IFQ landings since 2013.

As stated above, regarding halibut, the numbers in Table 3-6 are not adjusted from gross bycatch weight to estimated discard mortality. The halibut DMR for pot gear differs from that of HAL gear under the current groundfish harvest specifications, which are set annually. BSAI Harvest Specifications 2022/23 (Table 18) show that halibut caught in pot gear are presently assumed to have a 33% DMR while halibut caught in HAL gear – both CP and CV – are assumed to have a 10% DMR. Taken at face value, this would suggest that transitioning the non-trawl Greenland turbot fishery from HAL gear to longline pot gear could negatively impact halibut, all else equal. An understanding of how annual DMRs are determined tempers that conclusion to some degree. According to the most recent recommendations report from the Interagency Halibut DMR Workgroup (Sept. 2021), specified DMRs simply reflect the average of observer-estimated DMRs for the two most recent complete fishing years. Those estimates are based on the quantity of observer sampling and mortality/condition assessments. Sampling in the pot gear sector has tended to occur at a lower rate relative to HAL gear, especially given the high volume of HAL CP activity and the low proportion of halibut in pot catch across all gear types. Figure 1 on page 2 in the Workgroup report linked above plots non-trawl halibut DMRs from 2010 through 2020. The BSAI pot CP/CV sectors have been at a DMR of around 30% since 2017, but prior to that were between 6% and 10% from 2013 through 2016. The pot DMR was between 15% and 20% from 2010 through 2012. That volatility is at least partly explained by the small number of sampled pots that contained halibut, with a high proportion of pots determined at either 0% mortality for excellent viabilities or 100% mortality for both dead and poor viabilities. By contrast, the BSAI HAL CP sector has maintained a consistent DMR of roughly 10% or slightly below, while the CV sector was as high as 20% in 2014 and as low as 5% in 2017 and 2018. To conclude this point, the analysts are not able to state that a halibut caught in pot gear is more

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[21] Note that the halibut catch-by-weight in Table 3-6 is gross weight, not converted to estimated tons of halibut *mortality* by applying a discard mortality rate. For this reason, the average annual catch of halibut in, for example, the Pacific cod HAL target is higher than the PSC estimates in Table 3-7.

[22] In addition to having sufficient IFQ onboard, retention of IFQ or CDQ halibut requires a vessel to complete logbooks, operate VMS, and submit an IFQ landing PNOL (§679.42(m)).

or less likely to survive upon discard relative to a halibut caught on HAL gear. Superficially, it would seem that halibut caught in pot gear are less damaged by hooks or release at the rail. However, halibut caught in pot gear might be subject to greater soak time while trapped in a pot. Lacking comparative data specific to the turbot fishery setting, the net effect of introducing longline pot gear is best evaluated on the basis of whether pots are more or less likely than HAL gear to capture halibut, and whether halibut and turbot are likely to be collocated in terms of fishing depth. The Option under Alternative 2 to increase pot tunnel width openings might increase the likelihood of halibut entering a pot, but that effect could be inconsequential if longline pot gear is deployed at a depth where halibut are relatively less available.

3.3.5.1.1. Potential Interaction with Pacific Cod

Sections 2.1 and 2.2 of this document noted that Pacific cod caught with longline pot gear is currently considered a prohibited species and thus could not be retained. Pacific cod that would be discarded from longline pot gear would still accrue to the BSAI HAL/Pot ICA. If the Council proposed regulatory amendments to allow retention of Pacific cod in longline pot gear up to the MRA then it would need to consider the possibility that some cod catch would accrue to the BSAI Pot CP Pacific cod TAC if a haul ends up with a “cod target” designation.

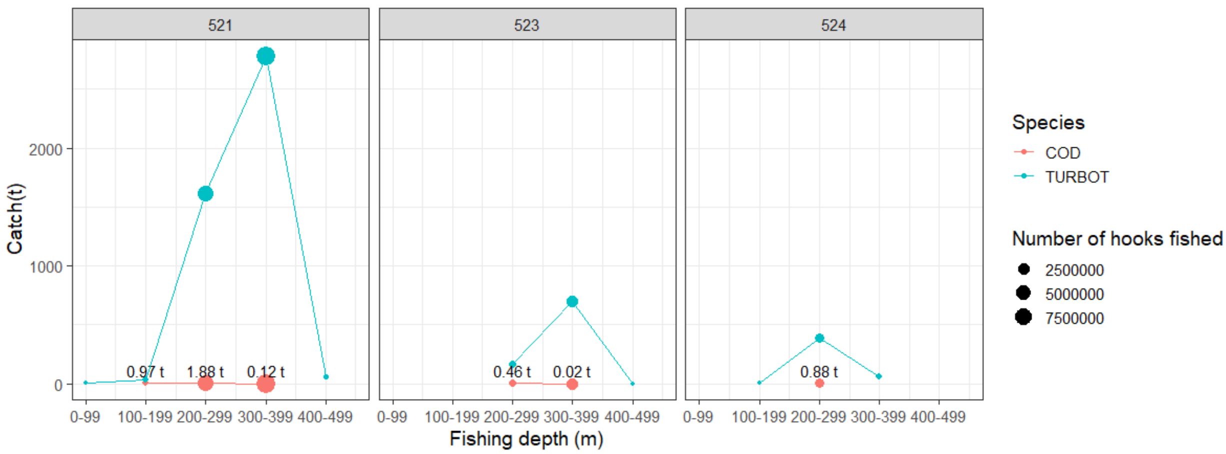
The Council is interested in whether a longline pot fishery for Greenland turbot is likely to result in higher levels of Pacific cod catch for two reasons. First, additional expected cod accruing to the BSAI HAL/Pot ICA may have to be accounted for by NMFS managers by increasing the ICA as part of the harvest specifications process, which in turn reduces the total TAC that is allocated across all of the HAL and pot sectors that are defined in Amendment 85. Second, cod catch by CPs with pot gear accruing directly to the “pot cod CP sector” TAC directly reduces the amount of harvest available to that sector, which is made up of a small number of active vessels (recently two to four) that have not historically participated in the Greenland turbot fishery. The pot cod CP sector is initially allocated only 1.5% of the total BSAI Pacific cod non-CDQ TAC, which equated to 2,003 mt in 2022; by comparison, HAL CPs receive 48.7% of the non-CDQ TAC (65,027 mt in 2022).

Table 3-6 showed that Pacific cod was not a high-volume species in the deep-water sablefish targets for either pot or HAL gear. Pacific cod was the fifth ranked species by average annual volume in the Greenland turbot HAL target fishery – behind grenadier, turbot, skates, and sablefish – accounting for only 2.4% of total catch in that target. In addition to looking at historical secondary or incidental catch of Pacific cod in different target fisheries (HAL/Pot sablefish) or with different gear (HAL turbot), the analysts considered data on the depth at which cod have been caught in the turbot HAL fishery. Observer data from the BSAI HAL Greenland turbot target fishery, spanning 2010 through 2021, reveals that Pacific cod catch on observed hauls was low overall but particularly low at depths greater than 150 meters, while most turbot catch occurred at those greater depths. These data suggest that the future incidence of Pacific cod in the turbot target fishery will be determined mostly by the depth at which turbot are found in a given year. While it is generally understood that mature turbot move to deeper waters, the depth around which the market size biomass is distributed each year could shift due to environmental changes.

Figure 3-2 through Figure 3-4 illustrate the incidence of Pacific cod caught in the Greenland turbot HAL target fishery at different fishing depths. The figures are restricted to NMFS Areas 521, 523 and 524 (see Figure 1-1), which account for the vast majority of where turbot HAL fishing occurred (over 99% from 2010 through 2021). The data below represent only hauls that were directly observed and for which fishing depth was recorded. Figure 3-2 groups the fishing depth for each haul into 100 meter bins and plots cumulative catch from 2010 through 2021 by species. The data for Area 521, which accounted for roughly 77% of turbot HAL catch during the analyzed period, illustrate that turbot effort (number of hauls and hooks) is higher at greater depths, that more turbot catch occurs at those depths, and that the proportion of total observed catch that was Pacific cod declines as depth increases. Again using Area 521 as an example, 61% of all observed hauls occurred between 300 and 399 meters of depth (1,173 hauls) and 38% occurred between 200 and 299 meters of depth (737 hauls). No Pacific cod was observed in the 17 hauls that occurred deeper than 400 meters.

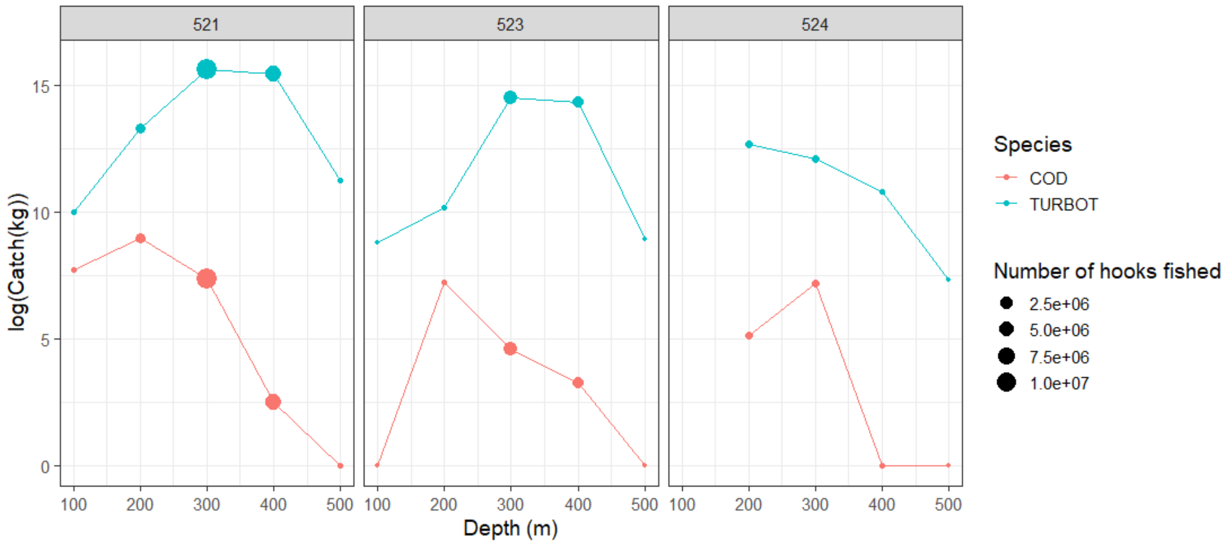
Figure 3-3 uses the same data source going back to the year 2000 to illustrate the shape of the drop-off in Pacific cod catch at greater depths. Note that the vertical axis is transformed to a logarithmic scale so that the relatively miniscule volumes of Pacific cod do not appear as a nearly-flat line. Each unit on the vertical axis represents a 10x step up in volume, so a value of 2 represents 100 kg, a value of 3 represents 1000 kg, a value of 6 represents 1 million kg, and so on.

Figure 3-4 summarizes observed catch data for both species on an annual basis for the 2010 through 2021 period. No Pacific cod catch was observed in the turbot target fishery in 2011, 2013, 2014, 2017, 2019, and 2021.



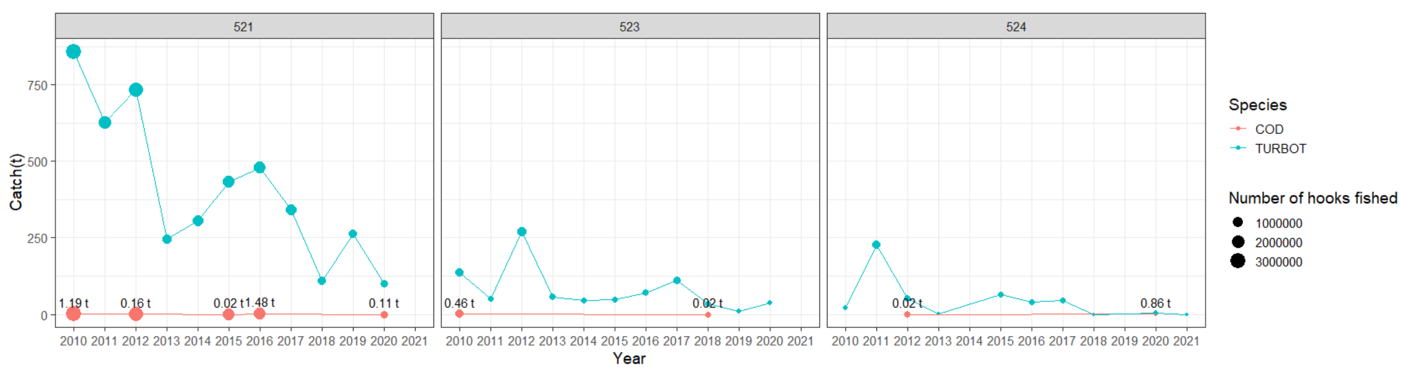
Source: NMFS AFSC Observer Program, compiled by AKFIN in Comprehensive_OBS; provided by S. Barbeaux (AFSC), 2022.

Figure 3-2 Cumulative Greenland turbot and Pacific cod catch weight (metric tons) by depth (meters) on observed hauls in the BSAI HAL turbot target fishery, 2010-2021



Source: NMFS AFSC Observer Program, compiled by AKFIN in Comprehensive_OBS; provided by S. Barbeaux (AFSC), 2022.

Figure 3-3 Cumulative Greenland turbot and Pacific cod catch weight (kilograms) by depth (meters) on observed hauls in the BSAI HAL turbot target fishery – logarithmic scale, 2000-2021



Source: NMFS AFSC Observer Program, compiled by AKFIN in Comprehensive_OBS; provided by S. Barbeaux (AFSC), 2022.

Figure 3-4 Greenland turbot and Pacific cod catch weight (metric tons) by year on observed hauls in the BSAI HAL turbot target fishery, 2010-2021

3.3.5.2. Prohibited Species Catch

Table 3-7 compares PSC for pot gear and HAL gear from 2013 through 2021 in the most relevant NMFS management areas in the BS. Both CP and CV data are included. The data include all catch that occurred while targeting groundfish species in both CDQ and non-CDQ management programs. Catch in the IFQ fishery is not included, which is why the amount of halibut reported in this table is lower than what is seen in the sablefish target panels of Table 3-6. The table also lists the total number of vessels fishing the analyzed area in each year. This scope of data provides the most complete possible survey of how much PSC is estimated to be encountered in these areas and with these gear types. Gross PSC estimates – in terms of number of animals for crab species and salmon, and metric tons of mortality for halibut – are indexed according to the basis weight (mt) of the groundfish species that were caught in the fishing event records that are included in both tables (Table 3-8).

The data indicate that 98.9% of total groundfish catch during this period, in these areas, was in the Pacific cod target; 0.8% was in the Greenland turbot target and 0.2% was in the halibut IFQ fishery (IFQ data not shown in table). Data from trips using HAL gear account for 98.6% of the total basis weight. The remainder of the groundfish catch that came from pot gear was virtually all within the Pacific cod target.

Groundfish basis weight ("GF Basis Wt.") is a simple means to standardize PSC rates for each gear, year, and PSC species combination. The basis weight is the total amount of groundfish catch that occurred. Most of the trips targeted Pacific cod. Standardizing gross PSC numbers is useful because it allows the reader to see whether a year-over-year change in the number of crab, halibut, or salmon taken was driven by the amount of fishing effort in the area or by other unobservable factors. Unfortunately, due to low historical effort in the area, this is less easily interpreted for pot gear. The small number of pot vessels operating in the area make crab PSC – perhaps the item of most interest – not only difficult to interpret but also difficult to report due to confidentiality. For example, the highest values of blue king crab and bairdi Tanner crab bycatch occurred in years for which data are confidential. The data show, however, that pot gear in this area has not recently resulted in large amounts of halibut PSC or any salmon PSC. Whether or not a longline pot fishery in the western BS would continue to produce little or no halibut PSC might change in the future depending on gear specifications that could allow for larger pot gear tunnel openings, as considered under the Option to Alternative 2.

The robust number of HAL vessels allows some conclusions to be drawn about the relative prevalence of PSC by species for that gear type. The predominant PSC species by weight is halibut. The gross amount of halibut PSC declined over the analyzed period and was stable in terms of PSC rate at 0.001 mt of halibut mortality or less per metric ton of groundfish catch. Crab PSC – measured in number of animals – was greatest for bairdi Tanner crab followed by blue king crab, which was more variable across years. Salmon bycatch occurred in low numbers relative to other fisheries. Non-Chinook salmon accounted for the majority of salmon bycatch.

Note that HAL CPs fishing Greenland turbot in the BSAI currently have a halibut PSC limit of 49 mt of estimated mortality. A CP using pot or longline pot gear to fish Greenland turbot would not be subject to a halibut PSC limit. The total BSAI non-trawl halibut PSC limit is 710 mt; 661 mt of that limit is currently specified for vessels directed fishing for Pacific cod and the remaining 49 mt is for all other non-trawl groundfish fishing *except when using pots, jig gear, or fishing for sablefish with HAL gear* (see [2022/23 BSAI Harvest Specifications Table 17]).

Table 3-7 Bycatch of prohibited species in western Bering Sea NMFS Areas by gear, 2013-2021; does not include IFQ fishing (top panel: HAL gear; bottom panel: pot gear). All species in 'number of animals' except halibut (metric tons of estimated mortality). RKC = red king crab; BKC = blue king crab; BTC = bairdi Tanner crab; GKC = golden king crab; OTC = opilio Tanner crab. Confidential data denoted by *

HAL	RKC	BKC	BTC	GKC	OTC	Hlbt. (mt)	Chinook	Non-Chnk	GF Basis Wt.	#Vessels
2013	145	613	3,200	265	0	164	0	102	56,970	28
2014	299	794	4,901	260	0	179	0	107	72,158	29
2015	362	354	5,052	334	0	113	31	66	82,596	44
2016	523	1,008	7,225	212	10	98	19	151	113,290	44
2017	225	683	7,358	148	18	85	19	123	112,860	47
2018	194	680	3,580	79	91	57	43	153	99,158	50
2019	36	761	3,862	41	33	35	22	305	78,754	35
2020	42	1,427	3,970	25	61	63	20	127	75,652	32
2021	171	350	3,139	24	19	49	6	30	63,895	25

POT	RKC	BKC	BTC	GKC	OTC	Hlbt. (mt)	Chinook	Non-Chnk	GF Basis Wt.	#Vessels
2013	No pot fishing								-	-
2014	*	*	*	*	*	*	Zero PSC		*	1
2015	*	*	*	*	*	*			*	1
2016	76	2,820	8,509	0	0	0.2			2,708	3
2017	*	*	*	*	*	*			*	2
2018	26	3,810	13,636	0	0	0.2			1,650	3
2019	16	2,948	767	10	0	0.1			1,554	3
2020	8	0	719	2	1	0.1			714	3
2021	*	*	*	*	*	*			*	2

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

Table 3-8 Bycatch rate of prohibited species in western Bering Sea NMFS Areas by gear, 2013-2021 (top panel: HAL gear; bottom panel: pot gear). Calculated as 'number of animals per metric ton of groundfish catch' except halibut (metric tons of estimated mortality per metric ton of groundfish). RKC = red king crab; BKC = blue king crab; BTC = bairdi Tanner crab; GKC = golden king crab; OTC = opilio Tanner crab. Confidential data denoted by *

HAL	RKC	BKC	BTC	GKC	OTC	Hlbt. (mt)	Chinook	Non-Chnk
2013	0.003	0.011	0.056	0.005	0.000	0.003	0.000	0.002
2014	0.004	0.011	0.068	0.004	0.000	0.002	0.000	0.001
2015	0.004	0.004	0.061	0.004	0.000	0.001	0.000	0.001
2016	0.005	0.009	0.064	0.002	0.000	0.001	0.000	0.001
2017	0.002	0.006	0.065	0.001	0.000	0.001	0.000	0.001
2018	0.002	0.007	0.036	0.001	0.001	0.001	0.000	0.002
2019	0.000	0.010	0.049	0.001	0.000	0.000	0.000	0.004
2020	0.001	0.019	0.052	0.000	0.001	0.001	0.000	0.002
2021	0.003	0.005	0.049	0.000	0.000	0.001	0.000	0.000

POT	RKC	BKC	BTC	GKC	OTC	Hlbt. (mt)	Chinook	Non-Chnk
2013	No pot fishing							
2014	*	*	*	*	*	*	-	-
2015	*	*	*	*	*	*	-	-
2016	0.028	1.041	3.176	0.000	0.000	0.000	-	-
2017	*	*	*	*	*	*	-	-
2018	0.016	2.309	8.263	0.000	0.000	0.000	-	-
2019	0.010	1.897	0.494	0.006	0.000	0.000	-	-
2020	0.011	0.000	1.006	0.003	0.001	0.000	-	-
2021	*	*	*	*	*	*	-	-

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

As noted in Sections 3.3.1 and 3.3.4, the HAL CP Greenland turbot fishery has historically occurred along the Bering Sea slope in the western portion of the BS between the Zemchug Canyon and the US-Russia international boundary line, with some effort occurring south along the slope in the direction of the Pribilof Canyon. NMFS staff has provided the most recent available annual snapshot of spatial data on where crab bycatch in pot gear occurred in the BSAI, covering the 2021 fishing year (Figure 3-5). The predominant contour line on the maps is the Bering Sea slope. Golden king crab (bottom left panel) is the only species for which pot bycatch occurred along the slope where the Greenland turbot fishery has historically operated. That said, the small amount of pot gear effort along the slope – as shown in the tables above – does not provide a solid basis for forecasting potential crab bycatch by species. The maps do indicate, however, that pot bycatch of bairdi Tanner crab, opilio Tanner crab, and red king crab tends to be concentrated closer to the mainland coast and in waters shallower than where the Greenland turbot fishery occurs. No pot bycatch of blue king crab was recorded in 2021, but Table 3-7 reflects that blue king crab have been taken in western BS pots (as defined in this paper) in previous years. The analysts suggest that the reader not overinterpret historical bycatch data given the low amount of pot effort in the area of interest.

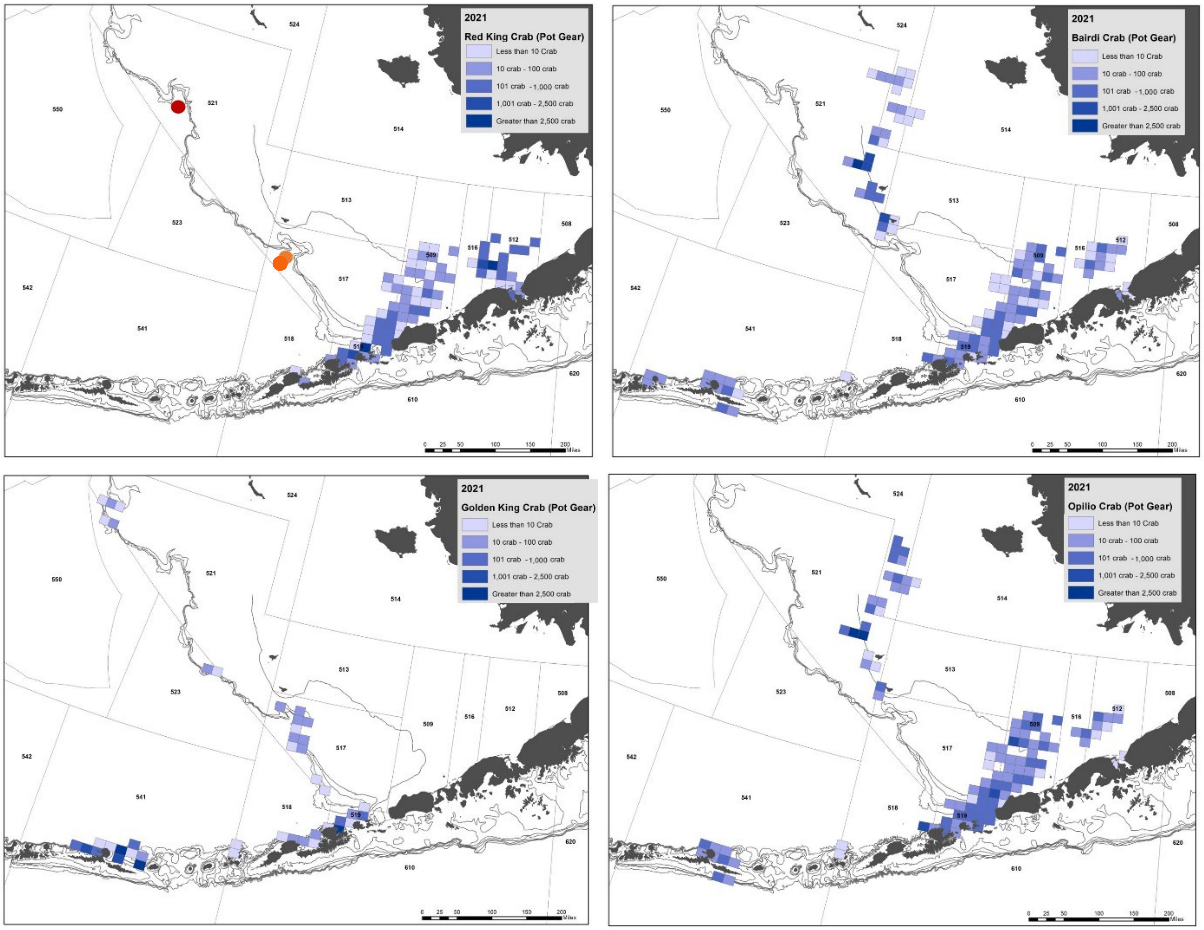


Figure 3-5 Bycatch of crab (number of animals) in pot gear in the Bering Sea, 2021. Clockwise from top left: bycatch of red king crab, bairdi Tanner crab, opilio Tanner crab, and golden king crab. No bycatch for blue king crab occurred in pot gear in 2021. The Greenland turbot fishery is known to occur along the Bering Sea slope which is depicted by bathymetry lines. In the top-left panel, Zhemchug Canyon is indicated by a red dot and Pribilof Canyon is indicated by an orange dot. (Source: NMFS Catch Accounting System, December 2021)

Non-trawl sectors in the BSAI do not operate under "hard cap" PSC limits for crab. In other words, there is not maximum permissible number of crab bycatch that would trigger an immediate closure of directed fishing with non-trawl gear in a crab bycatch limitation zone. If the catch and bycatch of a crab stock were to approach the overfishing limit (OFL) during a year, NMFS could implement in-season closures under the Inseason Management Adjustment authority (§679.25) to close fisheries that are contributing to removals to prevent an overage. (Note that the crab species listed in the tables above are managed as specific stocks based on their area – e.g., Bristol Bay red king crab or Pribilof Islands blue king crab.) Most crab fisheries are managed on a year that runs from July 1 to June 30 of the following calendar year. The exceptions to that are Pribilof Islands golden king crab and Norton Sound red king crab, which are managed on the calendar year. Given the typical historical timing of the Greenland turbot fishery (May through September), it is at least conceivable that a newly authorized longline pot fishery could begin harvesting as a "July to June" crab stock is nearing the end of a fishing year where the crab OFL is of concern to fishery managers. If there were to be an OFL-related closure prior to June 30, it is possible that the longline pot groundfish fishery could reopen on July 1 at the start of a new crab OFL year. Figure 3-5 suggests the most likely crab fishery that the Greenland turbot fishery could encounter is the Pribilof Islands Golden king crab (PIGKC) fishery as they occur at similar depths and in the same spatial area (i.e., Bering Sea slope). The PIGKC fishery is managed on a calendar year cycle and could also have an OFL hit should the Greenland turbot fishery encounter many PIGKC. PIGKC OFL would most likely be affected later in the year. A closure for the PIGKC OFL could close the Greenland turbot fishery for longer (i.e. until January 1st instead of July 1st). Finally, while not FMP-managed species, scarlet king crab and deep-water Tanner crab are also known to spatially overlap with the turbot fishery.

3.3.5.2.1. Types of Pot Gear

The Council is not currently considering regulating the specifications of the pots that can be used in a longline format to directed fish for Greenland turbot, other than the option to remove the 9-inch maximum tunnel opening restriction. Any pot must comply with existing regulations that require a biodegradable panel to open after a period of time to prevent "ghost fishing" if gear is lost.[23] The design of the pot that is used could span traditional groundfish pots (e.g., rectangular, conical, stackable, trapezoidal, etc.) to a newer design of collapsible "slinky" pots that has become popular in the IFQ sablefish fishery (see Figure 3-6 and Figure 3-7). Slinky pots are preferred by some due to their relative light weight, which could reduce the severity of gear entanglements, reduce the amount of space needed for deck storage, and might also have cost or safety impacts that are noted in Sections 4.3 and 6.4 of this document.

This subsection acknowledges the variety in pot designs for the purpose of stating that the analysts do not have a basis for predicting whether, or to what extent, the gear can be tuned to select against certain PSC species. Any fleet working with a new gear type for an area is likely to experience a learning curve. Pot gear is currently used to catch and retain IFQ halibut on vessels that possess the necessary quota, so it is reasonable to expect that pot tunnel openings can be manipulated to catch flatfish. Figure 3-6, below, notes that the tunnel (component labeled "B") can be manipulated to maintain an elongated shape that suits flatfish. Whether or not that shape would increase the undesired catch of PSC halibut might be secondary to where and at what depth the gear is set. The presence of halibut in pot gear used to target sablefish (Table 3-6) is indicative of IFQ fishing where halibut is intended to be retained, which would not always be the case in a directed Greenland turbot fishery. Table 3-6 also showed that the Pacific cod pot fishery encountered small amounts of halibut, Greenland turbot, and other flatfish like arrowtooth and Kamchatka flounder. Setting the issue of fishing depth aside, these low encounter rates might also be reflecting the effect of the 9-inch maximum tunnel opening.

Noting again that the encounter of crab species in pot gear in the western portions of the BS (Table 3-7) might not be an accurate reflection of how a directed turbot fishery would operate (at what depth, etc.), pot gear can be fitted with crab deterrents like sock-tunnels. A loose, fine mesh tunnel could dissuade crab while allowing fish species to push through. A depiction of the sock tunnel in a collapsible pot is shown as component "E" in Figure 3-6. Sock tunnels can be used with any type of pot.

[23] § 679.2(15)(i)

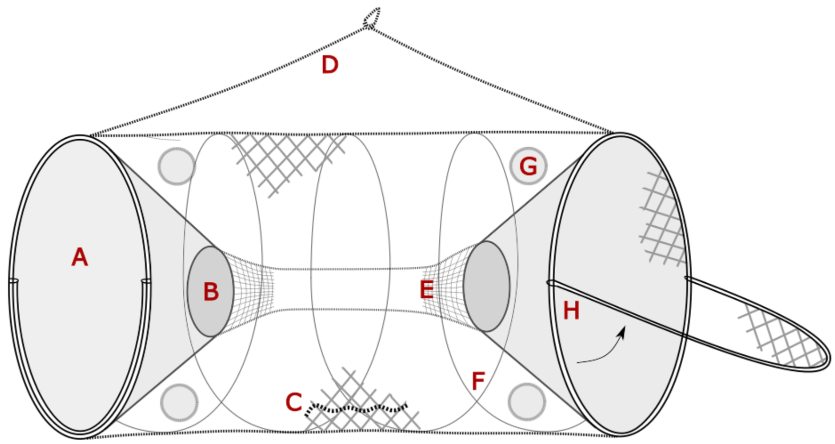


Figure 3-6 Diagram of a collapsible (“slinky”) pot and components (Source: J. Sullivan, AFSC)

A = pot end (composed of closed helical spring). B = tunnel opening / tunnel entrance (rigid/hard = stainless steel welded rings or rigid plastic, flexible/soft = pliable stainless steel chord coated with soft plastic, which allows the tunnel opening to elongate in one direction for halibut). C = bio twine/escape panel (aka “rotten cotton”). D = bridle. E = fine mesh tunnel entrance (aka “sock tunnel”). F = slinky/spring coil, which serves as the frame of the pot and also allows it to collapse. G = escape ring (note that there are four escape rings in this diagram). H = door hinge (doors on both pot ends).

Figure 3-7 Examples of stackable (left) and trapezoidal (right) groundfish pots

3.3.6. Catcher Vessel Sector Participation & Shore-based Processing

CVs have rarely targeted Greenland turbot during the analyzed period. This is likely due to the remoteness of the area where directed fishing occurs and characteristics of Greenland turbot flesh that would degrade value in the time required to make a shoreside landing. Since 2003, only eight non-trawl CVs have records of catch in the Greenland turbot target per NMFS CAS. Six of those records occurred in 2003, one in 2006, and one in 2014. In all cases, the catch was made with HAL gear and was delivered to shore-based processing facilities in Unalaska, AK. Two processing facilities received fish from a CV turbot target trip in 2003; three different facilities received these deliveries over the entire period. The total volume of catch from this turbot target fishing was around 25 mt. The vast majority of that catch occurred in 2003, which was the only year in which any HAL CV landed more than one metric ton in the turbot target. As is evident from the total fishing revenues in the set of Alaska communities that were linked to the Greenland turbot fishery by vessel homeports (see Table 3-18 in Section 3.5), the proportional share of CV turbot revenue compared to all activity in a place like Unalaska is close to zero.

Of the eight records being considered, only two vessel-year combinations suggest that Greenland turbot was the primary objective of the trip (both in 2003). It is likely that the other records were assigned a turbot target in CAS due to unexpectedly high catch of turbot while directed fishing for Pacific cod or sablefish.

The number of non-trawl CVs that *retained* Greenland turbot and delivered it to a shoreside plant is higher than the number that were credited with trips targeting the species, though still small. Table 3-9 shows that the volume of catch and number of vessels has been consistently low for roughly 15 years. Since 2015, all of the small amount of retained turbot entered processing facilities in Unalaska. De minimis amounts were delivered to King Cove, AK in 2006 and 2014, to Akutan, AK in 2013, to St. Paul Island, AK from 2007 through 2010, to Adak, AK from 2003 through 2006, and to Atka, AK in 2006.

Table 3-9 Greenland turbot catch (mt) retained by BSAI non-trawl CVs, 2003-2021

Gear	HAL		POT	
	Retained	#Vessels	Retained	#Vessels
2003	51.8	25	15.6	6
2004	10.9	14	10.0	6
2005	2.7	7	5.4	10
2006	5.7	13	3.3	5
2007	1.7	4	1.9	4
2008	1.3	5	1.2	3
2009	0.7	4	*	1
2010	0.6	4	*	1
2011	1.3	4		
2012	*	1	*	1
2013	0.4	3		
2014	4.0	6	*	1
2015	0.5	4		
2016	0.8	3	*	1
2019	*	1		
2020	*	1	*	2
2021	*	1		

The trawl CV sector has retained more Greenland turbot by comparison. The annual average volume of retained catch was 14.5 mt from 2003 through 2021, but 23 mt during the five most recent years (2017-2021). That recent average is elevated by a retained catch of 67.5 mt in 2020; the next highest year was 23 mt in 2017 and no other year had been above 20 mt since 2009. Annual retained catch was highly variable, going as low as 1.6 mt in 2016 and 3.7 mt in 2021. In most years, the majority of trawl CV turbot catch was delivered to mothership processors – usually by a wide margin. The years that were exceptions to that pattern were years when the total amount of retained turbot was relatively low. In recent years, the number of trawl CVs delivering turbot to motherships was between seven and 11, and mothership deliveries accounted for 90% of the turbot retained by the sector. With the exception of the high-turbot year of 2020, average catch per vessel was between 0.5 and 2.0 mt of turbot. The number of trawl CVs delivering shoreside – largely to Unalaska and Akutan – was between 22 and 44.

The high number of vessels in that category and low average turbot catch suggests that shore-side turbot was largely incidental to Pacific cod fishing.

3.4. Killer Whale Depredation on Bering Sea Hook-and-Line CP Vessels

The primary motivation for the Council's proposed action alternative is the total drop-off in non-trawl effort in the BS Greenland turbot fishery. The reduction in HAL CP effort began in 2018 and reached a complete absence of target effort in 2021 and 2022 to date (Table 3-1). This section presents the best available evidence for the contention that this substantial shift in non-trawl effort can be attributed to increasing killer whale depredation on HAL gear.

The analysts have two available avenues by which to characterize the extent of killer whale depredation on HAL gear in the BS: data from the biennial longline survey of the BS area and fishery data recorded by observers on HAL CPs. The analysts do not presume to arrive at a number of depredating whales or fully account for their impact on HAL gear catch. Whale behavior is complex and their interaction with a fishery that is somewhat pattern-driven in time and space can be confounding. This section presents time trends in observations of whale depredation. Conclusions about the severity of the issue should be based on the combination of the trends presented below, fishery performance – all else equal – and public testimony to the Council.

The Alaska Fisheries Science Center's (AFSC) longline survey samples the BS in odd-numbered years. Sampling in that area occurs during the first two weeks of June and covers 16 sampling stations. AFSC staff report that killer whale depredation has been occurring regularly at BS stations for many years, though standardized survey depredation data are only available dating back to 1999. Depredated survey sets are removed from the calculations of the Relative Populations Numbers and Weights (RPN and RPW) that are used in stock assessment, including those calculated for Greenland turbot. Table 3-10 shows the number of the 16 sampling stations where some portion of survey sets were depredated in each year. Depredation occurred at more than half of the stations in 2009 and in each year from 2013 through 2021. Figure 3-8 illustrates that killer whale depredation is most prominent in the BS management area in terms of the number of sampling stations where depredation occurred. Figure 3-9 shows the proportion of BS longline survey skates that were depredated from 1999 through 2021. A skate of gear is the standard unit of measurement for the longline survey; a skate consists of 45 hooks. The figure shows that the proportion of depredated skates has increased over the analyzed period, leveling off around 50% since 2013.

AFSC staff provided several caveats to consider when using the longline survey as an index of killer whale depredation – particularly as applied to the BS Greenland turbot fishery. First, the relevant portion of the longline survey occurs over a relatively small number of days in a limited, predetermined area. Second, annual participation in collocated non-trawl fisheries – e.g., HAL Greenland turbot – during the survey period has been inconsistent meaning that sometimes the survey vessel is one of only a few fishing vessels in operation and thus may be targeted more intensely by depredating whales in years when commercial fishing vessels are not in the area. Third, observations of depredating whales from one survey station to another during a given year may not be independent as individual whales are known to follow the survey from station to station and may learn over time when/where depredation opportunities will exist.

Table 3-10 Number of Bering Sea longline survey stations (of 16) with killer whale depredation, 1999-2021

Year	1999	2001	2003	2005	2007	2009	2011	2013	2015	2017	2019	2021
#Stations with KW depredation	7	5	7	2	7	10	7	11	9	11	10	10

Source: Table 3-11 in 2021 Sablefish stock assessment (Goethel et al., 2021). Available at: https://apps-afsc.fisheries.noaa.gov/Plan_Team/2021/sablefish.pdf.

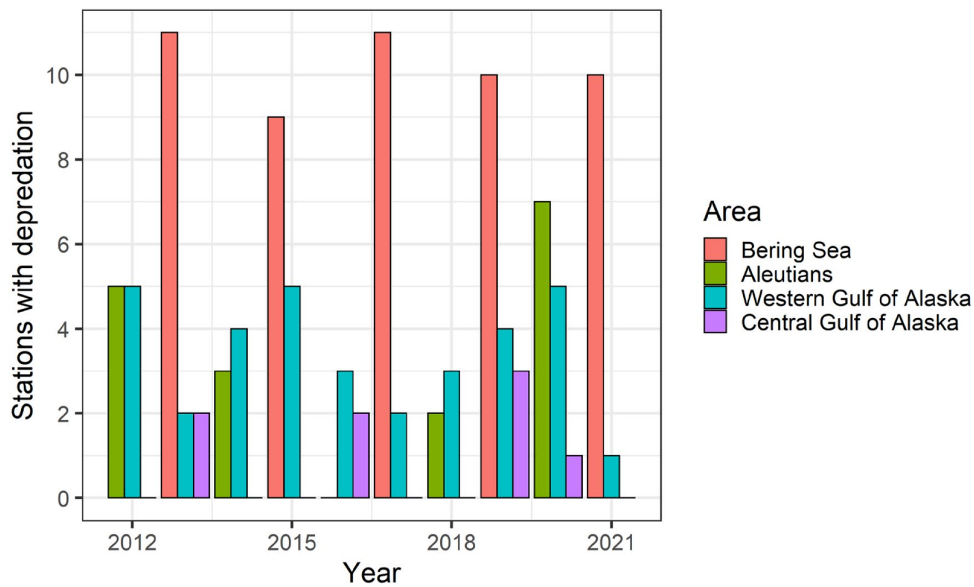
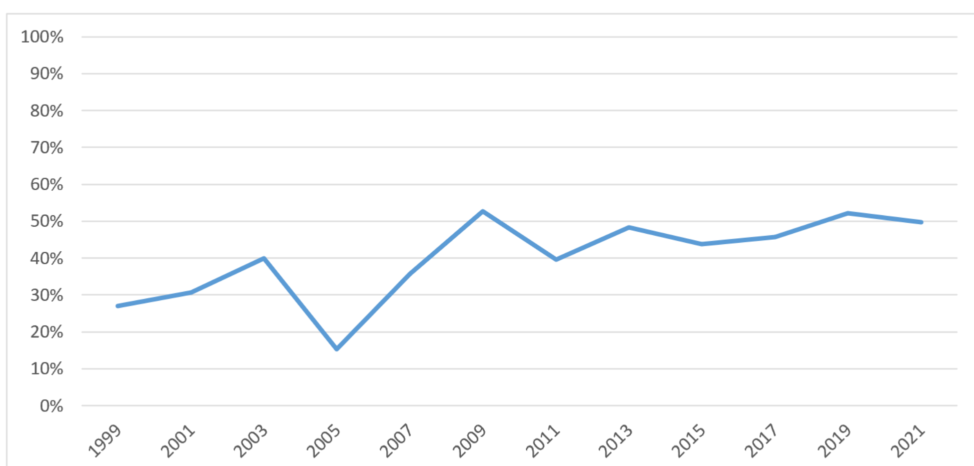


Figure 3-8 Number of AFSC longline survey stations with killer whale depredation by area, 2012-2021 (Source: Siwicke et al. 2021)



Dep. Skates	630	718	933	360	831	1,234	924	1,132	1,024	1,069	1,220	1,164
Tot. Skates	2,331	2,338	2,336	2,342	2,322	2,344	2,338	2,340	2,342	2,341	2,339	2,340
% Depredated	27%	31%	40%	15%	36%	53%	40%	48%	44%	46%	52%	50%

Figure 3-9 Proportion of AFSC Bering Sea longline survey skates where depredation was observed, 1999-2021; odd-number years only (Source: AFSC, personal communication)

Given the caveats above, the analysts also looked to fishery data recorded by observers on vessels, as provided by NMFS Fishery Monitoring and Analysis division (FMA). Table 3-11 estimates a percentage of all BS HAL CP hauls where some form of killer whale depredation occurred from 2011 through 2021. For this purpose, depredation is being defined as one or more of the following occurring during an observed haul: killer whales deterred, killer whales feeding on discards, or killer whales feeding on catch. As is evident from the fact that the grey rows in the table sum to more than the number of unique hauls where any depredation occurred, it is often the case that more than one form of marine mammal interaction occurs during a depredated haul. The final estimate requires weighting and extrapolation based on the proportion of HAL CP gear (i.e., hooks hauled) that was actively observed for marine mammal interactions.[24] The table reflects a jump in the estimated percentage of hauls that were depredated occurring around 2016 (7.1%), with the two highest years in the decade occurring in 2019 and 2020 (8.5% and 7.8%). Note that the data used for this exercise includes all BS HAL CP fishing – not limited to hauls targeting Greenland turbot.

Table 3-11 also reflects that feeding on catch is the most frequently observed type of killer whale interaction (relative to observations of deterrence and/or feeding on discards). To position Greenland turbot within the context of all BS HAL CP hauls, Table 3-12 ranks species by the number of times they were noted by an observer as having been the subject of killer whale depredation. Note that more than one species could have been noted for a given haul. The table shows that Greenland turbot appear to be a preferred target for depredating killer whales. The relative frequency of Greenland turbot identified as compared to Pacific cod is especially notable given that Pacific cod is the predominant catch species for the BS HAL CP sector at large.

Table 3-11 Estimated frequency of killer whale depredation on Bering Sea hook-and-line CP hauls based on observer data, 2011 through 2021 (Source: NMFS FMA Division)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total hauls	13,264	14,219	14,144	16,192	15,029	13,636	12,203	9,008	7,083	5,548	4,461
% Total haul *gear* monitored for marine mammals	25.3	23.9	23.5	24.2	24.4	21.5	22.0	20.4	17.2	18.2	17.1
#hauls feeding on catch, on discards, and/or deterred	92	100	107	92	102	209	144	102	103	79	45
#hauls deterred	17	29	10	2	13	37	25	24	5	13	1
#hauls feeding on discards	8	16	5	2	6	7	1	1	3	0	0
#hauls feeding on catch	83	87	98	89	84	179	137	92	99	78	44
Estimated % hauls with ≥ 1 mammal interactions	**2.7**	**2.9**	**3.2**	**2.3**	**2.8**	**7.1**	**5.4**	**5.5**	**8.5**	**7.8**	**5.9**

Table 3-12 Number of instances that an observer noted a species as "depredated" by killer whales during Bering Sea hook-and-line CP hauls, 2011 through 2021 (Source: NMFS FMA Division)

Species	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total	%
Greenland turbot	22	39	24	12	20	68	59	49	37	26		356	32%
Kamchatka/ATF/Gturbot (unident.)	42	24	15	18	19	65	39	21	27	13	3	286	25%
Halibut	12	14	50	44	44	23	36	3	2	21	11	260	23%
Sablefish	15	10	6	6	3	8	1	12		4	30	95	8%
Flatfish (unidentified)	5	8	6	3	6	2		1	20	3		54	5%
Pacific cod	3	1	3	10	3	9	1	4	8	11		53	5%
Unidentified	1				1	7		2	5			16	1%
Other	1			1			1					3	0%
Grand Total	**101**	**96**	**104**	**94**	**96**	**182**	**137**	**92**	**99**	**78**	**44**	**1,123**	

Note: "Other" includes flathead sole, Alaska plaice, and grenadier.

24 The estimated percentage of all hauls where depredation may have occurred is derived as follows. For a given year, the number of hauls where at least one form of depredation was observed is divided by the percentage of gear that was hauled under observation. This extrapolates from observed gear hauling to all gear hauling. That amount of "depredated hauling" is then divided by the total number of hauls to yield the estimate. For example, in 2020 there were 79 observed instances of at least one type of killer whale depredation in the Bering Sea (hauls where multiple types of depredation occurred are not double-counted). In that year, 18.2% of BS HAL CP gear was observed for marine mammal interaction. The analysts arrive at a 2020 estimate of 7.8% = (79/0.182)/5,548.

For comparison, killer whale depredation on HAL gear has occurred at a lower rate in the AI management area; the total number of hauls and the instances of depredation being noted by observers were also lower. Table 3-13 uses the same method as Table 3-11 and shows that less than 2% of HAL CP hauls in the AI are estimated to have experienced depredation in recent years. Zero gear hauled under observation in the AI has experienced depredation since 2017.

Table 3-13 Estimated frequency of killer whale depredation on Aleutian Islands hook-and-line CP hauls based on observer data, 2011 through 2021 (Source: NMFS FMA Division)

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total hauls	979	1,107	1,362	698	933	498	782	658	484	688	649
% Total haul *gear* monitored for marine mammals	29.8	41.0	45.0	50.0	38.7	30.5	22.5	41.6	17.3	18.4	18.8
#hauls feeding on catch, on discards, and/or deterred	21	9	10	6	4	3	0	0	0	0	0
#hauls deterred occurred	6	2	6	1	3	2	0	0	0	0	0
#hauls feeding on discards	0	0	0	0	0	0	0	0	0	0	0
#hauls feeding on catch	18	8	5	5	3	3	0	0	0	0	0
Estimated % hauls with ≥ 1 mammal interactions	**7.2**	**2.0**	**1.6**	**1.7**	**1.1**	**2.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

3.5. Communities and Revenue Dependency

This section summarizes participation, revenues, and relative dependency on the BS Greenland turbot fishery to the extent possible within the restrictions on confidential data. The scope of data included is any activity on a vessel that operated as a non-trawl CP in the BSAI FMP area since 2012 – not restricted to the Greenland turbot "target" fishery – and the corresponding fishery-related participation and revenues associated with the localities that are identified based on reported "homeport" for the relevant BSAI non-trawl CPs. Community participation summaries typically include extensive information on the CV sector and the communities in which those vessels land fish for processing by local or transient workers. However, historical CV participation in the BS Greenland turbot fishery is sparse and so the small amount of information relating to that operational sector is concentrated in Section 3.3.5.2.1 of this document.

The analysts have framed this section around homeport rather than the reported residence of the vessel owner for several reasons. First, the corporate nature of the CP fleet often means that a vessel has multiple individual owners or owning entities, and the listed address for a limited liability company (LLC) that holds the vessel title is not necessarily a better indicator of where the benefits of the vessel's activity primarily flow. Second, some of the CP vessels that were analyzed have changed ownership address, inter-state, while maintaining the same homeport during the relevant period. The analysts do not believe that the corporate re-homing of a vessel, in these cases, materially impacted where the benefits of the vessel's activity primarily flowed. In short, both homeport and vessel ownership residence are flawed indicators but a better alternative does not exist. For this set of vessels, homeport has been a more stable indicator over the analyzed period and, in some cases, better signifies the ownership interest and the ultimate destination of owner income on the level of state affiliation or Alaska CDQ group affiliation.

Homeport is a self-reported piece of information that entails some shortcomings. For example, several CPs list homeports in communities of the Yukon-Kuskokwim (Y-K) delta region of Alaska where it is reasonably concluded that CP vessels are not moored, offloading, purchasing supplies, or directly bringing on crew members. In such cases, tables are annotated to indicate the location of vessel ownership address to give the most complete possible understanding of the primary stakeholders' geographic location. Not all examples are from the Y-K delta. Some vessels with a homeport identified as Kodiak, AK and Petersburg, AK list vessel ownership addresses in the state of Washington.

Table 3-14 shows the number of non-trawl CPs that fished in the BSAI from 2012 through 2021 by homeport. Table 3-15 reduces the scope of the table to non-trawl CPs that retained and sold Greenland turbot during that period. The reader should note two things: that total non-trawl CP participation has decreased over the analyzed period – including before COVID and trade disruptions that occurred from 2019 through 2021 – and that the participation in the directed and incidental non-trawl turbot fishery decreased starting around 2018 with a culmination in 2021 (see Table 3-1). Also note that the “grand total” unique vessel count in both tables (43 and 31 vessels, respectively) overstates the number of vessels involved because some individual vessels were identified as “FLC” vessels at earlier points in the annual data set but were then counted as non-FLC vessels in more recent years.

Table 3-14 BSAI pot or HAL CP vessels by community of vessel homeport address, 2012-2021

	Community	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Annual Average 2012-2021 (number)	Annual Average 2012-2021 (percent)	Unique Vessels 2012-2021 (number)
FLC (Freezer Longline Coalition)	Kodiak[1]	3	4	4	4	4	4	4	4	3	3	3.7	14.18%	4
	Newtok[2]	0	0	0	0	0	0	1	1	1	1	0.4	1.53%	1
	Petersburg[1]	4	4	4	4	4	4	3	2	2	0	3.1	11.88%	5
	Scammon Bay[2]	0	0	0	0	0	0	0	1	0	0	0.1	0.38%	1
	Alaska	**7**	**8**	**8**	**8**	**8**	**8**	**8**	**8**	**6**	**4**	**7.3**	**27.97%**	**11**
	Seattle WA	**24**	**21**	**21**	**21**	**22**	**20**	**17**	**15**	**14**	**13**	**18.8**	**72.03%**	**27**
	FLC Total	**31**	**29**	**29**	**29**	**30**	**28**	**25**	**23**	**20**	**17**	**26.1**	**100.00%**	**36**
Other	Dutch Harbor	0	1	1	1	1	1	1	1	1	1	0.9	11.69%	1
	Homer	1	1	0	0	0	0	0	0	0	0	0.2	2.60%	1
	Juneau	2	2	2	2	2	2	2	2	2	2	2.0	25.97%	2
	Petersburg[1]	0	0	1	1	0	0	0	0	0	0	0.2	2.60%	1
	Alaska	**3**	**4**	**4**	**4**	**3**	**3**	**3**	**3**	**3**	**3**	**3.3**	**42.86%**	**5**
	Seattle WA	**3**	**5**	**4**	**5**	**4**	**4**	**5**	**5**	**5**	**4**	**4.4**	**57.14%**	**7**
	Other Total	**6**	**9**	**8**	**9**	**7**	**7**	**8**	**8**	**8**	**7**	**7.7**	**100.00%**	**12**
	Grand Total	**37**	**38**	**37**	**38**	**37**	**35**	**33**	**31**	**28**	**24**	**33.8**		**43**

[1] Some vessel ownership addresses listed in state of Washington
[2] Vessel ownership addresses listed in Anchorage, AK
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Table 3-15 BSAI pot or HAL CP vessels that retained Greenland turbot by community of vessel homeport address, 2012-2021

	Community	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Annual Average 2012-2021 (number)	Annual Average 2012-2021 (percent)	Unique Vessels 2012-2021 (number)
FLC (Freezer Longline Coalition)	Kodiak[1]	1	0	3	3	1	4	3	3	2	0	2.0	17.70%	4
	Newtok[2]	0	0	0	0	0	0	0	0	1	0	0.1	0.88%	1
	Petersburg[1]	0	0	0	0	1	1	2	0	1	0	0.5	4.42%	2
	Scammon Bay[2]	0	0	0	0	0	0	0	0	0	0	0.0	0.00%	0
	Alaska	**1**	**0**	**3**	**3**	**2**	**5**	**5**	**3**	**4**	**0**	**2.6**	**23.01%**	**7**
	Seattle WA	**13**	**8**	**8**	**5**	**8**	**12**	**11**	**9**	**9**	**4**	**8.7**	**76.99%**	**20**
	FLC Total	**14**	**8**	**11**	**8**	**10**	**17**	**16**	**12**	**13**	**4**	**11.3**	**100.00%**	**27**
Other	Dutch Harbor	0	0	0	1	1	0	0	0	0	0	0.2	18.18%	1
	Homer	1	1	0	0	0	0	0	0	0	0	0.2	18.18%	1
	Juneau	0	0	0	0	1	0	0	0	0	0	0.1	9.09%	1
	Petersburg[1]	0	0	0	0	0	0	0	0	0	0	0.0	0.00%	0
	Alaska	**1**	**1**	**0**	**1**	**2**	**0**	**0**	**0**	**0**	**0**	**0.5**	**45.45%**	**3**
	Seattle WA	**1**	**2**	**1**	**1**	**0**	**0**	**1**	**0**	**0**	**0**	**0.6**	**54.55%**	**2**
	Other Total	**2**	**3**	**1**	**2**	**2**	**0**	**1**	**0**	**0**	**0**	**1.1**	**100.00%**	**5**
	Grand Total	**16**	**11**	**12**	**10**	**12**	**17**	**17**	**12**	**13**	**4**	**12.4**		**31**

[1] Some vessel ownership addresses listed in state of Washington
[2] Vessel ownership addresses listed in Anchorage, AK
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

Table 3-16 reports total gross first wholesale revenues that non-trawl CPs earned from catching and selling Greenland turbot in the BSAI, by homeport community. Due to confidentiality restrictions, community-level information has to be combined at the state level for Alaska. State-level data from 2012 and 2013 are confidential due to the total number of vessels with homeports listed in Alaska (see Table 3-15). Note that the Grand Total row is the same as the total revenue estimate for all retained Greenland turbot in Table 3-5.

Table 3-16 BSAI Greenland turbot revenues for pot or HAL CPs by community of vessel homeport address, 2012-2021 ($1,000s, real-dollar adjusted to 2021)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Annual Average 2012-2021	Annual Average 2012-2021
Alaska	*	*	$13	$4	$1	$24	$6	$3	$10	$0	$22	0.7%
Seattle WA	*	*	$2,258	$3,936	$4,541	$4,255	$1,123	$2,428	$1,076	$5	$3,039	99.3%
Grand Total	$8,843	$2,086	$2,271	$3,940	$4,542	$4,279	$1,130	$2,431	$1,086	$5	$3,061	100.0%

* Denotes confidential data
Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_BLEND_CA.

This section of the RIR often addresses the dependency of certain vessels or vessel groups on the fishery being analyzed, as reflected in the proportion of a vessel's total revenues that occur in a certain directed fishery or CAS target. The definition of dependency is typically subjective and can be nuanced by the analysts' understanding of how vessels might operate as part of a fishing cooperative or the relative importance of one fishery in a vessel's overall fishing portfolio. Due to the low number of CP vessels involved and restrictions on reporting confidential data, the analysts must address dependency qualitatively. Vessel-level data show that two CPs generated an average of roughly 20% of their annual gross revenues from Greenland turbot. Each of those vessels recorded at least four of the ten analyzed years with more than 25% of their total revenues coming from the catch and sale of turbot (not restricted to activity that NMFS CAS defines as occurring in a Greenland turbot "target"). The top year for each vessel was in the 35% to 45% range. Both vessels list homeport and ownership residence in Seattle, WA and are part of the FLC cooperative. Cooperative membership is notable when thinking about which vessels spend time fishing turbot because – while outside of the analysts' ability to know – it is possible that a cooperative-level fishing plan designates certain vessels to focus more on one fishery while sharing revenues with affiliates that focus on another fishery. Table 3-1 indicated that even the most relatively turbot-dependent CPs did not target turbot in 2021.

Among the 29 *other* CPs that caught and sold Greenland turbot during the analyzed period, the average proportion of total revenues that came from turbot was less than 1%. Eight of these CPs recorded at least one year with turbot revenues accounting for more than 1% of total gross revenue; six of eight were members of the FLC cooperative. One of those vessels lists a homeport in Alaska while the other seven are homeported in Seattle, WA. All eight list the residence of vessel ownership as Seattle, WA. Seven of those eight CPs recorded a year with greater than 5% of revenue from turbot, and two recorded a year with more than 10% (but none since 2014).

Table 3-17 shows that non-trawl CP vessels listing their homeport in Alaska are minimally reliant on the Greenland turbot fishery as a proportion of their total gross revenues generated in Alaska fisheries, while turbot makes up roughly 4% of total Alaska revenues for the relevant vessels homeported in Seattle, WA. Table 3-18 compares the turbot first wholesale revenues for this set of CPs to that of all commercial fishing vessels with the same homeports listed, during the analyzed period. The table reflects that the number of vessels catching and selling Greenland turbot is small compared to the total number of vessels fishing out of these ports, and that total gross revenues are small in comparison to the total amount generated in these communities or groupings of communities.

Table 3-17 Revenue diversification for pot or HAL CPs that retained BSAI Greenland turbot, 2012-2021 (first wholesale value in $millions; real-dollar adjusted for 2021)

Geography	Annual Average Number of Vessels	Annual Average First Wholesale Revenues from Turbot Target Only	Annual Average Total Wholesale Gross Revenues from All Area, Gear, and Species Fisheries	Turbot Value as a Percentage of Total First Wholesale Value Annual Average
Alaska	3.1	< $0.1	$32.3	**0.1%**
Seattle WA	**9.3**	$3.0	$73.1	**4.2%**
Grand Total	**12.4**	$3.1	$105.3	**2.9%**

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

Table 3-18 Revenue diversification by community grouping for pot or HAL CPs that retained BSAI Greenland turbot, 2012-2021 (first wholesale value in $millions; real-dollar adjusted for 2021)

Geography	Annual Average Number of Vessels	Annual Average Number of All Commercial Fishing Vessels in those Same Communities	Annual Average First Wholesale Revenues from Turbot Target Only	Annual Average Total First Wholesale Revenues from All Areas, Gears, and Species Fisheries for the Community Fleet	Turot First Wholesale Revenue as a Percentage of Total Community First Wholesale Revenue Annual Average
Alaska	3.1	548.3	< $0.1	$434.0	< 0.1%
Seattle WA	**9.3**	**172.1**	$3.0	$1,722.4	**0.2%**
Grand Total	**12.4**	**720.4**	$3.1	$2,156.5	**0.1%**

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

Vessel crews are an important stakeholder group for any fishery management action. In addition to their stakeholder status, crew wages flow throughout communities close to where the fishery embarks, occurs, or offloads, and communities where the crew reside or remit wages. Crew residency data by community are not available for the BSAI non-trawl groundfish fleet because its fisheries are not subject to an economic data reporting (EDR) program. Alaska Department of Fish & Game (ADFG) maintains a data base of licensed crew members but individuals are not identifiable by the vessel(s) on which they worked. Previous testimony to the Council and a general understanding of the fishery indicates that many of the crew on BSAI non-trawl CPs are hired from the Seattle metropolitan statistical area (MSA), but that is by no means exclusive and there is no way to corroborate that information or quantify the manner in which crew wages are distributed across communities inside and outside of Alaska.

Per the declaration of the FLC – which represents the HAL CP sector, a subset of which has historically targeted Greenland turbot – the typical HAL CP has 20 to 25 crew onboard at a given time. Vessels make one or two crew rotations each year. In total, including vessels that do not fish for Greenland turbot, the full set of FLC member vessels employ between 1,250 and 1,500 crew annually. FLC states that its members directly employ an additional 200 persons onshore in Alaska and Washington.[25] Only a portion of the FLC fleet has recently targeted Greenland turbot. A reasonable estimate of crew positions would be 20 to 25 individuals of varying income-share levels per crew, two crews per vessel, and three to five vessels targeting turbot per year (Table 3-1).[26] That would amount to between 200 and 250 individuals engaged in at-sea harvesting and processing of Greenland turbot on the high end. Given the supplementary nature of Greenland turbot to the FLC fleet's main fishery of Pacific cod, the loss of the non-trawl turbot fishery is more likely to cause a marginal reduction in crewing, crew rotations, or annual crew share wages on certain vessels rather than a wholesale elimination of vessels from the active FLC fleet.

Vessels that participate in the BSAI Pacific cod pot CP fishery are a reasonable analogue to the segment of the HAL CP fleet that might directed fish for Greenland turbot, and comprise a set of vessels that would already possess the license endorsements to participate in a BS Greenland turbot longline pot fishery. A recent analysis of that fishery (NPFMC 2021d, Section 3.4.5.2) noted that low TACs had led some CPs to reduce crew to around 10 individuals when there was not enough fishing opportunity available to justify multiple shifts per day. The segment of the HAL CP fleet that has been engaged in BS Greenland turbot might be less likely to reduce crew than pot cod CPs because the annual fishing plan of FLC vessels is largely centered around a HAL gear Pacific cod fishery for which there is a significantly larger TAC. However, given that the FLC operates as a cooperative, it is possible that vessels that were once moving from cod into turbot during the summer months might end or reduce activity if the turbot fishery is not viable and the cod TAC allocation can be harvested by other cooperative member vessels.

For comparison, a typical crew onboard an A80 trawl CP numbers between 30 and 40 individuals: roughly five deck crew, 27 processing workers, and 8 "others" comprising the officers, engineers, and cooks.[27]

[25] Freezer Longline Coalition. Personal communication. April 2022.
[26] Through personal communication with BSAI non-trawl groundfish owners and operators, the analysts understand that a typical crew of 25 might include six people on deck, 14 in the factory, two in the wheelhouse, two in the engine room, and a cook (NPFMC 2021d).
[27] NPFMC 2021 (December). Draft EIS for Halibut Abundance-Based Management, Section 3.3.1. Available at: https://meetings.npfmc.org/CommentReview/DownloadFile?p=0f935597-eb18-48fb-aff1-760429ac6eea.pdf&fileName=C2%20Halibut%20ABM%20Draft%20Environmental%20Impact%20Statement.pdf

3.6. Taxes Generated

Bering Sea groundfish catch and processing at-sea generates taxes that are important revenue sources for communities, boroughs, and the State of Alaska. That production includes the catch a processing of Greenland turbot. As with other background sections in this document, this section focuses on the non-trawl component of the Greenland turbot fishery, which is the component that is most likely to experience different production levels under the action alternative. As noted previously, non-trawl turbot catch (Table 3-1), and thus tax revenues, have declined to near-zero in the last several years. The trawl component of the fishery would not be directly impacted by the action alternative. This maximum proportion of the BS Greenland turbot TAC that the trawl sector could harvest is expected to be governed by the voluntary TAC-sharing agreement described in Section 3.1; that proportion is not known to the analysts. Any variation to specific levels below that maximum amount would likely pivot around recent trawl harvest trends depending on the size of the BS turbot TAC and the annual fishing plans and performance of individual trawl companies who spend time in the BS turbot fishery. Tax revenues for the trawl component of the BS Greenland turbot fishery are not estimated in this document, but the taxes to which trawl CPs are subject are the same as those described below for non-trawl CPs.[28]

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. HAL CP 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., BS HAL CP). The Alaska Department of Commerce, Community, and Economic Development (DCCED) provides a summary of municipal taxes.[29]

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

The Fishery Resource Landing Tax is levied on fish processed outside the 3-nautical-mile offshore boundary but within the U.S. EEZ. Taxable processed product must be 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 all of the existing BS groundfish fisheries. 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

[28] Because the Freezer Longline Coalition (FLC) is a voluntary cooperative and not a regulated Limited Access Privilege Program (LAPP), the FLC vessels that fish for Greenland turbot as HAL CPs are not subject to NMFS Cost Recovery Fees. The Amendment 80 trawl CPs that fish for turbot are part of a LAPP and thus subject to cost recovery. More information about the Alaska Region's cost recovery program is available here.
[29] The 2021 Alaska Taxable Supplement reports a variety of municipal taxes in Table 1A; fish taxes are sometimes rolled into sales taxes or "other taxes" in summary tables. The Supplement provides a sense of non-fishing tax types that a CP owner might encounter while operating in western Alaska communities.

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 Fishery Resource Landing Tax brought in $9.7 million in 2018, $12.5 million in 2019, $14.8 million in 2020, and $13.0 million in 2021, though much of that revenue was likely generated in the at-sea sector of the AFA pollock fishery and the Amendment 80 non-pollock trawl sector.[30] The Alaska Department of Revenue report (footnote 30) report shows that the amount of this tax that is shared with municipalities is highly variable by year. From 2018 through 2021, the proportion that went to the State's General Fund was, sequentially, 36%, 52%, 66%, and 55%. The balance was shared directly with municipalities or went to the DCCED Municipal Allocation. The number of entities that paid the tax each year was between 55 and 60, except for the anomalous 2020 year when only eight entities paid the tax.

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).[31] Revenues from the Assessment are deposited in the State's General Fund by statute but are historically appropriated to the Alaska Seafood Marketing Institute (ASMI).

Table 3-19 provides a rough estimate of the State of Alaska tax revenues generated from HAL CPs retaining, processing, and landing BSAI Greenland turbot from 2010 through 2021. The estimated tax rate of 3.5% is the sum of the Fishery Resource Landing Tax and the Seafood Marketing Assessment. The Alaska Department of Revenue publishes the ex-vessel prices used to calculate the landing tax annually. AKFIN uses a proxy value to estimate the unprocessed value of CP catch because those vessels do not sell unprocessed fish. The AKFIN estimate of ex-vessel value is based on an assumed 40% relationship between ex-vessel value and first wholesale value, which was reported in Table 3-5. That assumption is augmented, when possible, by data from ADFG Fish Tickets that are submitted with the vessel's own estimate of unprocessed value. CPs that deliver processed product in Alaska are required to submit Fish Tickets with raw unprocessed weight, but the vessel operator is not required to submit an unprocessed value estimate. The reader should be aware that the values presented in Table 3-19 are not the same values used by the State of Alaska to calculate fish tax liabilities.

From 2010 through 2021, the cumulative estimated ex-vessel value of BSAI non-trawl Greenland turbot catch was $17.5 million if considering only catch within the target fishery, or $19.5 million if considering all turbot that was retained and sold by CP vessels (all values in 2021$). During that period, the annual average ex-vessel proxy value for vessels targeting turbot was around $1.5 million, or $1.6 million if the no-target year of 2021 is excluded. The annual average ex-vessel value for all retained turbot was around $1.6 million, or $1.8 million when excluding 2021. The lower panel of Table 3-19 applies the 3.5% tax rate, showing that the non-trawl Greenland turbot fishery likely contributed between $600 and $700 thousand dollars in tax revenues over the analyzed period. Annual average tax payments would have totaled between $51 and $62 thousand. The low end of that range is limited to the target fishery and includes 2021; the high end includes all retained turbot and excludes 2021. The period average seems indicative of a return to the tax levels before non-trawl turbot fishing began to decline (approximately 2015 through 2017), but the average understates the potential seen in the early 2010s and overstates the tax revenues that have been generated in the most recent four years for which data are available. The analysts consider the estimated taxes based on the target fishery to be the most relevant in assessing the action alternative because the authorization of longline pot gear is intended to revive directed fishing and is less expected to affect the amount of turbot that are retained while targeting other species like Pacific cod and sablefish (refer to Section 3.3.5 for catch of BS Greenland turbot in other target fisheries).

[30] 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 July 2022.
[31] Processors or harvesters who produce less than $50,000 worth of seafood products during the year are exempt.

Table 3-19 Proxy for unprocessed value of Greenland turbot on BSAI HAL CPs and estimated State of Alaska tax revenues, 2010 through 2021. Estimated tax based on sum of Fishery Resource Landing Tax and Seafood Marketing Assessment (3.5%). $1,000s; real-dollar adjusted for 2021

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
							Proxy Ex-Vessel Value (2021$ thousands)						
Target	2,423	3,688	3,377	589	873	1,517	1,745	1,575	403	905	406	0	17,502
All Retained	2,866	4,440	3,537	835	908	1,576	1,817	1,710	452	972	434	2	19,549
							Estimated Tax at 3.5% Rate (2021$ thousands)						
Target	85	129	118	21	31	53	61	55	14	32	14	0	613
All Retained	100	155	124	29	32	55	64	60	16	34	15	< 0.1	684

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

The revenues captured in Table 3-19 include a small amount of harvest that was derived from CDQ group quota (see Table 3-3). Under AS 43.77.040, a taxpayer – i.e., the owner or permit holder for a CP vessel – 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.

3.7. Markets

The analysts use trade data from NMFS Office of Science and Technology (OST) and the United Nations Food and Agriculture Organization (FAO) to describe the foreign and domestic markets for Greenland turbot produced in the waters off Alaska. Note that the following data include both trawl and non-trawl catches. Within the 2015 through 2021 period, the volume and value of U.S. Greenland turbot exports peaked in 2019, though the unit value ($/kg) was higher in 2018 (Table 3-20). Due to the recent reduction in non-trawl participation (Table 3-1), it is not surprising that gross volume and value reached a low point in 2021. NMFS OST data for 2022 is only available through April at the time of writing, and represents a small volume of trade. Though not shown in the table, unit values through April of 2022 represent a further decline to $2.70/kg ($1.22/lb.). While gross value may be down due to lower production, lower unit values may also be indicative of trade factors including reciprocal tariffs on U.S. seafood exports entering key foreign markets and COVID-related supply chain disruptions where flatfish like turbot were relatively de-prioritized at receiving ports and secondary processing facilities. Reduced unit value might also reflect changes in the demand market that have been observed across BSAI flatfish in recent years.

Table 3-21 shows U.S. import data from NMFS OST. Reported import unit values are higher than export unit values. This likely indicates the importation of value-added product forms from Canada and northern Europe (see Table 3-23), as opposed to head-and-gut (H&G) product forms shipping from Bering Sea CPs to countries where secondary processing occurs. The analysts do not have access to specific wholesale pricing for Greenland turbot sold from the Bering Sea into the U.S. domestic market, but the NMFS OST import price should be a reasonable proxy for that unit value, if controlling for the amount of value added to an H&G product. Whatever turbot is imported is likely a close or perfect substitute to Bering Sea Greenland turbot. The trade theory of the "law of one price" suggests that – setting aside transport costs, tariffs, and consumer preferences – identical goods should sell for the same price, adjusted for the amount of processing that has gone into the final product. In other words, unless there is some preference in east coast U.S. markets for turbot sourced from the Atlantic (i.e., imported from Canada or northern Europe) there should not be a significant difference between the wholesale value of Bering Sea turbot entering the domestic market from the values reported in Table 3-21. However, companies that operate Bering Sea CPs and are not vertically integrated with secondary processing for the retail market would likely receive a price lower than what U.S. national import unit prices indicate.

Table 3-22 estimates the proportion of Alaskan Greenland turbot that is sold to the U.S. domestic market by subtracting U.S. exports (NMFS OST) from total catch (UN FAO), both in H&G weight. The analysts are confident that U.S. exports represent exclusively Alaskan production based on knowledge of U.S. fisheries and the fact that NMFS CAS harvest data – translated to H&G weights – closely match UN FAO "capture production" data. The two right-hand columns of Table 3-22 show the results of this subtraction method when using UN FAO data versus NMFS CAS data as the starting point from which NMFS OST exports values are subtracted. Those columns indicate that less than half of Greenland turbot caught in Alaska – across all gear types – is primarily sold to the domestic market. The proportion that was sold domestically increased in the two most recent years, which could reflect a combination of marketing and the consequences of the COVID pandemic that caused difficulty getting product into primary export markets like China (see Table 3-23) where cargo throughput was limited and inspection delays increased exporters' business risk.

The analysts do not speculate as to whether a revitalized non-trawl BS Greenland turbot fishery would continue to sell into the U.S. domestic market at rates similar to 2020 and 2021. Greenland turbot can be found marketed under its own name at U.S. retailers, which could indicate successful market development. That said, consumer preferences, supply chain barriers (including COVID inspections and international relations), and trade factors (i.e., tariffs, currency relations, and relative foreign/domestic transportation costs) could look different by the time that any regulation resulting from the action alternative would be implemented several years from the time of writing. The relative prevalence of imports from the Canadian Atlantic indicate that Alaskan Greenland turbot faces competition in at least part of the domestic market, which means that Alaskan turbot needs to be price competitive with similar flatfish products – holding equal any retailer and consumer preferences that are based on product origin. The analysts are led to understand that Alaskan Greenland turbot has been adopted by some east coast U.S. retailers as a supplement to Atlantic flounder species.[32]

Table 3-20 U.S. exports of Greenland turbot, 2015-2021

Year	Volume (kg)	Value ($)	Price/kg	Price/lb.
2015	1,053,867	$3,345,668	$3.17	$1.44
2016	1,276,192	$4,344,155	$3.40	$1.54
2017	1,313,403	$4,481,804	$3.41	$1.55
2018	1,094,072	$4,877,400	$4.46	$2.02
2019	1,684,263	$6,097,432	$3.62	$1.64
2020	862,703	$2,523,436	$2.93	$1.33
2021	771,231	$2,307,706	$2.99	$1.36

Source: NMFS OST "FOSS Trade Data"; www.fisheries.noaa.gov/foss, accessed June 2022.

[32] Alaska Seafood Marketing Institute (ASMI). Personal communication. July 2022.

Table 3-21 U.S. imports of Greenland turbot, 2015-2021

Year	Volume (kg)	Value (USD)	Price/kg	Price/lb.
2015	1,156,650	$7,163,068	$6.19	$2.81
2016	1,565,661	$9,156,014	$5.85	$2.65
2017	1,062,676	$5,790,387	$5.45	$2.47
2018	1,187,077	$7,764,017	$6.54	$2.97
2019	1,487,202	$10,394,630	$6.99	$3.17
2020	1,115,101	$6,591,257	$5.91	$2.68
2021	1,008,620	$5,581,022	$5.53	$2.51

Source: NMFS OST "FOSS Trade Data"; www.fisheries.noaa.gov/foss, accessed June 2022.

Table 3-22 Estimate of domestic market for U.S.-caught Greenland turbot, 2015-2021

Year	kg (round)	kg (H&G est.)	Domestic est. (kg)	% Domestic est. (FAO)	% Domestic est. (CAS)
2015	2,085,000	1,355,250	301,383	22%	26%
2016	2,156,000	1,401,400	125,208	9%	12%
2017	2,733,000	1,776,450	463,047	26%	29%
2018	1,760,000	1,144,000	49,928	4%	8%
2019	2,787,000	1,811,550	127,287	7%	9%
2020	2,244,000	1,458,600	595,897	41%	43%
2021*	1,596,000	1,037,400	266,169	26%	26%

Source for 'kg (round)': UN FAO "Capture Production" at https://www.fao.org/fishery/en/statistics, accessed June 2022.
'kg (H&G est.)' is 65% of 'kg (round)'.
* 2021 catch weight not yet reported by FAO; the analysts used catch total from NMFS CAS. FAO 'capture' and CAS 'harvest weight' were well-matched in previous years.

Table 3-23 Cumulative value of U.S. international trade in Greenland turbot, 2015 through April 2022

	Export	Import
China	$24,241,252	$2,290,388
Canada	$81,653	$24,463,645
Other Countries	$3,657,162	$6,416,914
Norway	$2,880	$8,097,383
Denmark		$5,034,052
Greenland		$4,338,222
Taiwan		$4,002,044
Spain		$1,247,736
Total	$27,982,947	$55,890,384

Source: NMFS OST "FOSS Trade Data"; www.fisheries.noaa.gov/foss, accessed June 2022.

The prominent near-term market risks for the Alaska flatfish industry come from inflation in the U.S. and rising production costs. Rising production costs that affect both the producers and the prices that primary buyers are willing to pay include fuel, labor in a tight employment market, and freight costs that are up as much as 500% to 700% (ASMI 2022). According to the Alaska Seafood Marketing Institute's International Marketing Committee (ASMI), demand for Alaska seafood in general – and flatfish in particular – is strong but logistical challenges sometimes make it difficult to transport products to where the demand exists. ASMI's marketing committee noted that short-term challenges may have the long-term result of reaching new markets that were sought out in recent years as necessary alternatives. The extent to which these anecdotes pertain to Greenland turbot is not known to the analysts.

The ASMI committee noted that flatfish demand was strong in the U.S., Europe, and Japan, and that domestic demand for large sizes is stable.

Price inflation within the U.S. economy has emerged as a market-driving issue in the period after the most recent available trade data were reported (April 2022). As a result, the effects of inflation on Alaska flatfish and Greenland turbot are not objectively quantified. Retail prices will likely rise as a result of cost-increases along all stages of the supply chain, and the cost of labor may rise as in-demand workers require higher wages to cover their own expenses. A bad inflation outcome would be a persisting upward price spiral where high costs lead to high prices, high prices lead to higher wages, and higher wages bid up prices throughout the economy. That outcome could price-out consumers who do not individually experience sufficient wage gains, thus shrinking the market of seafood consumers at the bottom of the income distribution. A different outcome might be a mix of measures that restrain inflation in the medium-term (e.g., Federal banking and monetary policy; consumer restraint) but could squeeze producers in the short-term through a mix of higher interest rates on business investment, persistently high short-term operating costs, and flattening product prices. At the time of writing, the full course of events related to domestic inflation and the extent of their impact are unknown. The effects would not be uniquely limited to the Greenland turbot market, foreign or domestic.

The uncertainty facing Greenland turbot producers primarily lies in whether they can cover their costs and margins while selling to intermediate businesses (e.g., shippers, reprocessors, retailers) at a price that will not shrink the demand market in the short- or long-term. It is the analysts' understanding that demand for Alaska flatfish is strong but troubled by logistical hurdles and international diplomatic uncertainty. Presuming that those issues will resolve at some point, the other concern would be maintaining market share for a product – whitefish seafood – for which there are many substitutes.

4. Economic and Social Impacts

4.1. Methods for the Cost and Benefit Impact Analysis

The impact analysis in this document is designed to meet the requirements of E.O. 12866, which necessitates an RIR to evaluate the costs and benefits of the alternatives including both quantifiable and qualitative considerations. Additionally, the analysis should provide information for decision makers "to maximize net benefits (including potential economic, environment, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach."

The analysis is supported by recent fisheries data, analyses, and reference documents with the goal of using the best scientific information available (National Standard 2) to inform the Council's decision-making. This section compares the No Action alternative (Alt. 1) to the action alternative (Alt. 2). The primary data sources are total and retained catch of Greenland turbot and other species, including prohibited species, that occur in the directed turbot fishery and other directed groundfish fisheries that operate in a similar area or with similar non-trawl gear types. Those data are derived from NMFS CAS and compiled by AKFIN. Spatial and temporal catch data for non-trawl and trawl effort within the BS Greenland turbot target fishery are also drawn from NMFS CAS and mapped onto ADFG statistical areas by AKFIN (Section 3.3.4).

The core descriptive tables in Section 3.3, which inform the discussion in this section, focus on groundfish activity from 2010 through 2021 (in some cases, 2022 data is provided year-to-date). That time period provides a sample of periods before and after the non-trawl sector reduced effort in the BS Greenland turbot fishery due to whale depredation. That period also captures the period after which the relevant portions of the non-trawl and trawl sectors (FLC and A80, respectively) were mostly settled into the internal cooperative management regime that exists today. Estimated PSC data prior to 2013 are not included. AKFIN advises that data prior to that year may be less accurate due to changes in the North Pacific Observer Program that were not yet implemented for some of the non-trawl CV sectors that were used to characterize the difference in PSC by gear type in the western BS (Section 3.3.5.2). Data from prior to 2013 are not always updated with reestimates as methodological changes are implemented.

Revenue data for the HAL CP sector and for comparison to overall fisheries income in relevant communities (Section 3.3.3) is compiled by AKFIN based on Commercial Fisheries Entry Commission (CFEC) Fish Ticket data, and Alaska Department of Fish and Game (ADFG) Commercial Operators Annual Report (COAR) data, from which AKFIN can supply catch and discard records as well as estimates of gross ex-vessel and first wholesale revenues.

Secondary data sources used to provide the best available information on whale depredation trends include the NMFS longline survey and the Observer Program (Section 3.4). The market conditions for Alaska Greenland turbot are described using trade data from NMFS Office of Science and Technology (OST) and the United Nations Food and Agriculture Organization (UN FAO).

4.2. Economic Impacts of Alternative 1, No Action

A simple way to gauge direct economic fishery impacts under the No Action alternative is the difference in BS Greenland turbot gross revenues for non-trawl vessels for years prior to 2018, when targeted effort most noticeably declined, and the years since (see Table 3-1 for trend in turbot catch within the target fishery). The subset of non-trawl CPs that had regularly relied upon Greenland turbot as a fishing opportunity complementary to their focus on Pacific cod had already declined from around seven to nine vessels near the beginning of the analyzed period (2010-2012) to three to five vessels in more recent years; 2021 and 2022 brought a total halt to targeting turbot. Table 3-4 showed that the non-trawl vessels targeting turbot had relied upon that fishery for between 10% and 17% of gross annual revenues prior to 2018 but that amount declined to around 5% in more recent years, culminating with no target revenues in 2021 or 2022 year-to-date. In 2021 inflation-adjusted dollars, the total annual value of the non-trawl turbot target fishery had declined from a peak of $9.2 million to around $1.0 million before targeting ceased in 2021. Total non-trawl turbot revenues, included retained catch that was not part of the “target” definition, declined from a peak of around $11.1 million to roughly $1.1 million in 2020. The information presented in Section 3.4 provides a basis for the reasonable conclusion that killer whale depredation on Greenland turbot HAL gear has been a significant factor in reduced non-trawl effort. Non-trawl vessels that resume targeting BS Greenland turbot with HAL gear in the presence of effective depredating whales would likely be subject to higher operating costs and lower CPUEs, which decreases the overall efficiency of the fleet and has adverse economic impacts that flow down to crew members who are paid for their time based on revenue shares.

Reduced direct economic activity in a relatively small non-trawl CP turbot subsector flows through the fishery-adjacent economy somewhat differently than a CV-dominated fishery with a large number of vessels. Impacts are concentrated on the most directly affected vessel owners, operators, and crews. The complementary nature of the Greenland turbot fishery means that the absence of a turbot opportunity is less likely to eliminate vessels entirely from the Alaska fleet, but certain individuals are affected on the margin. The extent to which the continued cessation of the non-trawl turbot fishery might reduce the number of active vessels in the FLC (Pacific cod HAL CP) fleet is difficult to separate from the pre-existing trend of vessel consolidation within that cooperative (see Section 3.3.1.1). The overall size of the BSAI HAL CP fleet is primarily determined by the size of its Pacific cod TAC allocation and the number of vessels needed to harvest it while balancing other opportunities that are available to cooperative members (e.g., non-trawl groundfish in the GOA and, formerly, BS Greenland turbot).

Section 3.5 reported on the range of vessel dependency on the non-trawl turbot fishery to the extent possible under confidentiality restrictions. Two non-trawl CPs recorded an average of roughly 20% of annual gross revenues in the Greenland turbot target during the analyzed period, with short individual peaks in the range of 35% to 45% of annual revenue. Aside from those vessels, few others generated more than 5% of annual gross revenue from turbot in any year, and dependency of greater than 10% among those other vessels has not occurred since 2014. In aggregate, those less-dependent vessels averaged less than 1% of their total gross revenues from the BS Greenland turbot fishery during the years when they caught and sold turbot. These data reflect that the non-trawl BS turbot fishery has served as a niche for a subset of cooperatively-affiliated FLC vessels that may – though unbeknownst to the analysts – share revenues within their ownership company or within the cooperative with vessels that focus solely on the HAL CP Pacific cod TAC allocation. The analysts do not have an objective basis to predict a number of HAL CP vessels that might cease all BSAI operations if Greenland turbot is not viable for non-trawl vessels. It is reasonable to assume that the 2021 and 2022 fisheries reflect how the BSAI HAL CP sector will deploy effort in years with no turbot fishing opportunity. Section 3.3.1.1 noted that the total number of active FLC vessels had settled at 17 in 2021 and was at 15 in mid-summer 2022. Factors that might increase or decrease that fleet size but are independent of the status of the turbot fishery include the Pacific cod TAC and whether new-build HAL CP vessels come into the fleet with substantially higher catch capacity or the ability to process higher-value product forms that pushes older vessels in the cooperative to the side. The latter cases would be internal business decisions which – while they could affect crew participation – are independent of the considered action on longline pot gear authorization.

Additional information on Greenland turbot revenues at the community level is provided in Section 3.5. Whether looking at community participation and dependency from the perspective of vessel homeport or listed ownership address, community revenue data must be aggregated to the state-level in Alaska for confidentiality. All non-Alaska homeports and ownership residences were associated with Seattle, WA. The data in Section 3.5 give the straight-forward impression that the vessels most impacted by increased whale depredation are typically associated with the Seattle MSA, which is unsurprising since that characterizes the majority of the BSAI HAL CP fleet (Table 3-17). Whether based on self-reported vessel homeport (Table 3-18) or ownership address, a comparison of turbot-related revenues to total Alaska-fishing revenues for the communities involved in targeting turbot (as aggregated) shows that the BS turbot fishery has not historically accounted for a significant share of the total fishing economy in those locales (~0.2% or less).

Tax revenues that benefit the State of Alaska have declined as a result of less participation in the non-trawl sector. Section 3.6 estimated that tax revenues based on non-trawl turbot fishing peaked at around $155,000 annually in 2011 but had more recently been in the low tens of thousands. These are relatively small numbers compared to the total public revenues generated from the fishery taxes and assessments to which BSAI CPs are subject (between $10 and $15 million annually since 2018). Under Alternative 1, tax revenues from the non-trawl portion of the Greenland turbot fishery are expected to remain insignificant or close to zero.

Selection of the No Action alternative is not likely to affect the portion of the trawl sector that engages in directed fishing for BS Greenland turbot in the near-term. During the analyzed period, between one and seven A80 trawl CPs recorded Greenland turbot target catch in the BS area – out of roughly 18 to 20 total active A80 CPs in recent years. Even considering trawl CPs that caught and processed turbot as a secondary species to other flatfish, turbot typically accounted for between 1% and 11% of the annual gross revenues of the vessels that were *most* engaged with turbot (Section 3.3.1.2). In the near-term, a continuation of the status quo would likely result in fewer non-trawl vessels on the fishing grounds along the slope in the western portion of the BS, but the existing, private, voluntary TAC-splitting agreement between the A80 and FLC cooperatives remains in place so available turbot catch in the trawl sector might not change immediately. If the non-trawl sector remains disengaged from the turbot fishery for many more years, the subset of A80 vessels that have a partial reliance on turbot could work with FLC or with NMFS (inseason) to access more of the total BS TAC in certain years. As noted in Section 3.3.1.2, not all A80 vessels target turbot or the other flatfish alongside which turbot are often encountered (arrowtooth and Kamchatka flounders). The A80 sector's desire to prosecute the full BS TAC is not solely dictated by the presence/absence of non-trawl effort. The A80 vessels that fish turbot are fitting the species in as a piece of a portfolio that may or may not include seasonal fishing opportunities in the AI or the GOA. The A80 vessels that are BS-dependent may determine their annual level of engagement in the turbot target or secondary fisheries based on the timing of yellowfin sole and rock sole fishing, and the annual or seasonal markets for those species. The A80 sector – vessels, companies, and in aggregate – balances potentially impactful bycatch constraints (i.e., halibut and crab). For some A80 vessels, the future level and timing of engagement in western BS Greenland turbot might vary annually depending on other areas that are being avoided due to bycatch rates.

4.3. Economic Impacts of Alternative 2

The simplest interpretation of the potential economic impact under Alternative 2 is a direct benefit to the subset of non-trawl CPs that had historically targeted BS Greenland turbot with HAL gear but stopped doing so due to operational challenges posed by killer whale depredation that made fishing uneconomical. The analysts' baseline assumption, compared to No Action, is that the authorization of longline pot gear could restore the participation and catch levels observed in the non-trawl segment of the directed fishery from roughly 2010 through 2017. This section considers factors that could tilt the likely outcome in either direction relative to that assumption in the near- to medium-term – less participation or more – and how that might affect other users of the BS Greenland turbot resource (i.e., some A80 trawl vessels). This section also considers the possible effects on non-turbot species through the lens of incentives that may or may not exist to retain them under existing regulations. (Effects on non-turbot species, themselves, are discussed in Section 5.3.2 of the EA.)

<u>Non-trawl participation</u>

The baseline assumption that authorizing a gear that would combat killer whale depredation – longline pot gear – would restore historical participation is predicated on the efficacy of that gear type in protecting catch from whales while also fishing effectively for turbot. Neither of those outcomes can be assured based on past experience, but both are deemed likely. Pot gear has been an effective mitigation tool for BS sablefish fisheries that were beset by killer whale depredation. The efficacy of longline pot gear at great depths in the western portion of the BS cannot be assumed, but the option to test it represents a clear benefit to non-trawl participants relative to the No Action alternative. Turbot might interact differently with pot gear than sablefish, which have been successfully targeted with pots (Table 3-6); the Option to remove the 9-inch tunnel opening restriction is viewed as a clear benefit to those who would target turbot with longline pots.

A first-order consideration for how many non-trawl vessels might reengage in the BS Greenland turbot fishery is the amount of available harvest. Recent TAC levels are more similar to those at the beginning of the analyzed period, when seven to nine vessels targeted turbot, and trended upward in 2022 (Table 3-1). However, history shows that the BS non-CDQ turbot fishery is not fully utilized due to its nature as a complementary fishery and that is a reason not to base predicted participation levels on TAC trends alone. History shows that a turbot fishery with a non-regulatory trawl/non-trawl TAC-split supported three to five non-trawl CPs at TAC levels that were lower than they are today (2013-2017). None of those vessels were generating a majority of their annual fishing revenues in the turbot fishery. Nothing under existing regulations or the action alternative would prevent a larger number of vessels from participating, but at a certain point each additional vessel would dilute expected per-vessel revenues to the point where vessels that have other fishing or tendering options would choose those over the opportunity cost of fishing off the western BS slope in the late spring or summer. For the purpose of rough impact estimation in the EA, this document has set a "likely" number of longline pot participants in the range of four to nine vessels, with nine representing a rebound to participation from the 2010-2012 period with very limited expectation of non-FLC vessels entering the fishery (see Section 5.2).

Assuming a vessel has the appropriate LLP license and aside from available TAC and competition for that catch, the potential value of entering (or re-entering) the non-trawl BS Greenland turbot fishery would be determined by three factors: opportunity cost, operational cost, and markets for turbot processed at-sea. The opportunity cost should naturally be lowest for vessels that have made turbot part of their annual fishing plan in the past and, absent increasing whale depredation, would presumably have continued to do so. Non-historical participants that are part of a voluntary cooperative (i.e., FLC) might have low opportunity cost because their access to their primary fishery (Pacific cod) is assured through intracooperative allocation. On the other hand, those vessels might have lower incentives to move into a turbot fishery that is new to them because they might have company affiliations with FLC/turbot vessels and might, in a sense, already be sharing revenues from the turbot fishery. Those vessels would have no incentive to make the non-trawl turbot fishery operate with less overall economic efficiency by accruing additional operating costs and competing down the marginal value of catch. For these vessels, entering the turbot fishery would probably only occur if the turbot TAC is relatively large and the Pacific cod HAL CP allocation declines relative to the levels that have dictated fishing plans during the analyzed period.

The most consequential unanswered question is whether non-FLC vessels with no turbot history would utilize a longline pot gear authorization to make a new entry. Section 3.2 summarized the number of LLP licenses that could possibly operate as BS non-trawl CPs, reaching the rough conclusion that there are seven CP licenses that have been active in the BSAI, are not part of the FLC cooperative, and are not attached to A80 trawl CPs. Those licenses have not all been active in every year, and some might be attached – now or in the future – to vessels that focus on fisheries with more opportunity than what could be derived from competing for the non-trawl portion of the BS turbot TAC. These seven licenses are a combination of BS Pacific cod pot CPs, crab vessels, and halibut/sablefish IFQ vessels. The crab history among these licenses is relatively low, which is worth noting because crab fisheries are at a low ebb and could be thought of as a source of vessels seeking different opportunities. In other words, these seven licenses as a group are not heavily dependent on crab. Four of these seven licenses were primarily associated with Pacific cod fishing. While it would not preclude participation in the turbot fishery, recall that Pacific cod (and other non-turbot/non-IFQ species) could not be retained in longline pot gear under current regulations (see Section 2). That means that any new entrant would likely be gearing up for a new fishery that does not provide the added benefit of co-targeting species that are already part of a vessel's fishing plan.

The cost of entering or reengaging with the Greenland turbot fishery under a longline pot authorization obviously includes costs of new gear or vessel hardware that will vary across individual platforms. The most recently cited estimates of longline pot conversion costs – developed through Council/agency staff communicating with fishery participants, and through testimony to the Council and its advisory bodies/committees – was in the April 2022 IFQ Omnibus RIR (Section 4 of NPFMC 2022b). That analysis cites information from the three-year review of the GOA sablefish longline pot fishery (see Section 8 of NPFMC 2021c) and the original analysis for GOA Amendment 101 (NPFMC 2016). Both of those sources include information that is slightly dated and focuses primarily on CV platforms which are assumed more likely than CPs to need power and hydraulic upgrades to haul longline pot gear in deep water. The GOA sablefish three-year review (NPFMC 2021c) placed a rough estimate for a CV refit to move from HAL gear to longline pots in the $75,000 to $150,000 range if major power improvements were not required. These estimates are anecdotal and sometimes obscured because refits can be folded into other vessel improvements that are being made at the same time. It is possible that the non-gear costs of shifting to longline pot gear could be less for CPs; the best source of updated information on this topic will be testimony received directly from fishery participants. Regardless of the need for vessel system upgrades, many vessels would need to purchase groundfish pot gear and groundline, which is not the same gauge as HAL groundline. Again citing the somewhat dated estimates from the GOA Amendment 101 EA/RIR (NPFMC 2016), costs strictly related to longline pot gear were estimated in the range of $12,000 to $16,000 per mile. The best available information on comparable set-mileage for HAL gear versus longline pot gear is included in Section 3.3.4 of this document. The emergence of collapsible "slinky" pots could provide a lower cost option (cost estimated at $100-$150 per pot in NPFMC 2022b) but whether that pot type would be effective and adopted in a BS Greenland turbot fishery remains to be seen. If it is the case that Pacific cod pots are appropriate for the turbot fishery then the small number of CPs with pot cod history but no turbot history (roughly four vessels) would have one fewer barrier to entering this new fishery.

Additional costs that might be associated with accommodating required NMFS monitoring for vessels using pot gear is covered in Section 6.1 of this document with preliminary cost estimates incorporated by reference from Section 3.7.1 of NPFMC 2021d (Initial Review RIR for an action that considered some BSAI Pacific cod pot CP LLP licenses).

Each of the aforementioned considerations could be tipped by the relative strength of the market for Greenland turbot. The best market information available to the analysts is summarized in Section 3.7. In the near-term, market and trade conditions would indicate that turbot has viable markets but that international logistics, lingering COVID-19 restrictions in some primary Asian markets, cost inflation, and challenges in crew hiring would suggest that a business operation with no historical reliance on turbot and significant gear-up costs would need to be facing serious contraction in its primary fisheries to jump into non-trawl turbot for the first time at this moment.

The analysts have largely discounted the likelihood of CVs entering the BS Greenland turbot fishery in the near-term because they would face the highest barriers to entry in terms of the cost of gearing up, refitting, and getting on the grounds. Given their lack of recent participation, CVs would also be overcoming the highest barriers in terms of knowledge of the fishing grounds. More directly, however, CVs would face the unique costs of time and fuel required to deliver shoreside, as well as a lack of shoreside plants operating near the turbot fishing grounds in the summer months. The analysts think it unlikely that the non-trawl turbot TAC and expected "first-time" effort by CVs would support a mothershipping operation for turbot CVs that would not be allowed to retain any catch of non-turbot species in their longline pots.

<u>Retention of non-turbot species</u>

As noted in Section 2, current regulations mean that Alternative 2 would only allow a vessel using longline pot gear to retain Greenland turbot (or IFQ species if quota is onboard). All other groundfish would be regulatory discards. That regulatory position limits the attractiveness of entering the fishery on the margin since other marketable groundfish species are likely to be encountered (Table 3-6). Regulatory discards reduce the overall economic efficiency of the fishery but they can still accrue to catch limits and ICAs and, thus, could cause certain directed fisheries to close earlier while generating no revenue. On the other hand, one could argue that right now there is no productivity in the non-trawl turbot fishery so, compared to No Action, Alternative 2 would at least allow the production of Greenland turbot.

Catch of non-retainable species like Pacific cod, Kamchatka flounder, or arrowtooth flounder would affect commercial users of those directed fishing allowances in that year and also influence the level of ICAs set for the following year, which in turn affects TAC allocations. While Section 3.3.5.1.1 suggested that there should not be a large amount of inadvertent Pacific cod catch in a directed turbot fishery, it is worth noting that most non-trawl turbot participants that were historically active or might be active in the future are cod-dependent so their incentives are aligned to minimize cod discards that would accrue to the ICA. Whether non-retainable under current regulations or retainable up to an MRA under a regulatory amendment (not currently under consideration), longline pot catch of commercial flatfish species like arrowtooth and Kamchatka flounder could affect the timing of directed fishing closures for the trawl gear sector. For Pacific cod, *if* regulations were amended to allow retention up to a trip-based MRA then a longline pot *haul* that falls into the cod "target" based on the predominance of catch in the haul would accrue to the BS Pacific cod pot CP sector's annual allocation; that would have negative consequences for the BS pot cod CP sector and its small annual TAC. Given that turbot and Pacific cod are not typically targeted at the same depth, the outcome described above would likely only occur if a vessel was "topping off" a trip with the cod MRA.

Further discussion of how Alternative 2 might indirectly impact the BS trawl sector is also included in the following two subheadings.

<u>Time and location of fishing</u>

It is possible that the timing of the non-trawl turbot fishery could shift or be redistributed under Alternative 2. Other than a directed fishing closure on the basis of TAC, there are no regulatory restrictions on the timing of turbot fishing after the May 1 opening date for directed fishing, so any suppositions about how a longline pot fishery might behave differently than the HAL fishery are better informed by direct input from potential participants. Alternative 2 would not directly change regulations on when the fishery could occur. The issue of fishery timing is discussed in more detail in Section 5.2.2 of this document. There are several reasons that the adoption of a gear that mitigates whale depredation could affect timing. The SAFE report partially attributes the recent historical timing of the fishery – prior to the practical end of non-trawl directed fishing in 2021 – to whale depredation avoidance. With that being a lesser concern, non-trawl operators might experiment with fishing earlier in the year, allowing a gap between cod seasons when vessels could return to port for service or where vessels might pursue other sources of fishing revenue. If vessels use heavy groundfish pots, operators might also choose to shift effort earlier in the year to reduce safety risks associated with deck-loads and pot handling in harsher weather later in the calendar year. From an economic impact perspective, removing the timing constraint of depredating whale prevalence provides options to the fleet to make decisions that are optimized on an individual level. Because the alternative does not dictate the timing of the fishery, vessels would still have the ability to make adjustments if new trends lead to crowding on the fishing grounds at certain times of year. The timing data reported in the Appendix to this document is based on a relatively small number of non-trawl vessels that have changed annual timing patterns for a variety of external reasons over the analyzed years (e.g., vessel maintenance, crew turnover, etc.). As a result, the analysts do not have the basis to say what is the typical/optimal timing that has existed and then consider how it might change. Instead, the effect of Alternative 2 on timing is viewed as a measure that enhances flexibility. Those familiar with the non-trawl turbot fishery expect that vessels would experiment with timing in the first years after new regulations authorizing pot gear were adopted.

This document presents the best available data on the extent to which trawl and non-trawl vessels targeting Greenland turbot overlap in space as well as time, with the spatial unit of measure defined at the ADFG Statistical Area level. That information is detailed in Section 3.3.4 and in the Appendix to this document. In terms of economic impacts under Alternative 2 relative to No Action, the key points of interest are whether a longline pot fishery would occupy fishing grounds that keep trawl vessels out of productive areas or whether the presence of heavier longline pot strings would result in costlier gear conflicts. The starting points for that discussion are that the FLC HAL CP sector and the A80 trawl sector have not reported gear conflict or grounds preemption issues occurring during the period when both sectors we active in the western portion of the BS, and that both sectors operate under single-cooperative structures that tout inseason communication as a key value and strength. The data illustrated in Figure 3-1 (Section 3.3.4) and expanded in the Appendix corroborate the lack or gear conflict reports. There were only three ADFG areas identified where both sectors routinely shared time and space, and the number of vessels involved on either side was never more than one or two. Typically, vessels fished far apart along the BS slope or fished in time-area combinations with fellow members of their gear-based cooperative.

The frequency of identifying both sectors in the same time/area was not significantly different in 2017 and 2018 – when the non-trawl sector was more active in the turbot fishery – than it was in 2019 and 2020 (non-trawl vessels did not target turbot in 2021). It would seem that the chance of gear conflict would be greatest if a number of independent non-trawl vessels entered the fishery. However – absent the fact of whale depredation – that possibility has been open to non-FLC HAL vessels throughout the analyzed period and has not occurred. Given that the likely amount of independent non-trawl vessels entering the fishery is small (if any), it is not unreasonable to expect that those participants could be brought into the working relationship between trawl/non-trawl cooperatives that has spawned successful non-regulatory management actions like the voluntary TAC split. One outstanding question that could be best answered with direct stakeholder input to the Council is whether pot gear would be left to soak and sort longer than HAL gear would be, all else equal. Well-marked gear in an environment of good communication is not necessarily a conflict-risk, but could cause other vessels to incur operational costs. Requirements to tend and move pot gear in this fishery have not been proposed. The area-dispersal of fishing effort shown in Figure 3-1 and the Appendix suggest that the best fishing grounds are not spatially concentrated and that vessels who encounter marked gear would not have to move great distances along the slope before they set their own.

Potential for indirect effects on trawl sector

Some of the topics addressed under this subheading overlap other parts of this discussion section, but aggregating potential issues that relate to the trawl segment of the Greenland turbot fishery may help the reader locate these issues. Consideration of indirect effects on the A80 trawl sector is warranted because a subset of that cooperative comprises the only vessels currently targeting BS Greenland turbot and the only active gear group that is closely tied to this action but not directly regulated under the considered action alternative.

In reference to the uncertain level of future participation in the non-trawl turbot fishery, it is worth noting that the voluntary TAC-splitting agreement is explicitly between the A80 cooperative and the FLC cooperative, not between "trawl and non-trawl". As a result, some could question whether future non-FLC non-trawl participants could be folded into that agreement – or would want to be. The general conclusion of this document is that the number of non-FLC non-trawl entrants is likely to be small, if any, and the effect that their participation has on the existing agreement concerning a TAC that is not fully utilized could be managed through industry means or tolerated until it proves intolerable – at which point new non-regulatory approaches could be considered.

The A80 sector includes individual companies and vessels that have different degrees of reliance on certain non-pollock groundfish species. The subset of A80 that targets Greenland turbot, Kamchatka flounder, and arrowtooth flounder in the late-spring/summer period (after yellowfin sole/flathead sole; before fall yellowfin sole) would be the most attuned to participation levels in the non-trawl turbot fishery. Trawl vessels could theoretically experience earlier directed fishing closures for turbot/Kamchatka/arrowtooth if the scale of the non-trawl turbot sector grows beyond what was managed throughout the analyzed period, or if NMFS is anticipating greater amounts of non-trawl turbot catch occurring later in the year. If directed fishing for turbot is closed then trawl vessels could not retain more than the turbot MRA in the combined A80 target category of turbot/Kamchatka/arrowtooth when they target those species in the spring and summer. The trawl sector might be particularly interested in how much Kamchatka flounder will occur in longline pots directed fishing for turbot since Kamchatka has been more likely to have a directed fishing closure during the year due to high catch limit utilization. If NMFS anticipants more non-trawl incidental catch of Kamchatka flounder later in the year then it might close directed fishing for that species earlier to prevent an overage.[33] Trawl participants might have

[33] The lack of an existing longline pot turbot fishery makes it difficult to predict the amounts of other closely managed species that will end up in turbot pots, but the analysts note that Kamchatka flounder ranked sixth among the species

similar concerns regarding the Option to increase the maximum pot tunnel opening if it is expected to result in more flounder species that have directed fishing allowances being caught by longline pot vessels that cannot retain them.

The trawl sector is also potentially affected by how the Greenland turbot ICA is set in harvest specifications. NMFS sets the turbot ICA to account for, among other things, catch in the trawl fisheries targeting yellowfin sole and flathead sole. The ICA is set prior to the FLC/A80 voluntary agreement being finalized (since the agreement is contingent on harvest specifications), and the size of the ICA has a direct trade-off with the amount of the TAC that can be split among trawl and non-trawl directed fishing allowances. Uncertainty in the amount of non-trawl effort could affect the size of the turbot ICA, and thus the TAC. A lower TAC affects the trawl sector's ability to retain turbot in the turbot/Kamchatka/arrowtooth target, while a lower ICA affects the ability to retain catch in the yellowfin and flathead targets. While this document acknowledges uncertainties in future non-trawl participation under Alternative 2, it is worth noting that these trade-offs were successfully managed in the setting of relatively low non-CDQ turbot TACs, moderate non-trawl (HAL CP) participation (3 to 5 vessels), and a voluntary agreement in place from 2013 through 2019. The trawl sector's concerns would be most likely to manifest if non-trawl participation increases substantially or if the recent upward turbot TAC trend reverses course.

The trawl sector should not be affected by non-retainable Pacific cod catch that occurs in a longline pot turbot fishery and accrues to the HAL/Pot Pacific cod ICA, because that catch allowance is deducted only from non-trawl sector TACs. In other words, if vessels using longline pot gear record unexpected amounts of Pacific cod catch and the HAL/Pot ICA needs to be adjusted in the future based on that rate then A80 vessels that rely on a certain amount of Pacific cod allocation to support their primary fisheries should be insulated from any effect.

Option to remove tunnel opening restriction

The economic impact of the Option under Alternative 2 are generally considered within the broader context of the alternative because its effects would appear relatively straightforward. A larger pot tunnel opening could increase the average size of the Greenland turbot that are retained in pot gear relative to pot gear with a 9-inch maximum opening width restriction, but the data on turbot retained in pots and sampled for size are not rich enough to make a comparison to turbot retained from HAL gear and assign a specific economic value estimate to that difference. The sparse data on pot-caught, sampled turbot come from incidental catch in sablefish and Pacific cod pot fisheries; 9-inch tunnel restrictions would have been in place for most if not all of those catches based on regulations at the time and the lower likelihood that uncaught halibut IFQ was onboard. To the extent that Pacific cod pot fisheries operate at shallower depths, the turbot sampled from those pots might be expected to be smaller due to the size/depth distribution typical of turbot. The Greenland turbot lead stock assessment author examined 156 records of turbot sampled by observers on vessels using pot gear in the Bering Sea. (The average depth of catch was 300 meters, which matches what would be expected based on the data shown in Section 3.3.5.1.1 of this document.) The sampled turbot caught in pots assumed to have the 9-inch restriction ranged from 55cm to 91cm.[34] Acknowledging the small available sample size, the length distribution was tri-modal, or clustered around three different mean lengths. The largest-size cluster occurred around 83cm, showing that large turbot caught in pots is not something that only happens at the lower-probability tail of the distribution. The ontogeny of the species suggests that larger turbot are found at depth on the BS slope. It would seem that the Option to remove the tunnel width restriction can benefit any vessel using longline pots but would provide the greatest benefit to those fishing deeper. Given that larger turbot were found in

recorded on turbot HAL gear from 2017-2020 (1.8% of total catch) behind grenadier, turbot, skates, sablefish and Pacific cod.

[34] M. Bryan, AFSC. Pers. Comm. June 2022.

tunnel-restricted pots, there is no objective basis to conclude that removing the width restriction will push effort into deeper waters since vessels fishing for turbot already had that incentive to fish at depth.

Few of the LLP licenses associated with the non-trawl vessels that have targeted BS Greenland turbot or might do so in the future have a history of fishing halibut IFQ or CDQ (Sections 3.2 and 3.3).[35] As a result, it is not expected that the Option to increase the maximum tunnel opening will have a near-term effect on decisions about where to directed fish for turbot in terms of the possibility of retaining halibut. It is generally understood that larger size turbot are found deeper than most halibut, and the inability for most to retain halibut means that vessels would not have an incentive to fish shallower. In the longer term, current regulations would not prohibit a vessel directed fishing for turbot from acquiring the appropriate class of halibut IFQ and retaining halibut in longline pot gear. Since that catch would be retained and sold, the effect of more halibut caught in pot gear could be a benefit to the individual vessel and the net effect can be considered in the broader context of who benefits or does not benefit when halibut IFQ or CDQ changes hands among harvester/processors, which is beyond the scope of this analysis. Table 3-6 showed that halibut did not rank high in the order of species that occurred in Greenland turbot HAL catch (2017-2020) and was also low on the list of species caught in Pacific cod pots even though one would expect cod and halibut to be more comingled than turbot and halibut. The net effect of the Option on halibut catches – most of which would not be retained – likely depends on the propensity of halibut to enter pots versus be caught with hooks in the western BS. The best available data to assess this is shown in Table 3-7, with the caveat that pot bycatch shown in that table is a small sample and comes from pot gear that did have a 9-inch tunnel restriction. Acknowledging the thin data, pot gear recorded lower rates of halibut bycatch. Effects on halibut are further discussed in Section 5.3.2.

Stock assessment

The Council's purpose and need (Section 1.1) concludes with the statement: "Other benefits of reduced whale depredation on Greenland turbot could include improved catch accounting for managers, and data quality for the Greenland turbot stock assessment." Improved precision in the assessment and less need to account for unobserved depredation mortality through management could benefit direct participants in the fishery by reducing management buffers, potentially allowing for more available harvest. The direct economic impact is less obvious for a stock that is not always fully prosecuted for a variety of reasons that go beyond the inefficiency caused by whale depredation. Nevertheless, according to the lead assessment author at AFSC, one crucial way that killer whale depredation affects the stock assessment is that depredated longline survey sets are removed from the relative population number (RPN) and relative population weight (RPW) calculations. This is not ideal for assessment science, but is the same methodology used in the assessment for sablefish which are also subject to killer whale depredation in the BS area. That challenge is further discussed in Section 3.4 of this document. Switching from HAL gear to pot gear in the non-trawl segment of the fishery might improve data quality for stock assessment by reducing the amount of fishing mortality that goes undetected due to depredation, but stock assessment experts cannot fully analyze the benefit without gaining a better understanding of the selectivity of longline pot gear compared to HAL gear. It will take experience within a pot gear fishery to ascertain sex-specific length and age samples that would allow the authors to adjust estimations of selectivity in the assessment model.

4.4. Social impacts of the alternatives

The key difference between Alternative 2 and the No Action alternative is the potential for the non-trawl segment of the BS Greenland turbot fleet to return catch and effort levels to those that were successfully prosecuted until roughly 2018. The marginal losses that are suffered as a fishery operates inefficiently while avoiding whale depredation or suffering lost catch have already been subsumed by the voluntary

[35] One FLC HAL CP and one non-FLC CP that was active during the analyzed period.

cessation of the non-trawl turbot target fishery. Vessels are no longer diminishing the value of their crew and equipment time, and any loss of crew-weeks on the vessels that partially relied on BS turbot have likely already been realized in 2021 and 2022. In that sense, the Council is weighing "no non-trawl fishery" versus "some non-trawl fishery", with seemingly no middle ground as demonstrated by the sector's choices over the past two years.

The social impact ramifications of that choice are largely confined to the micro-economies of the non-trawl participants that were partly reliant on Greenland turbot participation or those that could become engaged in the future. Vessels that would have less fishing opportunity under the No Action would produce less crew wage and purchase fewer consumables such as fuel, bait, and provisions. Given the cooperative, cod-focused nature of the vessels that historically participated in the non-trawl turbot fishery, it is likely that these vessels are redirected to other fishing opportunities but the total income and the benefits that it creates would remain relatively lower at the sector/cooperative level. Section 3.5 noted the lack of data available to trace these marginal crew losses to specific communities.

Section 3.5 and Section 3.6 put the relative scale of the non-trawl BS Greenland turbot fishery into the context of the communities to which the analysts can link the formerly active vessels. Vessel ownership ties link most of the vessels to the Seattle MSA, where the gross revenues from non-trawl BS Greenland turbot account for a very small portion of the total fishing economy (Table 3-18). Self-reported homeport records allow the inference that some of the formerly active vessels were affiliated with CDQ groups. Even though CDQ allocations of Greenland turbot are harvested in small amounts (Table 3-3), the groups' vessel ownership interests signify that the benefits of a revitalized fishery could flow to groups that are structured to invest directly in western Alaska coastal communities. However, the size of those revenues is also quite small relative to the total fishing income for CDQ groups, and the homeports that suggest CDQ ownership participation in the BS turbot fishery are associated with a small fraction of the gross revenues during the analyzed period (Table 3-16).

Relative to the No Action alternative, Alternative 2 is likely to increase fishery tax revenues. Table 3-19 estimated tax revenues going to the State of Alaska and partially distributed to boroughs or municipalities in western Alaska. The order of magnitude for fishery tax levies restored to, for example, 2015 through 2017 levels would be in the tens of thousands of dollars. Estimated tax revenues from 2010 through 2012 were between $100,000 and $155,000 (2021$). Tax revenues were roughly $50,000 to $60,000 from 2015 through 2017, then roughly $14,000 to $30,000 from 2018 through 2020, and essentially zero in 2021 and 2022. By comparison, the Fishery Resource Landing Tax – which is the primary source of CP tax revenue – has generated approximately $10 to $15 million during each of the four most recent complete years (2018-2021).

4.5. Affected Small Entities (Regulatory Flexibility Act Considerations)

Section 603 of the Regulatory Flexibility Act (RFA) requires that an initial regulatory flexibility analysis (IRFA) be prepared to identify whether a proposed action will result in a disproportionate and/or significant adverse economic impact on the directly regulated small entities, and to consider any alternatives that would lessen this adverse economic impact to those small entities. NMFS Alaska region will prepare the IRFA in the classification section of the proposed rule for an action and a separate IRFA is not necessary for Council final actions on the issue. This section provides information about the directly regulated small entities that NMFS will use to prepare the IRFA for this action if the Council recommends regulatory amendments.

This section identifies the general nature of the potential economic impacts on directly regulated small entities, specifically addressing whether the impacts may be adverse or beneficial. The exact nature of the costs and benefits of each alternative is addressed in the impact analysis sections of the RIR and is not repeated in this section, unless the costs and benefits described elsewhere in the RIR differs between small and large entities.

Identification of Directly Regulated Entities

Entities that could be directly regulated by this action include any holder of a Federal groundfish LLP license that is endorsed for non-trawl gear in the BS subarea. As noted throughout Sections 3 and 4 the entities that are most likely to be impacted by the action alternative are CP vessels. In keeping with that approach, the assessment of recently active vessels with respect to the SBA definition of a small entity is limited to CPs. There is no recent history of CVs participating in the BS Greenland turbot directed fishery; the analysts propose that classifying all CVs that are licensed for non-trawl BS groundfish would be overly broad and not informative as to the likely effects of the action alternative.

Count of Small, Directly Regulated Entities

Under the RFA, businesses that are 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, regardless of the type of fishing operation (81 FR 4469; January 26, 2016). If a vessel has a known affiliation with other vessels – through a business ownership or through a cooperative – these thresholds are measured against the small entity threshold based on the total gross revenues of all affiliated vessels. In 2021, there were 24 active vessels that had participated in the BSAI groundfish fishery as a CP using HAL or pot gear during the 2012 through 2021 period. Three of those vessels are considered small entities. There are 18 vessels that previously participated as CPs during the analyzed period but were not active in 2021, which is indicative of the declining non-trawl CP participation trend noted earlier in Section 4. Some of the vessels had also acted as CVs at some point during the analyzed period, but they are included in this initial RFA analysis on the basis of their past participation as a non-trawl groundfish CP fishing in the BS.

Impacts to Small, Directly Regulated Entities

The analysts do not anticipate that impacts on the three directly regulated small entities would be uniquely adverse or beneficial. As described previously in Section 4, the action alternative provides a benefit by allowing a different gear type that could make the fishery more successful and economical. The opportunity to utilize this gear is non-exclusive. The Greenland turbot fishery has not been fully utilized and thus access to the fishery – within the set of entities that hold the proper license – is effectively non-rival. The primary barriers to participation are of a logistical nature or based on the strength of the market for the product and the cost of operation. While entities with access to greater financial resources might find it easier to participate in a remote fishery in some cases, that fact is not changed or viewed differently in the context of having authorized longline pot gear for use.

4.6. Alternatives with Respect to Net Benefit to the Nation

This section will be completed for the final action draft if the Council moves forward with consideration of the action alternative.

5. Environmental Impacts

This section evaluates the potentially affected environment and the degree of the impacts of the alternatives and options on the various resource components, together with relevant past, present, and reasonably foreseeably actions. The socio-economic impacts of this action are described in the Regulatory Impact Review (RIR) section of this analysis (Sections 3 and 4).

Recent and relevant information, necessary to understand the affected environment for each resource component, is summarized in the relevant section below. For each resource component, the analysis identifies the potential impacts of each alternative, and evaluates these impacts. If significant impacts are likely to occur, preparation of an EIS is required. Although an EA should evaluate economic and socioeconomic impacts that are interrelated with natural and physical environmental effects, economic and social impacts by themselves are not sufficient to require the preparation of an EIS (see 40 CFR 1508.14).

5.1. Methods for Environmental Impact Analysis

5.1.1. Resource Components Addressed in the Analysis

Table 5-1 shows the components of the human environment and whether the proposed action and its alternatives have the potential to impact that resource component and thus require further analysis. Extensive environmental analysis on all resource components is not needed in this document because the proposed action is not anticipated to have environmental impacts on all resource components.

The effects of the alternatives on the resource components would be caused by changes in the distribution and/or intensity of fishing effort in the BS. The alternatives have the potential to affect Greenland turbot, incidental groundfish, prohibited species, marine mammals, seabirds, and social and economic components. No effects are expected on habitat and the ecosystem because the potential allowance of longline pot gear to fish for Greenland turbot would not result in changes in the harvest season or location of fishing, and does not authorize a gear type that is not already allowed for other fisheries managed by the NPFMC in the same areas.

Table 5-1 Resources potentially affected by the proposed action and alternatives

Potentially affected resource component							
Groundfish	Prohibited Species	Ecosystem Component Species	Marine Mammals	Seabirds	Habitat	Ecosystem	Social and economic
Y	Y	N	Y	Y	N	N	Y

N = no impact anticipated by each alternative on the component.
Y = an impact is possible if each alternative is implemented.

5.1.2. Effects of Aggregate Past, Present, and Reasonably Foreseeably Future Actions

This EA analyzes the effects of each alternative and the effects of past, present, and reasonably foreseeable future actions (RFFA). Based on Table 5-1, the resources with potentially meaningful cumulative effects are Greenland turbot, incidental groundfish, prohibited species, marine mammals, seabirds, and social and economic components. The aggregate effects on the other resources have been analyzed in numerous documents and the impacts of this proposed action and alternatives on those resources is minimal, therefore there is no need to conduct an additional aggregate impacts analysis.

Each section below provides a review of the relevant past, present, and RFFA that may result in cumulative effects on the resource components analyzed in this document. A complete review of the past, present, and RFFAs are described in the prior NEPA documents incorporated by reference (Section 1.5) and the supplemental information report (SIR) NMFS prepares to annually review of the latest information since the completion of the Alaska Groundfish Harvest Specifications EIS. SIRs have been developed since 2007 and are available on the NMFS Alaska Region website. Each SIR describes changes to the groundfish fisheries and harvest specifications process, new information about environmental components that may be impacted by the groundfish fisheries, and new circumstances, including present and reasonably foreseeable future actions. NMFS reviews the reasonably foreseeable future actions described in the Harvest Specifications EIS each year to determine whether they occurred and, if they did occur, whether they would fall within the scope of what was previous evaluated in the Harvest Specifications EIS of the impacts of the harvest strategy on the human environment. In addition, NMFS considered whether other actions not anticipated in the Harvest Specifications EIS occurred that have a bearing on the harvest strategy or its impacts. The SIRs provide the latest review of new information regarding Alaska groundfish fisheries management and the marine environment since the development of the Harvest Specifications EIS and provide cumulative effects information applicable to the alternatives analyzed in this EA.

Actions are understood to be human actions (e.g., a designation of 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. In addition to these actions, this aggregate effects analysis includes the effects of climate change.

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.

Considering the direct and indirect impacts of the proposed alternatives when added to the impacts of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of the RFFAs discussed in the following sections, the cumulative impacts of the proposed alternative is determined to be not significant.

5.2. Target Species (Greenland Turbot)

5.2.1. Status

Biology

Greenland turbot have a broad distribution in the northern hemisphere. Greenland turbot in the North Pacific and North Atlantic oceans are considered the same species; however, there is evidence for genetic divergence at the subspecific level such as the population in the Bering Sea and Aleutian Islands (BSAI) (Fairbairn, 1981; Orlova et al., 2017). In the North Pacific Ocean, Greenland turbot spend their first 3–4 years on the continental shelf before moving to the continental slope (Alton et al., 1998; Sohn et al., 2010; Swartzman et al., 1992), and an absence of juveniles around the Aleutian Islands suggests that these adults originate from the Bering Shelf (Bryan et al., 2018). As they grow, larger more mature fish are believed to move towards deeper (> 100 m) and warmer (> 0 °C) waters, while smaller fish remain shallow and are found in colder waters (Bryan et al., 2018). Greenland turbot reach sizes of up to 120 cm and mature around 60–70 cm (Cooper et al., 2007). Females are able to reproduce when they reach about 2 feet in length and 9 years old. They spawn in the winter in deep water near the ocean floor when females release about 60,000 to 80,000 eggs, and males fertilize them as they swim past (broadcast spawning). Although Greenland turbot is a flatfish, it is not uncommon for this species to be found in the water column (Merrett & Haedrich, 1997; Vollen & Albert, 2008). Unlike most flatfish, their left eye does not fully migrate to one side which provides a wider range of vision, they have well-developed muscles on both their dorsal and ventral sides (Alton et al., 1988), and their blind side is colored (Mecklenburg et al., 2002). These traits all suggest that this species is not confined to a benthic lifestyle. Additionally, the diet of Greenland turbot in the Bering Sea is dominated by walleye pollock, unidentified fish, and squid

(Bryan et al., 2018). In general, Greenland turbot occupy their maximal depths during January and February, and their shallowest depths from July to September. Greenland turbot also exhibit diel vertical migration and female Greenland turbot appear to prefer the Bering Sea shelf, whereas males do not (Siwicke & Coutré, 2020).

Stock Assessment

BSAI Greenland turbot is assessed biennially. During odd years, an executive summary is presented with recommendations of harvest levels for the next two years for this species. A statistical catch-at-age model configured in Stock Synthesis 3 (Methot & Wetzel, 2013) is used as the primary assessment tool for BSAI Greenland turbot, which qualifies as a Tier 3 stock. The assessment model is not run during an off-cycle year, but the projection model is updated with new catch information. This incorporates the most current catch information without re-estimating model parameters and biological reference points (Bryan et al., 2021).

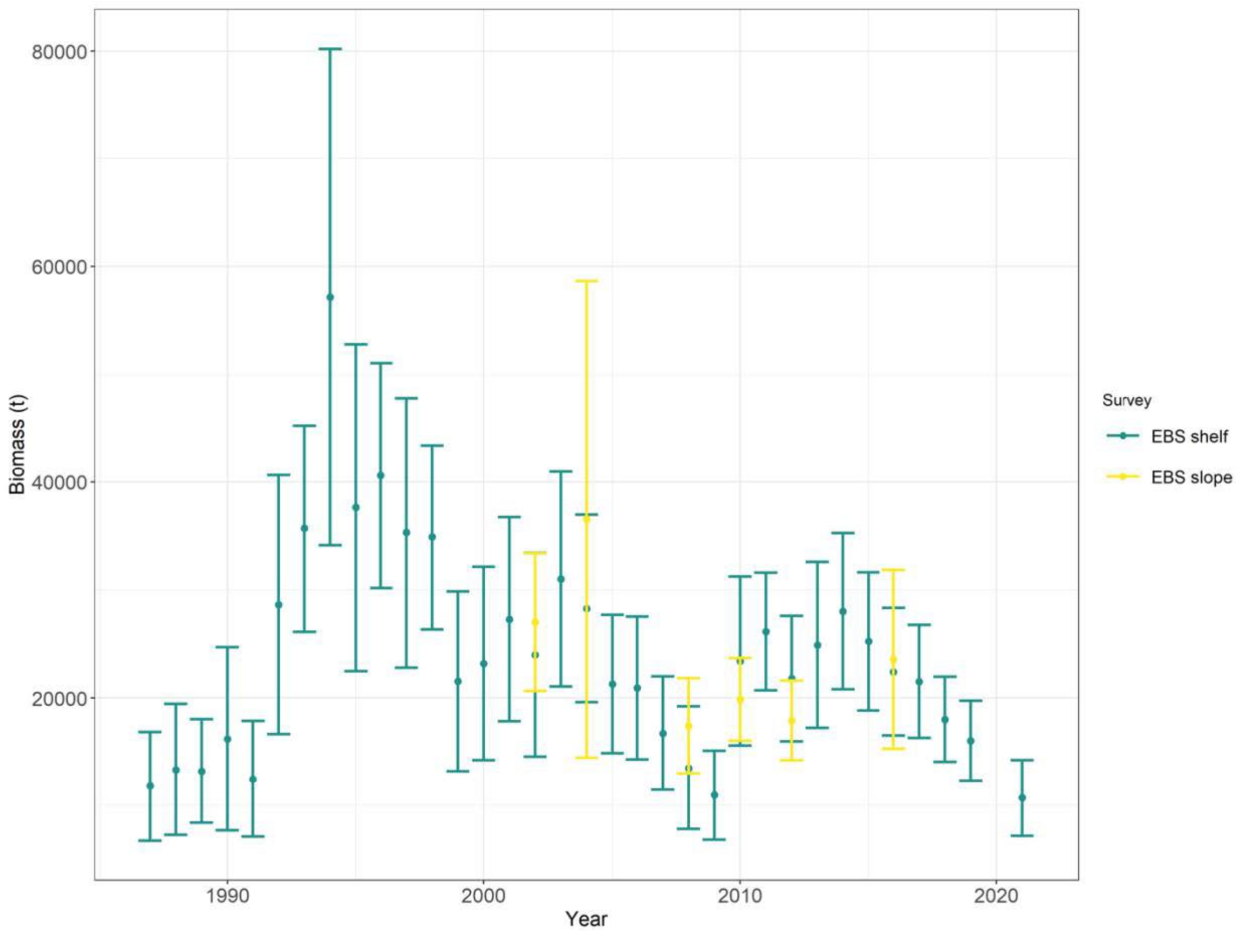


Figure 5-1 Biomass estimates from the Eastern Bering Sea shelf and slope bottom trawl surveys. The shelf survey was not conducted in 2020 due to the pandemic

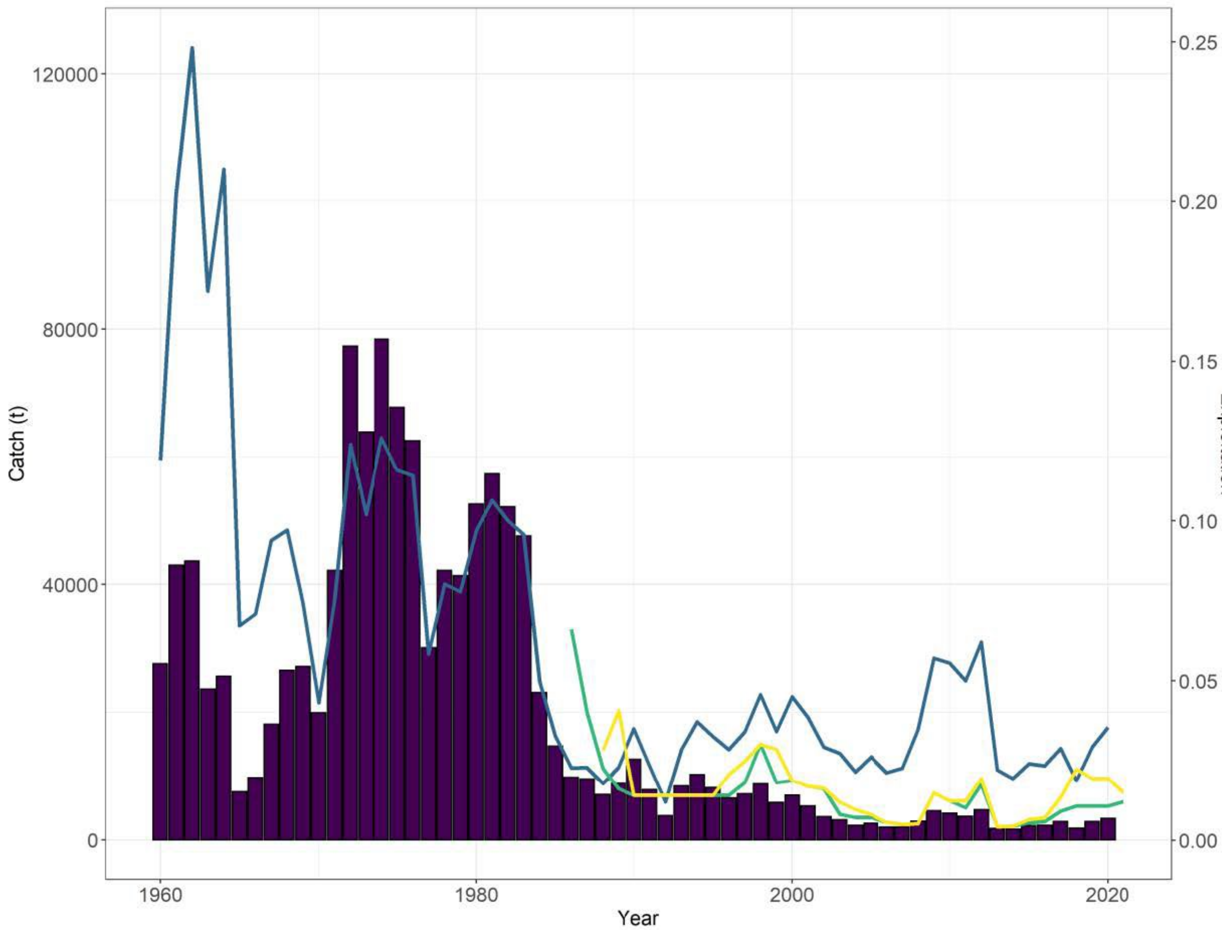


Figure 5-2 Time series of catch in tons (purple bars) and exploitation rate (catch/total biomass, blue line), annual ABC (yellow line, start year = 1988), and annual TAC (green line, start year = 1986)

Fishery

The BS Greenland turbot fishery is more fully described in Section 3 of this document. Historical data on Greenland turbot catch by gear sector dating back to 1977 is available in the most recent SAFE report for Greenland turbot (see Table 5.1 in Bryan et al. 2021, p.5). That table, which is not reproduced here, shows the changing nature of the Greenland turbot fishery in terms of biomass, catch limits, and participation by gear sector. As noted in Section 3, the Greenland turbot stock was at much higher levels in the 1970s and 1980s. The ABC peaked at 90,000 mt in 1979 and was only below 20,000 mt once (1988) prior to 1990 when the ABC fell from 20,300 mt to 7,000 mt. Total catch (including discards) was never less than 23,000 mt from 1977 to 1984. Until the early 1990s, total catch was dominated by the trawl sector. Then, from 1992 through 2007 the non-trawl sector caught more Greenland turbot in every year except one. The trawl sector's catch rebounded around the time that A80 Program was implemented in 2008. Catch by the HAL CP (FLC) and trawl (A80) sectors was roughly equivalent – to within 100 to 500 mt – from 2010 through 2016. Catch by non-trawl CPs has been substantially lower since 2017.

5.2.2. Effects of the Alternatives

Alternative 1

The effects of the Greenland turbot fishery on the Greenland turbot stock is assessed biennially in the BSAI SAFE report (NPFMC 2021), the Greenland turbot stock assessment (Bryan et al., 2021) and was also evaluated in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). Table 5-2 describes the criteria used to determine whether the impacts on target fish stocks are likely to be significant. The effects of the Greenland turbot fishery on fish that are caught incidentally have been comprehensively analyzed in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). These analyses concluded that under the status quo, neither the level of mortality nor the spatial and temporal impacts of fishing on fish species or prey availability are likely to jeopardize the sustainability of the target and ecosystem component fish populations. As a result, impacts on Greenland turbot under Alternative 1 are determined not to be significant.

Table 5-2 Criteria used to determine significance of effects on target groundfish stocks

Effect	Criteria			
	Significantly Negative	**Insignificant**	**Significantly Positive**	**Unknown**
Fishing mortality	Changes in fishing mortality are expected to jeopardize the ability of the stock to sustain itself at or above its MSST (minimum stock size threshold)	Changes in fishing mortality are expected to maintain the stock's ability to sustain itself above MSST	Changes in fishing mortality are expected to enhance the stock's ability to sustain itself at or above its MSST	Magnitude and/or direction of effects are unknown
Stock Biomass: potential for increasing and reducing stock size	Reasonably expected to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Reasonably expected not to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Action allows the stock to return to its unfished biomass.	Magnitude and/or direction of effects are unknown
Spatial or temporal distribution	Reasonably expected to adversely affect the distribution of harvested stocks either spatially or temporally such that it jeopardizes the ability of the stock to sustain itself.	Unlikely to affect the distribution of harvested stocks either spatially or temporally such that it has an effect on the ability of the stock to sustain itself.	Reasonably expected to positively affect the harvested stocks through spatial or temporal increases in abundance such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown

<u>Alternative 2</u>

Alternative 2 proposes a regulatory change to allow the use of longline pot gear when directed fishing for Greenland turbot in the BS. The BS Greenland turbot fishery has not been fully executed in recent years (see Section 3.1), likely due in part due to whale depredation (Section 3.4). This action could restore fishery participation and allow for a more fully utilized TAC, closer to the levels that were observed prior to 2018 (see Table 3-1). A substantial increase in fishery participation by non-historic users is not anticipated but is also not prohibited by this action.

The Greenland turbot fishery would remain constrained by existing regulations concerning the location and timing of the fishery, PSC and bycatch limits, and all other accountability measures currently in place so increase in vessel participation would be de minimis for the Greenland turbot stock. Similarly, it is not expected that the fishing footprint for the harvest of Greenland turbot would change under Alternative 2. Some Greenland turbot fishery participants have indicated to the analysts that they do not intend to alter fishing locations as result of a switch from a HAL to longline pot gear, but also noted that any new gear implementation entails a learning curve for vessel operators.[36] It is reasonable to expect that fishing locations will remain largely the same because the most productive place to fish for market-size Greenland turbot is along the Bering Sea slope.

As described in Section 5.4 – and in data previously shown in Section 3.4 – it is understood that whales (in particular, resident killer whales in the BSAI) prey on Greenland turbot in the BS HAL fishery. Greenland turbot that are captured on hooks that lie on the bottom of the ocean floor are vulnerable to

[36] J. Peterson. 2022. Personal communication; J. Armstrong. 2022. Personal communication.

whale depredation. Whales can completely remove or damage Greenland turbot before it is retrieved. Some depredation is obvious, such as when a crew retrieves a longline with hooks that contain only lips or torn, punctured fish remnants. Whales have also been observed pulling Greenland turbot from longline gear as it is nearing the surface. In addition, some depredation on HAL gear may go unobserved, and thus this source of removals is not directly included in the Greenland turbot stock assessment. Pot gear is an effective gear for minimizing depredation because it is generally assumed that whales cannot remove or damage Greenland turbot enclosed in a pot when the gear is soaking. Thus, there may be some level of decreased Greenland turbot mortality as some harvest of Greenland turbot shifts to pot gear and whales are less likely to depredate on these fish.

A large increase in participation does not seem likely given that the TAC was not fully utilized during the relatively stable period of participation that ended around 2017 (see discussion in Section 4.3). However, if longline pot gear proves to be an effective tool then it is conceivable that participation from within the FLC fleet might rebound and other non-trawl CPs might join opportunistically. Because the Greenland turbot fishery is a relatively small fishery in terms of TAC, a substantial increase in the number of CP participants could dilute the pool of available fish to such a point that it would not be economical for new vessels to participate. Presuming that the intent of the considered action is to restore fishery participation to the recent historical level, a probable scenario of directed fishery participation lies somewhere between average historical participation (roughly 4 vessels) and the greatest number of vessels to have participated in a single year (9 vessels). Conservatively assuming a scenario of nine vessels allows analysts to visualize what would likely be the greatest level of impact under Alternative 2. The analysts offer that the more likely scenario in the near-term is closer to four vessels due to current market conditions (Section 3.7) and the relatively small part of the non-trawl CP sector's total fishing portfolio that Greenland turbot has historically played (Section 3.3.3). That said, the initial TAC for BS non-CDQ Greenland turbot increased in 2022 and is approaching the level of the years in which there were more non-trawl vessels targeting the species (Table 3-1; 2010 through 2012).

As noted in Section 3.3, directed fishing for Greenland turbot in the BS and AI is authorized from May 1 through December 31 but vessels that target the species have typically done so between June and August. The SAFE report notes that the recent historical timing – prior to the practical end of non-trawl directed turbot fishing in 2021 – was at least partly based on whale depredation avoidance. The reader should keep in mind that historical trends in the timing of directed non-trawl turbot fishing are derived from a small number of vessels whose individual circumstances may vary from year to year for reasons unrelated to whale depredation. Moreover, the ability of killer whales to learn fishing patterns over time limits the utility of basing future avoidance techniques on past practices. Nevertheless, the season set out in regulations would not change under Alternative 2, but it is possible that Greenland turbot fishing effort could be spread more evenly over the season if whale depredation becomes less of a determining factor. Another possible timing outcome could be a shift in non-trawl turbot fishing to earlier in the year to minimize the need to handle pot gear on-deck in the late summer and early fall as weather becomes less favorable. Yet another possible outcome is that the timing of the fishery becomes completely decoupled from whale behavior and is instead determined by individual vessel fishing plans and the relative attractiveness of the turbot fishery relative to others that the relevant set of participants can access.

If historical non-trawl vessel participation levels rebound under Alternative 2 and the TAC is more fully utilized, the Greenland turbot fishery would still be constrained by annually determined catch limits. Though it is not possible to project how fishing effort may change from year to year under Alternative 2, it is reasonable to assume that harvest would not increase to a level that jeopardizes the continued sustainability of the Greenland turbot stock. The Greenland turbot stock is, and will continue to be, managed as a tier 3 species. This status provides a harvest control and other mechanisms to account for changing characteristics of the stock such as changes in biomass and spawning stock biomass. The Greenland turbot stock is evaluated biennially through a rigorous scientific process and any future concerns in the stock structure resulting from Alternative 2 would be addressed. Given this, it is unlikely that actions under Alternative 2 will jeopardize the continued sustainability of the Greenland turbot stock.

Effects of Aggregate Past, Present, and Reasonably Foreseeable Actions on Target Species

Considering the potential impacts of the proposed action under the alternatives evaluated in this analysis together with the effects of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of reasonably foreseeable future actions, the overall potential impacts of the proposed action are determined to be not significant.

5.3. Non-target Species

5.3.1. Status

Groundfish species that are managed under the BSAI FMP and caught incidentally in the Greenland turbot HAL fishery are listed in Table 3-6. Section 3.3.5 describes in detail incidental catch in the Greenland turbot fishery and similar fisheries in terms of location and depth. Table 3-6 provides information on the magnitude of incidental catch. The predominant species that are caught incidentally in the Greenland turbot HAL fishery are Grenadier, skates, sablefish and Pacific Cod. None of these species are listed as overfished or that overfishing is occurring.[37] The only stocks that are currently designated as overfished in Alaska Bering Sea snow crab (Chionoecetes opilio), Pribilof Islands blue king crab (Paralithodes platypus) and Saint Matthew Islands blue king crab bairdi Tanner crab and blue king crab, and there are no fish or crab stocks in Alaska that are experiencing overfishing. Table 3-6 does show that some incidental catch of bairdi Tanner crab is possible, but is not common. Catch of bairdi Tanner crab is combined with catch of RKC and GKC and totals less than 0.1% of the total catch (Table 3-6). Further information on these groundfish species and, for some, their directed fisheries can be found in the most recent BSAI Groundfish SAFE Reports available from: https://apps-afsc.fisheries.noaa.gov/refm/docs/2021/BSAIintro.pdf.

5.3.2. Effects of the Alternatives

Alternative 1

The effects of the Greenland turbot fishery on the Greenland turbot stock is assessed biennially in the BSAI SAFE report (NPFMC 2021a), the Greenland turbot assessment (Bryan et al. 2021) and was also evaluated in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). Table 5-3 describes the criteria used to determine whether the impacts on target fish stocks are likely to be significant. The effects of the Greenland turbot fishery on fish that are caught incidentally have been comprehensively analyzed in the annually BSAI SAFE reports (NPFMC 2021a) and was also evaluated in the Groundfish PSEIS (NMFS 2004), and Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). These analyses concluded that under the status quo, neither the level of mortality nor the spatial and temporal impacts of fishing on fish species or prey availability are likely to jeopardize the sustainability of the target and ecosystem component fish populations. As a result, impacts on incidental catch of groundfish under Alternative 1 are determined not to be significant.

[37] NMFS status of stocks

Table 5-3 Criteria used to estimate the significance of impacts on incidental catch

No impact	No incidental take of the prohibited species in question.
Adverse impact	There are incidental takes of the prohibited species in question
Beneficial impact	Natural at-sea mortality of the prohibited species in question would be reduced — perhaps by the harvest of a predator or by the harvest of a species that competes for prey.
Significantly adverse impact	An action that diminishes protections afforded to prohibited species in the groundfish fisheries.
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the prohibited species, and significantly beneficial impacts are not defined for these species.
Unknown impact	Not applicable

Alternative 2

Alternative 2 proposes a regulatory change to allow the use of longline pot gear when directed fishing for Greenland turbot in the Bering Sea subarea. The BS Greenland turbot fishery has not been fully prosecuted in recent years, in part due to whale depredation. This considered action is expected to restore fishery participation and allow for a more fully utilized TAC. A significant increase in fishery participation from non-historic users is not anticipated but is not prohibited by this action. As stated in Section 5.2.2, no matter what amount of change in participation occurs, the Greenland turbot fishery would continue to be managed under regulations that constrain the location and timing of the fishery, certain types of PSC and bycatch limits, and all other accountability measures currently in place.

Based on the comparison of catch between gear types in the western portion of the Bering Sea, the analysts can make presumptions about how a switch from HAL to longline pot gear might affect incidental catch of groundfish. The sablefish pot fishery could serve as the best proxy for what a Greenland turbot longline pot fishery could expect to catch, based on the depth at which these two fisheries occur and similar pot configurations. Aside from halibut (22.2% of total average catch) – which were likely co-targeted for IFQ retention – the next highest ranking non-target species in sablefish pots were grenadier (2.0%), arrowtooth flounder (1.1%), and Pacific cod (0.6%) – refer to Table 3-6. Unfortunately, the sample size of sablefish pot fishing in the relevant parts of the western BS is relatively small. (Note that under the Option to Alternative 2, Greenland turbot pots could have a larger tunnel opening than a vessel fishing sablefish IFQ if that vessel does not have halibut IFQ onboard.) In the most recent years of HAL Greenland turbot fishing, grenadier (46.0%), skates (6.0%), sablefish (3.6%) and Pacific Cod (2.4%) were the predominant incidental catch species in that fishery.

It is likely that introducing longline pot gear to the turbot fishery would reduce the incidental catch of grenadier and skates, which appear less prevalent in pots. It is also likely that the incidence of Pacific cod in the Greenland turbot fishery will remain a presence but a relatively small one due to the depth at which turbot are targeted (refer also to Section 3.3.5.1.1).

The effect of Alternative 2 on incidental catch of sablefish is unclear. Sablefish are targeted at similar depths to Greenland turbot, and the proportion of sablefish incidental catch was higher in the turbot HAL fishery than in Pacific cod fisheries (Table 3-6). However, it is unknown whether the use of pot gear with escape rings will mitigate some sablefish bycatch in ways that are not possible when fishing with hooks. It should be noted that escape rings are not currently required in regulation, but most manufactured pots have them.

The effect of Alternative 2 on incidental catch of halibut is also unclear. Any vessel that possesses unused halibut IFQ onboard would be required to retain the halibut if the IFQ season is open. In terms of gross incidental catch (Table 3-6), pots caught fewer halibut than HAL gear in the western BS Pacific cod target fishery – though both were at low proportions of total average catch. In the sablefish target, pots caught more halibut than HAL but sample sizes in the relevant area were small and co-targeting of IFQ species may be a confounding factor. In the Greenland turbot HAL fishery, halibut was encountered at a much lower rate than sablefish, perhaps signaling the significant difference in the depth fished. As noted in Section 3.2, only one FLC vessel retained IFQ halibut during the analyzed period; whether that vessel targeted Greenland turbot cannot be reported due to confidentiality. The same section notes that only one active non-FLC CP with a BS non-trawl LLP endorsement has retained halibut. Table 3-7 compared halibut PSC mortality in all western BS non-IFQ fisheries for HAL and pot gear and found that halibut PSC mortality was significantly lower in pots, with the important caveat that the pot sample size was small. The notion that halibut caught incidentally in pot gear has a lower mortality rate than halibut caught on hook gear seems appealing on its surface, as injury from hooks, gaffing, or the roller at the rail would not occur. That said, halibut caught in pots are currently assessed a higher DMR (33%) than HAL-caught halibut (10%). Section 3.3.5.1 discussed some of the methodological challenges associated with establishing a halibut DMR for pot gear. The analysts must also consider the possibility that halibut caught in pot gear are handled differently than those caught on HAL gear, or that they could spend more time captured in a pot on the seafloor where they are exposed to sea lice or other factors that affect survival upon release. The latter point is difficult to assess because pot soak times are not well-integrated into the available data and the relative pot soak time for a yet-to-be-established longline pot turbot fishery is a data point that does not exist.

For crab species, examination of bycatch in other pot fisheries shows that golden king crab would have the highest likelihood of interacting with a Greenland turbot longline pot fishery but that overall bycatch would not be expected to be high (Figure 3-5; Table 3-6). Other species of crab, such as bairdi Tanner crab, opilio Tanner crab, and red king crab generally occur shallower and closer to the mainland than where the Greenland turbot fishery would operate and it is not likely that high numbers of crab would interact with the BS turbot fishery. It is possible that blue king crab could interact with the turbot fishery but unlikely based on the fact that blue king crab only appear in Table 3-6 at Pacific cod target depths. It is difficult to assess this using mapped data from the most recent year because no blue king crab were caught in groundfish pots in 2021 (Figure 3-5). At the very least, there is no strong indication that catch of blue king crab would increase relative to recent historical levels.

Historical data by which to assess whether increasing the number of groundfish (turbot) pots in the western portion of the BS would increase instances or crab mishandling, or how that might be accounted for in fishery mortality estimates. One major factor in near-term mortality of crab that are handled and discarded is air temperature, and the timing of the Greenland turbot fishery aligns with relatively warm temperatures that are less of a mortality threat for crab. Also, it is unknown whether a Greenland turbot longline pot fishery will adopt the relatively new collapsible or "slinky" pot design and whether those pots will perform well at the depths and ocean conditions where turbot are found in the western part of the BS FMP area. As it relates to crab bycatch in those conditions, it is unknown whether slinky pots will fish differently for crab and whether those interactions would result in different rates of injury and, thus, successful careful release.

While it is not possible to project how fishing effort may change from year to year under Alternative 2, using methods described above, it is reasonable to assume that effort is not likely to increase to a level that would jeopardize the continued sustainability of groundfish, halibut, and crab species. As such, if actions under Alternative 2 were to result in greater incidental catch of those species, certain fisheries or areas would still be closed to directed fishing or be placed on non-retention status once existing limits are reached. NMFS's inseason management authority would remain in place to prevent impacts on groundfish or other stocks beyond the impacts that have already been evaluated in the Groundfish PSEIS (NMFS 2004) and the Harvest Specifications Environmental Assessment (NMFS 2007).

Effects of Aggregate Past, Present, and Reasonably Foreseeable Actions on Non-Target Species

Considering the direct and indirect impacts of the proposed action when added to 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 aggregate impacts of the proposed action are determined to be not significant.

5.4. Marine Mammals

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. The National Marine Fisheries Service (NMFS) maintains management authority for all marine mammal species in Alaska, while 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, the Endangered Species Act, and the Fur Seal Act are the relevant statutes for managing marine mammal interactions with human activities, including commercial fishing operations. The Marine Mammal Protection Act (MMPA) was enacted in 1972 with the ideal 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% or below the Potential Biological Removal level (PBR) of that marine mammal stock (69 FR 43338, July 20, 2004). Likewise, the Endangered Species Act (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 any habitat of endangered or threatened species, which is then 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.” 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. 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 (WDPS Steller sea lions, northern fur seals, bearded seals, ringed seals, Cook Inlet beluga whales, AT1 Transient killer whales, harbor porpoise, sperm whales, humpback whales (Western distinct population segment (DPS) and Mexico DPS), 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 DPSs 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.'' 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
    - critical habitat listing
    - 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 can be found on the NMFS website[38]. 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, 2013, 2014a, 2014c). 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, harbor porpoise, AT1 killer whales and Pacific walrus.

[38] https://www.fisheries.noaa.gov/species-directory/threatened-endangered?title=&species_category=any&species_status=any&regions=1000001106&items_per_page=25&sort=

Table 5-4 Marine mammals that are known to occur in the Bering Sea

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	None	Met
	Ringed seal *(Phoca hispida)*	Alaska [b]	Threatened, Depleted, Strategic	Met
	Pacific Walrus *(Odobenus rosmarus divergens)*	Alaska	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	Not Met
		Offshore***	None	Met
	Pacific White-sided dolphin (*Lagenorhynchus obliquidens*)	North Pacific	None	Unknown*
	Harbor porpoise *(Phocoena phoecena)*	Bering Sea	None	Unknown*
	Dall's porpoise (*Phocoenoides dalli*)	Alaska	None	Unknown*
	Beluga whale *(Delphinapterus leucas)*	Beaufort Sea	None	Met
		Eastern Chukchi Sea	None	Met
		Eastern Bering Sea	Strategic	Met
		Bristol Bay	None	Met
	Baird's beaked whale (*Berardius bairdii*)	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 Hawaii DPS: None	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
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 2021; Carretta et al 2021; List of Fisheries for 2021 (January 14, 2021, 86 FR 3028)
* 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, rather than in the Alaska, SAR.
‡ Includes the Western North Pacific and Hawaii DPS's
‡‡ Includes the Mexico and Hawaii DPS's.
[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 finalized in April 2022 (87 FR 19180).
[b] Ringed seals were listed as threatened under the ESA in December 2012. Critical habitat for ringed seals was finalized in April 2022 (87 FR 19232).

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 2021). 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 Greenland turbot fishery.

There are two primary means in which marine mammals could be affected by the Greenland turbot fishery, by interacting with the gear used to fish for Greenland turbot or from a reduction in prey as a result of the harvest of Greenland turbot. The following paragraphs describe the reasoning behind which species were not expected to be affected by the alternatives and therefore were not analyzed. Not all species listed in Table 5-4 are likely to be affected by this action, and any potential impacts that do occur are expected to be minimal due to the allowance of longline pot gear in the Greenland turbot fishery. Many of these species do not generally overlap with the action area or the fishery, or they are not known to directly interact with HAL and pot gear. Additionally, the effects of this action expected on certain marine mammal species from Table 5-4 have been considered in previous NEPA analyses, which are outlined here.

NMFS has completed ESA section 7 consultations for the Federal BSAI and GOA groundfish fisheries for all ESA-listed species, either individually or in groups. The last programmatic ESA section 7 consultation on the effects of the groundfish fisheries, as authorized by the BSAI groundfish FMP, was initiated in 2006 (NMFS 2006) and completed in 2010 (NMFS 2010). On June 21, 2006, NMFS Alaska Region Protected Resources Division agreed with the determination by the Sustainable Fisheries Division that the groundfish fisheries were not likely to adversely affect the following listed marine mammal species or designated critical habitat: blue whale, North Pacific right whale or designated North Pacific right whale critical habitat, sei whale, or fin whale (NMFS 2006).

The 2010 biological opinion (NMFS 2010) concluded that the BSAI and GOA groundfish fisheries were not likely to jeopardize the continued existence of the eastern DPS of Steller sea lion, humpback whales, sperm whales or fin whales. However, the 2010 biological opinion also concluded that NMFS could not ensure that the BSAI and GOA groundfish fisheries were not likely to jeopardize the continued existence of the Steller sea lion western DPS of (WDPS) or adversely modify its designated critical habitat. Additional protection measures to conserve prey for Steller sea lions in the western and central Aleutian Islands to ensure that the fisheries were not likely to jeopardize the continued existence of the Steller sea lion WDPS or adversely modify its designated critical habitat were implemented in the fisheries in 2011 (76 FR 2027, January 12, 2011) and amended again in 2015 (79 FR 70286, November 25, 2014) following the completion of a biological opinion on 2015 management measures (NMFS 2014b).

The USFWS listed the southwest Alaska DPS of the northern sea otter (northern sea otter SWDPS) as threatened under the ESA in 2005. In 2013, NMFS and the USFWS consulted on the effects of the BSAI and GOA groundfish fisheries on the northern sea otter SWDPS and determined that the BSAI and GOA groundfish fisheries were not likely to adversely affect the endangered southwest Alaska DPS of the northern sea otter or designated critical habitat (NMFS 2013).

NMFS designated critical habitat for the North Pacific right whale on April 8, 2008 (73 FR 19000; Figure 3-3) and concluded on April 30, 2008 (NMFS 2008) that fisheries in the BSAI and GOA were not likely to adversely affect the right whale or its critical habitat. NMFS reached this conclusion because the density of fishing effort in the areas comprising North Pacific right whale critical habitat is low compared with regions outside Alaska where right whale interactions have occurred, the low numbers of right whales in Alaska, and that most of the right whales appear to migrate from Alaska waters seasonally (though a few may come early or stay late or even over-winter) (Muto et al. 2021).

Of the marine mammals that occur in the BS (Table 5-4) only 12 have the potential to overlap spatially and temporally with the Greenland turbot fishery. Of these 12 only one, the killer whale, is listed as a marine mammal that has interacted with the HAL fishery on the list of fisheries (LOF) (87 FR 23122, April 19, 2022). If the pool of potentially affected marine mammals is expanded to include marine mammals that have interacted with *any* pot fishery in the BS *and* that overlap with the Greenland turbot fishery, sperm whales and humpback whales can also be included. The importance of Greenland turbot as a prey item for marine mammals was also considered, however none of the marine mammals that occur in Alaska preferentially target Greenland turbot and only a few species opportunistically predate on Greenland turbot. As such, no additional marine mammal species are included for further analysis based on prey availability. The remainder of this section will focus specifically on the alternatives proposed by this action and how they may affect killer, sperm and humpback whales.

Table 5-5 Status of cetacean stocks potentially affected by the action

Cetacean Stock/DPS	Population Trends	Distribution in Action Area
Killer whale - Eastern North Pacific Alaska resident stock	The minimum population estimate (NMIN) for the Alaska Resident stock of killer whales based on photo-identification studies conducted between 2005-2009 is 2,084 animals. Data from Matkin et al. (2003) indicate that the component of the Alaska Resident stock that summers in the Prince William Sound and Kenai Fjords area is increasing. With the exception of AB pod, which declined drastically after the Exxon Valdez oil spill and has not yet recovered, the component of the Alaska Resident stock in the Prince William Sound and Kenai Fjords area increased 3.2% (95% CI = 1.94 to 4.36%) per year from 1990 to 2005 (Matkin et al. 2008).	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.
Humpback whale - Western North Pacific†	Using the SPLASH population estimate (N) of 1,107 and an assumed conservative CV(N) of 0.300 would result in an Nmin for this humpback whale stock of 865. The SPLASH abundance estimate for Asia/2nd western N Pacific population represents a 6.7% annual rate of increase over the 1991-1993 abundance estimate (Calambokidis et al. 2008). However, the 1991-1993 estimate was for Ogasawara and Okinawa breeding grounds only, whereas the SPLASH estimate includes the Philippines, so the annual rate of increase is biased high to an unknown degree	The winter distribution of humpback whales in the Western stock includes several island chains in the western North Pacific, including the Ogasawara Islands, the Okinawa region, and in the Philippines. Humpback whales are reported to also occur in the South China Sea north of the Philippines near Taiwan, and east of Ogasawara in the Marshall and Mariana Islands. Humpback whales are increasingly seen north of the Bering Strait into the northeastern Chukchi Sea, with some indication that more humpback whales are seen on the Russian side north of the Bering Strait. A large area of overlap with the western North Pacific stock in the summer occurs in Southcentral Alaska and along the Aleutian Islands to about Umnak Island, as well as in Southwestern Alaska and Bristol Bay to approximately Cape Newenham.
Humpback whale - Central North Pacific†	The best minimum population estimate for the population is 7,891. Overall, the abundance trend is increasing and from SPLASH estimates 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 (Calambokidis et al. 2008). Reliable trend information for the Mexico DPS, part of which constitutes a part of the Central North Pacific stock, is not available at this time due to variability in the estimates from the early 1990s. A 6.9% increase might be indicated across the entire Mexico DPS. However the Mexico DPS is listed as threatened due to a low abundance estimate and the ongoing threat of entanglement in fishing gear.	The winter distribution of the Central North Pacific stock is primarily in the Hawaiian archipelago and a smaller percentage along the Pacific Mexican coast of mainland Mexico, the Baja Peninsula, and the Revillagigedos Islands. In summer, the majority of whales from the Central North Pacific stock are found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska/northern British Columbia. A large area of overlap with the western North Pacific stock in the summer occurs in Southcentral Alaska and along the Aleutian Islands to about Umnak Island, as well as in Southwestern Alaska and Bristol Bay to approximately Cape Newenham.
Sperm whale – North Pacific	Abundance and population trends in Alaska waters are unknown.	The sperm whale is one of the most widely distributed marine mammal species. In the North Pacific, sperm whales are distributed widely, with the northernmost boundary extending from Cape Navarin (62°N) to the Pribilof Islands and may move to higher latitudes in summer and to lower latitudes in winter. Sperm whales are found year-round in the Gulf of Alaska, although they appear to be more common in summer than in winter. Female sperm whales have been found above 50°N, in the western Bering Sea and in the western Aleutian Islands with movements into the Gulf of Alaska and western Aleutians. Males are found in the summer in the Gulf of Alaska, Bering Sea, and waters around the Aleutian Islands. Sperm whales are known to inhabit waters 600 m or more depth.

Sources: Muto et al 2021
† Critical habitat for humpback whales was established on April 21, 2021 (86 FR 21082).

Killer Whale Stock Status

Alaska resident and transient killer whales are found from southeastern Alaska to the Aleutian Islands and Bering Sea (Figure 5-3); these stocks overlap with the action area. Resident killer whales in Western Alaska show strong long-term associations consistent with a matrilineal pattern and have been shown to exhibit a high degree of site fidelity over time, with ranges generally limited to around 200 km (Ford and Ellis 1999; Forney and Wade 2006). Resident whales are those most likely to be involved in fishery interactions since these whales are known to be fish eaters. Transient killer whales generally feed on marine mammals. Fisheries observers report that large groups of killer whales in the Bering Sea follow vessels for days at a time, actively consuming the processing waste, particularly on trawl vessels (NMFS AFSC, Fishery Observer Program, unpubl. data). In general, the Alaska resident stock's primary prey consists of salmon, but as killer whales are opportunistic feeders, they have the ability to consume a wide variety of fish species.

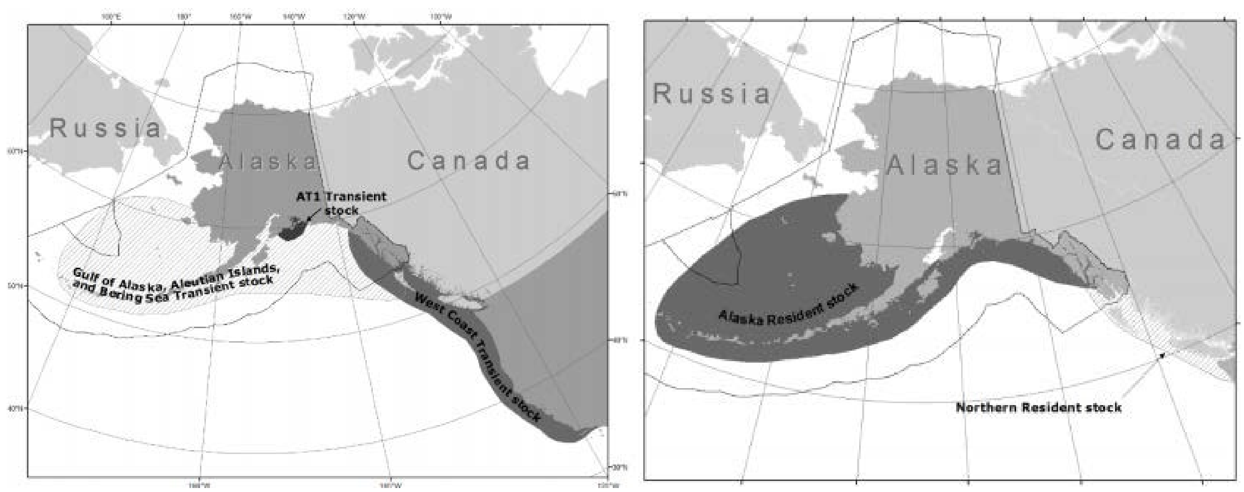


Figure 5-3 Approximate distribution of resident and transient killer whales in the eastern North Pacific

The Alaska Resident stock includes killer whales from southeastern Alaska to the Aleutian Islands and Bering Sea. Several abundance studies have been conducted for the Alaska resident stock. Combining the counts of known resident whales photographed during these studies gives a minimum number of 2,347 (Southeast Alaska + Prince William Sound + Western Alaska; 121 + 751 + 1,475) killer whales belonging to the Alaska Resident stock (Muto et al. 2021). Data from 2003 indicate that the component of the Alaska Resident stock that summers in the Prince William Sound and Kenai Fjords area is increasing (Matkin et al., 2003). With the exception of AB pod, which declined drastically after the *Exxon Valdez* oil spill and has not yet recovered, the component of the Alaska Resident stock in the Prince William Sound and Kenai Fjords area increased 3.2% (95% CI = 1.94 to 4.36%) per year from 1990 to 2005 (Matkin et al. 2008). Although the current minimum population count of 2,084 is higher than the last population count of 1,123, examination of only count data does not provide a direct indication of the net recruitment into the population. At present, reliable data on trends in population abundance for the entire Alaska Resident stock of killer whales are unavailable.

Based on currently available data, a minimum estimate of the mean annual mortality and serious injury rate due to U.S. commercial fisheries for the Eastern North Pacific Alaska Resident stock of killer whales (1 whale) is less than 10% of the PBR (10% of PBR = 2.4) and, therefore, is considered to be insignificant and approaching zero mortality and serious injury rate. A minimum estimate of the total annual level of human-caused mortality and serious injury (1 whale) is not known to exceed the PBR (24). Therefore, the Eastern North Pacific Alaska Resident stock of killer whales is not classified as a strategic stock.

Population trends and status of this stock relative to its Optimum Sustainable Population are currently unknown.

The Alaska Fisheries Science Center's (AFSC) longline survey samples the BS in odd-numbered years. Sampling in that area occurs during the first two weeks of June and covers 16 sampling stations. AFSC staff report that killer whale depredation has been occurring regularly at BS stations for many years, though standardized survey depredation data are only available dating back to 1999 (Figure 5-4). Depredation of survey skates has increased over the analyzed period (1999 – 2021), leveling off around 50% since 2013.

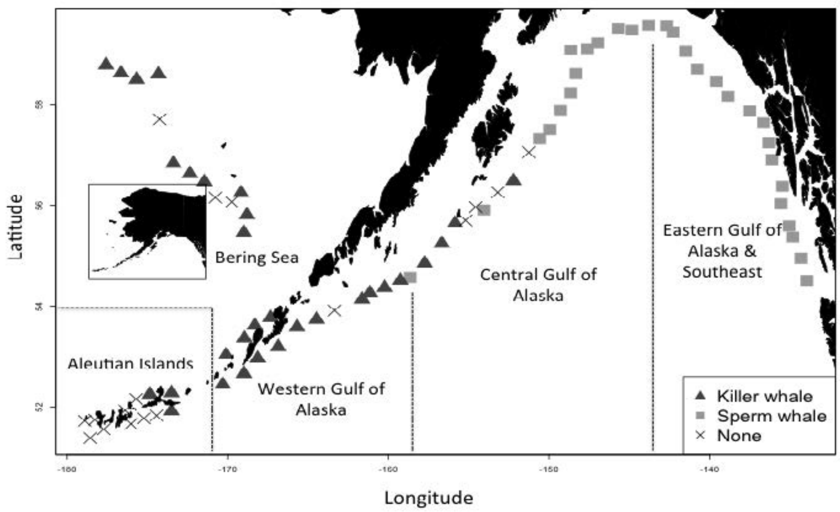


Figure 5-4 Depredation by whale species and management area based on NMFS longline survey, 1999-2011

Depredation by killer whales is common in the Greenland turbot fishery as well (Peterson et al., 2014). In a study conducted by Peterson and Carothers (2013), 87% of longline fishermen surveyed perceived whale depredation as worsening between 1990 and 2010. Killer whale depredation of Greenland turbot occurs more frequently in the BS, than in the AI (Source: NMFS FMA Division). Killer whale depredation in the BSAI occurs where high-value longline fisheries overlap with regions supporting some of the greatest densities of "fish-eating" or resident killer whales in the world (Forney and Wade 2006; Fearnbach et al. 2014), and whales seem to target fishing grounds with higher CPUEs (Peterson and Carothers 2013). Killer whales prey upon several groundfish species that are caught on longline gear in Western Alaska, including sablefish, Greenland turbot, arrowtooth flounder and Pacific halibut (Yano and Dahlheim 1995; Peterson et al. 2013). This reduces fishery catch rates and decreases the accuracy of stock assessments.

In a survey of Alaska longliners carried out by Peterson & Carothers (2013), the majority of respondents (70.7%) that reported interactions with killer whales (primarily western Alaska) estimated that depredation rates exceeded 40% of catch. In 2013, Peterson et al. used NMFS sablefish longline survey data to explore spatial and temporal trends in killer whale depredation and to quantify the effect of killer whale depredation on catches of groundfish species in the BS, AI, and WGOA. When killer whales were present during survey gear retrieval, whales removed an estimated 54% to 72% of sablefish, 41% to 84% of arrowtooth flounder and 73% of Greenland turbot.

Sperm Whale Stock Status

In the North Pacific, sperm whales are distributed widely with males and females concentrated seasonally in the Subtropical Frontal Zone (ca. 28ºN–34ºN) and the Subarctic Frontal Zone (ca. 40ºN–43ºN), with males also concentrated seasonally near the Aleutian Islands and along the Bering Sea shelf edge

(Mizroch and Rice 2013). Sperm whales generally inhabit waters 600m and deeper. While females and young generally stay in tropical and temperate waters, males may be seen during the summer in the Gulf of Alaska, Bering Sea and throughout the Aleutian Islands (ADF&G n.d.), where they feed on the rich biomass of the North Pacific. Sperm whales feed on medium to large-size squids and large demersal and mesopelagic sharks, skates, and fishes, such as sablefish (Rice 1989; Wild et al. 2020). Abundance and populations trends of sperm whales in Alaska waters are unknown. New estimates in the GOA indicate a population size of about 345 sperm whales (Rone et al. 2017), but no information on trend is available because historical estimates of the abundance of sperm whales in the North Pacific are considered unreliable. Sighting surveys conducted by the Alaska Fisheries Science Center's Marine Mammal Laboratory (MML) in the summer months between 2001 and 2010 found sperm whales to be the most frequently sighted large cetacean in the coastal waters around the central and western Aleutian Islands (MML, unpubl. data). Between 2014 and 2018, mortality and serious injury of sperm whales was observed in the Bering Sea/Aleutian Islands halibut longline fishery (one serious injury in 2015, prorated at 0.75), the Aleutian Islands sablefish pot fishery (one mortality in 2018), and the Gulf of Alaska sablefish longline fishery (one serious injury in 2016, prorated at 0.75). The mortality and serious injury was extrapolated to fishery-wide estimates when possible, resulting in a minimum estimated mean annual mortality and serious injury rate of 3.3 sperm whales in U.S. commercial fisheries between 2014 and 2018 (Muto et al., 2021). On the basis of total abundance, current distribution, and regulatory measures that are currently in place, it is unlikely that this stock is in danger of extinction (Muto et al. 2021).

Sperm whale depredation tends to be most prevalent in the Central and Eastern GOA (Figure 5-4). Of the stations sampled by in the AFSC longline survey, all instances of sperm whale depredation in the BSAI have occurred in the Aleutian Islands (NMFS 2010; Hanselman et al. 2018). Sperm whales are not known to depredate in the BS, likely because sperm whales are not known to occur in high concentrations in the BS. Furthermore, from research on sperm whale prey preferences, sperm whales do not appear to preferentially target Greenland turbot as a prey item (Cooper 2007; Flinn et al. 2002; Wild et al. 2020).

Humpback Whale Stock Status

Humpback whales were initially listed in 1969 with the Endangered Species Conservation Act, and maintained the status of endangered when the ESA passed into law in 1973. A Recovery Plan for Humpback whales was also adopted in 1991 (NMFS 1991). On September 8, 2016, NMFS published a final rule that revised the listing of humpback whales under the ESA by removing the original, taxonomic-level species listing, and in its place listing four DPSs as endangered and one DPS as threatened (81 FR 62260). Critical habitat for humpback whales was designated on April 21, 2021 (86 FR 21082) and encompasses areas throughout Alaska (Figure 5-5).

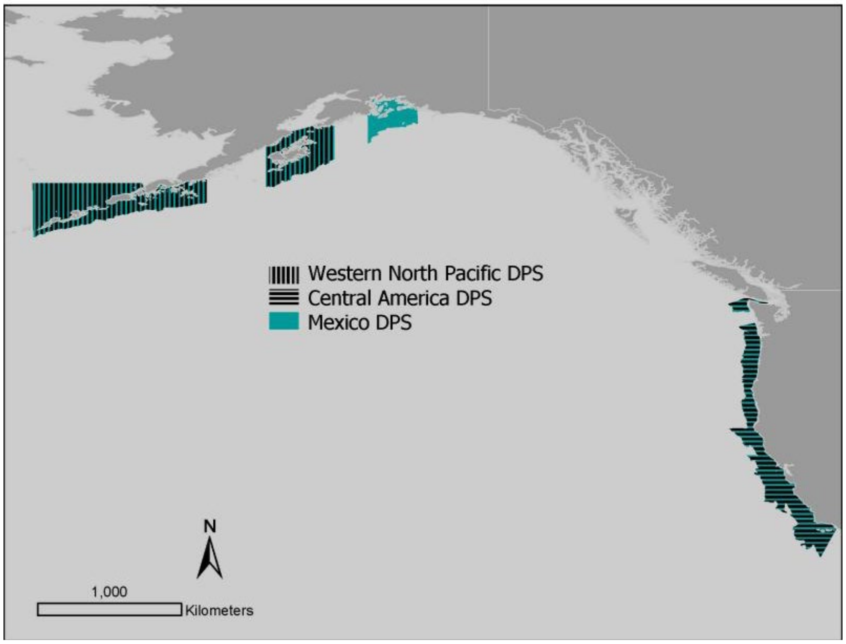


Figure 5-5 Humpback whale critical habitat for the three ESA listed DPSs

The historic summering range for humpback whales in the North Pacific encompasses coastal and inland waters around the Pacific Rim from Point Conception, California, north to the GOA and the Bering Sea, and west along the Aleutian Islands to the Kamchatka Peninsula and into the Sea of Okhotsk. The humpback whale population in much of this range was considerably reduced as a result of intensive commercial exploitation during this century.

Based on an analysis of migration between winter mating/calving areas and summer feeding areas using photo-identification, it was concluded that whales feeding in Alaskan waters belong primarily to the Hawaii DPS (not listed), with small numbers from the Western North Pacific DPS (endangered) and Mexico DPS (threatened) (Wade et al. 2016). For the area that encompasses the Greenland turbot fishery (largely NMFS Areas 521 and 523 as shown in Figure 1-1) humpback whales from the Western North Pacific DPS comprise a majority of the whales present, followed by whales from the Mexico DPS and then the Hawaii DPS (Wade et al. 2016) (Figure 5-6 and Figure 5-7). However, as there is overlap in the feeding range for these three stocks of humpbacks, it is nearly impossible to distinguish an individual from one stock from another.

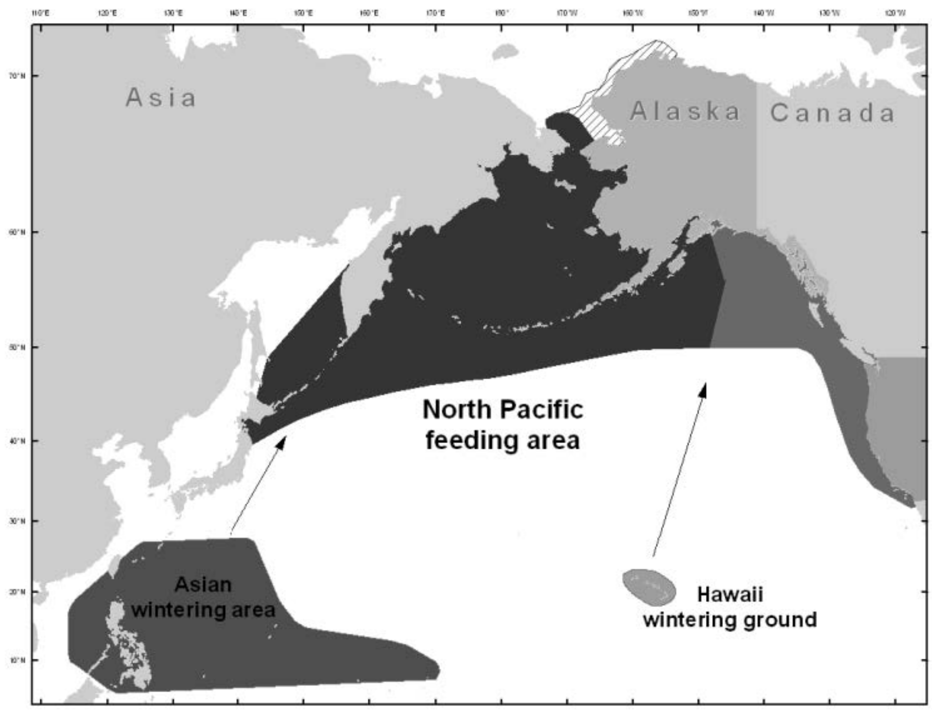


Figure 5-6 Approximate distribution of Western North Pacific humpback whales

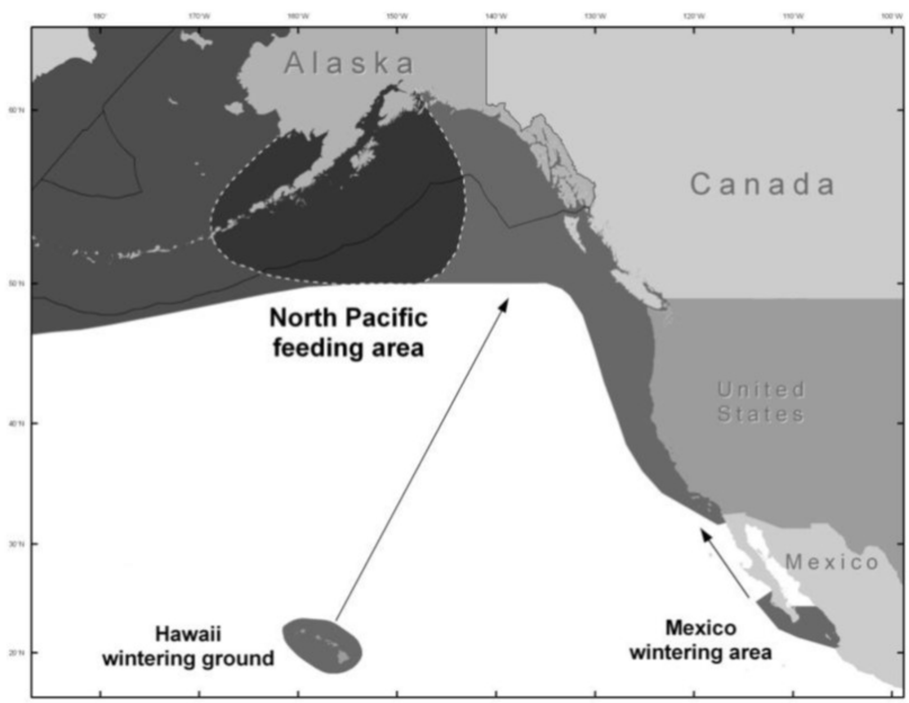


Figure 5-7 Approximate distribution of Central North Pacific humpback whales

These three DPSs of humpback whales migrate to Alaska to feed. While humpbacks may be present at any time of the year in Alaska, they are most prevalent in the summer. Humpback whales forage at the sea surface to depths of ~200m (Goldbogen et al. 2008). Humpback whales primarily feed on euphausiids, such as krill, small forage fish such as herring, capelin and sand lance and occasionally juvenile salmon (Dolphin 1987; Witteveen et al. 2012; Chenoweth et al. 2017). Recent population estimates for humpback whales place the Central North Pacific stock (primarily Hawaii and Mexico DPS) at 7,891 individuals and the Western North Pacific stock (primarily Western North Pacific DPS) at 865 individuals, for a total of 8,756 humpbacks potentially feeding in Alaskan waters (Muto et al. 2019).

NMFS has determined that for humpback whales, the mortality and serious injury incidental to commercial fishing operations will have a negligible impact (60 FR 45399; August 31, 1995). A 'negligible impact' is defined as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through an effect on annual rates of recruitment or survival. Section 7 consultation was completed in 2010 and included issuance of an incidental take statement for humpback whales for commercial fishing operations of an average annual incidental mortality and serious injury in commercial fishery of up to two humpback whales from the Central North Pacific stock and one humpback whale from the Western North Pacific stock per year (NMFS 2010). All humpback whale stocks that range into Alaska have increasing populations (Muto et al. 2019).

5.4.1. Effects on Marine Mammals

Table 5-6 contains the significance criteria for analyzing the effects of the proposed action on marine mammals. Significantly beneficial impacts are not possible with the management of groundfish fisheries as few, if any beneficial impacts to marine mammals are likely with groundfish harvest. Generally, changes to the fisheries do not benefit marine mammals in relation to incidental take, prey availability, and disturbances; changes increase or decrease potential adverse impacts. The only exception to this may be in instances when marine mammals target prey from fishing gear, as described previously in this section. In this example, the prey availability is enhanced for these animals, because they need less energy for foraging. However, that benefit may be offset by adverse effect from an increased potential for entanglement in the gear or swallowing hooks.

Table 5-6 Criteria for determining significance of impacts to marine mammals

	Incidental take / Entanglement in marine debris	Prey availability	Disturbance
Adverse impact	Mammals are taken incidentally to fishing operations or become entangled in marine debris.	Fisheries reduce the availability of marine mammal prey.	Fishing operations disturb marine mammals.
Beneficial impact	There is no beneficial impact.	Generally, there is no beneficial impacts, with the possible exception for certain net or hook and line fisheries, of increased prey availability from removals from gear.	There is no beneficial impact.
Significantly adverse impact	Incidental take is more than PBR or is considered major in relation to estimated population when PBR is undefined.	Competition for key prey species likely to constrain foraging success of marine mammal species causing population decline.	Disturbance of mammal is such that population is likely to decrease.
Significantly beneficial impact	Not applicable	Not applicable	Not applicable
Unknown impact	Insufficient information available on take rates.	Insufficient information as to what constitutes a key area or important time of year.	Insufficient information as to what constitutes disturbance.

The following discussion focuses on the potential interaction of marine mammals with fishing gear that is currently used and is proposed for use in the Greenland turbot fishery in the BS. This analysis considers potential impacts on humpback whales, sperm whales and killer whales, the latter two of which are known to depredate fish from HAL gear, although only killer whales are known to depredate fish caught in the Greenland turbot fishery. These latter interactions reduce the efficiency of the fishery and may increase the likelihood of entanglement of these whales in fishing gear and fishing-related ship strikes. Any potential impacts that do occur are expected to be minimal due to a change in allowed gear for the Greenland turbot fishery.

Alternative 1

Maintaining the current prohibition on longline pot gear in the Greenland turbot fishery in the BS is the status quo or no action alternative. Requiring Greenland turbot fishery participants to continue to use HAL gear would not address the purpose and need statement for the action, which stresses providing operational flexibility to allow fishery participants to combat whale depredation of catch.

Under Alternative 1, there would be no expected changes in incidental take, prey availability, or disturbance effects.

Incidental Take Effects

The BS Greenland turbot fishery is listed in the List of Fisheries for 2022 as Category III, with a remote likelihood of or no known incidental mortality and serious injury of marine mammals.

Adult Greenland turbot are generally found at depths greater than 200 m along the continental slope, whereas juvenile Greenland turbot spend the first 3-4 years farther inshore along the continental shelf and begin to move out to the continental slope around age 5. The majority of the Greenland turbot HAL fishery occurs at depths greater than 500m.

Killer Whales

There have been zero observed mortality events between killer whales and the Greenland turbot fishery from 2010-2014 (Muto et al. 2021). PBR is calculated to be 24 for Eastern North Pacific Alaska Resident stock. A minimum estimate of the mean annual mortality and serious injury rate due to U.S. commercial fisheries (1 whale) is less than 10% of the PBR (10% of PBR = 2.4) and, therefore, is considered to be insignificant and approaching zero mortality and serious injury rate. Under the status quo in the BS, killer whales interfere with HAL fishing operations when they prey upon fish that are hooked. Due to this behavior, killer whales may be at greater risk of vessel strike and/or entanglement than marine mammals that do not interfere with these fishing operations. However, cetacean entanglements in longline fishing gear are rare, with the likelihood of killer whale entanglement in longline gear being very low (Dalla Rosa & Secchi, 2007). For killer whales, the minimum estimate of the total annual level of human-caused mortality and serious injury is not known to exceed the PBR, and the status quo alternative is not likely to impact this total serious injury or mortality; therefore, we do not expect any significant population-level impacts as a result of Alternative 1.

Sperm Whales

There have been zero observed mortality events between the Greenland turbot fishery and sperm whales from 2013 through 2017 (Muto et al. 2021). PBR is calculated to be 0.5 sperm whales (244 × 0.02 × 0.1). However, because the NMIN is for only a small portion of the stock's range and does not account for females and juveniles in tropical and subtropical waters, the calculated PBR is not a reliable index for the entire stock. A minimum estimated mean annual mortality and serious injury rate of 3.3 sperm whales in U.S. commercial fisheries occurred between 2014 and 2018. The incidental take statement set in the 2010

BiOp was set at 2 sperm whales per year, or 6 whales in 3 years (NMFS 2010). Under the status quo in the BS, sperm whales are not known to interfere with HAL fishing operations as they do in HAL fisheries in the GOA. As such, sperm whales are at very low risk for entanglement in the Greenland turbot fishery and no events have ever been documented. For sperm whales, the minimum estimate of the total annual level of human-caused mortality and serious injury is not known to exceed the PBR, and the status quo alternative is not likely to impact this total serious injury or mortality; therefore, we do not expect any significant population-level impacts as a result of Alternative 1.

Humpback Whales

There have been zero observed mortality events between the Greenland turbot fishery and humpback whales from 2014-2018 (Muto et al., 2021). The minimum estimate of the mean annual and serious injury rate of humpback whales incidental to U.S. commercial fisheries in Alaska for both the Central North Pacific stock and the Western North Pacific stock from 2014-2018 is 0.4 whales (Muto et al. 2021). The Potential Biological Removal (PBR) for the WNP stock, using the minimum population estimate of 865, is calculated to be 3 whales, whereas the PBR for the CNP stock, using the minimum population estimate of 7,891, is 83 animals (Muto et al. 2021). For humpback whales, the minimum estimate of the total annual level of human-caused mortality and serious injury is not known to exceed the PBR, and the status quo alternative is not likely to impact this total serious injury or mortality; therefore, we do not expect any significant population-level impacts as a result of Alternative 1.

Prey Availability Effects

Harvest of marine mammal prey species in the BS fisheries may limit foraging success through localized depletion, overall reduction in prey biomass, and dispersion of prey, making it more difficult 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.

Diet data suggest that none of the marine mammals analyzed naturally forage for Greenland turbot, likely due to the depth range of Greenland turbot (Ford, 2009; Wild et al., 2020; Witteveen et al., 2012). However, killer whales are known to depredate Greenland turbot from HAL fisheries. The impacts of altered foraging behavior, such as removing hooked fish from longline gear or preying upon fish discarded from fishing vessels, are unknown. Optimal foraging theory states that an animal wants to gain the most benefit (energy) for the lowest cost during foraging, so that it can maximize its fitness. Obtaining food provides the animal with energy, while searching for and capturing food requires both energy and time. Depredation of fishing gear enables decreased energy expenditure required to forage for prey. Under Alternative 1, whale depredation is expected to continue as the status quo.

Overall, effects of Alternative 1 on prey availability for marine mammals are not likely to cause population level effects and are therefore not significant.

Disturbance Effects

Disturbance effects from the groundfish fisheries described in the 2010 Biological Opinion include: disruption of normal foraging patterns by the presence and movements of vessels and gear in the water, abandonment of prime foraging areas because of fishing activities, and disruption of prey schools in a manner that reduces the effectiveness of marine mammals' foraging. The 2010 Biological Opinion and subsequent EISs concluded that the status quo fishery does not cause disturbance to marine mammals at a level that may cause population level effects (NMFS 2010, NMFS 2014b).

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.

Alternative 2

As described in the preceding "effects" sections for Target and Non-target groundfish species, the action alternative would most likely return the level of non-trawl fishery participation to recent historical levels, and would not remove any of the existing management constraints that determine when and where fishing may occur or is likely to occur. While it is not possible to project how fishing effort may change from year to year under Alternative 2, it is reasonable to assume that effort is not likely to increase to a level that would have substantial impacts on marine mammals.

As discussed above in this section, the main threat to marine mammals from the Greenland turbot fishery is the risk of entanglement. Entanglement for marine mammals generally occurs with vertical lines that attach gear to a surface buoy and not the lines that lay at depth. As such, a discussion on how the number of vertical lines will change under Alternative 2 is key in understanding the effects of this alternative. Under the status quo alternative, from 2010 through 2020 the average number of sets deployed was 288 per year, with a range of 94 to 438 sets (Pers. Comm. FLC, 6/23/22). An average of 288 sets equates to an average of 575 vertical lines in the water, accounting for the two anchor lines used for a set. Allowing for a shift to a longline pot configuration would not change the number of vertical lines deployed per set, as fishery participants have indicated that they would continue to deploy two anchor lines per set (Pers. Comm. FLC, 6/23/22). As the main component of gear that could result in a marine mammal entanglement are vertical lines (in this case, anchor lines), any change from status quo would be the result of a change in the number of sets anticipated with a change to longline pot gear. Assuming similar behavior as the status quo and that each participating vessels in the Greenland turbot fishery makes roughly 72 sets per season (i.e., an average of 288 sets divided by average vessels participating in fishery (roughly 4)) targeting Greenland turbot, the analysts chart out several possible scenarios of participation.

Table 5-7 Several possible, if not all probable, scenarios of participation in the Greenland turbot fishery and how participation changes the number of vertical lines available to entangle marine mammals

Scenario	Average vessel participation from 2010-2021	Maximum number of vessels to have ever targeted fishery in one year from 2010-2021	All FLC Vessels
Number of Vessels	4	9	36
Number of Sets	288	648*	2,592*
Number of Vertical Lines	575	1,296*	5,184*

* Likely an overestimate as the rate of increase in number of sets in not likely to follow a linear increase with increasing vessel participation. The number of sets per vessels would likely decrease with increasing vessel participation.

As discussed earlier in this EA, the most likely scenario of participation is a return to recent historic participation levels, or roughly four vessels, but the analysts have chosen a scenario of nine vessels to account for the possibility of increased participation. In addition, as shown in the last column of Table 5-7, it is possible, although wholly improbable, that all of the BS non-trawl CP LLP licenses held by FLC cooperative members could be assigned to individual vessels and participate in the Greenland turbot fishery.

This maximal outcome is not realistic because the BS Greenland turbot TAC and the market for turbot never supported so much fishing effort even when at their respective peaks. Moreover, the number of active FLC vessels has declined as the HAL CP sector has consolidated over the years since the voluntary FLC cooperative was formed (see Section 3.3.1.1).

Two other factors must also be accounted for when evaluating the impact of Alternative 2 on marine mammals. Table 5-7, assumes that the number of sets made with a longline pot set up would be the same as for HAL setups. In reality, with the threat of depredation removed or significantly minimized and all else equal, the active fleet may be able to harvest the same amount of Greenland turbot more efficiently with fewer sets. In addition, the Greenland turbot fishery could be spread more evenly across the entirety of the regulatory season. In that scenario, fewer sets would be in the water at any one time, even if the total annual number of sets remains the same.

The remaining discussion assumes a scenario where nine non-trawl vessels participate in the Greenland turbot fishery. For reference, this scenario occurred in 2010 for the Greenland turbot fishery where HAL gear was used. With this level of vessel participation, no marine mammals were attributed as takes to the Greenland turbot fishery (Allen & Angliss, 2014).

Incidental Take Effects

As discussed above under Alternative 1, there have been no recent documented takes of marine mammals in the Greenland turbot fishery. As Alternative 2 would not significantly alter the number of vertical lines in the water from the status quo, and may even decrease the number of sets needed per boat to harvest Greenland turbot, allowing longline pot gear is not expected to increase interactions between marine mammals and the Greenland turbot fishery.

Prey Availability Effects

As discussed above under Alternative 1, harvest of marine mammal prey species in the BS fisheries may limit foraging success through localized depletion, overall reduction in prey biomass, and dispersion of prey, making it more difficult for foraging marine mammals to obtain necessary prey. Alternatively, fisheries may offer the opportunity for marine mammals to opportunistically depredate catch, which allows for decreased energy expenditure required to forage for prey.

Killer whales, sperm whales and humpbacks whales do not naturally forage for Greenland turbot, as such Alternative 2 would not negatively impact these marine mammals ability to meet metabolic demands. Killer whales are the only documented marine mammal that depredates catch of Greenland turbot in the BS. This represents a human derived source of food, which would not naturally be available for killer whales. While this method of obtaining calories likely benefits killer whales metabolically by decreasing the demands of foraging, the increased risk of entanglement associated with approaching HAL gear may not out weight the benefits of a “free meal.” In addition, should Alternative 1 be chosen over Alternative 2, it is likely that a continued decrease in vessel participation in the Greenland turbot fishery would occur as has been the trend over the last 10 years. Thus under either scenario, Alternative 1 or Alternative 2, killer whales would have a reduced opportunities to depredate Greenland turbot. Therefore, as Alternative 2 would remove the temptation for killer whales to approach fishing gear, thereby reducing this risk of entanglement, the allowance of longline pot gear would likely have a positive affect for killer whales, and would have not have an effect on prey availability for sperm and humpback whales.

Overall, effects of Alternative 2 on prey availability for marine mammals are not likely to cause individual or population level effects and are therefore not significant.

Disturbance Effects

Disturbance effects from the groundfish fisheries described in the 2010 Biological Opinion include: disruption of normal foraging patterns by the presence and movements of vessels and gear in the water, abandonment of prime foraging areas because of fishing activities, and disruption of prey schools in a manner that reduces the effectiveness of marine mammals' foraging. The 2010 Biological Opinion and subsequent EISs concluded that the status quo fishery does not cause disturbance to marine mammals at a level that may cause population level effects (NMFS 2010, NMFS 2014b). Because disturbances to marine mammals under the status quo fishery are not likely to cause population level effects, it is unlikely that Alternative 2 would do so as longline pot gear is an allowed gear type in the Aleutian Islands Greenland turbot fishery and would not change seasonal, temporal or OFL, ABC, or TAC limits. Therefore, Alternative 2 is not expected to significantly disturb marine mammal species.

Effects of Aggregate Past, Present, and Reasonably Foreseeable Actions on Non-Target Species

Considering the direct and indirect impacts of the proposed action when added to 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 aggregate impacts of the proposed action are determined to be not significant.

5.5. Seabirds

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 5-8; 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 5-8; USFWS 2009).

As noted in the PSEIS (NMFS 2004), 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 5-8 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 http://alaska.fws.gov/mbsp/mbm/index.htm.
- 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.
- The annual Ecosystem Status Reports have a chapter on seabird bycatch: https://www.fisheries.noaa.gov/alaska/ecosystems/ecosystem-status-reports-gulf-alaska-bering-sea-and-aleutian-islands
- The NMFS Alaska 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 (NPFMC and NMFS 2015).
- Seabirds and fishery impacts are also described in Chapter 9 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007).
- U.S. Fish and Wildlife Service (USFWS). 2021. 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. Anchorage, AK: 80 pp. Document available at https://ecos.fws.gov/tails/pub/document/18939343.

- NMFS. 2020. Programmatic Biological Assessment on the Effects of the Fishery Management Plans for Alaska Groundfish Fisheries on the Endangered Short-tailed Albatross, the Threatened Alaska-breeding Population of Steller's Eider, and the Threatened Spectacled Eider (Polysticta stelleri). Document available at: https://media.fisheries.noaa.gov/2021-11/AK-Groundfish-Seabird-BA-March-2020.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 Annual Report: 2020 (Krieger and Eich 2021). Document available at: https://repository.library.noaa.gov/view/noaa/32076

5.5.1. Effects on Seabirds

Short-tailed albatross (*Phoebastria albatrus*) are listed as endangered under the ESA. In addition to the endangered short-tailed albatross, two species of eider are also listed under the ESA. These are the threatened spectacled eider (*Somateria fischeri*) and the threatened Alaska-breeding population of Steller's eider (*Polysticta stelleri*). Two other populations of Steller's eider occur in waters off Alaska but only the Alaska-breeding population is listed under the ESA.

The USFWS consulted with NOAA Fisheries Alaska Region under section 7 of the ESA on the effects of the groundfish fisheries on the endangered short-tailed albatross, threatened spectacled eider, and threatened Alaska-breeding population of Steller's eider. In its March 8, 2021 USFWS Biological Opinion (USFWS 2021), the USFWS determined the groundfish fisheries off Alaska are likely to adversely affect short-tailed albatross, but they are not likely to jeopardize the continued existence of short-tailed albatross, spectacled eider, or Steller's eider (USFWS 2021). In its 2021 Biological Opinion for Alaskan groundfish fisheries, USFWS provides incidental take statements for short-tailed albatross, spectacled eider, and threatened Alaska-breeding population of Steller's eider:

- The reported take should not exceed six albatrosses in a 2-year period.
- The reported take should not exceed 25 spectacled eiders in a floating 4-year period.
- The reported take should not exceed three Steller's eiders in a floating 4-year period.

Table 5-9 Criteria used to determine significance of impacts on seabirds

	Incidental take	Prey availability	Benthic habitat
Insignificant	No substantive change in takes of seabirds during the operation of fishing gear.	No substantive change in forage available to seabird populations.	No substantive change in gear impact on benthic habitat used by seabirds for foraging.
Adverse impact	Non-zero take of seabirds by fishing gear.	Reduction in forage fish populations, or the availability of forage fish, to seabird populations.	Gear contact with benthic habitat used by benthic feeding seabirds reduces amount or availability of prey.
Beneficial impact	No beneficial impact can be identified.	Availability of offal from fishing operations or plants may provide additional, readily accessible, sources of food.	No beneficial impact can be identified.
Significantly adverse impact	Trawl and hook-and-line take levels increase substantially from the baseline level, or level of take is likely to have population level impact on species.	Food availability decreased substantially from baseline such that seabird population level survival or reproduction success is likely to decrease.	Impact to benthic habitat decreases seabird prey base substantially from baseline such that seabird population level survival or reproductive success is likely to decrease. (ESA-listed eider impacts may be evaluated at the population level).
Significantly beneficial impact	No threshold can be identified.	Food availability increased substantially from baseline such that seabird population level survival or reproduction success is likely to increase.	No threshold can be identified.
Unknown impacts	Insufficient information available on take rates or population levels.	Insufficient information available on abundance of key prey species or the scope of fishery impacts on prey.	Insufficient information available on the scope or mechanism of benthic habitat impacts on food web.

Alternative 1

Incidental Take Effects

Table 5-10 shows the estimate of incidental take of seabirds in the BS Greenland turbot fishery from 2011 through 2021. Refer to Krieger and Eich (2021) for a description of how seabird bycatch estimates are calculated. In the BSAI, incidental take estimates have historically been predominantly made up of Laysan albatross, and Northern fulmar. However, for the Greenland turbot fishery, it appears that Northern fulmar and Shearwaters make up a majority of the estimated seabird take, with no take of ESA-listed seabirds occurring since 2014.

Table 5-10 Estimated seabird bycatch in the BS HAL Greenland turbot fishery, 2011 through 2021. All estimates are for seabirds taken in the Greenland turbot target fishery which is defined as any fishing trips in the BS with Greenland turbot as the predominately retained species using HAL gear (data from NMFS CAS 6/24/2022)

Species/Species Group	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Grand Total	Annual Average
Short-tailed Albatross	0	0	0	6	0	0	0	0	0	0	0	6	1
Laysan Albatross	0	0	0	0	0	0	0	1	0	0	0	1	0
Northern Fulmar	498	341	64	54	17	81	130	38	0	1	0	1224	122
Shearwaters	41	37	60	0	55	173	14	0	11	3	0	394	39
Kittiwake	0	0	0	0	0	0	9	0	0	0	0	9	1
Other Alcid	0	0	0	0	0	0	0	0	0	0	0	0	0
Unidentified Birds	0	14	5	0	0	0	0	0	0	0	0	19	2
Total	539	391	129	61	72	254	153	39	11	4	0	1653	165

Surface feeders, such as albatrosses, fulmars, shearwaters, and gulls, are attracted to fishing vessels' offal discharge and bait on HAL gear. Nearshore foragers, such as cormorants, terns, guillemots, murrelets, and puffins, are less likely to interact with offshore groundfish and halibut fisheries. Mostly Northern fulmar, shearwaters, gulls, and various alcid species are taken by pot gear. Take of seabirds by pot gear is relatively rare compared to take of seabirds by HAL gear.

Over the years, the Council has worked with industry to reduce the impact of HAL gear on seabirds. In 1996, the Council established mandatory seabird avoidance measures for the longline fisheries, and approved more stringent requirements in 2001 (50 CFR Part 679.24(e)(2)). Seabird deterrent devices such as buoy bags or streamer lines are required for most groundfish longline fishing vessels. The Council has encouraged fishing industry initiatives to conduct research on new seabird avoidance measures, including studies on the effectiveness of paired streamer lines and integrated weight ground lines, and the development of techniques for minimizing seabird strikes with trawl warps and sonar transducer cables.

These research efforts, which were largely prompted by voluntary action on the part of the longline sector of the industry, indicated that paired streamer lines were nearly 100% effective at eliminating the catch of albatrosses and other surface-feeding birds. The sablefish and Pacific cod longline fishing fleets adopted this new technology two years before it was required, resulting in an eight-fold decrease in seabird mortality.

Implemented in January 2008, the Council's action specified that the use of seabird avoidance measures would not be required in Prince William Sound, Cook Inlet, and inside waters in Southeast Alaska except in outer Chatham Strait, Dixon Entrance, and outer Cross Sound. The Council action also identified performance standards for small vessels (those greater than 26 feet and less than or equal to 55 feet length overall) fishing in outside waters, and modified how seabird deterrent devices be used by small vessels. These efforts have resulted in a substantial reduction overall seabird bycatch estimates in fisheries operating off Alaska (Figure 5-8).

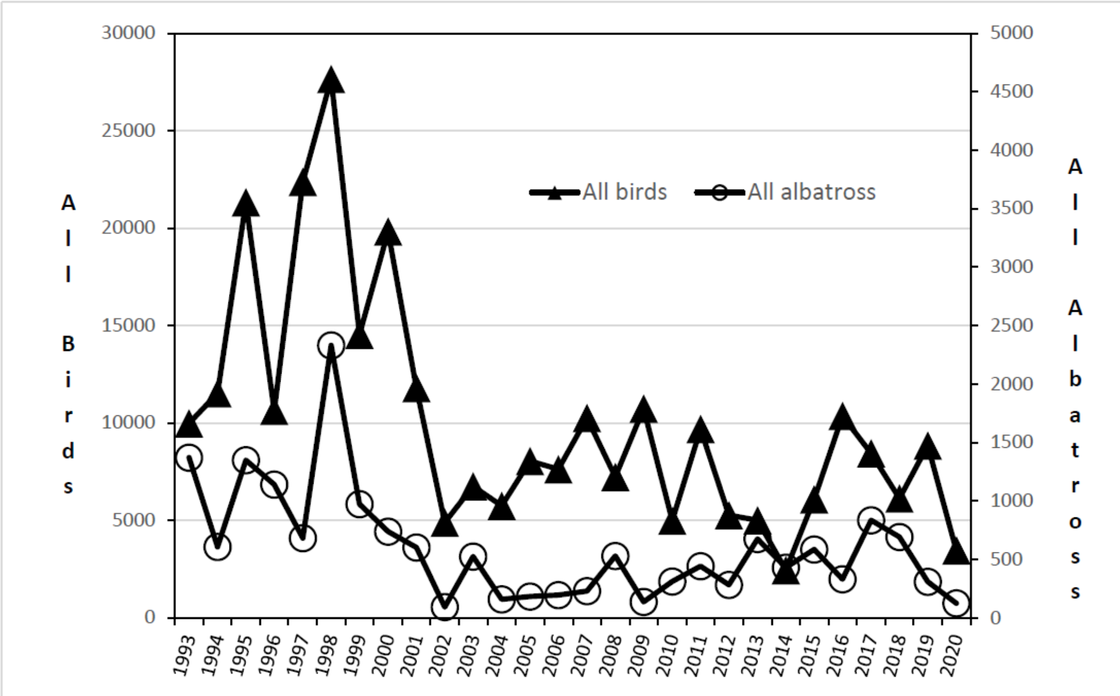


Figure 5-8 Seabird bycatch in Alaska groundfish fisheries (demersal longline, trawl, and pot) from 1993 through 2020 and halibut fisheries from 2013 through 2020, noting bycatch estimates for all birds (left indices; black triangles) and for albatrosses only (right indices; hollow circles). Note the difference in scale. Different data analysis methodologies were used (data from 1993 through 2006 are described in Fitzgerald et al. 2008; data from 2007 through 2020 are from NMFS CAS). The Observer Program was restructured for deployments beginning in 2013 where most CPs had 100 percent coverage, most CVs (over 40 feet length overall) were randomly selected, and the Pacific halibut fleet was incorporated into the program.

With these mitigation measures in place, takes of seabirds have drastically decreased. The Groundfish PSEIS (NMFS 2004) found that the current management regime is effective at providing protection to ESA-listed seabirds and non-ESA listed seabirds, and that current fishing practices are not likely to result in significantly adverse impacts to seabirds. Direct and indirect interactions of seabirds with the HAL Greenland turbot fishery is not likely to create a population-level impact on these species. Alternative 1 is not considered to have a significant impact on the incidental take of seabirds.

Incidental Take Effects

The status quo groundfish fisheries do not harvest seabird prey species in an amount that would decrease food availability enough to impact survival rates or reproductive success. Under the status quo alternative no substantive changes are expected, and impacts are expected to be negligible. Alternative 1 is not considered to have a significant impact on prey availability for seabirds.

Disturbance of Benthic Habitat

Several seabird species may be impacted indirectly by effects that fishing gear may have on benthic habitat used by seabird prey species. While forage fish, generally assumed to be the main prey items of seabirds are not evaluated for essential fish habitat (EFH), the 2017 EFH 5-year review concluded that none of the stocks for which stock assessments are available are experiencing habitat reduction within core EFH areas in ways that were more than minimal or not temporary. No recommendations were made to change management in regard to fishing within EFH (NMFS 2017).

As such, under the status quo alternative, there are presumed to be no impacts to the benthic habitat enough to decrease seabird prey base to the extent that it would impact survival rates or reproductive success. Alternative 1 is not considered to have a significant impact on benthic habitat for seabirds.

Alternative 2

As described in the preceding "effects" sections, the action alternative would most likely return the level of non-trawl fishery participation to recent historical levels, and would not remove any of the existing management constraints that determine when and where fishing may occur or is likely to occur. While it is not possible to project how fishing effort may change from year to year under Alternative 2, it is reasonable to assume that effort is not likely to increase to a level that would have substantial impacts on seabirds.

As discussed earlier in this section, the main threat to seabirds from groundfish fisheries is from interactions with baited hooks that float near the surface. Alternative 2 would be expected to replace some or all of the HAL gear in the Greenland turbot fishery with longline pot gear.

Incidental Take Effects

As discussed throughout this EA, the analysts do not assume that there will be an increase in fishing effort resulting from Alternative 2 that is significantly different from historical levels prior to 2018. However, the predominant non-trawl gear under Alternative 2 would likely be different from the status quo. In all likelihood, allowing for a switch to longline pot gear will decrease the overall take of seabirds. Table 5-11 shows takes of seabirds from 2011 through 2021 for *all* BS pot fisheries. Comparing Table 5-10 to Table 5-11 shows that more take occurred in the BS HAL Greenland turbot fishery than for *all* BS pot fisheries during the analyzed time. As discussed above, HAL gear is known to be a problematic gear type for seabirds and great efforts have gone into reducing the impact of this gear on seabirds. By allowing longline pot gear in the BS Greenland turbot fishery, a decrease in HAL gear use is expected. As a result, there would likely be an overall decrease in the number of seabird takes attributable to the Greenland turbot fishery if longline pot gear were allowed.

Overall, actions that may result under Alternative 2 are not expected to result in a significant impact on the incidental take of seabirds.

Table 5-11 Estimated seabird bycatch in BS pot fisheries, 2011 through 2021. All estimates are for seabirds taken using pot gear regardless of target (data from NMFS CAS 6/24/2022)

Species/Species Group	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Grand Total	Annual Average
Northern Fulmar	0	0	16	9	196	139	538	53	30	424	0	1405	141
Murre	0	0	0	0	0	13	0	0	0	0	0	13	1
Auklets	0	0	0	33	19	29	34	0	0	0	0	115	12
Unidentified Birds	0	18	0	0	0	0	0	0	0	0	0	18	2
Total	0	18	16	42	216	180	571	53	30	424	0	1550	155

Prey Availability Effects

Under Alternative 2, no substantive changes are expected and impacts on seabird prey availability are expected to be negligible. Alternative 2 is not considered to have a significant impact on prey availability for seabirds.

Disturbance of Benthic Habitat

Under Alternative 2, fishing effort is not expected to be significantly different than recent historical levels. Furthermore the Greenland turbot fishery is still constrained by existing regulations concerning the location and timing of the fishery, PSC and bycatch limits, and all other accountability measures currently in place. Several seabird species may be impacted indirectly by effects that fishing gear may have on benthic habitat used by seabird prey species. While forage fish, generally assumed to be the main prey items of seabirds are not evaluated for essential fish habitat (EFH), the 2017 EFH 5-year review concluded that none of the stocks for which stock assessments are available are experiencing habitat reduction within core EFH areas in ways that were more than minimal or not temporary. No recommendations were made to change management in regard to fishing within EFH (NMFS 2017).

As such, any changes associated with Alternative 2 are not likely to impact the benthic habitat enough to decrease the seabird prey base to the extent that it would impact survival rates or reproductive success. Alternative 2 is not considered to have a significant impact on benthic habitat for seabirds.

Effects of Aggregate Past, Present, and Reasonably Foreseeable Actions 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 Section 7 consultations may require modifications to groundfish fishing practices to reduce the impacts of these fisheries on 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 likely 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.

Considering the potential impacts of the proposed action under the alternatives evaluated in this analysis together with the effects of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of reasonably foreseeable future actions, the overall potential impacts of the proposed action are determined to be not significant.

5.6. Habitat

Fishing operations may change the abundance or availability of certain habitat 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 2005b). 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 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 concludes 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 indicates 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 2010) and (NPFMC and NMFS 2016). 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 has led to the refinement of EFH for a subset of Council-managed species. Maps and descriptions of EFH for groundfish species are available in the applicable fishery management plan.

5.6.1. Effects of the Alternatives

Alternative 1

The 2005 EFH EIS (NMFS 2010), 2010 EFH Review (NMFS 2011), and 2015 EFH Review (Simpson et al. 2017) concluded that fisheries do have long term effects on habitat, but these impacts were determined to be minimal and not detrimental to fish populations or their habitats. Similarly, the 2005 EFH EIS, 2010 EFH Review, and 2015 EFH Review found no substantial adverse effects to habitat in the BSAI or GOA caused by fishing activities. The analysis in the EFH EIS concludes that current fishing practices in the sablefish IFQ fishery have minimal or temporary effects on benthic habitat and essential fish habitat. These effects are likely to continue under Alternative 1 and are not considered to be significant.

Alternative 2

As described in the preceding "effects" sections, the action alternative would most likely return the level of non-trawl fishery participation to recent historical levels, and would not remove any of the existing management constraints that determine when and where fishing may occur or is likely to occur. While it is not possible to project how fishing effort may change from year to year under Alternative 2, it is reasonable to assume that effort is not likely to increase to a level that would have substantial impacts on seabirds. Furthermore, the EFH EIS states that very little information exists regarding the effects of longline gear on benthic habitat, and published literature is essentially nonexistent (NMFS 2005). However, what information does exist suggests that the impacts of longline pot gear are not currently of great concern for fisheries in Alaska, and that the type of pot (i.e. shape and material) and hauling behaviors (i.e. speed and direction) can influence what effects there are. A discussion paper of planned updates to the EFH 5-Review were outline in a discussion paper at the February 2022 Council meeting.[39] Taken together, the potential increase in fishing effort as a result of changes under Alternative 2 are not likely to have impacts on habitat beyond those previously considered. As a result, impacts on habitat under Alternative 2 are determined not to be significant.

[39] Effects of Fishing on EFH Discussion Paper February 2022

Effects of Aggregate Past, Present, and Reasonably Foreseeable Actions on Habitat

Considering the direct and indirect impacts of the proposed action when added to 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 aggregate impacts of the proposed action are determined to be not significant.

5.7. Ecosystem and Climate Change

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 Greenland turbot fishery potentially impacts the 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 BSAI groundfish fisheries are summarized annually in the annual Ecosystem Status Reports[40]. These considerations are summarized according to the ecosystem effects on the groundfish fisheries, as well as the potential fishery effects on the ecosystem.

Changing climate and oceans are affecting the nation's valuable living marine resources and the people, businesses and communities that depend on them. From warming oceans and rising seas, to droughts and ocean acidification, these impacts are expected to increase with continued changes in the planet's climate system.

In 2018, the Council adopted a Council's Bering Sea Fishery Ecosystem Plan (BS FEP) as a framework to continue incorporating ecosystem goals and actions into fishery management. The BS FEP documents current procedures and best practices for ecosystem-based fishery management, provides brief, targeted, and evolving descriptions of the interconnected physical, biological, and human/institutional Bering Sea ecosystem and through ecosystem thresholds and targets, and directs how that information can be used to guide fishery management options. Additionally, through the framework of the FEP, the Council has established a Climate Change Taskforce to evaluate the vulnerability of key species and fisheries to climate change, and to strengthen resilience in regional fisheries management. The intention is to address the following objectives: (1) coordinate to synthesize results of various ongoing and completed climate change research projects; (2) evaluate the scope of impacts on priority species identified in initial studies; and (3) strategically re-evaluate management strategies every 5-7 years; (4) include synthesis to evaluate climate-resilient management tools. Results will inform "climate ready" tactical and strategic management measures, which will help ensure a productive Bering Sea marine ecosystem and healthy fisheries for decades to come.

Additionally, NOAA Fisheries has developed a Climate Science Strategy as part of a proactive approach to increase the production, delivery, and use of climate-related information needed to reduce impacts and increase resilience with changing climate and ocean conditions. The Climate Science Strategy is designed to be customized and implemented through Regional Action Plans (RAPs) that focus on building regional capacity, partners, products and services to address the seven objectives.

[40] https://apps-afsc.fisheries.noaa.gov/refm/docs/2021/EBSecosys.pdf

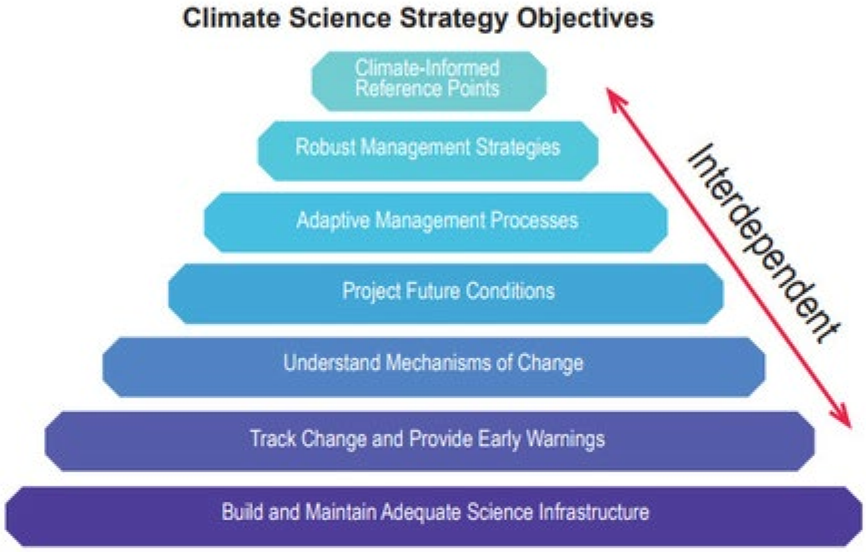


Figure 5-9 NOAA Fisheries Climate Science Strategy's Seven Priority Science Objectives

The Alaska Fisheries Science Center has developed three RAPs on climate, for the Bering Sea, the Gulf of Alaska, and the Arctic. The RAPs focus on building regional capacity, partners, products, and services tailored to each specific region, and identify current and new climate research activities over the time period of the RAPs, as well as evaluating remaining key scientific gaps for each region.

5.7.1. Effects on the Ecosystem

Alternative 1

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.

The effects of the Greenland turbot fishery on the ecosystem of the BSAI have been comprehensively analyzed in the annually BSAI SAFE report (NPFMC 2021) and was also evaluated in the Groundfish PSEIS (NOAA 2004), and Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). These analyses concluded that current fishing practices in the Greenland turbot fishery have minimal impact on the ecosystem of the BSAI and those impacts do occur are constantly monitored to prevent them from rising to a level which may jeopardize their continued sustainably. As a result, impacts on the ecosystem of the BSAI under Alternative 1 are determined not to be significant.

Alternative 2

Alternative 2 proposes a regulatory change to allow the use of longline pot gear when directed fishing for Greenland turbot in the Bering Sea subarea. The BS Greenland turbot fishery has not been fully executed in recent years, in part due to whale depredation. Therefore, this action is expected to restore fishery participation and allow for a more fully executed TAC. A significant increase in fishery participation from non-historic users is not anticipated, but is not prohibited by this action. In addition, the Greenland turbot fishery is still constrained by existing regulations concerning the location and timing of the fishery, PSC and bycatch limits, and all other accountability measures currently in place.

As described above, fishery impacts on the ecosystem of the BSAI are continuously monitored by both NMFS and the Council in order to recognize and account for changes in fishery - ecosystem interactions. Under Alternative 2, fishing effort is not expected to increase. As such, Alternative 2 is not likely to have impacts on ecosystem components and considerations beyond those summarized in the Stock Assessment and Fishery Evaluation Report for the BSAI groundfish fisheries. As a result, impacts on the ecosystem of the BSAI under Alternative 2 are determined not to be significant.

Cumulative Effects on the Ecosystem

Considering the direct and indirect impacts of the proposed action when added to 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 aggregate impacts of the proposed action are determined to be not significant.

5.8. NEPA Summary

One of the purposes of an environmental assessment is to provide the evidence and analysis necessary to decide whether an agency must prepare an environmental impact statement (EIS). The Finding of No Significant Impact (FONSI) is the decision maker's determination that the action will not result in significant impacts to the human environment, and therefore, further analysis in an EIS is not needed. The Council on Environmental Quality regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of “context” and “intensity.” An action must be evaluated at different spatial scales and settings to determine the context of the action. Intensity is evaluated with respect to the nature of impacts and the resources or environmental components affected by the action. These factors form the basis of the analysis presented in this Environmental Assessment/Regulatory Impact Review.

This section will be completed for the final action draft.

6. Management Considerations

This section describes the monitoring, management and enforcement considerations associated with Alternative 2.

6.1. Monitoring

CP vessels operating in the BS or AI are typically in the “full coverage category” of the Observer Program[41]. All vessels that have fished Greenland turbot during the analyzed period were in full coverage. Full coverage CPs carry at least one fishery observer at all times regardless of which gear type is being

[41] A non-trawl CP may request to be placed in the partial observer coverage category if it falls below a maximum weekly groundfish production limit, as established at §679.51(a)(3). Two CPs that have fished Greenland turbot at a time in the past have applied for and received partial coverage status but those vessels did not fish for turbot during any of those partial coverage years.

deployed. The potential action considered in this analysis would not directly affect observer coverage levels, though the number of deployed days could increase if total non-trawl effort increases. A caveat to consider is that the FLC is a cooperative and subject to specific monitoring requirements that are defined in regulation at §679.100 (Subpart I). Under, 679.100, FLCC vessels would need to adhere to existing observer requirements, including but not limited to having a sampling station onboard, video monitoring for compliance, and requirements that any Pacific cod brought onboard the vessel is weighed on a NMFS-approved scale as required at § 679.28(b), (d) and (k). In addition, the operator of a vessel participating in Greenland turbot fishery using longline pot gear would need to ensure they comply with the requirements for electronic logbooks as outlined at § 679.5(f) at all times during that year.

The analysts consulted both the NMFS Fisheries Monitoring and Analysis Division (FMA) and the NOAA Office of Law Enforcement (OLE) for a preliminary evaluation of challenges that could result from a new gear authorization in this fishery. The primary issue raised was whether observers on CPs deploying pot gear would have adequate time and safe access to sample *unsorted* catch, given that catch is brought onboard during a pot haul in a different manner than during a hook-and-line haul. Some of the major differences between observer sampling and safety protocols for pot hauls versus hook-and-line hauls are described on Page 2-6 of the NMFS Observer Sampling Manual.[42]

Catch must be reported by gear type, even if a vessel fishes multiple gear types on the same trip. On CPs with full observer coverage, the catch data is reported by gear since observers record the gear deployed at the haul-level. In addition, CPs fishing multiple gear types would submit separate reports by gear for their Daily Production Reports and landing reports. If a CV were to utilize both longline pot and HAL gear on a single trip, the processor would create two landing reports, one for each gear type at the time of delivery. No vessel may fish both pots and hooks on the same longline set.

NMFS FMA staff noted that as many as five active FLC vessels are set up for pot fishing and compliance with observer protocols for pot gear due to participation in other pot fisheries (Source: pers. comm. NMFS FMA). Any other HAL CP that elects to fish longline pot gear could incur costs or may need to implement operational modifications to accommodate observers on deck in terms of safety and compliance. A vessel's previous experience with pot gear might positively influence the likelihood of entering a BS Greenland turbot longline pot fishery due to lower costs of deck reconfiguration and gear acquisition. However, the analysts presume that participation in this new gear/species fishery is more likely to be influenced by opportunity costs. In other words, any vessels that might take up this gear type would be reacting primarily to the relative availability and value of Greenland turbot under reduced pressure from whale depredation as opposed to the costs of conversion and observer accommodation.

Vessels with no previous participation in pot fishing could elect to use pot gear and would thus need to coordinate with NMFS and comply with the monitoring protocols that are specific to pot gear.

Finally, it should be noted that NMFS has previously indicated its intent to modify monitoring requirements for CPs using pot gear to improve data quality and timeliness. FLC member vessels are already required to follow these requirements. The requirements are reiterated here for any potential non-FLC CPs that might enter the fishery. These requirements were recently discussed when the Council reviewed an analysis of reducing the number of BSAI pot CP LLP licenses in February 2021 (NPFMC 2021d). No action was taken, but none was required for NMFS to move these monitoring requirements forward. Section 3.7.1 of that public review draft (p.69) outlines data collection challenges in the Pacific cod pot CP fishery and proposes modifications that NMFS can implement under its management

[42] NMFS 2021 Observer Sampling Manual, accessed 7/8/2022.

authority.[43] Those suggested modifications are similar to what is currently required for CPs using pot gear to fish CDQ Pacific cod.

Given the likely small size of a BS Greenland turbot longline pot CP fishery, any such fishery could face similar challenges and might be subject to the same or similarly enhanced monitoring requirements. The monitoring enhancements that NMFS previously suggested for groundfish pot CPs are:

- Require observers deployed on BSAI pot CPs participating in the BSAI groundfish fisheries to have a level 2 deployment endorsement;
- Ensure that BSAI pot CPs participating in the BSAI groundfish fisheries comply with the pre-cruise meeting requirements before beginning a fishing trip;
- Require BSAI pot CPs participating in the BSAI groundfish fisheries to provide a certified observer sampling station and motion compensated platform scale for the observer's use.

NMFS's justification for those suggestions and preliminary cost estimates are provided in the document referenced above.

6.2. Management

This action is not expected to alter many aspects of management for the Greenland turbot fishery and the fishery will still be constrained by existing regulations concerning the location and timing of the fishery, PSC and bycatch limits, and all other accountability measures currently in place. The main management consideration is a change to regulations that would authorize an additional gear type for the fishery.

Regulation changes

Current regulations at §679.24 prohibit catch of Greenland turbot using longline pot gear. Regulations at §679.24 would need to be changed to allow for an exemption for the Greenland turbot fishery. A proposed regulatory change (indicated in italicized blue) could look as follows:

- **§679.24 Gear limitations**
    - (b) ***Gear restrictions*** -
        - (1) ***Pots - -*** *Longline pot gear.* Any person using longline pot gear must treat any catch of groundfish as a prohibited species, except:
            - (i) In the Aleutian Islands subarea.
            - (ii) While directed fishing for sablefish in the Bering Sea subarea.
            - (iii) While directed fishing for IFQ sablefish in the GOA.
            - (iv) While fishing for IFQ or CDQ halibut in the BSAI.
            - *Add: (v) While directed fishing for Greenland turbot in the BS.*

In addition, the Option under Alternative 2 would allow for an exemption from the 9-inch maximum tunnel opening restriction. Regulations at §679.2 define pot gear as having a tunnel opening no wider than

[43] With concurrence from the Council, NMFS would initiate rulemaking to implement monitoring requirements under MSA section 305(d) regulatory authority, consistent with Section 3.9 of the BSAI Groundfish FMP.

9 inches. Regulations at §679.2 would need to be changed to allow for an exemption to the maximum tunnel opening. A proposed regulatory change could look as follows:

- **§ 679.2 Definitions**
  - (15) ***Pot gear*** means a portable structure designed and constructed to capture and retain fish alive in the water. This gear type includes longline pot and pot-and-line gear. Each groundfish pot must comply with the following:
    - (i) ***Biodegradable panel.*** Each pot used to fish for groundfish must be equipped with a biodegradable panel at least 18 inches (45.72 cm) in length that is parallel to, and within 6 inches (15.24 cm) of, the bottom of the pot, and that is sewn up with untreated cotton thread of no larger size than No. 30.
    - (ii) ***Tunnel opening.*** Each pot used to fish for groundfish must be equipped with rigid tunnel openings that are no wider than 9 inches (22.86 cm) and no higher than 9 inches (22.86 cm), or soft tunnel openings with dimensions that are no wider than 9 inches (22.86 cm).
    - (iii) ***Halibut retention exception.*** If required to retain halibut when harvesting halibut from any IFQ regulatory area in the BSAI, vessel operators are exempt from requirements to comply with a tunnel opening for pots when fishing for IFQ or CDQ halibut or IFQ or CDQ sablefish in accordance with § 679.42(m).
    - *Add: **(iv) Greenland turbot exception**. If directed fishing for Greenland turbot in the Bering Sea subarea, vessel operators are exempt from requirements to comply with a tunnel opening for pots when fishing for Greenland turbot.*

Paperwork Reduction Act (PRA)

The PRA is a law governing how Federal agencies collect information from the American public. Federal agencies, including NMFS, are required by law to comply with the PRA and receive OMB approval every time the agency collects information from the public, except under specific circumstances. Some of the more common exemptions to PRA include:

- Requesting data from fewer than 10 people,
- Open-ended requests for comments or feedback,
- Only collecting information from federal employees as part of their work duties, or
- Discussions and questions at a public hearing, meeting, or online equivalent.

Because data collected by NMFS from eLogbooks does not fall under an exemption to the PRA law, the agency must comply with the PRA requirements when collecting these data.

When estimating time (burden hours) the agency is required to include the number of respondents, the frequency of response, and the total number of burden hours per year. To value all personnel burden hours, labor is supposed to be grouped by clerical and other unskilled workers, skilled-labor (including craft-labor and other technical workers), professionals and managers, and executives. All wages for these groupings must reflect the full cost of labor, including benefits. The Bureau of Labor Statistics' wage data will be used as the estimate unless better information is available to value those hours. The estimates will also be consistent with other current data submissions that collect similar data. For example, it is anticipated that the time burden/costs to comply with eLogbook reporting will be similar to other PRA time and costs estimates in place for other GOA and BSAI FMP fishery logbook requirements.

It is likely that a change to the collection of information that this action falls under would be required if the action alternative is approved and implemented.

6.3. Enforcement

The analysts consulted NOAA OLE for a preliminary evaluation of challenges that could result from a new gear authorization in this fishery. OLE, in general, did not identify any significant enforcement concerns related to this potential action.

Gear Preferences

OLE does not have a preference on what type of pot is used and would prefer regulatory language that is less restrictive and prescriptive to allow for flexibility and innovation for fishery participants in the future. In addition, OLE has indicated that they do not have a preference on how gear is setup, as long as it is consistent between fisheries. For example, OLE does not have a preference on string pot numbers, nor ultimately how many pots are allowed per participant. When asked about how vertical anchor lines should be set up in regard to a longline pot set up, OLE specified that they would prefer that GOA and BSAI regulations are consistent between regions and fisheries (GOA regulations currently require two vertical lines). Given adoption of regulatory language requiring only a single vertical anchor line, OLE suggests that deployment of two anchors should be required; one at each end of the string. This requirement would make it more likely for the string to stay in place and be recoverable if longline gear parts were to separate. Currently in the BSAI, there are no longline pot gear requirements, however there are specifications indicated for the GOA at 50 CFR 679.24(a)(3).

Option 1

NOAA OLE does not have concerns with removing the 9-inch tunnel opening requirement. Rather, consistency between fisheries achieved by removing the requirement is preferred (e.g., consistent with the Council's April 2022 IFQ Omnibus action, Element 4).

Lastly, a vessel targeting Greenland turbot with longline pots that possesses halibut or sablefish IFQ would be required to retain those species up to the amount of their quota during the IFQ season. Bycatch of halibut that occurs outside of the IFQ season, occurs on a vessel that does not possess IFQ, or is under the legal size limit could not be retained. Non-retainable halibut must be released with a minimum of injury. Sablefish caught with non-trawl gear on a vessel without an IFQ permit may not be retained unless the vessel is fishing on behalf of a CDQ group.[44]

Vessels that have unfished halibut IFQ onboard are not restricted to a maximum 9-inch pot tunnel opening (BSAI Groundfish FMP Amendment 118 and the aforementioned regulations at 679.2: “Authorized Fishing Gear” (15)(iii)). If a vessel does not possess halibut IFQ onboard then the 9-inch maximum tunnel restriction would apply. Presuming the vessels prosecuting this fishery are CPs, the halibut IFQ onboard would need to be derived from Class A quota shares or CDQ shares in area 4B, 4C, 4D and 4E. Lastly, further consideration would be needed to determine how mixed landings of IFQ species and Greenland turbot would be recorded. IFQ landings require a prior notice of landing (PNOL).

6.4. Safety Considerations

The considered action alternative provides the non-trawl fleet with an option to utilize pot gear where it had not done so before, but no vessel would be required to utilize a particular gear type or deploy it in a specific manner. Vessel operators would retain their current level of flexibility to deploy the gear that they deem the safest and most effective for their platform. Pot gear generally has a different safety profile than HAL gear when it is stored on deck. The degree of the difference may depend on the type of pot that is used. Section 8 in the recent IFQ Omnibus Amendments analysis (NPFMC 2021c) notes that newly

44 §679.7 Prohibitions (f)(3)(ii)

popularized collapsible ("slinky") pots can weigh as little as 10 lbs. compared to conventional groundfish or crab pots that often weigh more than 100 lbs. However, being a new gear fishery, it is not yet known whether collapsible pots will be effective for catching turbot at the depths and currents in the targeted area.

CP vessels may be especially well-suited to take on a new deck-stored gear type while maintaining safety because most longline CPs in Alaska comply with enhanced safety, stability, and inspection standards that were developed in conjunction with the U.S. Coast Guard (USCG). The Alternate Compliance and Safety Agreement (ACSA) is a safety agreement between the USCG and the longline and trawl vessels that operate in Alaska waters.[45] "Fish processing vessels" are distinguished from "fishing vessels" based on the range of NMFS product codes that they produce at sea. Fish processing vessels must meet certain classification and load line requirements. CPs that merely head, gut, gill, skin and freeze fish (product code listed as "H&G") are considered fishing vessels. Most Alaska longline and trawl CPs have opted to enroll in and comply with ACSA standards and thus are allowed to do "minimal processing". Only fish processing vessels that are classed and load lined are allowed to perform "extensive processing". The definitions of minimal and extensive processing are provided in ACSA Guidance Annex 1. Some common examples of product codes that are considered "beyond minimal processing" include H&G with tail removed; kirimi (steak), roe, heads, and cheeks. Product codes that are considered "extensive processing" include fillets (various forms), salted & split, belly flaps, and surimi.

The purpose of providing this detail is that all vessels that have directed fished for Greenland turbot (FLC and A80) or are likely to do so in the future comply with ACSA standards so that they can do minimal processing at sea. Moreover, the analysts understand that the active Pacific cod pot CPs that are not part of the FLC cooperative, which represent a small amount of potential future entry into the BS turbot fishery, also adhere to ACSA.[46] Some of the compliance standards for ACSA include: naval architect stability tests (5 years), drydock/internal structural examination (twice in 5 years), tail shaft exam (5 years), and annual USCG-approved inspection of watertight closures, machinery, lifesaving equipment, firefighting equipment and plans, and emergency communications/drill/training.

[45] Summary information about ACSA and links to documentation of specific policies, safety enhancements, examinations, and inspection checklists are available at http://www.fishsafewest.info/acsa.asp (accessed July 2022). Background on the purpose and history of ACSA is provided in program guidance published as CG-543 Policy Letter 12-01 (Feb. 2012). In short, ACSA was established after several vessel sinking losses in the early 2000s and the recognition that most BSAI cod freezer longliners (FLC) and non-pollock freezer trawlers (A80) were being regulated under the less comprehensive standards of fishing vessels instead of the higher standards of fish processing vessels. Vessels in these fleets had been in service at the time for an average of 31 years and lacked class plan review and approval of vessel systems and machinery components. In 2006 it was found that most vessels in these fleets would not have been accepted for fish processing vessel classification. Rather than have these vessels reduce operations to that of a "fishing vessel" (strict H&G only), which would not have improved vessel safety, the ACSA was developed to enhance safety and provide compliant vessels with additional processing options.
[46] S. Carroll. Personal communication. June 2022.

7. Magnuson-Stevens Act and FMP Considerations

7.1. Magnuson-Stevens Act National Standards

Below are the 10 National Standards as contained in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). In recommending a preferred alternative at final action, the Council must consider how to balance the national standards.

A brief discussion of this action with respect to each National Standard will be prepared for final action.

National Standard 1 — Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

National Standard 2 — Conservation and management measures shall be based upon 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.

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 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 a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

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.

National Standard 6 — Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

National Standard 7 — Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

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 meet the requirements of National Standard 2, 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.

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.

National Standard 10 — Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

7.2. Section 303(a)(9) Fisheries Impact Statement

Section 303(a)(9) of the Magnuson-Stevens Act requires that a fishery impact statement be prepared for each FMP or FMP amendment. As noted in Section 2 of this document, the action alternative under consideration would likely not require an amendment to the BSAI Groundfish FMP. This section is nevertheless included because the FMP provides the authority for the Council to make recommendations on regulatory changes.

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 an FMP 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 EA/RIR prepared for this potential regulatory amendment meets the requirements of a fishery impact statement. The likely effects of the considered action are analyzed and described throughout the EA/RIR. The effects on participants in the fisheries and fishing communities are described in the Section 4. The effects of the considered action on safety of human life at sea are evaluated in Section 6.4, and will be added to Section 7.1, above, regarding National Standard 10 for Council final action. Based on the information in this document that describes the likely effects of the considered action, there is no need to update the Fishery Impact Statement included in the FMP.

The proposed action would affect the BSAI groundfish fisheries in the EEZ off Alaska, which are under the jurisdiction of the North Pacific Fishery Management Council. Impacts on participants in fisheries conducted in adjacent areas under the jurisdiction of other Councils are not anticipated as a result of this action.

7.3. Council's Ecosystem Vision Statement

In February 2014, the Council adopted, as Council policy, the following:

Ecosystem Approach for the North Pacific Fishery Management Council

> ***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.

The vision statement 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.

Upon selection of a preferred alternative, this section will include the Council's rationale for how any action recommended to the Secretary of Commerce is consistent with this ecosystem approach to policy, and highlight evidence presented for that rationale to the extent that it is available. If selected, the action alternative would provide non-trawl vessels directed fishing for Greenland turbot in the Bering Sea the flexibility to use longline pot gear to mitigate whale depredation and could also allow flexibility in pot tunnel size openings to improve target size selectivity. Using gear flexibility to address increased and untenable whale depredation on hook-and-line fishing gear is an example of accounting for changing conditions, accounting for varying relationships between marine species, and mitigating threats. At this point, there are no anticipated impacts to the human environment and the action alternative would continue to support productive and resilient marine ecosystems.

Evidence of increasing whale depredation on Greenland turbot HAL gear and decreasing participation in the fishery is presented in Section 3 of this document. A discussion of the potential benefits that would flow to a subset of the BS groundfish fleet is included in Section 4. The limited information available on where those benefits would flow most directly is provided in Section 3.5 with further discussion in Section 4. The potential benefits of authorizing longline pot gear as a limited alternative for HAL gear, as it relates to seabirds and marine mammals, are addressed in Section 5.

8. Preparers and Persons Consulted

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Appendix – Spatial and Temporal Overlap of HAL and Trawl Effort in Western Bering Sea Areas (2017-2021)

This appendix is a supplement to Section 3.3.4, which described the coincidence of spatial and temporal overlap within the Greenland turbot target fishery. The map provided in that section (Figure 3-1) and the tables below are meant to provide the reader with the best possible basis for assessing the likelihood that longline pot gear and trawl gear might conflict on the grounds, or that non-trawl gear might occupy/preempt fishing areas for trawl gear. The analysts are presuming that longline pot gear would be deployed by the historically active operators who used HAL gear, and thus historical HAL gear location is a reasonable proxy for when and where longline pot gear might be deployed. There is no objective basis for analysts to forecast that non-trawl gear targeting Greenland turbot would be deployed in parts of the Bering Sea FMP area that were not subject to HAL fishing during the analyzed years.

Table A-1 and Table A-2 supplement Figure 3-1 by providing the temporal element of the temporal/spatial gear coincidence question. Each week of the calendar year is numbered 1-53. A "statistical week" (1-53) might fall in a different month given the calendar year, but the tables provide the 2022 week/month relationship as a frame of reference. The tables begin in Week 18, which is the earliest week of any year during which BS turbot was targeted. That week generally corresponds to the beginning of May, which is when the directed fishery opens by regulation. For presentation purposes, the tables end at Week 35 (the end of August and the beginning of September in 2022). During the 2017-2021 period, HAL and trawl vessels did target turbot sporadically between Week 36 and Week 49 (beginning of December in 2022) but no area/week combination during that period in any year included more than one vessel.

Both tables list ADFG statistical areas as a six-digit number in the left-hand column. The first two digits show the east-west location of the area in terms of "degrees west longitude". A value of 70 represents 170 degrees W longitude; 79 represents 179 degrees W. The second two digits show the north-south location of the area in terms of "degrees north latitude". A value of 56 represents 56 degrees N latitude; 60 represents 60 degrees N latitude. The last two digits identify areas by degree minute steps, with 30 being the intermediate between one degree N and the next. Areas with a final digit that is non-zero are those that are not a perfect lat-long square, such as those where Federal waters are curved around the state-waters surrounding a land feature (e.g., 705701 is around St. Paul Island). The rows in the tables below can be thought of as moving directionally from southeast to northwest in the Figure 3-1 map as the reader descends the table rows.

Table A-1 shows the number of sectors that targeted Greenland turbot in a given area and week. The maximum value for any cell is two: HAL CP sector and trawl sector. Those area/week combinations are highlighted in red. The blue-highlighted row at the top and bottom of both panels sums the number of "Multiple Sector" weeks that occurred during the entire 2017-2021 period and the statistical week in which they occurred. The blue row is shown in multiple places for ease of reading; they are not additive. The fact that the HAL CP sector did not target turbot in 2021 is evident in the fact that no area/week combination had a value of two during that year. Of the 26 statistical weeks analyzed in each year, only six weeks had multiple instances of both sectors operating in the same area/week: three weeks that typically correspond to mid/late June, one week in early/mid July, and two weeks that typically span late July and early August. Three statistical areas recorded multiple weeks within a year when both sectors were active: 755800, 775900, 785900. Cross-referencing those areas to the map in Figure 3-1, the reader can see that the first and third of those areas could be described as "along the BS slope". The second area is slightly east, up on the BS shelf. Of those three areas, only 785900 shows a roughly even split of total catch-by-gear-sector (metric tons) over the analyzed period. Area 775900 (on the shelf) is a relatively high-volume trawl area with a small amount of HAL catch.

This goes to show that not all instances of both gears being in the same time/area unit indicate that both sectors were equally historically engaged or reliant on that area.

Table A-2 uses the same design to show area/weeks where more than one vessel was targeting BS Greenland turbot. The “Multiple Vessel” row is highlighted red for weeks when this occurred more than once during the analyzed period. This table is a better indication of the degree of crowding on the fishing grounds, but is presented with the caveat that both historically active sectors are part of cooperatives (FLC and the A80 cooperative) that testify to the Council about their ability to communicate on the fishing grounds – at least within their own cooperative. For the weeks highlighted in red in Table A-2 that do not fall in the “Multiple Sector” weeks from Table A-1 (i.e., weeks 23, 24, 25, 27, 30, and 31), it can be assumed that all vessels were well coordinated. The greatest number of vessels targeting turbot in the same area/week occurred in 2020, Week 19, area 775900; four vessels from the trawl sector recorded turbot trip targets. Individual analysis of each “Multiple Sector” week reveals that no area/week combination featured more than three vessels. The vast majority of cases were one vessel from each sector. A minority of cases were two vessels from one sector and a single vessel from the other.

While the analysts cannot predict what changes might occur in the future, weekly data from the recent past suggest vessels are most often fishing an individual area/week by themselves, and when that is not the case multiple vessels operating in a single area tend to be from the same sector/cooperative. Data from 2017 and 2018, when the HAL CP sector was somewhat more engaged in targeting BS Greenland turbot, do not differ substantially in the number of “Multiple Sector” weeks from 2019 and 2020. It is possible that an influx of non-FLC effort could add new vessels to the fishing grounds or that a substantial increase in the BS turbot TAC could attract more effort. Neither of those outcomes is deemed likely to make the fishery look substantially different from 2017/2018 in the near-term, even under the action alternative. If non-trawl effort were to increase under the action alternative, it is most likely to occur in the areas along the BS slope where historical HAL CP effort was illustrated in Figure 3-1, or areas with similar bathymetric profiles.

Table A - 1 Weeks when more than one sector (HAL CP or Trawl) targeted BS Greenland turbot in the same ADFG statistical area, 2017-2021

Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
2022 Month	May				June				July					Aug				Sep	Mult.
Mult. Sectors	0	0	0	0	0	2	2	2	0	3	0	1	4	2	0	1	1	0	Sectors
2017																			
705630						1													0
705701						1													0
715600																			0
715730						1		1						1					0
715800						1								1					0
745800													1						0
755800					1				1	1	1								0
755830					1					1	1		1						0
765830				1	1						1		1	1	1			1	0
775830					1	1	1	1	1	1	1	1	1	1			1	1	0
775900			1	1	1	1	2	2		2	1	1	1	1		1			3
775930			1	1	1	1		1		1	1	1	1						0
785830										1									0
785900			1	1	1	1	1	1	1	1	1	2	1	1	1	1		1	1
785930						1						1	1	1		1			0
786000				1	1	1	1	1				1							0
786030					1	1	1												0
795930												1	1	1		1			0
796000				1	1	1	1	1	1		1	1	1			1			0
796030				1	1	1	1	1	1		1	1	1			1			0
2018																			
705630				1							1								0
715730						1													0
725630													1						0
735630												1							0
735700										1		1		1	1				0
745800											1								0
755800										2	1		2	1	1	1	1		2
755830						1				1	1	1	1	1	1	1			0
765830						1					1		1	1		2	1		1
765900						1													0
775830					1		1		1	1	1			1	1	1	1		0
775900	1	1			1	1				1	1	1	1	1	1	1	1		0
775930	1	1			1	1				1	1	1	1		1	1	1		0
785900					1	1				2		1	1	1	1	1	1		1
785930					1						1			1			1		0
786000	1	1	1		1	1						1	1		1	1	1		0
786030	1												1						0
795930					1									1					0
796000	1	1	1										1		1				0
796030		1			1								1		1	1	1		0
2019																			
705630					1														0
735630					1		1	1	1				1	1					0
735700					1		1	1	1				1						0
755800				1	1	2	1			1		1	2		1	1	1	1	2
755830										1			1			1			0
765830						2	1					1				1			1
765930									1				1						0
775830						1		1	1			1	1					1	0
775900					1	1			1	1	1		2	1		1			1
775930					1	1			1	1	1		1	1		1			0
785900						1		1			1		2	2		1	2		3
785930						1	1	1	1				1						0
786000					1	1	1	1	1				1	1			1		0
786030					1	1	1	1						1					0
795930						1	1	1					1						0
796000						1		1									1		0
796030						1	1						1	1			1		0
Mult. Sectors	0	0	0	0	0	2	2	2	0	3	0	1	4	2	0	1	1	0	Mult.
Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	Sectors
2022 Month	May				June				July					Aug				Sep	

Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
2022 Month	May				June				July					Aug				Sep	Mult.
Mult. Sectors	0	0	0	0	0	2	2	2	0	3	0	1	4	2	0	1	1	0	Sectors
2020																			
715600			1																0
715730									1	1		1							0
715800				1					1	1		1							0
725630			1				1												0
735630			1			1				1					1		1		0
735700			1			1	1			1					1		1		0
745830				1															0
755800			1											2	1			1	1
755830			1												1				0
765830			1						1									1	0
765900												1							0
765930														1					0
775830							1	1	1					1	1			1	0
775900	1	1	1	1		1	1	1	1	1	1	1		1					0
775930		1	1	1		1	1		1	1	1	1		1	1				0
785830							1	1	1		1								0
785900		1		1			2	2	1	1		1		1	1				2
785930				1			1												0
786000		1		1			1	1	1	1	1		1	1		1	1	1	0
786030		1					1				1								0
796000													1	1					0
796030		1					1	1	1		1		1			1		1	0
2021																			
715600						1													0
715730																1			0
725630			1															1	0
735630			1																0
735700			1			1													0
755800			1		1	1	1	1									1		0
755830			1			1	1												0
765830			1	1	1	1	1												0
775830				1	1		1							1	1	1			0
775900	1	1	1	1	1		1	1		1	1		1	1	1	1	1		0
775930	1	1	1	1			1	1			1		1	1		1	1		0
785830													1	1	1		1		0
785900				1	1		1	1		1	1		1		1	1			0
785930			1	1	1					1			1			1			0
786000		1	1	1	1		1			1	1	1	1	1	1		1		0
786030		1	1														1		0
796000				1	1		1				1				1				0
796030		1	1		1					1	1		1				1		0
Mult. Sectors	0	0	0	0	0	2	2	2	0	3	0	1	4	2	0	1	1	0	Mult.
Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	Sectors
2022 Month	May				June				July					Aug				Sep	

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

Table A - 2 Weeks when more than one vessel of any sector (HAL CP or Trawl) targeted BS Greenland turbot in the same ADFG statistical area, 2017-2021

Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
2022 Month	May				June				July					Aug				Sep	Mult.
Mult. Vessels	0	6	10	4	6	10	4	4	0	4	1	5	6	3	0	3	1	1	Vessels
2017																			
705630						2													1
705701						2													1
715600																			0
715730						1		1						1					0
715800						1								1					0
745800													1						0
755800					2				1	1	1								1
755830					1					1	1		1						0
765830				1	2						1		1	1	1			2	2
775830					1	1	1	1	1	1	1	1	1	1			1	1	0
775900			2	1	3	1	2	2		2	1	1	1	1		1			5
775930			2	2	2	1		1		1	1	1	1						3
785830										1									0
785900			1	1	1	1	1	1	1	1	1	2	1	1	1	1		1	1
785930						1						1	1	1		1			0
786000				3	3	2	1	1				1							3
786030					3	1	1												1
795930												1	1	1		1			0
796000				2	1	1	1	1	1		1	1	1			1			1
796030				3	2	2	1	1	1		1	2	1			1			4
2018																			
705630				1							1								0
715730						1													0
725630													1						0
735630												1							0
735700										1		1		1	1				0
745800											1								0
755800										2	1		2	1	1	1	1		2
755830						1				1	1	1	1	1	1	1			0
765830						1					1		1	1		2	1		1
765900						1													0
775830					1		1		1	1	1			1	1	1	1		0
775900	1	1			1	1				1	1	2	1	1	1	1	1		1
775930	1	1			1	1				1	1	2	1		1	1	1		1
785900					1	1				2		2	1	1	1	1	1		2
785930					1						1			1			1		0
786000	1	1	1		1	1						1	1		1	1	1		0
786030	1												1						0
795930					1									1					0
796000	1	1	1										1		1				0
796030		1			1								1		1	1	1		0
2019																			
705630					1														0
735630					1		1	1	1				1	1					0
735700					1		1	1	1				1						0
755800				1	1	2	1			1		1	2		1	1	1	1	2
755830										1			1			1			0
765830						2	1					1				1			1
765930									1				1						0
775830						1		1	1			1	1					1	0
775900					2	2			1	1	1		2	1		1			3
775930					2	2			1	1	1		1	1		1			2
785900						1		1			1		2	2		1	2		3
785930						1	1	1	1				1						0
786000					1	2	1	2	1				1	1			1		2
786030					1	1	1	1						1					0
795930						1	1	1					1						0
796000						2		1									1		1
796030						1	1						1	1			1		0
Mult. Vessels	0	6	10	4	6	10	4	4	0	4	1	5	6	3	0	3	1	1	Mult.
Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	Vessels
2022 Month	May				June				July					Aug				Sep	

Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	
2022 Month	May				June				July					Aug				Sep	Mult.
Mult. Vessels	0	6	10	4	6	10	4	4	0	4	1	5	6	3	0	3	1	1	Vessels
2020																			
715600			1																0
715730									1	1		1							0
715800				1					1	1		1							0
725630			2				1												1
735630			1			1				1					1		1		0
735700			1			1	1			1					1		1		0
745830				1															0
755800			2											2	1			1	2
755830			2												1				1
765830			1						1									1	0
765900												1							0
765930														1					0
775830							1	1	1					1	1			1	0
775900	1	4	2	2		1	1	1	1	1	1	1		1					3
775930		3	2	2		1	1		1	1	1	1		2	1				4
785830							1	1	1		1								0
785900		2		1			2	2	1	1		1		1	1				3
785930				1			1												0
786000		4		1			2	2	1	2	2		1	1		1	1	1	4
786030		1					2				1								1
796000													1	1					0
796030		2					1	1	1		1		1			1		1	1
2021																			
715600						1													0
715730																1			0
725630			1															1	0
735630			1																0
735700			1			1													0
755800			1		1	1	1	1									1		0
755830			1			1	1												0
765830			1	1	1	1	1												0
775830				1	1		1							1	1	1			0
775900	1	2	1	1	1		1	1		1	1		2	1	1	2	1		3
775930	1	2	2	1			1	1			1		1	1		2	1		3
785830													1	1	1		1		0
785900				1	1		1	1		1	1		2		1	1			1
785930			1	1	1					1			1			1			0
786000		2	2	1	1		1			1	1	1	1	1	1		1		2
786030		2	2														1		2
796000				1	1		1				1				1				0
796030		1	1		1					1	1		1				1		0
Mult. Vessels	0	6	10	4	6	10	4	4	0	4	1	5	6	3	0	3	1	1	Mult.
Week	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	Vessels
2022 Month	May				June				July					Aug				Sep	

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