INITIAL REVIEW DRAFT

Environmental Assessment/ Regulatory Impact Review for Proposed Amendment to the Fishery Management Plan for

Modifications to Gulf of Alaska Pollock and Pacific Cod Seasonal Allocation

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Abstract: This document analyzes the impacts of potential modifications to the seasonal allocation of pollock and Pacific cod total allowable catch (TAC) in the Central and Western Gulf of Alaska. The modifications are being considered by the North Pacific Fishery Management Council in order to improve management of the fisheries by reducing potential inefficiencies for fishery participants. Modifying the seasons or seasonal allocations of pollock and cod could allow the fisheries to more fully harvest the TAC, increase management flexibility and potentially decrease prohibited species catch. The modifications would not re-distribute allocations of pollock or cod between management areas or participants.

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
MMPA	Marine Mammal Protection Act
MSST	minimum stock size threshold
mt	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

Table of Contents

Executive Summary 7
1 *Introduction* *12*
1.1 Purpose and Need 12
1.2 History of this Action 12
1.3 Description of Management Area 13
2 *Description of Alternatives* *14*
2.1 Alternative 1, No Action 14
2.1.1 Pollock TAC Allocation and Management 15
2.1.2 Western and Central GOA Pacific Cod TAC Allocation and Management 17
2.2 Alternative 2 19
2.3 Alternative 3 20
2.4 Comparison of Alternatives 22
2.5 Alternatives Considered but not Further Analyzed 22
3 *Environmental Assessment* *23*
3.1 Methods 24
3.1.1 Documents incorporated by reference in this analysis 24
3.1.2 Resource components addressed in the analysis 25
3.1.3 Cumulative effects analysis 26
3.2 Target species 27
3.2.1 Pollock 27
3.2.1.1 Status of GOA Pollock 27
3.2.1.2 Harvest 27
3.2.2 Pacific cod 30
3.2.2.1 Status of GOA Pacific cod 30
3.2.2.2 Harvest 30
3.2.3 Effects of the Alternatives on Target Species 34
Pacific cod 35
3.2.3.1 Cumulative Effects on Target Species 35
3.3 Non-target species 37
3.3.1 Chinook Salmon 37
3.3.1.1 Management of Chinook Salmon 37
3.3.1.2 Status of Chinook Salmon 38
3.3.1.3 GOA Pollock Chinook PSC 40
3.3.1.4 Temporal Distribution of Chinook PSC in the Central and Western GOA Pollock Fisheries 41
3.3.2 Pacific Halibut 43
3.3.2.1 Management of Pacific Halibut 43
3.3.2.2 Importance of the Gulf of Alaska for North Pacific Halibut Stock 45
3.3.2.3 Status of Pacific Halibut 46
3.3.2.4 Temporal Distribution of Halibut PSC in the Central and Western GOA 47
3.3.3 Effects of the Alternatives on Non-Target Species 50
3.4 Marine Mammals 51
3.4.1 Status of Marine Mammals in the GOA 51
3.4.1.1 Marine Mammal Interactions with GOA Groundfish Fisheries 55
3.4.1.2 Steller Sea Lion, Western U.S. Stock Status 56
3.4.1.3 Steller Sea lion Protection Measures in the Gulf of Alaska groundfish fisheries 59
3.4.2 Effects on Marine Mammals 60
3.4.2.1 Alternative 1 60
3.4.2.2 Alternative 2 62
3.4.2.3 Alternative 3 64
3.5 Seabirds 66
3.5.1 Effects on Seabirds 67
3.6 Habitat 67
3.6.1 Effects on Habitat 68
3.7 Ecosystem 68
3.7.1 Effects of the Alternatives on the Ecosystem 68
3.8 NEPA Summary 68

4 Regulatory Impact Review ... 69
4.1 Statutory Authority ... 69
4.2 Purpose and Need for Action ... 70
4.3 Alternatives ... 70
4.4 Methodology for analysis of impacts ... 71
4.5 Description of Fisheries ... 72
4.5.1 Harvester Participation ... 72
4.5.1.1 Vessel Participation ... 72
4.5.1.2 Pollock and Pacific Cod Harvest ... 75
4.5.1.3 Products and Value ... 78
4.5.1.4 Prohibited Species Catch ... 83
4.5.2 Processor and Community Participation ... 86
4.6 Analysis of Impacts ... 88
4.6.1 Alternative 1 - No action ... 89
4.6.1.1 Pollock Fishery ... 89
4.6.1.1.1 Fishery Closures ... 89
4.6.1.1.2 Reallocation (Rollover) of Unharvested TAC ... 90
4.6.1.2 Pacific Cod Fishery ... 92
4.6.2 Alternative 2 - Combine A/B and C/D pollock seasons ... 93
4.6.3 Alternative 2 Option - Increase the amount on unharvested pollock TAC that NMFS can reallocate to subsequent season ... 95
4.6.4 Alternative 3 - Modify seasonal allocation of Pacific cod TAC for trawl CVs ... 96
4.7 Summation of the Alternatives with Respect to Net Benefit to the Nation ... 98
5 Magnuson-Stevens Act and FMP Considerations ... 98
5.1 Magnuson-Stevens Act National Standards ... 98
5.2 Section 303(a)(9) Fisheries Impact Statement ... 99
5.3 Council's Ecosystem Vision Statement ... 99
6 Preparers and Persons Consulted ... 100
7 References ... 100

List of Tables

Table 2-1 GOA pollock seasonal allocations, 2003 versus 2018 15
Table 2-2 Sector allocations for Western GOA Pacific cod TAC 18
Table 2-3 Sector allocations for Central GOA Pacific cod TAC 18
Table 2-4 GOA pollock seasonal biomass distribution used for area TAC-setting, 2017 and 2018 20
Table 2-5 Changes in seasonal GOA Pacific cod TAC apportionment under Alternative 3 options, relative to status quo 21
Table 2-6 Summary of alternatives 22
Table 2-7 Summary of environmental impacts 22
Table 3-1 Resources potentially affected by the proposed action and alternatives 26
Table 3-2 GOA pollock TAC and percent caught by area and season, 2012 through 2017 (seasons and years with <50% TAC utilization shaded in red) 28
Table 3-3 Western GOA Pacific cod TAC (mt) and percent caught, 2012 through 2017 31
Table 3-4 Central GOA Pacific cod TAC (mt) and percent caught, 2012 through 2017 32
Table 3-5 Criteria used to determine significance of effects on target groundfish stocks 34
Table 3-6 Reasonably foreseeable future actions 36
Table 3-7 Abundance indices for 1999–2017 for the SEAK, NBC, and WCVI AABM fisheries. Postseason values for each year are from the first postseason calibration following the fishing year. 39
Table 3-8 Halibut PSC rate by month in the GOA Pacific cod target CV trawl fishery, 2012 through 2017 48
Table 3-9 Criteria used to determine significance of effects on non-target species 50
Table 3-10 Marine mammals that are known to occur in the Gulf of Alaska 54
Table 3-11 Trends (annual rates of change expressed as % y-1 with 95% credible interval) in counts of western SSL non-pups (adults and juveniles) and pups in Alaska, by region, for 2003-2016 (Sweeney et al. 2016). 58
Table 3-12 Benthic dependent marine mammals, foraging locations, and diving depths 62
Table 3-13 Seabird species in Alaska 66
Table 3-14 ESA-listed and candidate seabird species that occur in the GOA. 66
Table 4-1 Active GOA pollock and Pacific cod CVs by season and gear type, 2017 72
Table 4-2 GOA pollock CVs that fished multiple regulatory areas in the same half of the year, 2016 through 2018 73
Table 4-3 Vessels participating in both the GOA Pacific cod trawl fishery and state-waters Pacific cod pot fishery, 2011 through 2016 74
Table 4-4 Pollock season closures, 2012 through 2017 77
Table 4-5 GOA pollock trawl production and wholesale value by product type, 2012 through 2016 79
Table 4-6 GOA pollock production by month, 2012 through 2017 79
Table 4-7 GOA Pacific cod production and wholesale value by product type, 2012 through 2016 80
Table 4-8 Average fish size (kg) by month, 2012 through 2017 83
Table 4-9 Average and median Chinook salmon PSC by month in the GOA pollock and Pacific cod target CV fisheries, 2012 through 2017 84
Table 4-10 Chinook salmon PSC rate (# Chinook/mt groundfish) by month in the GOA pollock and Pacific cod target CV trawl fisheries, 2012 through 2017 85
Table 4-11 GOA pollock and Pacific cod processing activity (all gears), 2012 through 2017 86
Table 4-12 GOA groundfish processor workers and labor hours/payments by month, 2015 (Source: Economic Data Reports) 88
Table 4-13 Retrospective trawl CV TAC (mt) by area and option under Alternative 3, 2016 through 2018 96

List of Figures

Figure 1-1 Regulatory and reporting areas in Federal waters off Alaska. 14
Figure 3-1 Spatial distribution of A/B season GOA pollock trawl harvest, 2015 through 2017 29
Figure 3-2 Spatial distribution of C/D season GOA pollock trawl harvest, 2015 through 2017....... 29
Figure 3-3 Spatial distribution of A season GOA Pacific cod trawl harvest, 2015 through 2017 33
Figure 3-4 Spatial distribution of B season GOA Pacific cod trawl harvest, 2015 through 2017 33
Figure 3-5 Annual estimated Chinook salmon PSC in pollock trawl CV fisheries, 2013 to partial year 2018, for the Western (WG) and Central GOA (CG). Source: NMFS Alaska Region Catch Accounting System....... 42
Figure 3-6 Summed 2013-2017 CV trawl pollock landings (mt) and Chinook PSC (numbers of fish) in the Central (top) and Western (bottom) Gulf of Alaska by week number. The seasons are indicated by the green bars. 42
Figure 3-7 IPHC Regulatory Areas and the Pacific halibut geographical range within the territorial waters of Canada and the United States of America....... 44
Figure 3-8 Stock distribution by biological region as estimated from annual IPHC longline survey catches from 2004-2018. Source IPHC....... 45
Figure 3-9 Halibut mortality by source for the coastwide stock (top) and within Region 3 (Gulf of Alaska) from 2004-2018. Source IPHC....... 46
Figure 3-10 Realized halibut PSC compared to specified halibut PSC limits for the shallow water complex trawl fisheries in the Gulf of Alaska from 2012-2018. Source NMFS Gulf of Alaska Halibut Mortality Report data through Nov 10, 2018....... 47
Figure 3-11 Summed 2013-2017 CV trawl Pacific cod landings (mt) and Pacific halibut PSC (numbers of fish) in the Central (top) and Western (bottom) Gulf of Alaska by week number. The seasons are indicated by the green bars....... 48
Figure 3-12 Halibut PSC by year in the CGOA and WGOA Pacific cod trawl CV fisheries. Source: AKFIN Prohibited Species Bycatch database 49
Figure 3-13 Halibut PSC and Pacific cod harvest (weekly in mt) in the combined 2013-2018 CGOA and WGOA Pacific cod trawl CV fisheries. Source: AKFIN Prohibited Species Bycatch database....... 50
Figure 3-14 Generalized distribution (crosshatched area) of SSLs in the North Pacific and major U.S. haulouts and rookeries (50 CFR 226.202, 27 August 1993), as well as active Asian and Canadian (British Columbia) haulouts and rookeries. Black dashed line (144°W) indicates stock boundary and solid black line delineates U.S. Exclusive Economic Zone....... 57
Figure 4-1 Catch pattern of GOA state-waters Pacific cod pot fisheries, 2008 through 2017 75
Figure 4-2 GOA pollock trawl wholesale value per pound, 2012 through 2016....... 81
Figure 4-3 GOA Pacific cod wholesale value per pound (all gear sectors), 2012 through 2016 81
Figure 4-4 Average price per pound (nominal $) for trawl-caught Pacific cod by GOA area, 2013 through 2016 82
Figure 4-5 Alaska export value ($/mt) by product form, 2015 through March 2018....... 82

Executive Summary

Purpose and Need

Evaluation of the pollock and Pacific cod trawl fisheries in the Gulf of Alaska indicates the seasonal distribution of pollock and cod may create inefficiencies for participants and there may be opportunities to improve management of the fisheries. Modifying the seasons or seasonal allocations of pollock and cod could increase fishery yield, particularly for roe quality and quantity of pollock, management flexibility and potentially decrease prohibited species catch. The Council intends to improve prosecution of these fisheries while not re-distributing allocations of pollock or cod between management areas or participants. The Council understand that this action may have implications for Steller sea lion management measures and would be reviewed consistent with the Endangered Species Act.

Alternatives

Alternative 1. No action (Status quo)

Alternative 2. Combine the A and B season into a single season, and combine the C and D season into a single season and allocate pollock among a combined A/B and C/D seasons 50% to the A/B season and 50% to the C/D season. This change is applicable to areas 610, 620, and 630.

Option: Increase the amount of unharvested pollock that may be reallocated from one season to the following season, or among areas, from 20% to:

Sub-option 1: 25%
Sub-option 2: 30%

Alternative 3. Modify the Western and Central Gulf of Alaska Pacific cod allocation for trawl catcher vessels among the existing A and B seasons as follows:

Option 1: A Season: 65%; B Season: 35%
Option 2: A Season: 70%; B Season: 30%
Option 3: A Season: 75%; B Season: 25%

Environmental Assessment

Target Species

Under the status quo, the pollock and Pacific cod stocks are neither overfished nor approaching an overfished condition (NPFMC 2017). Modifications to the seasonal allocations for pollock and Pacific cod and increasing the seasonal rollover limit for pollock may allow the fisheries to more fully realize the specified TACs. The actions are not expected to result in full harvest of TACs since competing harvest incentives rather than seasonal allocation inefficiencies can contribute to underharvest. Alternatives 2 and 3 do not increase the risk of overfishing occurring since management mechanisms that are in place to control total harvest would remain in place under those alternatives. If the groundfish TACs are not fully harvested, fishing will have less impact on the stocks. Any changes in fishing patterns that may result from the alternatives would be monitored and updated in future stock assessments.

Non-Target Species

The most important non-target species affected by the GOA pollock and Pacific cod trawl fisheries are Chinook salmon and Pacific halibut, respectively, through direct mortality due to PSC. There are no management measures that would modify established limits for PSC of Chinook salmon or Pacific halibut under either the status quo or action alternatives. Likewise, none of the alternatives propose to increase PSC utilization, but that outcome would be considered a minor change if it did occur. Under the existing management landscape, mortality of non-target PSC species will continue to be monitored and will be constrained to acceptable levels that were identified and analyzed in support of previous actions.

Marine Mammals

Under Alternative 1, there would be no expected changes in incidental take, prey availability, or disturbance effects. Alternatives 2 and 3 would not increase the annual TAC, and therefore, overall annual effort would be expected to remain similar to the status quo alternative. Any temporal shift in harvest effort resulting from adoption of Alternatives 2 or 3 and their options could be accompanied by a spatial shift in harvest. Unless those shifts result in the fishery being prosecuted in proximity to higher concentrations of SSL that could be attracted to the vessels, an increase in incidental take of SSL would not be not expected. Alternatives 2 and 3 would not increase the risk of incidental take or ship strikes of SSL.

Other Resource Components

Under the status quo, seabird disturbance and incidental take are at low levels and are mitigated by seasonal and spatial restrictions on the GOA trawl fisheries. Under the action alternatives, disturbance or incidental take is not expected to increase to a level that would result in population level effects on seabirds. If the fleet spends longer time fishing, there may be some increase to removals of seabird prey. However, this increase is unlikely to result in population level effects.

Previous analyses have found no substantial adverse effects to habitat in the GOA caused by fishing activities (citation needed). Any effects continue to be limited by the amount of the groundfish TACs and by the existing habitat conservation and protection measures. Overall, the combination of the direct, indirect, and cumulative effects on habitat complexity for both living and non-living substrates, benthic biodiversity, and habitat suitability is not likely to be significant under any of the alternatives.

Regulatory Impact Review

GOA Pacific cod and pollock total allowable catch (TAC) has been allocated across multiple seasons within the calendar year at the current proportions since 2001 and 2003, respectively. Pacific cod TAC is allocated between A and B seasons at a 60%:40% ratio across all gear and operational types. Because the Pacific cod aspect of this considered action (Alternative 3) is focused specifically on the trawl CV sector, it is critical to understand that trawl CVs are not currently managed under a 60%:40% seasonal TAC split. NMFS can reallocate quota between sectors within a season if it is unlikely to be harvested and another sector could benefit; such reallocations typically occur in the B season and flow from the trawl CV sector to other gear groups. Inshore pollock TAC is allocated equally (25%) across four seasons (A, B, C, D). Within each pollock season, TAC is apportioned across NMFS regulatory areas in the Western and Central GOA (610, 620, and 630) based on estimated seasonal biomass distribution across areas. Pollock TAC that goes unharvested in a season may be reallocated to the subsequent season in the area where the underharvest occurred, up to a cap equal to 20% of that area's TAC for the latter season; any remainder of unharvested quota can then be reallocated to the next season for other GOA areas, up to those areas' 20% caps. These seasonal TAC allocations and reallocation limits were implemented as a mitigation measure to reduce the potential for GOA groundfish fisheries to jeopardize or otherwise adversely affect Endangered Species Act (ESA) listed stocks of Steller sea lions (SSL).

Alternative 1 – No action

For the pollock fishery, status quo management can result in time gaps between the A and B seasons and between the C and D seasons. The gaps vary in length depending on the pace of fishing and TAC utilization during the A and C season. Time gaps due to regulatory closures in what would otherwise likely be a continuous fishery present a range of inefficiencies. The nature of those inefficiencies varies depending on the length of the disruption and the other opportunities available to pollock harvesters, processors, and processing workers during the time of closure. A short regulatory stand down primarily causes operational inefficiencies. For harvesters, operational inefficiencies could include direct fuel costs to transit back and forth to fishing grounds, lost labor productivity (more days to earn the same income), or missed windows of good weather, high CPUE, or times of valuable roe quality that fall between the A and B seasons. Processors also experience reduced productivity if labor and equipment is idled. Plants that house workers would continue to accrue labor overhead in addition to capital maintenance. The effect of a longer closure is determined by what other opportunities exist in that time and area or in other fisheries that a stakeholder can access. A long stand down also erodes the real-time knowledge of the fishing grounds that skippers develop over the course of a continuous season. That knowledge is often key to achieving higher CPUE and minimizing bycatch of non-target species and PSC. Processors might have a unique concern in that they have less certainty about how their delivering fleet will be comprised when fishing reopens.

The pollock inseason reallocation provision allows at least a portion of unharvested pollock to be available in the following season. The cap on reallocation limits the concentration of annual fishing activity in a given time and space so that it does not adversely impacts SSLs. However, the cap on rollovers can result in unharvested TAC that cannot be caught in the subsequent season. This can happen in two ways: (1) all eligible GOA areas have reached their 20% rollover cap but unharvested pollock from the previous season still remains, and (2) unharvested TAC is rolled over to the subsequent season in an area where it has a low probability of being caught. Because the 20% rollover cap must be “filled” for the next season in the area where an underharvest occurred before additional TAC may be allocated to other areas, reallocations between areas are less frequent but not uncommon. The typical condition that leads to reallocations from one area to another is a TAC that far exceeds harvesting capacity. In the current seasonal biomass distribution regime, this is most likely to occur in Area 620. In cases of severely underharvested quotas, reallocation caps can result in a situation where all areas receive the maximum possible quota for the following season, but an amount still remains that cannot be reallocated and is thus not available to be fished.

GOA trawl CVs only directed fish for B season Pacific cod in the Central GOA. The Western GOA trawl CV sector receives 10.7% of the total annual Western GOA Pacific cod TAC (see Table 2-2) but it goes largely unharvested. Central GOA B season TAC utilization is typically below 50% and fell precipitously in the years leading up to the 2018 reduction in ABC. Selecting the No Action alternative would maintain the 60%:40% TAC apportionment across all gear sectors and the sector-level season allocation percentages that were implemented in 2012 under GOA FMP Amendment 83. As a result, Alternative 1 would not warrant further study of how the GOA Pacific cod fishery is affecting SSLs.

Alternative 2 – Combine pollock A/B and C/D seasons

The alternative to combine the A/B and C/D seasons is transparently intended to provide the fleet and processors with flexibility to prosecute the pollock fishery in a manner that maximizes yield and profitability within certain constraints that would not be removed by combining the seasons. The likelihood of maximizing fishery yield is improved when vessels have more latitude to choose when to fish. That choice is determined by fish aggregation, market availability, and – fundamentally – when the fishery is open. Alternative 2 could improve the chance that the fishery is open during high yield or profitable fishing times (e.g., roe season) by reducing the incidence of mid-season closures. Alternative 2 might also help keep the fishery open later in the year by giving the fleet more flexibility to mitigate high Chinook salmon PSC rates by standing down.

Flexibility in timing might also increase the profitability of an individual vessel operator or a processing plant by allowing them to tune the timing of their participation to fit with their other fisheries while incurring less of an opportunity cost. A longer season might give processors and their delivering fleet more time to fish farther afield for larger fish that can be used in value added product forms, or it might allow plants to control product flow to achieve the same. However, unless a processor owns harvesting vessels, the ability to slow the fishery is constrained by vessels need to remain productive and get a return on their time. The analysts also acknowledge that not all plants are equally equipped to produce high value-added pollock products. At the most basic level, for a high-volume species like pollock the processing sector's greatest interest in a flexibility measure is likely to be increased TAC utilization.

Many constraints that dictate the timing and pace of the pollock fishery would remain even if seasons were lengthened and the fleet had more available TAC at any given moment with which to optimize its fishing. Time determinants include fish aggregation and the roe season. Factors that will slow the fishery include vessel capacities, the 300,000 lbs. trip limit, and processing capacity. On the other hand, factors that could prevent the combined season from stretching to its full length include opportunity costs in other fisheries that require re-gearing or moving out of the GOA, and processors' need to fill wholesale market demand at certain times while competing on a world market. The continued existence of timing and pacing constraints should prevent the larger TAC of a combined season from being harvested in a significantly different manner than history would suggest; rather, under Alternative 2 effort and productivity would be allowed to shift on the margins opportunistically. The maintenance of harvest patterns that are roughly similar to those observed in the past might reduce the risk of this action posing a new or heightened risk to prey availability for protected SSLs.

Alternative 2 Option – Increase inseason reallocation cap

The Council's objective in considering raising the inseason reallocation cap from 20% to (options) 25% or 30% is to reduce the amount of pollock TAC that could be stranded if a season's TAC is severely underharvested in an area. The efficacy of this option – and the appeal of choosing the suboption that implements the change to a lesser (25%) or greater (30%) extent – depends largely on how the Council chooses to consider the term "stranded." If "stranded" is to mean that pollock quota is lost to the system and *cannot possibly be fished*, then the option to increase the cap is inarguably appealing. However, if "stranded" is to mean that pollock quota is rolled over from an area with low TAC utilization to the subsequent season in the same area and that rolled-over quota is *unlikely to be fished*, then the choice is less clear and hinges on predicting which areas will experience consecutive seasons of poor TAC utilization in the future.

Increasing the rollover cap raises the bar for the amount of underharvest required for a reallocation to first fill the underharvested area's cap and then roll the remainder to other areas. Because this option is attached to Alternative 2, the occasion of an inseason rollover under a higher rollover cap could only occur at one point in the fishing year, as opposed to three points under status quo.

If stakeholders in one area hope to benefit from underharvest in another area by receiving additional quota in their proximate waters, then the status quo option (20%) seems preferable. The analysts emphasize that the Council is not currently considering a reduction in, or elimination of, the 20% rollover cap in order to make inter-area rollovers more common. In the extreme, reallocating all underharvest to areas with higher expected TAC utilization could result in a higher proportion of the annual TAC being taken in a more concentrated time and space, which could increase the likelihood of adverse effects on prey availability for SSLs.

Alternative 3 – Modify trawl CV Pacific cod seasonal TAC apportionment

Alternative 3 would modify the seasonal allocation of Pacific cod for the Western and Central GOA trawl CV sectors. The language of the alternative couches the allocation changes in reference to a 60%:40% ratio between the A and B seasons in each area, but that ratio only applies across all gear types taken together. In June 2018 the Council affirmed the analysts' approach to translating the intent of the alternative into +/-5% *relative* changes to the seasonal apportionment balance in the trawl CV sector. This approach does not impact the seasonal apportionment for any other sector, but it does alter the 60%:40%

ratio. Option 1 shifts 2% of the B season TAC to the A season, Option 2 shifts 4% of the B season TAC to the A season, and Option 3 shifts 6% of the B season TAC to the A season. Table ES-1 translates the seasonal allocation shifts for each option into metric tons of quota based on the harvest specifications for 2016 through 2018. The column labeled “increment” shows the difference in metric tons between the A or B season under each option from the one before it, moving sequentially from left to right in the table (status quo, Option 1, Option 2, Option 3).

Table ES-1 Retrospective trawl CV TAC (mt) by area and option under Alternative 3, 2016 through 2018

		Status Quo		**Option 1**		**Option 2**		**Option 3**		***Increment***
		A	**B**	**A**	**B**	**A**	**B**	**A**	**B**	
CG	2016	7,738	7,487	8,502	6,726	9,263	5,965	10,024	5,203	*± 761*
	2017	6,933	6,708	7,617	6,026	8,299	5,344	8,981	4,662	*± 682*
	2018	1,274	1,233	1,400	1,107	1,525	982	1,650	857	*± 125*
WG	2016	7,579	2,928	8,104	2,402	8,629	1,877	9,155	1,352	*± 525*
	2017	6,861	2,650	7,337	2,175	7,812	1,699	8,288	1,224	*± 476*
	2018	1,543	596	1,650	489	1,757	382	1,864	275	*± 107*

The WGOA trawl CV sector fully utilized its A season TAC in 2016 and 2017, but caught only 87% under the lower TAC for 2018. The CGOA trawl CV sector caught 70% of its A season TAC in 2016 and 2017, but caught only 31% under the lower TAC for 2018. Based on that sample of years one might say that additional quota apportioned to the A season has a good chance of being caught during times of normal abundance, but that the GOA Pacific cod fishery is not currently in a normal cycle.

During normal years, the timing of the GOA Pacific cod A season trawl fishery is driven by fish aggregation, roe content, and the pace of demand from processors during what can be a congested part of the year. Harvesters also consider PSC constraints for halibut and Chinook salmon. Bycatch of either PSC species in one GOA FMP subarea affects the ability of vessels in the other area to continue fishing, but the dynamic is slightly different for Chinook salmon. Much of the WGOA trawl CV fleet does not trawl for non-pollock groundfish later in the year, and because the Chinook PSC hard cap is applied cumulatively potential closures are more likely to affect opportunities that occur in the Central GOA. Halibut PSC can close the fishery for a shorter amount of time, but the first seasonal apportionment of halibut PSC for the shallow-water complex has to last until April 1 so it covers the most important part of the A season peak. A closure on halibut PSC could cause A season revenue to be forgone and vessels to switch into other targets or gear sectors. While Chinook salmon PSC rates in the cod target fishery are somewhat unpredictable throughout the course of the year, halibut PSC tends to track effort.

1 Introduction

This document is an Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA). An EA/RIR/IRFA provides assessments of the environmental impacts of an action and its reasonable alternatives (the EA), the economic benefits and costs of the action alternatives, as well as their distribution (the RIR), and the impacts of the action on directly regulated small entities (the IRFA). This EA/RIR/IRFA addresses the statutory requirements of the Magnuson Stevens Fishery Conservation and Management Act, the National Environmental Policy Act, Presidential Executive Order 12866, and the Regulatory Flexibility Act. An EA/RIR/IRFA 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.

1.1 Purpose and Need

The Council established the following purpose and need statement at its June 2018 meeting in Kodiak, Alaska:

Evaluation of the pollock and Pacific cod trawl fisheries in the Gulf of Alaska (GOA) indicates the seasonal distribution of pollock and cod may create inefficiencies for participants and there may be opportunities to improve management of the fisheries. Modifying the seasons or seasonal allocations of pollock and cod could increase fishery yield, particularly for roe quality and quantity of pollock, management flexibility and potentially decrease prohibited species catch. The Council intends to improve prosecution of these fisheries while not re-distributing allocations of pollock or cod between management areas or participants. The Council understands that this action may have implications for Steller sea lion management measures and would be reviewed consistent with the Endangered Species Act.

1.2 History of this Action

GOA Pacific cod and pollock total allowable catch (TAC) has been allocated across multiple seasons within the calendar year at the current proportions since 2001 and 2003, respectively. Pacific cod TAC is allocated between A and B seasons at a 60%:40% ratio across all gear and operational types, including catcher vessels (CV), catcher/processors (CP), trawl, pot, and hook-and-line. Inshore pollock TAC is allocated equally (25%) across four seasons (A, B, C, D).[1] Within each pollock season, TAC is apportioned across NMFS regulatory areas in the Western and Central GOA (610, 620, and 630) based on estimated seasonal biomass distribution across areas; pollock area apportionments are revised annually as part of the stock assessment and harvest specifications process. These seasonal TAC allocations were implemented as a mitigation measure to reduce the potential for GOA groundfish fisheries to jeopardize or otherwise adversely affect Endangered Species Act (ESA) listed stocks of Steller sea lions (SSL). The SSL mitigation measures were put in place after NMFS issued a Comprehensive Biological Opinion (BiOp) on November 30, 2000 that evaluated all authorized federal groundfish fisheries and the overall management framework established by the GOA and BSAI Fishery Management Plans (FMP). That BiOp concluded that, at the time, Alaska groundfish fisheries jeopardized the continued existence of the western distinct SSL population segment and adversely modify its critical habitat. Seasonal groundfish allocations were developed as a reasonable and prudent alternative to address this impact.

[1] The Offshore component (CPs) is allowed to take pollock as incidental catch in non-pollock groundfish fisheries, as limited by the maximum retainable amounts (MRA) defined at §679.20(e) and (f). GOA inshore-offshore allocations are defined at §679.20(a)(6).

The issues addressed in this analysis arose from a series of discussion papers that can be found on the December 2017 Council agenda[2]. Two of those papers addressed the relationship between halibut and Chinook salmon prohibited species catch (PSC) and the timing of GOA groundfish landings. One paper analyzed halibut PSC in the A season of the WGOA Pacific cod trawl fishery and found that PSC was somewhat more likely to occur early in the A season, soon after the January 20 start date. A paper on Chinook salmon PSC during the Western GOA pollock C/D season found evidence of association between vessel size (length) and Chinook PSC, but it did not identify a strong temporal trend in the Chinook PSC rate that was consistent across each year individually. After reviewing those papers, the Council did not find a clear avenue to PSC reduction through adjusting season dates, and further noted that season date changes -- e.g. a later start to the Pacific cod A season -- could have allocative effects across subsets of the GOA trawl fleet. A third December 2017 paper addressed the amount of uncaught Pacific cod TAC in all gear sectors during the GOA B season (Sept. 1 through Dec. 31) and scoped opportunities for—and complications with—regulatory changes intended to increase TAC utilization. As the Council considered the idea of re-apportioning annual GOA Pacific cod TAC from the B season to the A season it identified two primary complications: (1) accordance with the existing Steller sea lion mitigation measures referenced below, and (2) unintended effects on the relative A/B seasonal apportionments for particular gear sectors when changing the 60%:40% ratio that is applied at the FMP subarea level and considers all gear types jointly. (Note that Pacific cod TAC apportionment across seasons and gear sectors is described below in Section 3.2.2.)

In June 2018, the Council considered a discussion paper[3] that scoped policy options for changing GOA pollock and Pacific cod seasonal TAC allocation with the goal of improving efficiency in fishery management and prosecution while providing additional value from the fishery by allowing participants to focus effort when target groundfish species are available and of high product quality. For pollock, the Council considered options that could have altered the even 25% seasonal TAC allocation across the four seasons (A through D). Whether combining the A/B and C/D seasons or not, some options would have shifted the annual TAC towards the A and B seasons to varying degrees. The Council elected to analyze only options that would maintain the relative seasonal distribution of TAC across the A/B and C/D seasons; in other words, each of the four seasons would receive 25% of the annual TAC or each of two combined A/B and C/D seasons would receive 50% of the annual TAC. The Council arrived at that decision after concluding that shifting TAC, on net, towards the earlier part of the calendar year would have the unintended effect of increasing the proportion of total annual TAC that is available in Area 620 at the expense of Areas 630 and 610. For Pacific cod, the Council considered shifting annual Western and Central GOA TAC from the B season to the A season across all gear sectors. After concluding that a wholesale seasonal shift at the area level would have non-uniform effects across gear sectors, the Council elected to focus its action alternatives for Pacific cod solely on catcher vessels using trawl gear (Trawl CV). Additional detail on these considerations is provided below in Section 2.5.

1.3 Description of Management Area

This action pertains to management subareas in the Gulf of Alaska (Figure 1-1). In the GOA, pollock and Pacific cod are managed both area-wide (i.e. Gulf-wide specification of OFL/ABC) and by FMP sub-areas (i.e., subarea apportionment of the TAC). This action does not propose to establish or modify subarea allocation of pollock or Pacific cod or reduce access to the spatial availability of these resources.

The aspects of this action that apply to GOA pollock pertain only to Areas 610, 620, and 630 (Western GOA and Central GOA). The pollock TAC in Area 640 (West Yakutat District) is not divided into

[2] http://legistar2.granicus.com/npfmc/meetings/2017/12/967_A_North_Pacific_Council_17-12-04_Meeting_Agenda.pdf?id=0677aca4-0622-49ea-bf6b-b1f76598e30c
[3] http://npfmc.legistar.com/gateway.aspx?M=F&ID=983eceaa-fc41-4d4e-8276-2820b9e951bf.pdf

seasonal allowances; rather, the Area 640 TAC is allocated entirely to the Inshore component, which is typically prosecuted by a small number of Kodiak-based CVs and catch equals only a small proportion of the TAC. Moreover, Chinook salmon taken in Area 640—which occurs at de minimis levels—do not accrue to annual GOA trawl sector PSC limits, meaning that the timing of this fishery and seasonal PSC rates are not likely to influence annual Chinook salmon removals.

The aspects of this action that apply to GOA Pacific cod pertain only to the Western and Central Regulatory areas as shown in Figure 1-1.

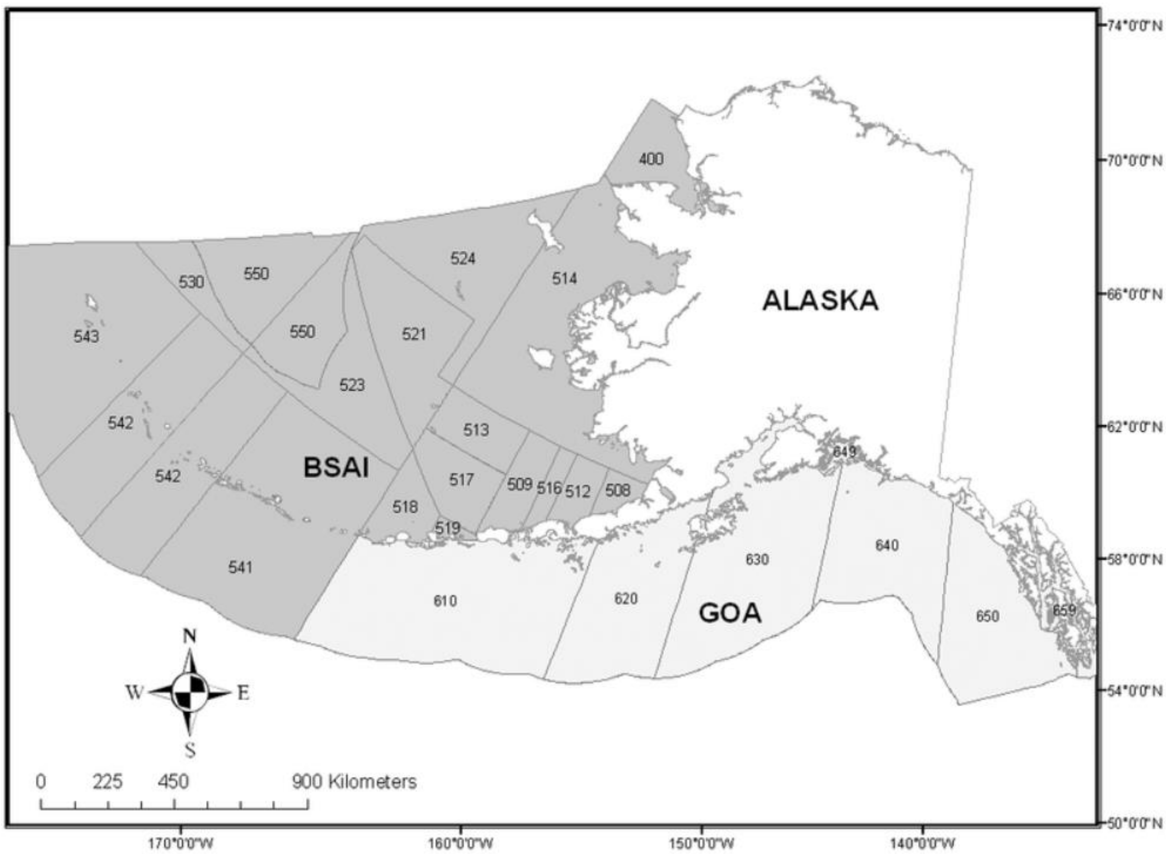


Figure 1-1 Regulatory and reporting areas in Federal waters off Alaska.

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 chapter were designed to accomplish the stated purpose and need for the action. The Council adopted the following range of alternatives and options and directed staff to provide preliminary environmental and regulatory impact analyses.

2.1 Alternative 1, No Action

Under Alternative 1, the pollock TAC would continue to be allocated equally (25%) across four seasons (A, B, C, D) in GOA management areas 610, 620, and 630. Additionally, the existing cap on seasonal reallocation of pollock would be maintained, where an area's unharvested pollock in one season can be reallocated to the same area and/or other areas in the subsequent season up to a maximum of 20% of the subsequent season's initial allocation.

Under Alternative 1, the Pacific cod TAC would continue to be allocated between the A and B seasons at a 60%:40% ratio across all gear and operational sectors in all management areas of the GOA.

2.1.1 Pollock TAC Allocation and Management

The four GOA pollock seasons for the WGOA and CGOA (610/620/630) are defined as follows:

A – January 20 to March 10 B – March 10 to May 31
C – August 25 to October 1 D – October 1 to November 1

Twenty-five percent of the annual pollock TAC for the WGOA and CGOA is allocated to each season, then further apportioned across regulatory areas based on estimated biomass distribution throughout the year. NMFS inseason managers close the directed pollock fishery in each management area as the seasonal TAC is taken. After each area's overages and underages are accounted for, uncaught pollock TAC may be reallocated from one season to the next according to a prescribed series of steps that is detailed later in this chapter. Within the confines of those steps, managers' objective is to allow for optimal harvest while avoiding an overage of the annual TAC. TAC that is uncaught in one area/season that cannot be reallocated to a subsequent season is not made available for later harvest. TAC that remains at the end of the D season is not rolled over to the following calendar year.

Over the last 15 years the seasonal pollock biomass distribution has shifted substantially, resulting in relatively smaller TACs in 610—most notably in the A/B season—while substantially increasing seasonal and annual TACs in 620 and, to a lesser degree, 630. In 2003, Area 610 received 25.00% of the A season and B season TACs, and 47.00% of the C season and D season TACs. In 2018, Area 610 receives only 3.50% of the A and B season TACs, and 36.59% of the C and D season TACs. Over the same period, Area 620's share of the A season TAC grew from 56.00% to 72.54%, and its share of the B season TAC grew from 66.00% to 85.39%. For the C and D seasons, Area 620's allocation has grown from 23.00% to 26.59%. Seasonal biomass distributions for the WGOA and CGOA pollock regulatory areas are summarized in Table 2-1. The seasonal biomass distribution aspect of annual harvest specifications is designed so that the pollock fleet is able to catch fish where they are occurring, and not to allocate harvest opportunities to one area relative to another.

GOA-wide pollock TAC has been on an upward trajectory throughout the last decade, peaking at a historic 247,952 mt in 2016. Since then, GOA pollock TAC has decreased to 198,675 mt in 2017, 157,455 mt in 2018, and is projected for 103,905 mt in 2019. For reference, the GOA-wide pollock TAC from 2008 through 2010 was 51,940 mt, 41,620 mt, and 75,500 mt, sequentially.

Table 2-1 GOA pollock seasonal allocations, 2003 versus 2018

Season	Year	610	620	630
A	2003	25.00%	56.00%	19.00%
	2018	3.50%	72.50%	24.00%
B	2003	25.00%	66.00%	9.00%
	2018	3.50%	85.40%	11.10%
C	2003	47.00%	23.00%	30.00%
	2018	36.60%	26.60%	36.80%
D	2003	47.00%	23.00%	30.00%
	2018	36.60%	26.60%	36.80%

As noted above, NMFS has the ability to reallocate (roll over) unharvested pollock to the subsequent season in the same and other regulatory areas. Regulations at §679.20(a)(5)(iv)(B) state that underharvested TAC may be added to subsequent seasonal allocation "in a manner to be determined by the Regional Administrator [NMFS], provided that any revised seasonal apportionment does not exceed 20% of the seasonal TAC apportionment for the statistical area." This language means that the 20% rollover cap is assessed in relation to the seasonal TAC of the area that is *receiving* the rollover of unharvested pollock, net of any overages that area incurred in the season from which the reallocation is being made. Regulations state that reallocation of uncaught TAC is applied *first* to the subsequent season in the *same* area, and only then may any remaining pollock be further reallocated to other GOA areas. The purpose of the rollover is to help the fishery achieve as much of the TAC as possible. The mechanics of how the rollover is applied (described below) are designed to mitigate incentives for the fleet to overharvest in an area because any seasonal overharvest reduces the size of the inter-seasonal rollover that it could receive.

NMFS uses predefined steps to determine how an inseason pollock reallocation from one season to the next -- A to B, B to C, or C to D -- is executed. These steps are predicated on the area/seasonal TAC levels established in annual harvest specifications (as determined by the area-wide TAC and seasonal biomass distribution) as well as over/underharvest of a given area/seasonal TAC. The following steps would be used to calculate a reallocation of unharvested A season pollock to the B season; the TAC and harvest numbers are hypothetical and chosen for ease of illustration.

1. Identify Area 610, 620, and 630 TACs and total catch during the A season.

Area	A Season TAC	A Season Harvest	Overage/Underage
610	10,000	9,000	1,000
620	30,000	23,000	7,000
630	10,000	11,000	-1,000

2. If an overage exists, deduct that amount from the area's B season TAC. If there is no overage, proceed to Step 3.

Area	A season Overage/Underage	B Season TAC	Modified B Season TAC
610	1,000	10,000	Go to step 3
620	7,000	30,000	Go to step 3
630*	-1,000	10,000	9,000

**If there were no pollock TAC available from Areas 610 or 620 to reallocate, the B season 630 TAC would be set to 9,000 mt.*

3. Determine the maximum rollover amount than each area can receive (equal to original B season TAC * 20%). If an area had an overage in the A season, that amount is deducted from the 20% maximum rollover amount (reduces incentive to overharvest).

Area	Orig. B Season TAC	20% cap	Overage?	Modified cap	= Max. B season TAC
610	10,000	2,000	No	2,000	12,000
620	30,000	6,000	No	6,000	36,000
630*	10,000	2,000	Yes (-1,000)	1,000	11,000

**630 modified 20% maximum is 2,000 mt minus 1,000 mt overage equals 1,000 mt.*

4. Determine whether each area's A season underharvest (if any) is an amount greater than its maximum rollover cap (Step 3). If no, the entire A season underharvest is added to the area's B season TAC. If yes, the area's B season TAC is set equal to the maximum B season TAC determined in Step 3, then proceed to Step 5.

Area	A season overage/ underage (Step 1)	20% cap (Step 3)	Underage > 20% cap?	Amt. needed from other areas to reach Max. TAC	B Season TAC
610	1,000	2,000	No	1,000	11,000
620	7,000	6,000	Yes	6,000	36,000
630*	-1,000	1,000	No	1,000	9,000

**If there were no pollock available to reallocate from under harvest in 620 the B season 630 TAC would be set to 9,000 mt.*
B Season TAC for Area 620 is set at 36,000 mt

5. Determine the remainder of each area's underharvested A season TAC (i.e. amount in excess of the 20% cap on reallocation to the area's own B season); this is the amount that can then be reallocated to the B season in *other* areas.

For this example, the only area with additional underharvested A season TAC that can be reallocated to the B season in other areas is Area 620. The Area 620 A season underage was 7,000; the rollover to the Area 620 B season was 6,000. Thus, 1,000 mt of pollock are available to Areas 610 and 630 (7,000 - 6,000 = 1,000).

6. Reallocate these excess amounts to the areas that are not at their reallocation cap. Do so in proportion to how the B season seasonal biomass distributions for the areas receiving the excess (published in harvest specifications) relate to one another.

For this example, presume that Area 610 and Area 630 each have a B season seasonal biomass distribution of 20%. Since they are equal, each would receive half (50%) of the 1,000 mt available as excess from 620, thus each area would receive 500 additional mt of B season pollock TAC. [If Area 630's B season biomass distribution was 30% and Area 610's was 10%, then Area 630 would receive 75% of the available excess (750 mt) and Area 610 would receive 25% (250 mt).]

7. Calculate the amount of TAC that could not be reallocated, and is thus not available for harvest, due to the 20% cap.

*Look at the areas that received an excess rollover from Area 620 and determine the maximum amount they could have received as a rollover (Orig. B season TAC * 20%, less any A season overage). Area 610 had a 1,000 mt underage; Area 630 had no underage. Combined, the two areas had a 1,000 underage. 1,000 mt was available from Area 620. Areas 610 and 630 each received a 500 mt rollover from Area 620 so, on net, the 20% cap did not result in any stranded TAC.* **The final B season TACs are: Area 610 = 11,500 mt; Area 620 = 36,000 mt; Area 630 = 9,500 mt.**

The impacts portion of the RIR (Section 4.6) will discuss how this methodology was applied to inseason pollock reallocations in 2013 (C to D seasons) and 2016 (A to B seasons). In both cases, the 20% rollover cap resulted in some amount of pollock TAC that was not allowed to be reallocated to the subsequent season in any area and thus a harvest opportunity was lost.

2.1.2 Western and Central GOA Pacific Cod TAC Allocation and Management

The Pacific cod TAC for GOA trawl CVs is apportioned across two seasons. The A season runs from January 20 through June 10 and the B season runs from September 1 through November 1. Vessels deploying non-trawl gear fish A and B seasons that run from January 1 through June 10 and September 1 through December 31, respectively.

Across all gear (trawl/non-trawl) and operational-type (CV/CP) sectors – except a set-aside for the jig gear sector – the A season in each area is allocated 60% of the annual Pacific cod TAC and the B season is allocated 40% of the TAC. Since the implementation of GOA Groundfish FMP Amendment 83 in 2012, the A and B season GOA Pacific cod TACs have been further divided between five sectors in the Western GOA and six sectors in the Central GOA. The Council established Pacific cod sector allocations after efforts to rationalize the GOA groundfish fisheries—in progress since 1999—were halted in 2006. The sector allocations were part of a package of GOA actions intended to enhance stability in the fishery by reducing competition between sectors and preserving historical participation; those actions also included limiting entry by extinguishing latent License Limitation Program (LLP) licenses.

Regulations at Section 679.20 (a)(12)(i) show the allocations for each sector (Table 2-2 and Table 2-3). The tables illustrate that no sector, in isolation, experiences a 60%:40% seasonal TAC split. For example, the CGOA trawl CV sector is currently allocated 21.1% of the CGOA A season TAC and 20.5% of the CGOA B season TAC. Those two figures are at a 51%:49% ratio to each other. The WGOA trawl CV sector is allocated 27.7% of the WGOA A season TAC and 10.7% of the WGOA B season TAC, which results in a 72%:28% seasonal ratio. The sectors that receive a small percentage of a seasonal TAC tend to be those that encounter Pacific cod as incidental catch that must be retained (as an IR/IU species), but do not directed fish for cod. Note that the Western GOA trawl CVs receive a relatively greater proportion of their annual TAC allocation in the A season, as they do not target Pacific cod in the fall.

Because the Pacific cod aspect of this considered action (Alternative 3) is focused specifically on the trawl CV sector, it is critical to understand that trawl CVs are not currently managed under a 60%:40% seasonal TAC split. The Council discussed this fact when it reviewed the June 2018 discussion paper and provided the analysts on-the-record feedback on how to translate action alternatives that are written in terms of modifications relative to "60/40". The method employed by analysts to capture the Council's intent is described in Section 2.3. Methods that were considered but discarded because of the impact they would have on sectors other than trawl CV are noted in Section 2.5.

Table 2-2 Sector allocations for Western GOA Pacific cod TAC

Sector	Gear type	Operation Type	Seasonal allowances	
			A season (in percent)	B season (in percent)
(1)	Hook-and-Line	Catcher vessel	0.70	0.70
(2)	Hook-and-Line	Catcher/Processor	10.90	8.90
(3)	Trawl	Catcher vessel	27.70	10.70
(4)	Trawl	Catcher/Processor	0.90	1.50
(5)	Pot	Catcher Vessel and Catcher/Processor	19.80	18.20

Table 2-3 Sector allocations for Central GOA Pacific cod TAC

Sector	Gear type	Operation Type	Length overall in feet	Seasonal allowances	
				A season (in percent)	B season (in percent)
(1)	Hook-and-Line	Catcher vessel	< 50	9.31552	5.28678
(2)	Hook-and-Line	Catcher vessel	≥ 50	5.60935	1.09726
(3)	Hook-and-Line	Catcher/Processor	Any	4.10684	0.99751
(4)	Trawl	Catcher vessel	Any	21.13523	20.44888
(5)	Trawl	Catcher/Processor	Any	2.00334	2.19451
(6)	Pot	Catcher Vessel and Catcher/Processor	Any	17.82972	9.97506

Regulations to implement the 2012 sector allocations of GOA Pacific cod TAC include language about the reallocation of TAC for underages and overages, and also for inseason reallocations "if […NMFS] determines that a sector will be unable to harvest the entire amount of Pacific cod allocated to [a] sector."[4]

[4] Section 679.20(a)(12)(ii)

These inseason actions are noticed in the Federal Register and posted on the NMFS Alaska Region website as Information Bulletins (IB). Each such IB notes that "the action is necessary to allow the total allowable catch of Pacific cod to be harvested." That consistent rationale across all inseason reallocation actions underlines the fact that NMFS has a tool, and is using it, to minimize the stranding of Pacific cod TAC. Regulations state that NMFS should apply this tool in the form of a policy that takes into account "the capability of a sector […] to harvest the remaining Pacific cod TAC." There are no set dates upon which reallocations should occur; NMFS relies on its management expertise as well as communication with the fleets about their expected levels of activity and/or encounter rates of Pacific cod that—as an IR/IU species—must be retained when the season is open, or up to an MRA if the season is closed. In practice, NMFS reallocates TAC that will go unharvested either to sectors that have the ability and desire to catch additional Pacific cod, or to sectors that have small cod allocations that are meant to cover incidental catch and could use additional TAC as a precautionary measure to prevent an overage (e.g., trawl CPs or Western GOA HAL CVs). The regulations provide a hierarchy that guides preference in reallocations if there are competing needs for additional TAC that would be going unharvested. That hierarchy states that NMFS should consider reallocation to CV sectors first, then reallocation to the combined CV and CP pot sector, and then to any of the other CP sectors (trawl and hook-and-line). NMFS provides a record of inseason Pacific cod TAC reallocations on its website.[5] Since the policy was implemented in 2012 almost all inseason reallocations have occurred during the B season, and most reallocations flowed from the trawl CV sector; no reallocations have been made to the trawl CV sector.

GOA Pacific cod TAC has declined precipitously from a recent high of 73,081 mt in 2015. From 2016 through 2018, the CGOA TAC for non-jig gear sectors fell from 36,614 mt to 32,804 mt to 6,028 mt. Over the same period the WGOA non-jig TAC fell from 27,360 mt to 24,769 mt to 5,572 mt. (These TAC levels reflect an adjustment for 27.1% of ABC being allocated to State of Alaska GHL fisheries.) The Council will recommend harvest specifications for the 2019 fishing year at the December 2018 meeting.

2.2 Alternative 2

The Council's action alternative for the GOA pollock fishery in Areas 610, 620, and 630 reads:

Combine the A and B season into a single season, and combine the C and D season into a single season and allocate pollock among a combined A/B and C/D seasons 50% to the A/B season and 50% to the C/D season. This change is applicable to areas 610, 620, and 630.

Option: Increase the amount of unharvested pollock that may be reallocated from one season to the following season, or among areas, from 20% to:

Sub-option 1: 25%
Sub-option 2: 30%

This alternative would not affect the process for allocating pollock TAC via harvest specifications to the first part of the year (existing A & B seasons: January 20 through May 31) relative to the second part of the year (existing C & D seasons: August 25 through November 1). If the A/B and C/D seasons are combined, one necessary procedural change would be to reformulate the seasonal biomass distribution percentages for each regulatory area from four seasons to two. Because the A and B seasons have different seasonal biomass distribution percentages in Areas 620 and 630, the analysts presume that the percentages for those two seasons would be averaged to create a distribution percentage for a new combined A/B season. As under the No Action alternative, the seasonal biomass distribution percentages for each season (or newly combined season) must sum to 100% across the three affected areas.

[5] https://alaskafisheries.noaa.gov/sites/default/files/GOA_Pcod_reallocation_2012-2016.pdf

Table 2-4 shows the seasonal biomass distribution percentages that were used to set harvest specifications in 2017 and 2018. For each season (row), the shaded cells sum to 100%. The percentage under "Total WG+CG" reflects the percentage of the GOA-wide annual pollock TAC that is apportioned to a given season (25% for each season under status quo, and 50% for each newly combined season under Alternative 2). Note that the A/B seasonal biomass distribution under Alternative two reflects the average of the A and B seasons from Alternative 1. The difference between 2017 and 2018 reflects changes in surveyed biomass, with pollock generally moving out of Area 610 and moving into 620/630. The only Central GOA area/season combination that did not receive a higher distribution percentage in 2018 relative to 2017 is the Area 630 B season. When the A and B seasons are combined under Alternative 2, the year-on-year increase for the Area 630 A season (23.97% versus 23.04%) is swamped by the decrease in the 630 B season (11.11% versus 12.85%). As a result, the combined-A/B season percentage for Area 630 would have decreased from 2017 to 2018 (17.54% versus 17.95%) under Alternative 2.

Table 2-4 GOA pollock seasonal biomass distribution used for area TAC-setting, 2017 and 2018

		2017				2018			
		% Seasonal GOA TAC			% Annual GOA TAC	% Seasonal GOA TAC			% Annual GOA TAC
Alt. 1	Season	610	620	630	Total WG+CG	610	620	630	Total WG+CG
	A	4.67%	72.29%	23.04%	25%	3.50%	72.54%	23.97%	25%
	B	4.67%	82.48%	12.85%	25%	3.50%	85.39%	11.11%	25%
	C	40.94%	25.82%	33.24%	25%	36.59%	26.59%	36.82%	25%
	D	40.94%	25.82%	33.24%	25%	36.59%	26.59%	36.82%	25%
	Total				100%				100%
Alt. 2	Season	610	620	630	Total WG+CG	610	620	630	Total WG+CG
	A/B	4.67%	77.39%	17.95%	50%	3.50%	78.97%	17.54%	50%
	C/D	40.94%	25.82%	33.24%	50%	36.59%	26.59%	36.82%	50%
	Total				100%				100%

2.3 Alternative 3

The Council's action alternative for the GOA Pacific cod trawl CV fishery in the Western and Central GOA reads:

Modify the Western and Central GOA Pacific cod allocation for trawl catcher vessels among the existing A and B seasons as follows:

Option 1: A Season: 65%; B Season: 35%
Option 2: A Season: 70%; B Season: 30%
Option 3: A Season: 75%; B Season: 25%

As noted in Section 2.1.2, the alternative is framed as a change relative to an A:B seasonal apportionment ratio of 60% to 40% for the WGOA and CGOA trawl CV sectors, but that is not how the trawl CV sectors' seasons are currently apportioned (see Table 2-2 and Table 2-3). Rather, the 60%:40% ratio holds only when considering all non-jig gear sectors in an area jointly. In June 2018, the analysts identified this disconnect and offered the Council three potential approaches to reflect the action's intent. The approach selected by the Council (termed Approach B in the June 2018 discussion paper) changes only the trawl CV sectors' relative seasonal apportionment, holding all other sectors' percentage allocations constant. The result of this decision is that the options under Alternative 3 alter the 60%:40% ratio for all sectors combined. Shifting the trawl CV seasonal allocations while maintaining the overall 60%:40% ratio in each area would have required compensatory changes to other gear sectors; this was not desired and would have made this action far more expansive in effect. The other approach considered is described in Section 2.5, below.

The selected approach captures the Council's intent of shifting Pacific cod TAC from the B season to the A season in 5% increments relative to status quo. For example, the CGOA trawl CV sector is currently allocated 21.14% of the total CGOA A season TAC and 20.45% of the total CGOA B season TAC. Those two figures are at a 51%:49% ratio to each other. Option 1 seeks a +/- 5% in relation to the status quo ratio or, in other words, a 56%/44% ratio. Option 2 would result in a 61%:39% ratio for CGOA trawl CVs, and Option 3 would result in a 66%:34% ratio. The same method applied to the WGOA trawl CV sector, where the sector has 27.7% of the total WGOA A season TAC and 10.7% of the total WGOA B season TAC, starts from the point of a 72%:28% seasonal ratio. Option 1 would change that ratio to 77%:23%, Option 2 would change it to 82%:18%, and Option 3 would change it to 87%:13%.

Table 2-5 illustrates how the selected approach translates into the Central and Western GOA trawl CV sectors' seasonal apportionment of each area's total annual Pacific cod TAC. To relate this table back to the previous paragraph, consider the WGOA trawl CV sector's A/B season apportionments under Option 3 (bottom-right panel). The sector would receive 33.46% of the total annual WGOA Pacific cod TAC in the A season and 4.94% of the total annual TAC in the B season. These two numbers are in the same proportion to each other as 87% is to 13%. The table also illustrates that no other sector's seasonal or annual TAC apportionment is changed from status quo. **Note, however, that under this approach Alternative 3 affects the overall 60%:40% A-B TAC ratio.** Rounded to the nearest whole percentage, Option 1 would shift *overall* GOA Pacific cod TAC from the B season to the A season by 2%, Option 2 would shift it by 4%, and Option 3 would shift it by 6%.

Table 2-5 Changes in seasonal GOA Pacific cod TAC apportionment under Alternative 3 options, relative to status quo

Allocation %		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	9.32%	5.29%	Same		Same		Same	
	HAL CV ≥ 50	5.61%	1.10%						
	HAL CP	4.11%	1.00%						
	Trawl CV	21.14%	20.45%	23.22%	18.37%	25.30%	16.29%	27.38%	14.21%
	Trawl CP	2.00%	2.19%	Same		Same		Same	
	Pot (CV/CP)	17.83%	9.97%						
	CG Total	60%	40%	62.09%	37.92%	64.17%	35.84%	66.25%	33.76%
WG	HAL CV	0.70%	0.70%	Same		Same		Same	
	HAL CP	10.90%	8.90%						
	Trawl CV	27.70%	10.70%	29.62%	8.78%	31.54%	6.86%	33.46%	4.94%
	Trawl CP	0.90%	1.50%	Same		Same		Same	
	Pot (CV/CP)	19.80%	18.20%						
	WG Total	60%	40%	61.92%	38.08%	63.84%	36.16%	65.76%	34.24%

2.4 Comparison of Alternatives

Table 2-6 and Table 2-7 summarize the alternatives and potential environmental impacts at a high level.

Table 2-6 Summary of alternatives

	Alternative 1	Alternative 2	Alternative 3
	No action (status quo)	Modify pollock seasons and rollover caps	Modify Pacific cod seasonal allocations
Seasons and rollovers	Pollock: A, B, C, D season 25% each Seasonal rollover cap 20% Pacific cod: A:B season allocation 60:40 of which CG Trawl CV allocation is 21.14%:20.45% and WG Trawl CV allocation is 27.70%:10.70%	Pollock: -Combine A/B and C/D seasons -Increase rollover cap --Option 1: Rollover cap:25% --Option 2: Rollover cap:30%	Pacific cod: Modify season allocations for trawl CV only: Option 1: +/- 5% Option 2: +/- 10% Option 3: +/- 15%

Table 2-7 Summary of environmental impacts

	Alternative 1	Alternatives 2 & 3
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.	Increased seasonal flexibility is not likely to increase fishing pressure. Even if there is a redistribution of effort, the fishery will likely remain within the established footprint of the trawl fishing grounds. Consequently, these alternatives are not likely to result in adverse impacts to pollock and Pacific cod stocks.
Chinook salmon	No changes.	Chinook salmon PSC may decrease slightly from the status quo if pollock fishing effort moves away from periods with relatively high Chinook PSC rates occurs.
Pacific halibut	No changes.	Pacific halibut PSC may decrease slightly from the status quo if Pacific cod fishing effort moves away from periods with relatively high halibut PSC rates occurs.
Marine mammals	No changes.	No substantial change in the number of incidental takes or prey availability is expected under either alternative.
Seabirds	No changes.	Effects on seabird takes are not likely to change substantially, and impacts are expected to be negligible.
Habitat	No changes.	Neither alternative is likely to result in significantly adverse effects to habitat.
Ecosystem	No changes	No anticipated population-level impacts to marine species or change ecosystem-level attributes beyond the range of natural variation.

2.5 Alternatives Considered but not Further Analyzed

When scoping the current set of alternatives through its review of the June 2018 discussion paper, the Council dispensed with several policy avenues that would have broadened the overall scope of potential impacts. For pollock, the Council did not pursue further analysis of options that would have shifted the overall GOA annual TAC towards the earlier part of the calendar year. The principal complications presented by those options were (1) a greater likelihood of impacts on Steller sea lions, and (2) a foreseeable but unintended rebalancing of harvest opportunities -- at least under the present regime of seasonal biomass distribution -- in some areas (e.g., 620) at the expense of others (primarily 610). Options that would have moved a greater percentage of TAC to the earlier part of the year were considered both under a four-season model (A, B, C, D) and the combined two-season model that is analyzed in this paper. The Council did not pursue options that would maintain the four-season model (other than the No Action alternative) due to its inclination towards alternatives that minimize inefficiency in management and prosecution of the fishery. Time gaps and inter-seasonal reallocation (rollover) caps between the A/B and C/D seasons were shown to cause lost harvest or product quality opportunities.

Regarding Pacific cod, the Council explicitly confined the intended direct effects of Alternative 3 to the trawl CV sectors in the Western and Central GOA. The Council has also attempted to limit the scope of the action to the trawl CV sector by selecting an approach (as described in Section 2.3) to applying its options that does not directly alter seasonal apportionment percentages for other gear and operational-type sectors. The Council directed the analysts not to analyze methods that would maintain the overall 60%:40% seasonal apportionment by counterbalancing additions to the trawl CV A season TAC with subtractions to other groups' A season percentages (vice versa for the B season). The Council did not recommend analyzing a wholesale shift of seasonal apportionment from the B season to the A season across all sectors, as some sectors receive a larger proportion of their annual Pacific cod TAC in the B season.

3 Environmental Assessment

There are four required components for an environmental assessment. The need for the proposal is described in Chapter 1, and the alternatives in Chapter 2. This chapter addresses the probable environmental impacts of the proposed action and alternatives. A list of agencies and persons consulted is included in Chapter 6.

This chapter evaluates the direct, indirect, and cumulative impacts of the alternatives and options on the various resource components. The socio-economic impacts of this action are described in detail in the Regulatory Impact Review (RIR) portion of this analysis (Chapter 4).

Recent and relevant information, necessary to understand the affected environment for each resource component, is summarized in the relevant chapter. For each resource component, the analysis identifies the potential impacts of each alternative, and uses criteria to evaluate the significance of 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).

An environmental assessment must consider cumulative effects when determining whether an action significantly affects environmental quality. The Council on Environmental Quality (CEQ) regulations for implementing NEPA define cumulative effects as:

"the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

The concept behind cumulative effects analysis is to capture the total effects of many actions over time that would be missed if evaluating each action individually. Concurrently, the Council on Environmental Quality (CEQ) guidelines recognize that it is most practical to focus cumulative effects analysis on only those effects that are truly meaningful.

3.1 Methods

For biological and physical ecosystem components (target species stocks, non-target species, marine mammals, seabirds, and EFH), impacts of the alternatives were evaluated in a largely qualitative manner although data are presented to support conclusions.

The analyses presented in the sections below include target stocks (Section 3.2), Chinook salmon and Pacific Halibut (Section 3.3), Steller Sea Lions (Section 3.4) and the economic impacts (Section 4).

3.1.1 Documents incorporated by reference in this analysis

This EA relies heavily on the information and evaluation contained in previous environmental analyses, and these documents are incorporated by reference. The documents listed below contain information about the fishery management areas, fisheries, marine resources, ecosystem, social, and economic elements of the groundfish fisheries. They also include comprehensive analysis of the effects of the fisheries on the human environment and are referenced in the analysis of impacts throughout this chapter.

Alaska Groundfish Harvest Specifications Final Environmental Impact Statement (NMFS 2007a).

This EIS provides decision makers and the public an evaluation of the environmental, social, and economic effects of alternative harvest strategies for the federally managed groundfish fisheries in the GOA and the Bering Sea and Aleutian Islands management areas and is referenced here for an understanding of the groundfish fishery. The EIS examines alternative harvest strategies that comply with Federal regulations, the Fishery Management Plan (FMP) for Groundfish of the GOA, the Fishery Management Plan (FMP) for Groundfish of the BSAI Management Area, and the Magnuson-Stevens Fishery Conservation and Management 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) Report for the Groundfish Resources of the GOA (NPFMC 2017).
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.

EA/RIR/IRFA for Amendment 93 to the FMP for Groundfish of the GOA: Chinook Prohibited Species Catch in the GOA Pollock Fishery (NPFMC 2011).
This analysis accompanied proposed Amendment 93 to the GOA Groundfish FMP, recommending Chinook salmon PSC limits applicable to GOA pollock fisheries.

Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis to Revise Gulf of Alaska Halibut Prohibited Species Catch Limits (NPFMC 2012).
This analysis accompanied proposed Amendment 95 to the GOA Groundfish FMP, recommending a change to the process for setting halibut PSC limits applicable to GOA groundfish fisheries. The amendment also proposes reducing limits for the groundfish trawl gear sector, the groundfish catcher vessel hook-and-line sector, and the catcher processor hook-and-line sector. The environmental assessment includes an evaluation of the environmental impacts of the trawl fisheries.

Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis to set GOA Chinook PSC limits for non-pollock trawl fisheries (NPFMC 2014).
This analysis accompanied proposed Amendment 97 to the GOA Groundfish FMP, recommending a process for setting Chinook salmon PSC limits applicable to GOA non-pollock trawl fisheries.

Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis to allow the reapportionment of Chinook salmon PSC between the pollock and non-pollock GOA trawl fisheries (NPFMC 2016).
This analysis accompanied proposed Amendment 103 to the GOA Groundfish FMP, recommending a process allowing NMFS to make inseason reallocations of Chinook salmon PSC between GOA trawl sectors based on projected use and need.

Initial Review Draft - Environmental Assessment/ Regulatory Impact Review/Initial Regulatory Flexibility Analysis for Chinook Salmon Prohibited Species Catch in the Gulf of Alaska Non-Pollock Trawl Fisheries (NPFMC 2018).
This draft analysis was provided to support Council consideration of increased Chinook salmon PSC limits for the GOA non-pollock trawl fisheries. Although the Council chose not to proceed to final action on the issue, the analyses covered a variety of issues that overlap with the actions contemplated in this document.

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 from https://alaskafisheries.noaa.gov/sites/default/files/sir-pseis1115.pdf.

3.1.2 Resource components addressed in the analysis

Table 3-1 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. For groundfish, increased seasonal flexibility is not likely to increase fishing pressure. Even if there is a redistribution of effort, the fishery will likely remain within the established footprint of the trawl fishing grounds. Consequently, these alternatives are not likely to result in adverse impacts to pollock and Pacific cod stocks. Chinook salmon and Pacific halibut PSC may decrease slightly from the status quo if fishing effort moves away from periods with relatively high PSC rates occurs. No substantial change in the number of incidental takes or prey availability for Steller sea lions is expected under either alternative.

Table 3-1 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	N	N	N	Y

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

3.1.3 Cumulative effects analysis

This EA analyzes the cumulative effects of each alternative and the effects of past, present, and reasonably foreseeable future actions (RFFA). Implicit in each chapter below is a review of the relevant past, present, and RFFA that may result in cumulative effects on the resource components analyzed in this document. Relevant past and present actions are described in several documents and are incorporated by reference. These include the PSEIS (NMFS 2004), the EFH EIS (NMFS 2005), the harvest specifications EIS (NMFS 2007a), the Central Gulf of Alaska Rockfish Program EA (NPFMC 2011), the EA/RIR/IRFA to Revise GOA Halibut PSC Limits (NPFMC 2012), and the EA/RIR/IRFA to establish GOA Chinook Salmon PSC Limits (NPFMC 2011). This analysis provides a brief review of the RFFAs that may affect environmental quality and result in cumulative effects. Future effects include harvest of federally managed fish species and current habitat protection from federal fishery management measures, harvests from state managed fisheries and their associated protection measures, efforts to protect endangered species by other federal agencies, and other non-fishing activities and natural events.

In addition, the supplemental information report (SIR) NMFS prepares to annually review the latest information since the completion of the Alaska Groundfish Harvest Specifications EIS is incorporated by reference (NMFS 2007a). 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 change the analysis 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.

A summary table of the RFFAs is provided in section 3.2.3.1 (Table 3-6). The table summarizes the RFFAs identified applicable to this analysis that are likely to have an impact on a resource component within the action area and timeframe. The term “actions” in the analyses herein is confined to human actions (e.g., a regulatory change that amends the allocation of TAC to Pacific cod seasons A and B), as distinguished from natural events (e.g., anomalous sea surface temperatures in the Gulf of Alaska). 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 cumulative 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.

3.2 Target species

The actions addressed in this document are intended to alleviate seasonal management inefficiencies that can limit harvest of specified pollock and Pacific cod TACs by directed CV trawl fisheries in the Central and Western Gulf of Alaska. Although other species are retained in the prosecution of these fisheries, none of the actions is expected to directly or indirectly cause shifts in species targeting. A brief description of the pollock and cod stocks and their current status is provided below.

3.2.1 Pollock

Walleye pollock (*Gadus chalcogrammus*) are distributed broadly in the North Pacific Ocean. Pollock in the central and western Gulf of Alaska are managed as a single stock independently of pollock in the Bering Sea and Aleutian Islands. This separation of stocks is supported by a number of scientific studies identified in NPFMC (2017). Pollock are semi-pelagic, distributed from near the surface to depths of 500 m. In late winter and early spring pollock form very large spawning aggregations, including those found in the Gulf of Alaska's Shelikof Strait. Pollock migrate seasonally between spawning and feeding areas. Pollock feed on copepods, euphausiids, and fish, and are preyed upon by other finfish, marine mammals, and seabirds. Pollock enter the fishery around age 3 and can live up to about 20 years.

3.2.1.1 Status of GOA Pollock

According to the most recent GOA Groundfish SAFE (NPFMC 2017), the Gulf of Alaska pollock stock is not being subjected to overfishing and is neither overfished nor approaching an overfished condition. In 1998, stock biomass dropped below 40% of unfished stock size (i.e., below $B_{40\%}$) for the first time since the early 1980s and reached a minimum in 2003 at $B_{25\%}$. From 2009-2013, the stock increased from 32% to 60% of unfished stock size but declined to 39% by 2016. The spawning stock is projected to increase again in 2018 as the strong 2012 year class continues to increase in body size. Survey data in 2017 are contradictory, with acoustic surveys indicating large or increasing biomass, and bottom trawl surveys indicating a steep decline in recent years. These divergent trends are likely due to changes in the availability of pollock to different surveying methods, though additional research is needed to confirm this hypothesis. The model estimate of female spawning biomass in 2018 is 342,683 t, which is 57.5% of unfished spawning biomass (based on average post-1977 recruitment) and above the B40% estimate of 238,000 t.

3.2.1.2 Harvest

The pollock fishery in the GOA is prosecuted exclusively by trawl catcher vessels (CVs). The GOA pollock TAC is apportioned across four seasons, as follows:

Season	A	B	C	D
Start	20-Jan	10-Mar	25-Aug	1-Oct
End	10-Mar	31-May	1-Oct	1-Nov
Length (days)	49	82	37	31

Since 1992, the Gulf of Alaska pollock Total Allowable Catch (TAC) has been apportioned spatially and temporally. The details of the apportionment scheme have evolved over time, but the general objective is to allocate the TAC to management areas based on the distribution of surveyed biomass, and to establish stability in the harvest of the TAC over the course of the fishing year. In 2001, the FMP established four seasons in the Central and Western GOA beginning January 20, March 10, August 25, and October 1, with 25% of the total TAC allocated to each season, and that is the current seasonal allocation.

Table 3-2 shows GOA pollock TACs by area/season and the percentage of the initially specified TAC that was harvested for the years 2012 through 2017. The lowest incidence of GOA pollock TAC utilization in that was less than 80% was 2016 (73%). Catch accounting reports for pollock are generated based upon the initially specified TAC, and changes to area/season allocations via inseason rollovers are tracked manually. In Table 3-2, seasonal TAC utilization numbers greater than 100% indicate that an inseason or inter-area rollover occurred. It should be noted that the total WGOA/CGOA (610/620/630) TAC has not been exceeded.

Table 3-2 GOA pollock TAC and percent caught by area and season, 2012 through 2017 (seasons and years with <50% TAC utilization shaded in red)

		610		620		630	
		TAC	% Caught	TAC	% Caught	TAC	% Caught
2012	A	5,797	47%	14,023	102%	5,787	102%
	B	5,797	110%	17,221	98%	2,589	71%
	C	9,338	100%	7,282	125%	8,986	101%
	D	9,338	100%	7,282	61%	8,986	90%
	Total	30,270	92%	45,808	98%	26,348	99%
2013	A	4,292	22%	16,433	99%	5,998	100%
	B	4,292	115%	19,812	99%	2,619	105%
	C	9,744	10%	7,600	97%	9,378	88%
	D	9,744	6%	7,600	124%	9,378	119%
	Total	28,072	27%	51,445	103%	27,373	109%
2014	A	4,800	14%	25,924	95%	8,680	96%
	B	4,799	74%	30,963	110%	3,636	130%
	C	13,235	58%	12,448	78%	13,720	90%
	D	13,235	10%	12,448	116%	13,720	112%
	Total	36,069	37%	81,783	102%	39,756	107%
2015	A	3,632	3%	30,503	94%	11,316	78%
	B	3,632	58%	37,820	111%	4,000	110%
	C	12,185	114%	14,628	34%	18,639	96%
	D	12,185	101%	14,628	39%	18,639	110%
	Total	31,634	91%	97,579	83%	52,594	100%
2016	A	3,826	94%	43,374	33%	12,456	100%
	B	3,826	112%	50,747	37%	5,083	126%
	C	24,421	125%	15,404	14%	19,822	115%
	D	24,421	91%	15,402	77%	19,822	115%
	Total	56,494	108%	124,927	38%	57,183	113%
2017	A	2,232	116%	34,549	104%	11,014	108%
	B	2,232	68%	39,420	63%	6,143	65%
	C	19,569	128%	12,341	70%	15,886	117%
	D	19,569	103%	12,341	96%	15,886	113%
	Total	43,602	114%	98,651	83%	48,929	108%

Source: NMFS catch reports, available at: https://alaskafisheries.noaa.gov/fisheries-catch-landings.

Figure 3-1 and

Figure 3-2 illustrate the spatial distribution of pollock harvest across the CGOA (620/630) and the WGOA (610). The figures reflect the greater level of trawl effort in the GOA C/D seasons relative to the A/B seasons—largely as a result of higher area TACs—and a shift in fishing location within Area 630 from the A season (Shelikof Strait) to the B season (southeast of Kodiak Island). Spatial effort data is relevant to sharing the pollock resource with Steller sea lions.

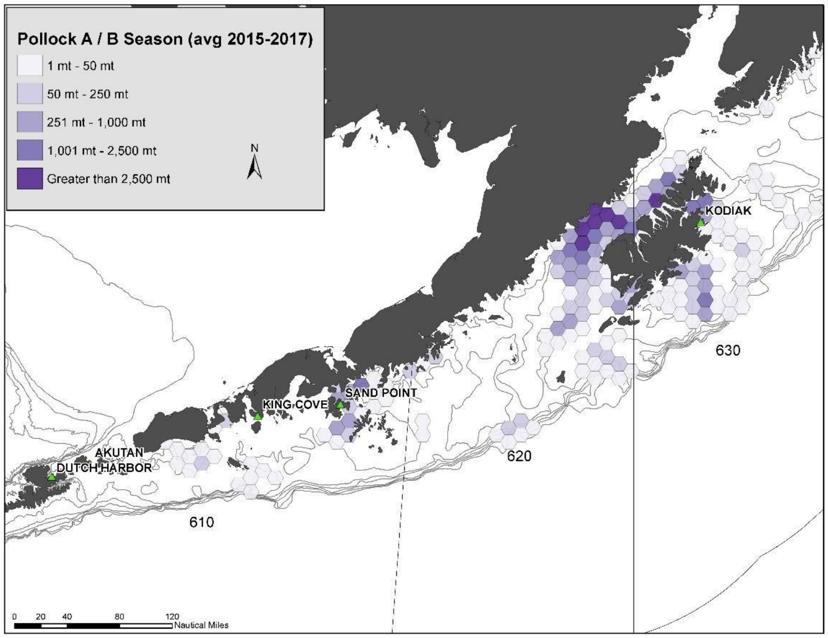


Figure 3-1 Spatial distribution of A/B season GOA pollock trawl harvest, 2015 through 2017

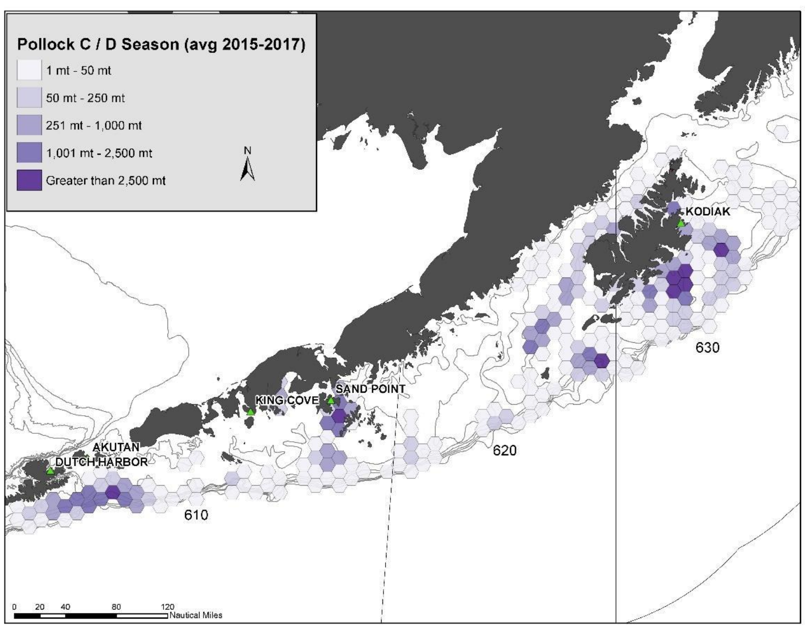


Figure 3-2 Spatial distribution of C/D season GOA pollock trawl harvest, 2015 through 2017

3.2.2 Pacific cod

Pacific cod (Gadus macrocephalus) are transoceanic and occur at depths from shoreline to 500 m. The southern limit of the species' distribution is about 34° N latitude, with a northern limit of about 63° N latitude. Pacific cod are distributed widely in the Gulf of Alaska, as well as in the eastern Bering Sea and the Aleutian Islands. Tagging studies (e.g., Shimada and Kimura 1994) have demonstrated significant migration both within and between these areas. Pacific cod are known to form dense spawning aggregations and to undertake seasonal migrations, the timing and duration of which may be variable (Shimada and Kimura 1994, Savin 2008). In the Gulf of Alaska, adult Pacific cod exhibit an annual cycle of variation in body condition, or weight at length, which reaches maximum values in ripe fish in March and minimum values in July. Pacific cod enter the fishery around age 3 and can live up to about 18 years.

3.2.2.1 Status of GOA Pacific cod

According to the most recent (2017) GOA Groundfish SAFE, the Gulf of Alaska Pacific cod stock is not being subjected to overfishing and is neither overfished nor approaching an overfished condition. The 2018 spawning biomass is estimated to be at $B_{21\%}$ compared to a biomass target of $B_{40\%}$. The reason for the low current biomass is a very large decrease in the abundance of Pacific cod occurred in the GOA in 2017. A discussion of ecosystem processes in the 2017 SAFE suggests that the decline was the result of an unusually warm mass of water (the "warm blob") that persisted from 2014 through 2016. This warm water in the Gulf of Alaska increased the metabolism of cod while also reducing available food, and this resulted in poor body condition and increased mortality for cod. The warm water also affected cod egg production and larval survival, reducing recruitment during these years. The reduction in the number of adult and juvenile cod will likely affect the population and fishery for several years to come. Accordingly, catch limits for Pacific cod were set at very low amounts for 2018 and 2019 with the 2018 ABC (18,000 mt) representing an 80% reduction compared to the 2017 ABC (88,342 mt).

Food-web dynamics in the Gulf of Alaska (GOA) are structured by climate-driven changes to circulation and water temperature, which can impact the distribution of key predators in the system and mediate trophic interactions. Predation is a major structuring pressure in the GOA ecosystem. The composition of Pacific cod prey varies spatially and with changing environmental conditions. The marine heat wave of 2014-2016 in the Northeast Pacific was unusual in the degree of temperature increase, the maintenance of warm water through the winters and the depth to which the warm temperatures reached (Bond et al 2015). Metabolic demand for Pacific cod is largely a function of ambient temperature and tends to increase exponentially with increasing temperatures. Thus, if temperature and prey are limiting, metabolic costs may exceed energetic consumption and decreases in growth or increases in mortality may occur. The protracted warm conditions from 2014-2016 may have exceeded both adaptive options, potentially leading to starvation and mortality. In addition, other ectothermic fish species would be expected to have similarly elevated metabolic demands during the warm conditions, increasing the potential for broad scale prey limitations.

3.2.2.2 Harvest

Prior to passage of the MSA) in 1976, the fishery for Pacific cod in the GOA was small, averaging around 3,000 mt per year. Most of the catch was taken by the foreign fleet, whose catches of Pacific cod were usually incidental to directed fisheries for other species. By 1976, catches had increased to 6,800 mt. Presently, the Pacific cod stock is exploited by a multiple-gear fishery, including trawl, longline, pot, and jig components. Prior to 2002, trawl gear took the largest share of the catch, but since then, pot gear has taken the largest single-gear share of the catch.

Table 3-3 and Table 3-4 show GOA Pacific cod TACs by season and the percentage of the final TAC that was harvested from 2012 through 2017. Note that these tables report TAC *after* any inseason reallocations were made between sectors. The tables reflect that the percentage of the TAC that is harvested in the higher-volume directed fisheries is greater in the A season than the B season. Those directed Pacific cod fishing sectors include trawl CVs, the pot sector (CV/CP), and hook-and-line (HAL) CVs and CPs. Fishery participants report that Pacific cod TAC utilization in the B season is generally lower because the fish are not as aggregated as they are during the spawning season in February and March. Even so, sectors that deploy bait (pot and HAL) often have lower TAC utilization rates in the B season.

Table 3-3 Western GOA Pacific cod TAC (mt) and percent caught, 2012 through 2017

			Trawl CV	Trawl CP	Pot	HAL CV	HAL CP	Jig
2012	A	TAC	5,736	186	4,100	145	2,257	189
		% Caught	98%	215%	103%	89%	90%	63%
	B	TAC	666	311	5,769	145	1,243	276
		% Caught	70%	0%	63%	24%	83%	74%
2013	A	TAC	5,728	186	4,095	145	2,254	318
		% Caught	102%	23%	114%	111%	100%	12%
	B	TAC	113	210	5,764	345	1,840	212
		% Caught	73%	0%	84%	21%	26%	111%
2014	A	TAC	6,191	201	4,425	156	2,436	344
		% Caught	106%	10%	94%	72%	114%	98%
	B	TAC	1,491	335	4,617	206	1,989	529
		% Caught	53%	40%	95%	25%	75%	85%
2015	A	TAC	7,242	235	5,176	183	2,850	569
		% Caught	97%	1%	106%	68%	98%	10%
	B	TAC	2,797	392	4,758	183	2,326	Conf.
		% Caught	8%	12%	36%	14%	52%	*
2016	A	TAC	7,579	246	5,417	192	2,982	595
		% Caught	96%	18%	106%	36%	93%	9%
	B	TAC	2,927	410	4,979	191	2,435	Conf.
		% Caught	1%	1%	22%	8%	51%	*
2017	A	TAC	6,861	222	4,904	174	2,700	381
		% Caught	109%	6%	105%	30%	98%	13%
	B	TAC	2,650	372	4,508	173	2,204	Conf.
		% Caught	1%	0%	17%	63%	81%	*

Source: NMFS catch reports, available at: https://alaskafisheries.noaa.gov/fisheries-catch-landings.

Table 3-4 Central GOA Pacific cod TAC (mt) and percent caught, 2012 through 2017

			Trawl CV	Trawl CP	Pot	HAL CV <50	HAL CV ≥50	HAL CP	Jig
2012	A	TAC	8,936	847	7,538	3,938	2,382	1,736	256
		% Caught	103%	79%	104%	114%	105%	99%	107%
	B	TAC	4,268	928	6,467	2,435	464	422	471
		% Caught	32%	14%	85%	75%	18%	13%	27%
2013	A	TAC	7,657	726	6,459	3,375	2,032	1,488	444
		% Caught	107%	107%	92%	101%	119%	42%	45%
	B	TAC	6,408	1,795	3,614	1,915	398	361	296
		% Caught	52%	19%	42%	65%	83%	0%	1%
2014	A	TAC	8,249	782	7,140	3,636	2,189	1,603	297
		% Caught	111%	106%	95%	97%	65%	99%	78%
	B	TAC	7,981	856	4,212	2,063	428	389	0*
		% Caught	42%	40%	110%	102%	79%	51%	0%
2015	A	TAC	9,623	912	8,118	4,241	2,554	1,870	276
		% Caught	84%	62%	102%	94%	35%	66%	124%
	B	TAC	5,558	999	6,542	2,407	500	454	184
		% Caught	77%	15%	78%	48%	24%	33%	6%
2016	A	TAC	7,738	734	8,028	2,411	1,354	1,504	422
		% Caught	70%	8%	103%	85%	54%	39%	63%
	B	TAC	5,078	803	4,652	1,936	402	365	148
		% Caught	28%	15%	88%	1%	4%	30%	0%
2017	A	TAC	5,433	657	7,349	3,056	1,840	1,347	199
		% Caught	69%	16%	90%	60%	26%	91%	9%
	B	TAC	5,446	720	3,272	1,734	360	327	132
		% Caught	16%	22%	26%	20%	22%	0%	1%

* 2014 Jig sector caught 28 mt in the B season, which was covered by 63 mt of remaining quota from the A season.
Source: NMFS catch reports, available at: https://alaskafisheries.noaa.gov/fisheries-catch-landings.

Figure 3-3 and Figure 3-4 show seasonal and spatial effort patterns in the GOA Pacific cod fishery for trawl gear participants. These maps reflect both local intensity by season and the generally reduced Pacific cod TAC utilization during the B season when the target species is less aggregated.

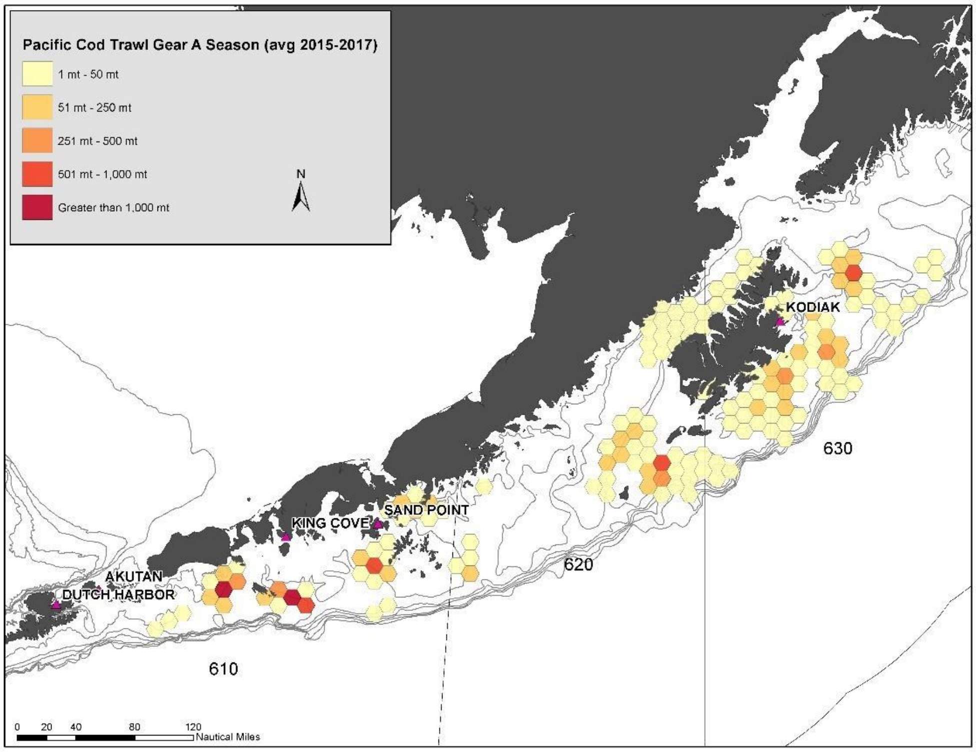


Figure 3-3 Spatial distribution of A season GOA Pacific cod trawl harvest, 2015 through 2017

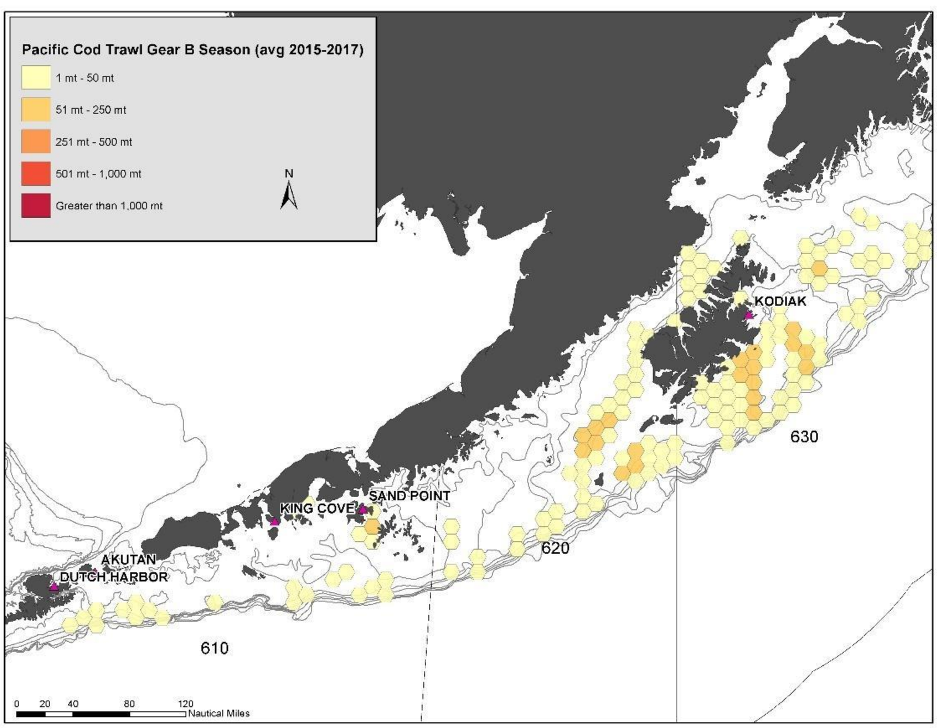


Figure 3-4 Spatial distribution of B season GOA Pacific cod trawl harvest, 2015 through 2017

3.2.3 Effects of the Alternatives on Target Species

The effects of the GOA trawl fisheries on groundfish stocks are assessed annually in the GOA SAFE report (NPFMC 2017) and were also evaluated in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007a). Table 3-5 describes the criteria used to determine whether the impacts on target fish stocks are likely to be significant. The effects of the GOA trawl fisheries on fish species that are caught incidentally have been comprehensively analyzed in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007a). These fisheries were also evaluated recently under the GOA halibut PSC EA/RIR/IRFA (NPFMC 2012) and the GOA Chinook salmon PSC EA/RIR/IRFA (NPFMC 2014). 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.

Table 3-5 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
Change in prey availability	Evidence that the action may lead to changed prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action will not lead to a change in prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action may result in a change in prey availability such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown

If the groundfish TACs are more fully harvested, fishing will have a greater impact on the stocks, but there will be no significantly adverse impact on the groundfish stocks from the fisheries. Changing fishery patterns or seasonal changes in the timing of the fishing pressure may result in the fisheries focusing on different ages of groundfish than would otherwise have been taken. These changes, however, would be monitored and updated in future stock assessments.

The risk to the stocks is considered minor, since conservation goals for maintaining spawning biomass would remain central to the assessments. None of the options or alternatives would affect the annual assessment process or inseason monitoring of catch quotas. Thus, any changes in fishing patterns or the timing of fishing pressure would not be expected to affect the sustainability of the stocks.

The potential biological effects of the alternatives are expected to be correctly incorporated in the present groundfish stock assessment and harvest specifications system, and there is no anticipated adverse impact to the target or incidental catch groundfish stocks that would result from a fishery with lower catch per unit effort. Consequently, neither action alternative is likely to result in adverse impacts to groundfish stocks and are likely insignificant.

Pollock

As stated above, the pollock stock in the Gulf of Alaska is currently at a high biomass level ($B_{58\%}$ according to the 2017 stock assessment). Through continued management under the GOA Groundfish FMP, safeguards that prevent overfishing will be maintained. Additionally, directed fishing is prohibited in the event that spawning biomass for pollock or other species identified as prey for Steller sea lions (Pacific cod and Atka mackerel) is projected in the stock assessment to fall below $B_{20\%}$ in the coming year. Additionally, biomass below the proxy minimum stock size threshold of $B_{17.5\%}$ would result in an overfished designation that would initiate a rebuilding program and curtail directed harvest in order to achieve rebuilding. The probability that biomass will decline below $B_{20\%}$ is explicitly calculated in the stock assessment, and five-year projections currently estimate that probability to be 0.0%.

The GOA pollock stock is not at increased risk under any of the alternatives. Existing harvest limits will continue to constrain landings in the GOA trawl fisheries to levels identified by the scientific analyses and precautionary harvest principles as not resulting in undue risk to the sustainability of the affected pollock population. The options under Alternative 1 would make it more likely for the fishery to achieve designated harvest levels, when circumstances are favorable. Other constraints on overall GOA harvest of pollock, such as market conditions and availability of the resource to the fishing fleet will continue under any of the alternatives.

Pacific cod

As stated above, the Pacific cod stock in the Gulf of Alaska is currently at a low biomass level ($B_{21\%}$ according to the 2017 stock assessment). According to the GOA Groundfish FMP, directed fishing is prohibited in the event that spawning biomass for Pacific cod or other species identified as prey for Steller sea lions (walleye pollock and Atka mackerel) is projected in the stock assessment to fall below $B_{20\%}$ in the coming year. Cod harvest limits currently specified for the 2018 and 2019 fishing years in the GOA were calculated with the explicit intent of avoiding biomass decline below $B_{20\%}$. Additionally, biomass below the proxy minimum stock size threshold of $B_{17.5\%}$ would result in an overfished designation that would initiate a rebuilding program and curtail directed harvest in order to achieve rebuilding. Pacific cod biomass is currently at a very low risk of declining to an overfished state.

The GOA Pacific cod stock is not at increased risk under any of the alternatives. As a point of emphasis, the ecosystem conditions that resulted in major reductions to the biomass of GOA Pacific cod have been and will continue to be considered as part of the rigorous scientific scrutiny involved in the development and review of the GOA cod stock assessment. Additional scientific review by the Council's SSC has the explicit function of identifying catch levels that would prevent overfishing. Under any of the alternatives, future harvest limits, oversight of harvest, and the ongoing analysis of the impacts of harvest on the GOA pacific cod population will continue to ensure the long-term sustainability of the resource. In addition to explicit management actions to control harvest, exogenous constraints on harvest of Pacific cod, such as market conditions and variations in the availability of the resource to the fishing fleet will continue under any of the alternatives.

3.2.3.1 Cumulative Effects on Target Species

RFFAs that may affect groundfish are shown in Table 3-6 . Ecosystem management, rationalization, and traditional management tools are likely to improve the protection and management of target and prohibited species, including targets of the pollock and Pacific cod trawl fleet, Pacific halibut and Chinook salmon, and are not likely to result in significant effects when combined with the direct and indirect effects of Alternatives 2 and 3.Other government actions and private actions may increase pressure on the sustainability of target and prohibited fish stocks either through extraction or changes in the habitat or may decrease the market through aquaculture competition, but it is not clear that these would result in significant cumulative effects. Any increase in extraction of target species would likely be offset by federal management. These are further discussed in Sections 4.1.3 and 7.3 of the Harvest Specifications EIS (NMFS 2007a) and in the 2017 SIR (NMFS 2017c).

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 reasonably foreseeable future actions listed above, the cumulative impacts of the proposed alternatives are determined to be not significant.

Table 3-6 Reasonably foreseeable future actions

Ecosystem-sensitive management	• Increasing understanding of the interactions between ecosystem components, and ongoing efforts to bring these understandings to bear in stock assessments • Increasing protection of ESA-listed and other non-target species components of the ecosystem • Increasing integration of ecosystems considerations into fisheries decision-making
Traditional management tools	• Authorization of groundfish fisheries in future years • Increasing enforcement responsibilities • Technical and program changes that will improve enforcement and management
Other federal, state, and international agencies	• Future exploration and development of offshore mineral resources • Reductions in United States Coast Guard fisheries enforcement activities • Continuing oversight of seabirds and some marine mammal species by the USFWS • Expansion and construction of boat harbors • Expansion of state groundfish fisheries • Other state actions • Ongoing EPA monitoring of seafood processor effluent discharges
Private actions	• Commercial fishing • Increasing levels of economic activity in coastal zone off Alaska • Expansion of aquaculture

Pending Allocation Review

An allocation review under NOAA's July 2016 Allocation Policy is scheduled for the 2020 agenda. The NOAA policy is meant to provide a mechanism to ensure that fisheries allocations are periodically evaluated to remain relevant to current conditions. Allocation reviews provide a transparent process to ensure that U.S. fisheries are managed to achieve National Standard 1 (prevent overfishing and achieve optimum yield). NPFMC staff is tentatively scheduled to present a GOA Pacific cod allocation review work plan at the December 2018 Council meeting. The review will consider the FMP objectives along with other relevant factors that have changed and may be important to the fisheries allocation. Within this context, the Council will have an opportunity to assess whether the existing sector allocations of GOA Pacific cod TAC are meeting the FMP objectives, or whether options for new allocations should be developed for analysis. NMFS has provided Procedural Directive 01-119-02, which outlines the factors to consider when reviewing existing allocations. In June 2017 NPFMC staff prepared a discussion paper that summarizes the allocation review policy and the steps to conducting a review."

3.3 Non-target species

Pollock Non-Target Species
Incidental catch in the Gulf of Alaska directed pollock fishery is low. For tows classified as pollock targets in the Gulf of Alaska between 2013 and 2017, on average about 96% of the catch by weight of FMP species consisted of pollock (NPFMC 2017). Nominal pollock targets are defined by the dominance of pollock in the catch, and may include tows where other species were targeted, but pollock were caught instead. The most common managed species in the incidental catch are arrowtooth flounder, Pacific cod, Pacific ocean perch, flathead sole, shallow-water flatfish, and squid. The most common non-target species are grenadiers, miscellaneous fish, eulachon, jellyfish, and other osmerids.

Bycatch estimates for prohibited species over the period 2013-2017 are addressed in Dorn 2017. Chinook salmon (directly addressed in section 3.3.1 below) are the most important prohibited species caught as bycatch in the pollock fishery. A sharp spike in Chinook salmon bycatch in 2010 led the Council to adopt management measures to reduce Chinook salmon bycatch, including a cap of 25,000 Chinook salmon bycatch in directed pollock fishery. Estimated Chinook salmon bycatch since 2010 has been less than the peak in 2010, but increased in 2016 and 2017.

Pacific Cod Non-Target Species
The largest component of incidental catch of other targeted groundfish species in the Pacific cod fisheries by weight are skate species in combination followed by arrowtooth flounder and walleye pollock (NPFMC 2017). Rockfish, octopus, rock sole, sculpin species, and shark species also make up a major component of the bycatch. Pacific halibut (directly addressed in section 3.3.2 below) is the most important prohibited species caught as bycatch in the Pacific cod fishery. Multiple actions have been taken by the Council to address halibut PSC with the most recent being Amendment 95 that implemented a phased in reduction in the halibut PSC limit starting in 2013 and arriving at the current regulatory limit (1,706 mt) in 2016.

3.3.1 Chinook Salmon

Chinook salmon (*Oncorhynchus tshawytscha*), the largest species in the Pacific salmon genus Oncorhynchus, is a prohibited species in the NPFMC groundfish fisheries. In Alaska, the species is abundant from the southeastern panhandle to the Yukon River. Major populations return to the Yukon, Kuskokwim, Nushagak, Susitna, Kenai, Copper, Alsek, Taku, and Stikine rivers. Important runs also occur in many smaller streams.

Like all species of Pacific salmon, Chinook salmon are anadromous. They hatch in freshwater, spend part of their life in the ocean, and then spawn in freshwater. Chinook salmon may become sexually mature from their second through seventh year, and as a result, fish in any spawning run may vary greatly in size. For example, a mature 3-year-old will probably weigh less than 4 pounds, while a mature 7-year-old may exceed 50 pounds. Alaska streams normally receive a single run of Chinook salmon in the period from May through July. Chinook salmon migrate through coastal areas as juveniles and returning adults; however, immature Chinook salmon undergo extensive migrations and can be found inshore and offshore throughout the North Pacific.

3.3.1.1 Management of Chinook Salmon

The State of Alaska manages commercial, subsistence, personal use, and sport fishing of salmon in Alaskan rivers and marine waters and assesses the health and viability of individual salmon stocks accordingly. The catches of Chinook salmon in Southeast Alaska are regulated by quotas set under the Pacific Salmon Treaty. In other regions of Alaska, Chinook salmon fisheries are also closely managed to ensure stocks of Chinook salmon are not overharvested. No commercial fishing for salmon in offshore waters is permitted west of Cape Suckling.

Full retention of Chinook salmon is required in all GOA trawl fisheries. Retention of salmon supports biological sampling and other data collection to identify the stock of origin of Chinook salmon bycatch. In 2011, Amendment 93 established a PSC limit of 25,000 Chinook salmon for the Central and Western GOA pollock fisheries, and in 2013 Amendment 97 established a PSC limit of 7,500 Chinook salmon for the Central and Western GOA non-pollock fisheries. The pollock fishery Chinook PSC limit is divided at 18,316 fish for Central GOA (73%) and 6,684 fish for Western GOA (27%).

Salmon bycatch is estimated using a mixture of observer coverage and vessel reports to the Alaska Region's Catch Accounting System (CAS). For the GOA pollock fishery, tows are observed either directly at sea or at offloading locations, primarily shore-based processing plants. The Region's Fisheries Monitoring and Analysis Division provides observer data on groundfish catch and salmon bycatch, including expanded information to NMFS. NMFS estimates salmon bycatch for unobserved catcher vessels whereby haul-specific observer information is used by the CAS to create salmon bycatch rates from observed vessels that are applied to total groundfish catch in each delivery (trip level) by an unobserved vessel. The rate is calculated using the observed salmon bycatch divided by the groundfish weight, which results in a measure of salmon per metric ton of groundfish caught.

3.3.1.2 Status of Chinook Salmon

A simple measure of the overall abundance of Chinook salmon in the affected fishing areas does not exist. As a result, it is difficult to determine whether years with high Chinook salmon PSC in the GOA trawl fishery are the result of more numerous Chinook salmon present in the fishing grounds.

The best available information on salmon abundance covers only the Aggregate Abundance Based Management fisheries in the Pacific Salmon Treaty areas. The Pacific Salmon Commission's Exploitation Rate Reports list abundance indices for Chinook salmon in the Southeast Alaska, Northern British Columbia and West Coast Vancouver Island troll fishery areas from 1999 to 2017 (Table 3-7) Abundance indices for the high GOA Chinook salmon PSC years are not substantially different from the period's average index values, and in some regions were lower than the index values for years with relatively low GOA Chinook salmon PSC[6].

[6] See Table 3-3 on page 95 of the report, available at http://www.psc.org/pubs/tcchinook15-1_v1.pdf

Table 3-7 Abundance indices for 1999–2017 for the SEAK, NBC, and WCVI AABM fisheries. Postseason values for each year are from the first postseason calibration following the fishing year.

	SEAK		NBC		WCVI	
Year	Preseason	Postseason	Preseason	Postseason	Preseason	Postseason
1999	1.15	1.12	1.12	0.97	0.60	0.50
2000	1.14	1.10	1.00	0.95	0.54	0.47
2001	1.14	1.29	1.02	1.22	0.66	0.68
2002	1.74	1.82	1.45	1.63	0.95	0.92
2003	1.79	2.17	1.48	1.90	0.85	1.10
2004	1.88	2.06	1.67	1.83	0.90	0.98
2005	2.05	1.90	1.69	1.65	0.88	0.84
2006	1.69	1.73	1.53	1.50	0.75	0.68
2007	1.60	1.34	1.35	1.10	0.67	0.57
2008	1.07	1.01	0.96	0.93	0.76	0.64
2009	1.33	1.20	1.10	1.07	0.72	0.61
2010	1.35	1.31	1.17	1.23	0.96	0.95
2011	1.69	1.62	1.38	1.41	1.15	0.90
2012	1.52	1.24[1]	1.32	1.15[1]	0.89	0.76[1]
2013	1.20[1]	1.63	1.10[1]	1.51	0.77[1]	1.04
2014	2.57	2.20	1.99	1.80	1.20	1.12
2015	1.45	1.95	1.23	1.69	0.85	1.05
2016	2.06	1.65	1.70	1.39	0.89	0.70
2017	1.27		1.15		0.77	

[1] Due to changes in calibration procedures (reviewed in section 3.1.4), 2012 postseason (CLB 1309) and 2013 preseason (CLB 1308) AIs are based on different calibrations; the procedures and assumptions CLB 1309 mirror those used during the 2012 preseason calibration.

North Pacific Chinook salmon are the subject of commercial, subsistence, personal use, and sport/recreational (used interchangeably) fisheries. Chinook salmon are the least abundant of the five salmon species found on both sides of the Pacific Ocean and the least numerous in the Alaska commercial harvest. The majority of the Alaska commercial catch is made in Southeast Alaska, Bristol Bay, and the Arctic-Yukon-Kuskokwim area. Chinook salmon is one of the most highly prized sport fish in Alaska and is extensively fished by anglers in the Southeast and Cook Inlet areas. The sport fishing harvest of Chinook salmon is over 170,000 fish annually with Cook Inlet and adjacent watersheds contributing over half the catch.

Alaska Chinook Salmon Stock Status

Chinook salmon runs in Alaska have been below average since 2007, and management of the fisheries has been conservative in many systems. Implementation of strict fishery management actions has been necessary to meet escapement objectives, and many fisheries have been curtailed to protect Chinook salmon. In the Yukon and Kuskokwim Rivers, weak runs of Chinook salmon resulted in extensive restrictive management actions in the subsistence, sport, personal use, and commercial fisheries by the department.

In 2016, runs improved for the western Alaska stocks (i.e., Yukon, Kuskokwim, and Nushagak) but overall these runs are still below the long-term averages. While also remaining below the long-term averages, runs improved in Kodiak and Cook Inlet in 2016. Unfortunately, Chinook salmon runs from the Copper River to southern Southeast Alaska declined in 2016 and were the lowest on record. It is unclear whether runs will continue to improve over the long term in Kodiak, southcentral, and western Alaska. Runs to the Kenai River were good in 2017, the Copper River run was better than expected, and over 80%

of Chinook salmon escapement goals in western Alaska were met in 2017. However, the near-term outlook for southeast Alaska is not positive as very few "jacks," typically a strong indicator of future production, were seen in 2016, and escapements to most systems in 2017 were historically low despite restrictions to fishing. Runs in this region were expected to remain low in 2018.

It is not advisable to draw any correlation between patterns of PSC and the status of Alaska salmon stocks, especially given the uncertainty associated with estimates of PSC in the groundfish fisheries, and the lack of data on river of origin of Chinook salmon PSC. This results in the inability to accurately describe small scale impacts on particular individual stocks. There is no evidence to indicate whether the groundfish fisheries' take of Chinook salmon is, or is not, causing escapement failures in Alaska rivers.

GOA Chinook Abundance
An overview of Chinook abundance in the Gulf of Alaska was included in an analysis that was reviewed by the Council in April 2018[7]. That information is not carried into this analysis in order to maintain reasonable proportionality of provided information to the actions contemplated in the alternatives, which in this case, do not directly affect Chinook PSC or PSC limits.

Relating Chinook salmon PSC abundance to GOA Chinook abundance in a given year is complicated (multiple age classes and many stocks of origin), though relationships are apparent. The Pacific Salmon Commission Joint Chinook Technical Committee (CTC) tracks landed catches of Chinook in the Pacific Salmon Treaty (PST) area (Oregon to SE Alaska). Additionally, information comes from catches of Chinook in targeted Southeast Alaska and British Columbia troll fisheries, which are temporally limited and are biased towards the movements of larger fish (i.e., commercially retained). Genetic information is becoming increasingly available for Chinook PSC from the pollock trawl and rockfish fisheries (see Guthrie et al. 2018 for a limited discussion of inter- and intra-annual variability of stock composition). However, genetic information or coded wire tag (CWT) data are limited due to sample size limitations for genetic analyses. A migration model is also lacking for the GOA due to the number of stocks, but limited movement data can be interpreted through these data.

3.3.1.3 GOA Pollock Chinook PSC

Chinook salmon are prohibited species in the GOA trawl fisheries, however, they are incidentally taken as bycatch (or PSC) given their co-occurrence with GOA trawl fishery target species. Online NMFS PSC reports[8] indicate that Chinook salmon PSC in the pollock trawl fisheries have accounted for approximately 70% on average of total Chinook salmon PSC in the GOA since 2000. Total GOA pollock fishery Chinook PSC since 1991 from the same report shows that PSC levels are highly variable from year to year with the extremes in the time series occurring in back-to-back years: 3,189 fish in 2009 and 44,825 fish in 2010. When and if the PSC limits are met, NMFS inseason managers close directed pollock trawl fishing in the relevant management area. Once annual limits are reached, the groundfish trawl fishery in the respective regulatory area is closed. In 2016, Amendment 103 allowed NMFS in-season managers to re-allocate Chinook salmon PSC from one GOA trawl sector to another within a given calendar year based on need and availability. The amount of reapportioned PSC that a sector may receive is limited to 50 percent of that sector's annual Chinook salmon PSC apportionment.

According to NOAA Fisheries Alaska Region Status of Fisheries webpage[9], GOA pollock has not exceeded its PSC limits since 2013.

[7] http://npfmc.legistar.com/gateway.aspx?M=F&ID=e0062177-6b46-48dc-8971-6e2afbef236e.pdf
[8] https://alaskafisheries.noaa.gov/sites/default/files/reports/goasalmonmort2018.pdf
[9] https://alaskafisheries.noaa.gov/status-of-fisheries

The magnitude of Chinook PSC is generally greater in CGOA than in the WGOA for the pollock trawl CV fleet, ranging from 66% (2017) to 87% (2013) of combined area removals (Figure 3-5), but is consistent with the relative distribution of pollock harvest between the two areas. In the 2013-2018 timeframe, CGOA trawl CV pollock harvest ranged between 65% (2016) and 91% (2013) of the combined area harvest.

3.3.1.4 Temporal Distribution of Chinook PSC in the Central and Western GOA Pollock Fisheries

In 2016, the Council directed staff to evaluate the timing of trawl pollock harvest and Chinook salmon prohibited species catch (PSC) in the Western Gulf of Alaska (GOA) C and D seasons. The Council's primary concern at that time was to determine whether there are times when Chinook salmon PSC rates tend to be greatest (Figure 3-6). Reviewing the discussion paper[10] allowed the Council to evaluate trends in pollock trawl landings and Chinook PSC during the C/D seasons, which were suggested to be different for small and large vessels. That analysis showed greater Chinook PSC in the D season relative to C season, however, the pattern was not stable from year to year.

Extending the analysis to the CGOA, PSC rates (PSC as a ratio of target landings) for the pollock trawl fisheries tend to be greatest early in A season and in D season, as compared to rates in the B and C seasons (Figure 3-6). One would expect increases in pollock fishing effort to periods when the PSC rate is relatively high, such as the early A season or D season (Figure 3-6), to increase the probability of Chinook PSC. Impacts of Alternative 2 on Chinook, therefore, are informed by an understanding of the likely fishery responses to 1) consolidating the A/B and C/D seasons, and 2) increasing the rollover percentages as envisioned in the Options under Alternative 2.

Consolidating the A/B and C/D seasons
Flexibility introduced by season redefinitions may drive pollock harvest toward the "B" part of the A/B season and the "C" part of the C/D season, either of which would tend to reduce the incidence of Chinook PSC. With regard to D season effort, it is expected that a combination of additive availability of pollock, relatively milder at-sea conditions, and lower risk of Chinook PSC that all tend to predominate in early in the C/D season will generally attract CV trawl effort. Such an outcome would clearly reduce pollock trawl fishery impacts on Chinook salmon by reducing Chinook mortality relative to the status quo (Alternative 1). These factors could similarly drive shifts in fishery effort toward the latter part of the consolidated A/B season, but are less likely given the attraction of the valuable roe season that only occurs during the A season. Additionally, the risk associated with achieving the Chinook PSC limit is likely less palpable when the season has just begun. It is, therefore, anticipated that shifts in effort are more likely to move away from D season than away from A season, but it is also unlikely that movement of effort will be toward these seasons of greater Chinook PSC incidence.

Increasing the rollover percentages
Shifts in fishing effort under a relaxation of rollover caps is potentially more complicated to predict than season consolidation. This is because, besides adding TAC to a subsequent season, inseason managers have the option of transferring TAC to other areas if a given area cannot fully absorb the rollover necessitating anticipation of effort shifts in time and space. Since temporal trends in Chinook PSC are more distinct in the CGOA than in the WGOA (Figure 3-6), it is expected that effort shifts toward CGOA A and D seasons present a greater risk of Chinook PSC incidence than shifts to those seasons do in the WGOA. On the other hand, spatial redistribution of effort, though likely marginal in terms of magnitude, could prevent an area from contributing to the Chinook salmon PSC limit if uncaught seasonal TAC is moved to an area with a lower PSC risk.

[10] http://npfmc.legistar.com/gateway.aspx?M=F&ID=13971f7f-aefc-41b2-9ecc-bac1ea37fec4.pdf

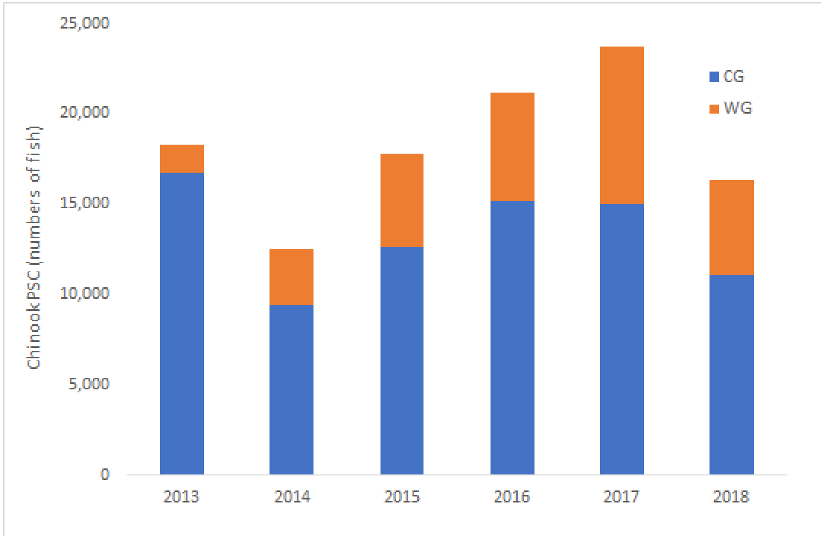


Figure 3-5 Annual estimated Chinook salmon PSC in pollock trawl CV fisheries, 2013 to partial year 2018, for the Western (WG) and Central GOA (CG). Source: NMFS Alaska Region Catch Accounting System

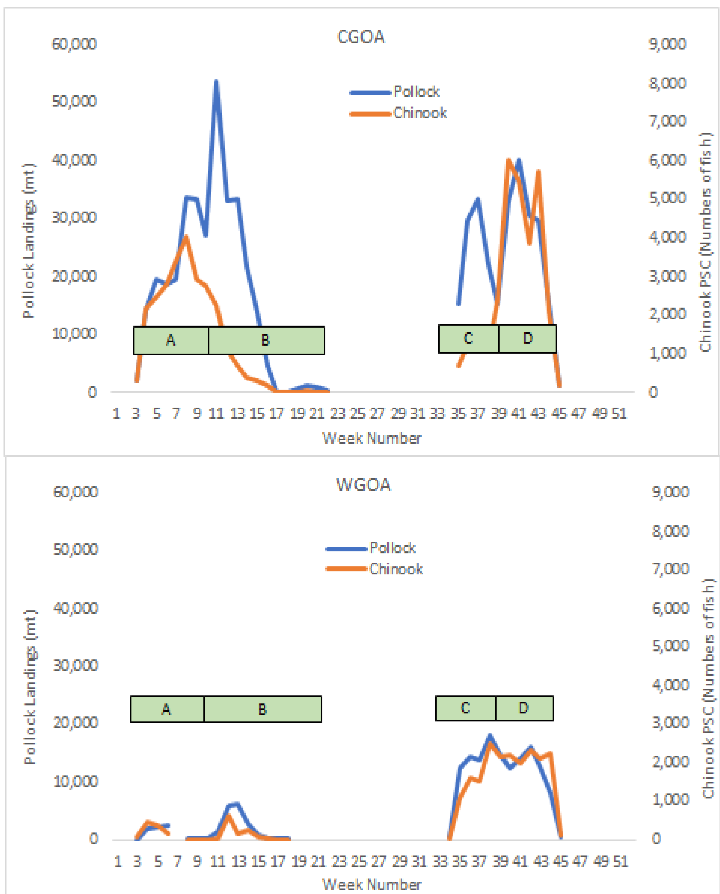


Figure 3-6 Summed 2013-2017 CV trawl pollock landings (mt) and Chinook PSC (numbers of fish) in the Central (top) and Western (bottom) Gulf of Alaska by week number. The seasons are indicated by the green bars.

3.3.2 Pacific Halibut

Pacific halibut (*Hippoglossus stenolepis*) is one of the largest species of fish in the world, with many individuals growing to over 8 feet (244 cm) in length and weighing over 500 pounds (225 kg). The species is found on the continental shelf of the north Pacific Ocean from northern California through the Bering Sea. The depth range for halibut is up to 250 fathoms (457 m) for most of the year and up to 500 fathoms (914 m) during the winter spawning months. During the winter, the eggs are released, move up in the water column, and are caught by ocean currents. Prevailing currents carry the eggs north and west. The young fish settle to the bottom in bays and inlets. Research has shown that the halibut then begin what can be called a journey back. This movement runs counter to the currents that carried them away from the spawning grounds and has been documented at over 1,000 miles for some fish. Pacific halibut are generally pre-teens (8 to 12 years old) when they are large enough to meet the minimum size limit for the commercial fishery of 32 inches.

3.3.2.1 Management of Pacific Halibut

IPHC Halibut Management
The Pacific halibut (*Hippoglossus stenolepis*) resource is managed by the International Pacific Halibut Commission (IPHC) through a U.S. – Canada convention that establishes harvest policy within a defined geographic range in the North Pacific termed the IPHC Convention Area (Figure 3-7). The IPHC was established in 1923 and its mandate is research on and management of the stocks of Pacific halibut within the Convention waters of both nations. The IPHC consists of three government-appointed commissioners for each country who serve their terms at the pleasure of the President of the United States and the Canadian Parliament. The Commission receives monies from both the United States and Canadian governments to support a director and staff. Annually, the IPHC meets to conduct the business of the IPHC. At this annual meeting the budgets, research plans, biomass estimates, catch recommendations, as well as regulatory proposals are discussed and approved then forwarded to the respective governments for implementation.

The IPHC employs a Harvest Strategy Policy[11] in order to ensure a rigorous, science-based approach to Pacific halibut management within the Convention Area. The Policy defines the biological and economic objectives of the Commission, and identifies reference points for use in the harvest strategy to achieve those objectives. The harvest strategy is consistent with the principles of ecosystem-based fisheries management and ecologically sustainable development which includes consideration of the relationship the species has with others in the food web and the marine environment.

Harvest regulations promulgated by the IPHC are applied to geographically defined regulatory areas and subareas (Figure 3-7), specifically: Area 2 (California, Oregon, Washington, and British Columbia), Area 3 (Gulf of Alaska), and Area 4 (Aleutian Islands and Bering Sea). The geographic application of IPHC regulations and associated monitoring allow for spatially discrete estimates of harvest and bycatch which are provided by the IPHC through its Annual Reports[12].

[11] https://www.iphc.int/the-commission/harvest-strategy-policy
[12] https://www.iphc.int/library/documents/category/annual-reports

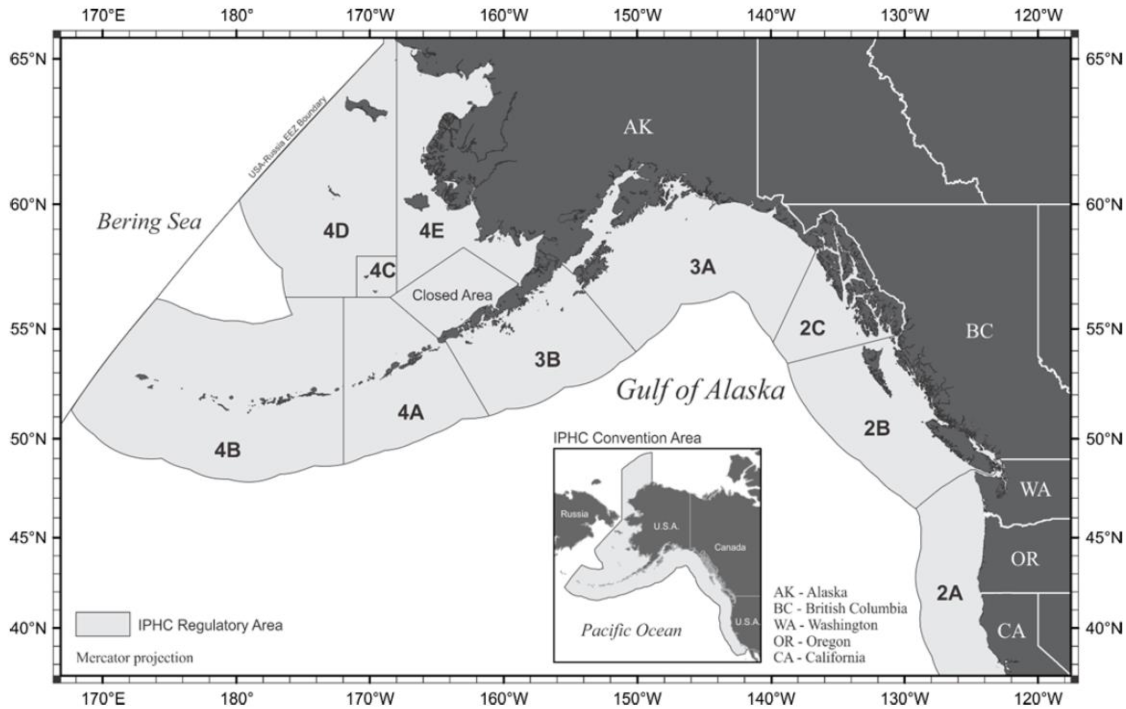


Figure 3-7 IPHC Regulatory Areas and the Pacific halibut geographical range within the territorial waters of Canada and the United States of America.

NPFMC Halibut PSC Management

The incidental capture of Pacific halibut by groundfish trawl vessels in the GOA is defined as prohibited species catch (PSC) in the GOA Groundfish FMP. The accumulation of halibut PSC is monitored by the Alaska Groundfish and Prohibited Species Catch Accounting System (CAS). A combination of observer data, dealer landing reports, and at-sea production reports is used to generate estimates of total catch, including prohibited species catch and at-sea discards. Data from industry are reported through the interagency Electronic Reporting System and are fed into the NMFS database every half-hour. Data from observers are integrated into the Alaska Fisheries Science Center Observer database as soon as they become available and are incorporated into the CAS nightly.

In 2013, the Alaska Region's Fishery Monitoring and Assessment Program (FMA) was restructured so that all sectors of the groundfish fishery including those with little or no coverage such as Western GOA trawl CVs less than 58 feet length overall (LOA) were included. This is an important consideration for a discussion of halibut PSC in the Western GOA Pacific cod trawl fishery since the majority of vessels in that fishery are less than 58 feet. Before assignment of observers to these vessels was optimized under the partial coverage selection category, almost all of the halibut PSC attributed to these vessels were extrapolations from other operations or other areas in the Gulf. The change in selection protocol starting in 2013 makes comparison of PSC rates before and after 2013 problematic.

In the GOA, halibut PSC limits were most recently reduced by Amendment 95 to the GOA Groundfish FMP, effective in 2013. That action reduced the GOA halibut trawl PSC limit by from 2000 mt to 1,705 mt, phased in over three years. PSC limits were reduced by 15% for the groundfish trawl gear sector and groundfish catcher vessel (CV) hook-and-line gear sector. PSC limits were reduced by 7 % for catcher processor (CP) hook and line gear, for an overall (CV/CP) hook and line limit of 256 mt overall. An additional halibut PSC limit of 9 mt is set for the demersal shelf rockfish fishery.

The halibut PSC limit for trawl gear in the GOA is apportioned into shallow water (pollock, Pacific cod, Atka mackerel, shallow water flatfish, flathead sole, and 'other species') and deep water (deepwater flatfish, rex sole, arrowtooth flounder, sablefish, and rockfish) species targets, and the limits are apportioned seasonally. Apportionments can be changed from year to year, though no such change has occurred recently. In considering a change, regulations at 679.21(d)(4) list seven factors that should be considered by the Council:

1. Seasonal distribution of halibut;
2. Seasonal distribution of target groundfish species relative to halibut distribution;
3. Expected halibut bycatch needs, on a seasonal basis, relative to changes in halibut biomass and expected catches of target groundfish species;
4. Expected variations in bycatch rates throughout the fishing year;
5. Expected changes in directed groundfish fishing seasons;
6. Expected start of fishing effort; and
7. Economic effects of establishing seasonal halibut allocations on segments of the target groundfish industry.

The current apportionment scheme provides flexibility and adaptability through an allowance for seasonal re-apportionment of PSC through the specification process while still requiring explicit consideration of the impacts of those reallocation decisions through the enumerated factors.

3.3.2.2 Importance of the Gulf of Alaska for North Pacific Halibut Stock

The Gulf of Alaska comprises Region 3 as identified for management and stock assessment by the IPHC (see Figure 3-7). Relative to other Regions, the greatest biomass of halibut occurs in Region 3 with annual contributions ranging from approximately 50% to 68% of the coastwide population (Figure 3-8).

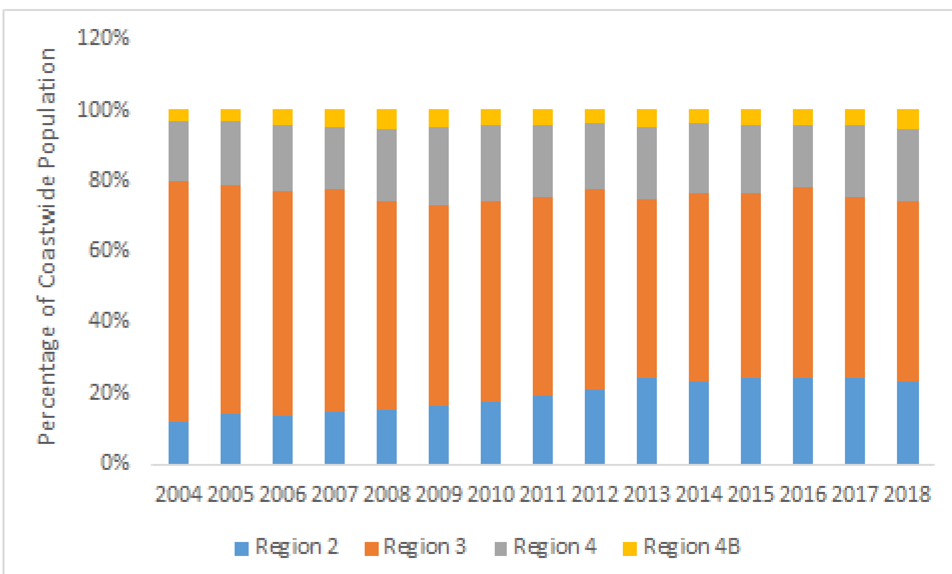


Figure 3-8 Stock distribution by biological region as estimated from annual IPHC longline survey catches from 2004-2018. Source IPHC.

Pacific halibut mortality is dominated by harvest in the directed commercial and recreational halibut fisheries, however, bycatch mortality from non-directed fisheries such as the groundfish trawl fleet comprise a very important proportion as well. As illustrated in Figure 3-9, coastwide mortality of halibut from non-target bycatch ranges from 12% (2004) to 21% (2014) coastwide, while within the Gulf of

Alaska, bycatch ranges from 8% (several years) to 16% (2014) of total mortality suggesting that bycatch mortality is not proportionately consistent by area.

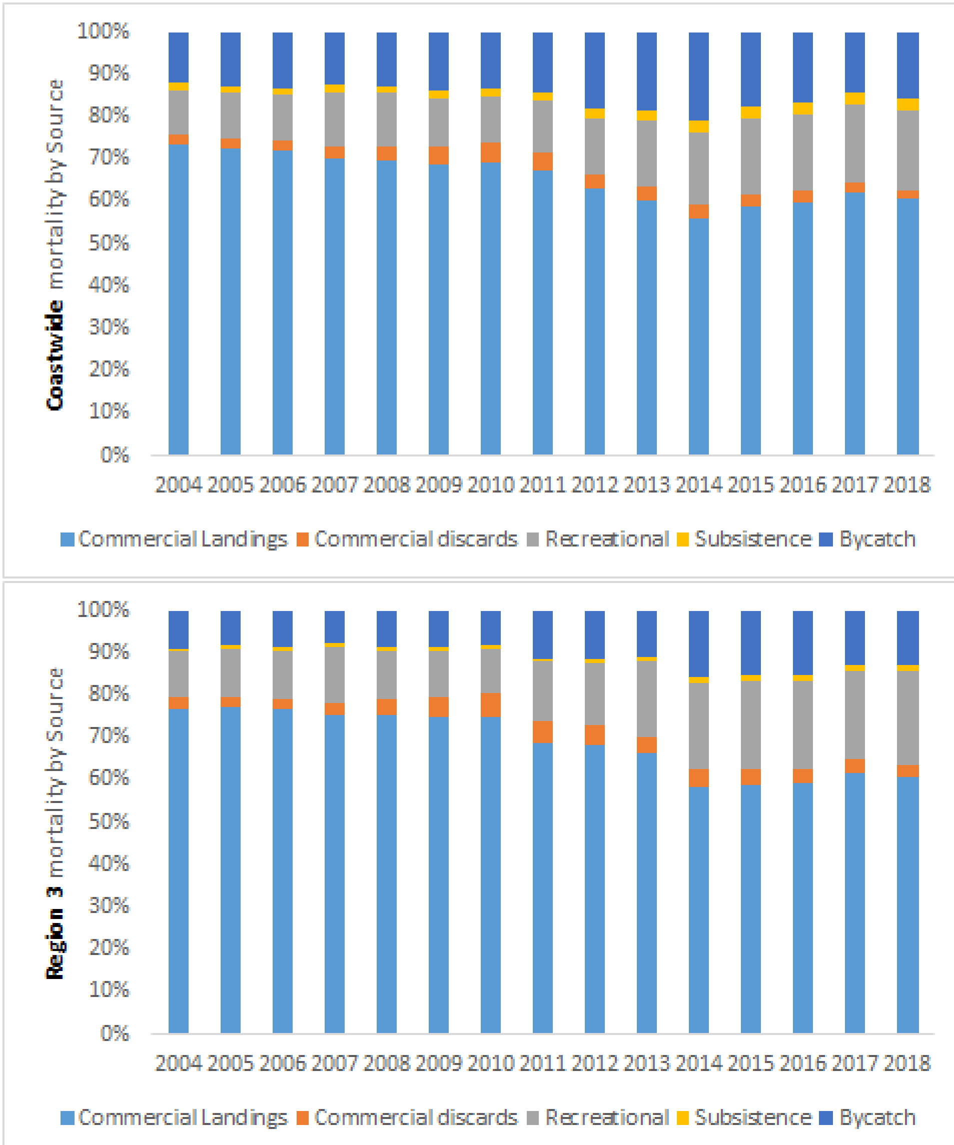


Figure 3-9 Halibut mortality by source for the coastwide stock (top) and within Region 3 (Gulf of Alaska) from 2004-2018. Source IPHC.

3.3.2.3 Status of Pacific Halibut

Annually, a quantitative stock assessment for Pacific halibut is conducted by IPHC assessment scientists, and within the assessment halibut are modelled as a single stock extending from northern California through the Gulf of Alaska, Aleutian Islands and Bering Sea. According to the most recent complete stock assessment (Stewart and Hicks 2017) the Pacific halibut stock declined continuously from the late 1990s to 2011 as a result of decreasing size-at-age, as well as somewhat weaker recruitment than had occurred during the 1980s. Female spawning biomass (SB) stabilized near 200 million pounds (~90,100 t) in 2010, and since then the stock is estimated to have been increasing gradually through 2017. Recruitment estimates indicate that the largest recent year classes occurred in 1999 and 2005 and cohorts from 2006 through 2013 are likely smaller than any recruitment from 1999-2005. In the future, these incidences of low recruitment will translate into declines in stock biomass and fishery yield as these year classes enter fully into the age range over which much of the harvest and spawning takes place. The stock is currently projected to decrease gradually from the present through 2020 assuming removals at the reference SPR (46%) level (31 million pounds, ~14,060 t) annually. There is a small chance (~21%) that the stock will decline below the threshold reference point ($SB_{30\%}$) if removals are 40 million pounds (~18,100 t) over the same time period.

3.3.2.4 Temporal Distribution of Halibut PSC in the Central and Western GOA

The accumulation of halibut PSC is monitored by the Alaska Groundfish and Prohibited Species Catch Accounting System (CAS). A combination of observer data, dealer landing reports, and at-sea production reports is used to generate estimates of total catch, including prohibited species catch and at-sea discards. Data from industry are reported through the interagency Electronic Reporting System and are fed into the NMFS database every half-hour. Data from observers are integrated into the Alaska Fisheries Science Center Observer database as soon as they become available, and are incorporated into the CAS nightly.

The annual halibut PSC limit for the GOA trawl fisheries was 2,000 mt until a phased in reduction was implemented in 2013 (NPFMC 2011) after which PSC limits declined each year until they reached the current limit of 1,706 mt in 2016. The annual PSC limit is divided into five seasonal apportionments of halibut PSC (start dates are Jan 20, Apr 1, Jul 1, Sep 1, and Nov 1). The A season for the Pacific cod trawl fishery (Jan 20-Jun 10) occurs across the first two seasonal halibut apportionments. The first four halibut seasons are separated into PSC amounts for the deep-water and shallow-water species complexes, and halibut PSC taken by the Pacific cod fisheries is counted against the limit for the shallow-water complex.

Halibut catch as PSC by the shallow water complex exceeds the seasonal PSC limits occasionally, but when under-utilization of seasonal PSC occurs, which is often, the excess PSC rolls over to the next season. Annual PSC usage is 75% on average relative to the PSC limits for the 2012-2018 period. Figure 3-10 illustrates halibut catches relative to specified limits from the last year when the 2,000 mt limit was in place (2012) through the current year.

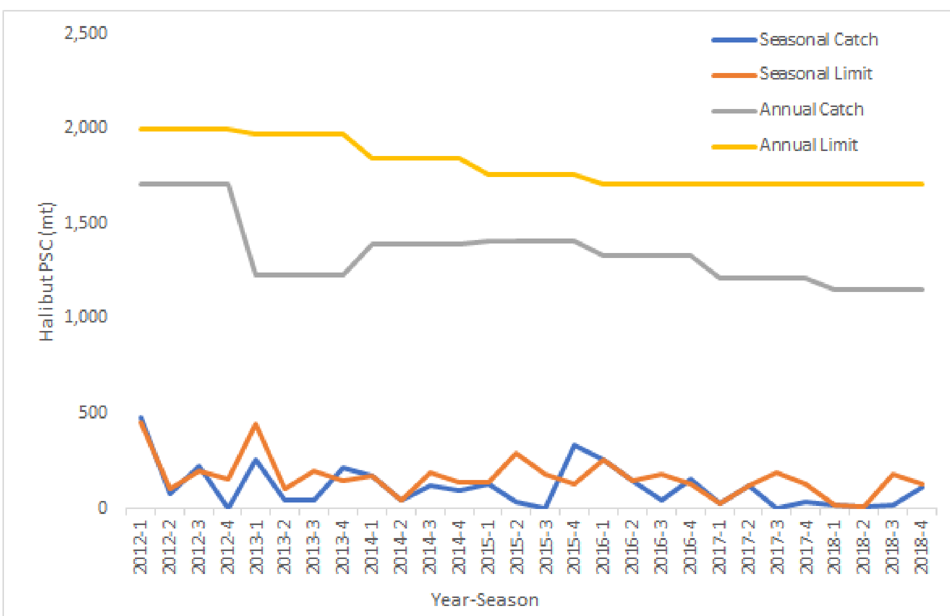


Figure 3-10 Realized halibut PSC compared to specified halibut PSC limits for the shallow water complex trawl fisheries in the Gulf of Alaska from 2012-2018. Source NMFS Gulf of Alaska Halibut Mortality Report data through Nov 10, 2018.

In December 2017, the Council reviewed a discussion paper that addressed halibut PSC in the Western GOA Pacific cod trawl fishery. Updating that to include the Central GOA, summed weekly halibut PSC for 2013-2017 show a decline over the course of the cod A season (Figure 3-11) that tracks Pacific cod landings including a large increase in cod landings and halibut PSC around week 12 in the CGOA. Very little Pacific cod trawl harvest occurs in the WGOA during the B season so shifts in halibut PSC under Alternative 3 would likely only apply to the Central GOA. Within the CGOA, halibut PSC rates (mt halibut/mt groundfish) are greater than they are in the WGOA (Table 3-8); additionally, the rates tend to reach their largest average values early in the B season. To the extent that halibut PSC in the CGOA B season is stable, movement of effort from the B season to the A season would be expected to reduce the incidence of halibut PSC in the CGOA.

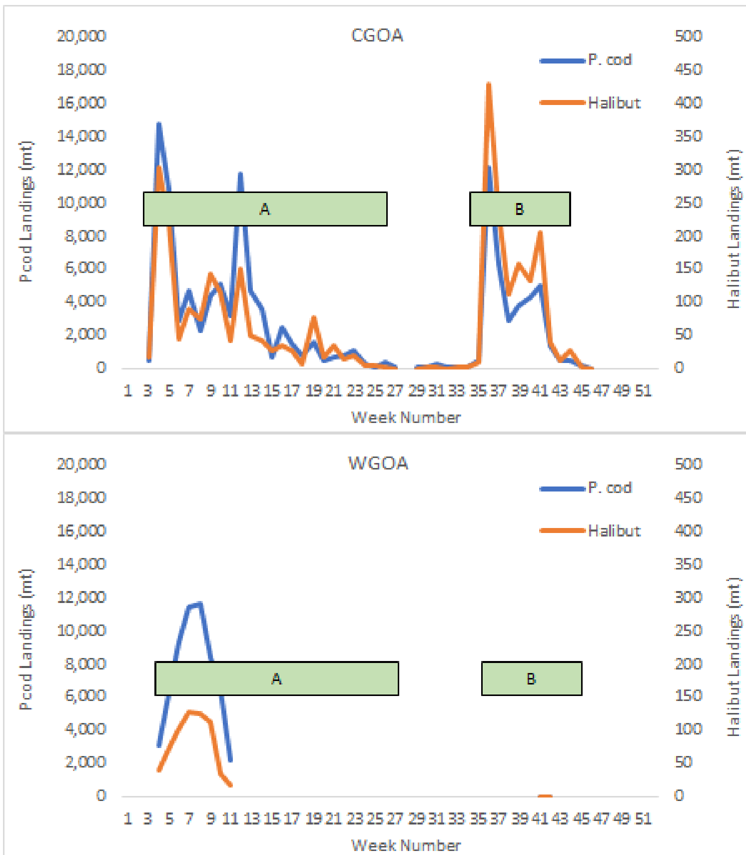


Figure 3-11 Summed 2013-2017 CV trawl Pacific cod landings (mt) and Pacific halibut PSC (numbers of fish) in the Central (top) and Western (bottom) Gulf of Alaska by week number. The seasons are indicated by the green bars.

Table 3-8 Halibut PSC rate by month in the GOA Pacific cod target CV trawl fishery, 2012 through 2017.

Area		JAN	FEB	MAR	APR	AUG	SEP	OCT	NOV
WG	mt PSC/mt GF	0.012	0.012	0.005					
	kg PSC/mt GF	12.16	12.09	5.49					
CG	mt PSC/mt GF	0.027	0.018	0.016	0.016	0.012	0.038	0.029	0.023
	kg PSC/mt GF	27.33	18.24	15.84	16.03	11.62	37.93	29.10	23.435

The magnitude of the seasonal halibut catch varies greatly from year to year (Figure 3-12). In 2015, season 4 halibut PSC was 255% of the seasonal limit, although total annual catch was only 80% of the overall limit. Patterns of declining halibut PSC during the A season, identified as potentially important in a review of WGOA halibut PSC, are not stable when the data are disaggregated into individual years suggesting that a characterization of the probability of PSC as a function of time would be inappropriate. Instead, it is suggested that halibut PSC is mostly predicted by the magnitude of Pacific cod harvest (e.g., Figure 3-13), which itself, should be a function of fishing effort. If halibut PSC, in the context of the GOA Pacific cod trawl fisheries, is primarily driven by Pacific cod effort, then confidence improves regarding predictions about the likelihood of changes in halibut PSC.

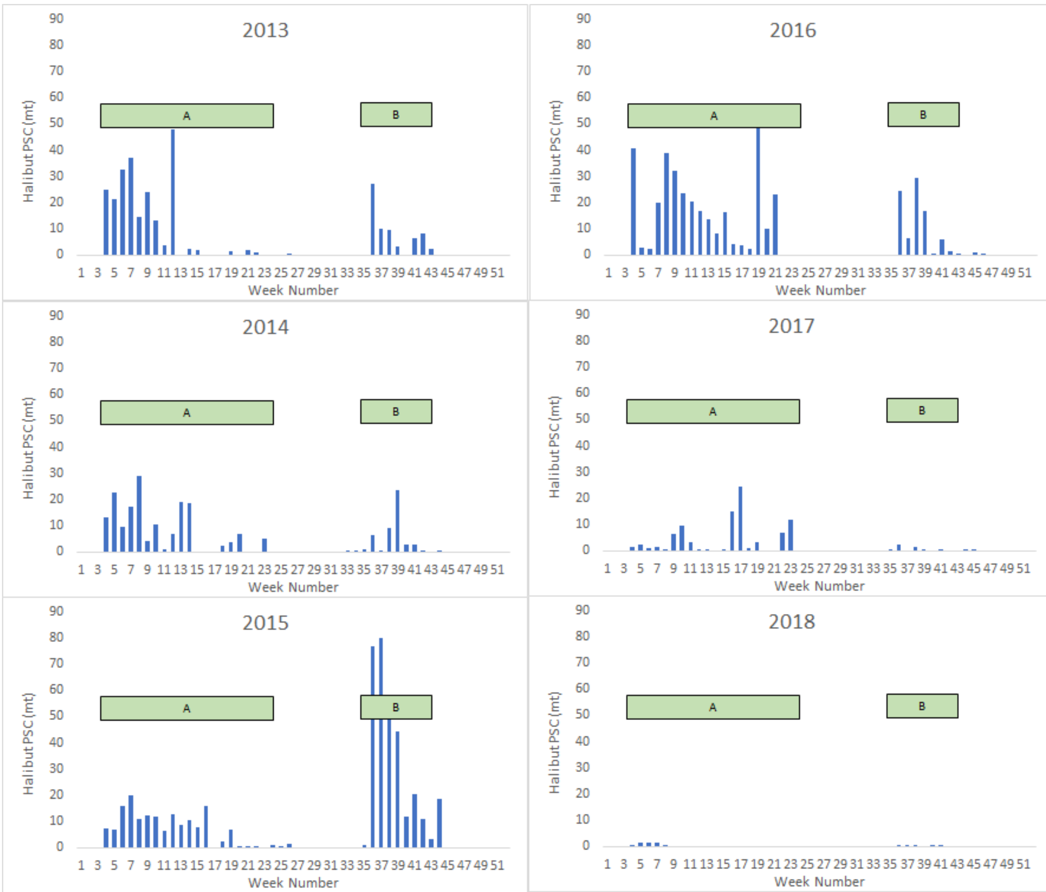


Figure 3-12 Halibut PSC by year in the CGOA and WGOA Pacific cod trawl CV fisheries. Source: AKFIN Prohibited Species Bycatch database

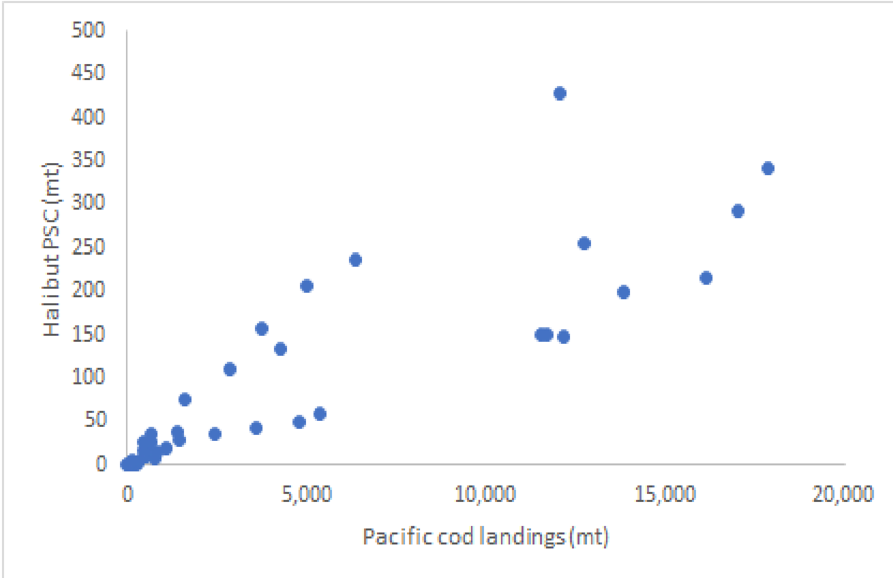


Figure 3-13 Halibut PSC and Pacific cod harvest (weekly in mt) in the combined 2013-2018 CGOA and WGOA Pacific cod trawl CV fisheries. Source: AKFIN Prohibited Species Bycatch database

3.3.3 Effects of the Alternatives on Non-Target Species

The impact of the GOA groundfish fisheries on Chinook salmon was analyzed most recently in the Alaska Groundfish Fisheries Harvest Specifications Supplemental EIS (NMFS 2007a). Table 3-9 describes the criteria used to determine whether the impacts on Chinook salmon stocks are likely to be significant.

Table 3-9 Criteria used to determine significance of effects on non-target species

No impact	No incidental take of the ecosystem component species in question.
Adverse impact	There are incidental takes of the ecosystem component species in question
Beneficial impact	Natural at-sea mortality of the ecosystem component 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 would be a significantly adverse impact.
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the ecosystem component species, and significantly beneficial impacts are not defined for these species.
Unknown impact	Not applicable

Chinook Salmon

Chinook salmon are not at increased risk under any of the alternatives. Amendment 93 established annual Chinook salmon prohibited species catch (PSC) limits in the directed pollock trawl fisheries of the Central and Western GOA. Inshore sector trawl vessels fishing for pollock in the Central GOA are limited to 18,316 Chinook salmon per year. Trawl vessels fishing for pollock in the Western GOA are limited to 6,684 Chinook salmon per year. When and if those PSC hard caps are met, NMFS inseason managers close directed pollock trawl fishing in the relevant management area. Under any of the alternatives, existing PSC limits will continue to constrain Chinook PSC levels in the GOA pollock trawl fisheries to levels identified by the Council as not resulting in undue risk to the sustainability of the affected Chinook salmon populations.

Relative to other seasons, the incidence of Chinook salmon PSC tends to be greatest in D season in both CGOA and WGOA, but the difference is more evident in the CGOA. Consolidation of C and D pollock seasons combined with increased rollover allowances from the consolidated A/B season has the potential to increase effort during the part of the year when the likelihood of Chinook PSC is greatest. The directionality of temporal shifts in effort is explored in the RIR in this document. Conclusions from that analysis indicate that fishing during the D season can be less desirable due to poor weather, especially for smaller vessels operating in the WGOA

Pacific Halibut

Pacific halibut are not at increased risk under any of the alternatives. Temporal patterns in halibut PSC rates are generally absent in the CGOA and WGOA Pacific cod trawl fisheries. Instead, the magnitude of halibut PSC appears to be most closely linked to the magnitude of Pacific cod landings. Given this tendency toward proportionality, changes in Pacific cod landings are likely to correspond to increased incidence of halibut PSC. Furthermore, the removal of or reduction in management inefficiencies that constrain Pacific cod harvest from meeting annual or seasonal TACs would likely result in increased halibut PSC.

Temporal shifts in effort such as fishing deeper into the A season may occur as a result of increased allocation to that season lowering the likelihood that competitive fishing will close the season early. Such an outcome or any other redistribution of Pacific cod effort would likewise tend to redistribute halibut PSC within the fishing year. Regardless of the difficulty in anticipating temporal dynamics of fishing effort under the alternatives, existing PSC limits will continue to constrain halibut PSC in the GOA Pacific cod trawl fisheries to levels identified in analyses previously reviewed by the Council (e.g., Amendment 95) as not resulting in undue risk to halibut sustainability.

3.4 Marine Mammals

3.4.1 Status of Marine Mammals in the GOA

Alaska supports one of the richest assemblages of marine mammals in the world. Twenty-two species are present from the *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 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 (Muto, et al. 2018). 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 to ensuring marine mammal populations continue to be functioning elements of the ecosystems of which they are a part and to address mortality and serious injury (M/SI) of marine mammals incidental to commercial fishing operations. The 1994 MMPA Amendments established a requirement for commercial fisheries operations to reduce incidental 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 met for a marine mammal stock when the M/SI level from all commercial fisheries is 10% (or below) of the Potential Biological Removal level (PBR) of that marine mammal stock (69 FR 43338, July 20, 2004). The level of serious injury and mortality (but not non-serious injury) that result from fishery interactions is compared to the overall population level and the PBR for each marine mammal stock. This comparison allows an evaluation of whether the serious injury/mortality will have a deleterious effect at a population (stock) level. The MMPA requires that this information be published in an annual List of Fisheries (LOF) for each commercial fishery. 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. The term ‘‘endangered species’’ means any species which is in danger of extinction throughout all or a significant portion of its range, and a ‘‘threatened species’’ means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

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.

The most recent stock status and fishery interaction information is available in the Marine Mammal Stock Assessment Reports (SARs), which are published annually for all stocks that occur in state and federal waters of the Alaska region (Muto et al. 2018). 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 PBR has been exceeded. The SARs also include the stock’s ESA listing status and MMPA depleted and strategic designations. Strategic stock SARs are updated annually, and SARs for non-strategic stocks are updated every three years or when significant new information becomes available.

Under the ESA species, subspecies, and distinct population segments (DPS) are eligible for listing as a threatened or endangered species. The ESA defines a “species” as “any subspecies of fish or wildlife or plants, and any DPS of any species of vertebrate fish or wildlife which interbreeds when mature”. 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.

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. These sources are incorporated by reference.

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 the 2017 Supplemental Information Report (SIR).[1] These documents are incorporated by reference. Each year, NMFS publishes a Human-Caused Mortality and Injury of NMFS-Managed Marine Mammal Stocks Technical Memorandum, which includes marine mammal interactions with all types of fisheries; it is not limited to commercial fishery interactions.[2] The data from this report are then summarized by stock in the SARs and then used in the annual List of Fisheries (LOF) analyses.[3] The LOF analyzes serious injury and mortality of marine mammals in fisheries by stock and by individual commercial fisheries. Through the annual List of Fisheries analysis, the level of serious injury and mortality (but not non-serious injury) that resulted from incidental take in commercial fisheries for each marine mammal stock is compared to the stock's PBR to evaluate whether the potential for a deleterious effect at a population (stock) level.

Marine mammal bycatch data from the Alaska groundfish fisheries from 1998- 2004 is provided in a 2006 NOAA Technical Memorandum (Perez 2006). This document also describes the nature of marine mammal bycatch in the fisheries, the methods used to document marine mammal interactions with fishing gear and the methods used to extrapolate the fishery observer data to the entire fishery.

A number of conservation concerns and/or management determinations may be related to marine mammals and the potential impacts of fishing. For individual species, these concerns or determinations may include—

- Protection under the ESA:
    - listed as endangered or threatened
    - placed on NMFS' list of "species of concern" or designated as a "candidate species" for ESA listings;
- Protection under the MMPA:
    - designated as a depleted or strategic stock;
    - 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.

Marine mammal stocks, including those currently listed as endangered or threatened under the ESA, that are present in the GOA are listed in Table 3-10.

Table 3-10 Marine mammals that are known to occur in the Gulf of Alaska

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	Met
		Eastern U.S.	Depleted, Strategic †	Not Met
	Northern fur seal *(Callorhinus ursinus)*	Eastern Pacific	Depleted, Strategic	Met
	Harbor seal *(Phoca vitulina)*	Northern Kodiak	None	Met
		Southern Kodiak	None	Met
		Prince William Sound	None	Met
		Cook Inlet/Shelikof Strait	None	Met
		Glacier Bay/Icy Strait	None	Unknown**
		Lynn Canal/Stephens Passage	None	Unknown**
		Sitka/Chatham Strait	None	Unknown**
		Dixon/Cape Decision	None	Unknown**
		Clarence Strait	None	Met
	Ribbon seal *(Phoca fasciata)*	Alaska	None	Met
	Northern elephant seal *(Mirounga angustirostris)*	California***	None	Met
Cetacea	Beluga whale (*Delphinapterus leucas*)	Cook Inlet (includes Yakutat Bay animals)	Endangered, Depleted, Strategic	Met
	Killer whale *(Orcinus orca)*	Eastern North Pacific Northern Resident	None	Met
		Eastern North Pacific Alaska Resident	None	Met
		Eastern North Pacific GOA, Aleutian Islands, and Bering Sea Transient	None	Not Met
		AT1 Transient	Depleted, Strategic	Met
		West Coast Transient	None	Met
		Eastern North Pacific Offshore***	None	Met
	Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)	North Pacific	None	Unknown*
	Harbor porpoise *(Phocoena phocoena)*	Southeast Alaska	Strategic	Unknown*, **
		Gulf of Alaska	Strategic	Unknown*, **
	Dall's porpoise (*Phocoenoides dalli*)	Alaska	None	Unknown**
	Sperm whale (*Physeter macrocephalus*)	North Pacific	Endangered, Depleted, Strategic	Unknown*
	Baird's beaked whale (*Berardius bairdii*)	Alaska	None	Unknown*
	Cuvier's beaked whale (*Ziphius cavirostris)*	Alaska	None	Unknown*
	Stejneger's beaked whale (*Mesoplodon stejnegeri*)	Alaska	None	Unknown*
	Gray whale *(Eschrichtius robustus)*	Eastern North Pacific***	None	Met
	Humpback whale†† *(Megaptera novaeangliae)*	Western North Pacific‡	Endangered, Depleted, Strategic	Not Met
		Central North Pacific‡‡	Mexico DPS: Threatened, Depleted, Strategic‡‡ Hawaii DPS: None	Not Met
	Fin whale *(Balaenoptera physalus*)	Northeast Pacific	Endangered, Depleted, Strategic	Unknown*
	Minke whale *(Balaenoptera acutorostrata)*	Alaska	None	Unknown*
	North Pacific right whale *(Eubalaena japonica)*	Eastern North Pacific	Endangered, Depleted, Strategic	Met
	Blue whale *(Balaenoptera musculus)*	Eastern North Pacific***	Endangered, Depleted, Strategic	Met
	Sei whale *(Balaenoptera borealis)*	Eastern North Pacific***	Endangered, Depleted, Strategic	Met
Mustelidae	Northern sea otter *(Enhydra lutris)*	Southeast Alaska	None	Unknown**
		Southcentral Alaska		Unknown**

Sources: Muto et al 2018; Proposed List of Fisheries for 2019 (February 7, 2018 83 FR 53422).
*Unknown due to unknown abundance estimate and PBR.
**Unknown due to inadequate observer coverage,
*** This stock is found in the Pacific, rather than in the Alaska, SAR.
† The Steller sea lion EDPS was removed from the ESA list of endangered and threatened wildlife on November 4, 2013.
†† On September 8, 2016, NMFS published a final decision revising the status of humpback whales under the ESA (81 FR 62259), effective October 11, 2016. In the 2016 decision, NMFS recognized the existence of 14 DPSs, classified several as endangered and one as threatened, and determined the remaining DPSs do not warrant protection under the ESA. Three DPSs of humpback whales occur in waters off the coast of Alaska: the Asia/2nd Western North Pacific (WNP) DPS (endangered), the Mexico DPS (threatened), and the Hawaii DPS, which is not protected under the ESA. Whales from these three DPSs overlap to some extent on feeding grounds off Alaska. As of November 2018, the MMPA stock designations of humpback whales found in Alaska have not been updated to reflect the newly-designated DPSs.
‡ Corresponds to the new Asia/ 2nd WDPS (endangered)
‡‡ Includes the New Mexico (threatened) and Hawaii DPSs (not protected under the ESA).

3.4.1.1 Marine Mammal Interactions with GOA Groundfish Fisheries

Direct and indirect interactions between marine mammals and fishing vessels may occur due to temporal and spatial overlap in marine mammal occurrence and commercial fishing activities, as well as overlap between the size and species of fish harvested that are also important marine mammal prey. The GOA groundfish FMP contain measures to protect marine mammals from potential effects of fishing, and several species are the subjects of continuing research and monitoring to further define the nature and extent of fishery impacts on them.

Of the species listed under the ESA and present in the GOA, several species may be adversely affected by commercial groundfish fishing. These include: Steller sea lions (SSL), humpback whales, fin whales, and sperm whales (NMFS 2010). 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 fishing, include northern fur seals and harbor porpoises.

Not all species listed in Table 3-10 are likely to be affected by this action. The following paragraphs describe why those species are not expected to be affected by the alternatives and therefore were not analyzed. Many of these species do not generally overlap with the action area or the fishery, or they are not known to directly interact with GOA pollock or Pacific cod trawl gear. Additionally, the effects of this action expected on certain marine mammal species from Table 3-10. have been considered in previous NEPA and ESA 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 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, right whale or designated right whale critical habitat, sei whale, or fin whale.

The 2010 biological opinion, which subsequently included fin whales, concluded that the BSAI and GOA groundfish fisheries were not likely to jeopardize the continued existence of the eastern DPS of SSL, 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 SSL 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 and ensure that the fisheries were not likely to jeopardize the continued existence of the SSL 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 2014).

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.

Although some northern fur seals are caught incidental to commercial fisheries, the number is low compared to the PBR. Based on currently available data, the minimum estimate of the mean annual U.S. commercial fishery related mortality and serious injury rate for this stock (3.5 fur seals) is less than 10% of the calculated PBR (10% of PBR = 1,140) and is therefore considered to be insignificant and approaching a zero mortality and serious injury rate. The total estimated annual level of human-caused mortality and serious injury (437 fur seals) does not exceed the PBR (11,405) for this stock (Muto et al. 2018). No Eastern Pacific stock of northern fur seals were incidentally taken in the GOA pollock or Pacific cod trawl fisheries from 2011 through 2015. This action is not likely to adversely affect the Eastern Pacific stock of northern fur seals.

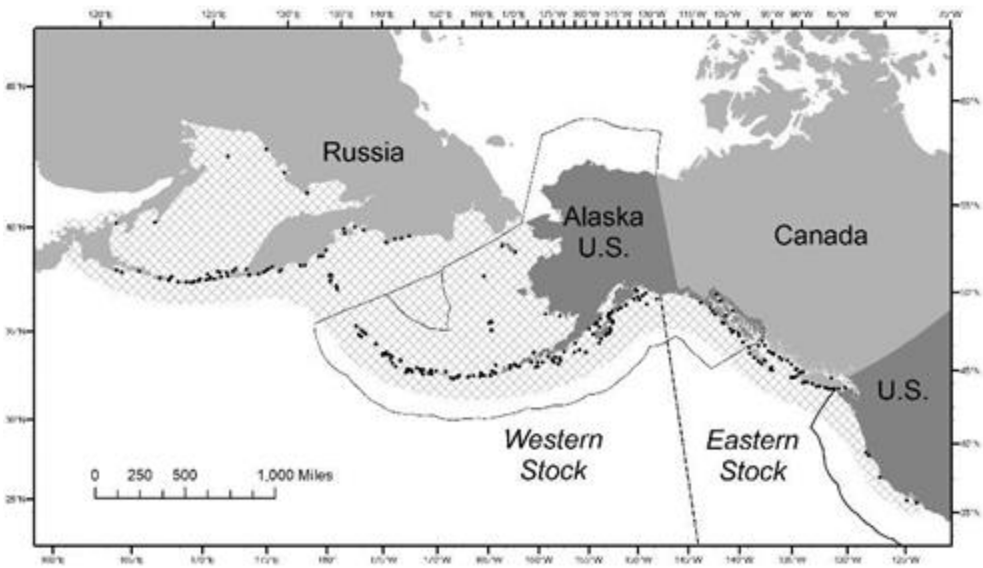
NMFS designated critical habitat for the North Pacific right whale on April 8, 2008 (73 FR 19000) and concluded on April 30, 2008 that the fisheries in the BSAI and GOA were not likely to adversely affect the right whale or critical habitat. NMFS reached this conclusion because the density of fishing 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. 2018).

The proposed 2019 List of Fisheries indicates that for the period 2011 through 2015 only the GOA, AI, BSAI transient stock of killer whales and the central and western Pacific stocks of humpback whales have levels of annual serious injury and mortality from any commercial fisheries that is greater than 10% of the PBR for each stock. Although there have been past serious injury and mortality levels for marine mammal stocks in GOA groundfish fisheries greater than 10% of PBR of the stock, the LOF makes these assessments based on the most recent five-year period for which data are available. Since none of the serious injuries or mortalities to those stocks were in GOA groundfish fisheries, it is reasonable to conclude that none of those stocks is likely to be directly affected through incidental take by this proposed action.

Other types of direct take include disturbance by vessel noise and traffic. The Alaska Groundfish Harvest Specifications EIS contains a detailed analysis of the disturbance of marine mammals by the groundfish fisheries (NMFS 2004) and is incorporated by reference. Disturbance of marine mammals would depend on the timing and location of a fishery in relation to the occurrence of marine mammals. The harvest specifications EIS concluded that the groundfish fisheries do not cause disturbance to marine mammals that may cause population level effects. The following marine mammal stock is likely to be indirectly affected by this action.

3.4.1.2 Steller Sea Lion, Western U.S. Stock Status

SSLs range along the North Pacific Rim from northern Japan to California (Loughlin et al. 1984), with centers of abundance and distribution in the Gulf of Alaska and Aleutian Islands (Figure 3-14). Two separate stocks of SSLs are recognized within U.S. waters: an Eastern U.S. stock, which includes animals born east of Cape Suckling, Alaska (144° W.), and a Western U.S. stock, which includes animals born at and west of Cape Suckling (Loughlin 1997). However, Jemison et al. (2013) summarized regular movement of SSLs from the western Distinct Population Segment (DPS; the ESA DPS designation for eastern and western SSL are roughly equivalent to the MMPA stock designations for these respective populations) (males and females equally) and eastern DPS (almost exclusively males) across the DPS boundary. SSLs that breed in Asia are considered part of the western stock. Whereas SSLs seasonally inhabit coastal waters of Japan in the winter, breeding rookeries of western stock animals outside of the U.S. are currently only located in Russia (Burkanov and Loughlin 2005). Large numbers of individuals disperse widely outside of the breeding season (late May-early July), probably to access seasonally important prey resources. This results in marked seasonal patterns of abundance in some parts of the range and potential for intermixing in foraging areas of animals that were born in different areas (Sease and York 2003).



Source: Muto et al. 2017

Figure 3-14 Generalized distribution (crosshatched area) of SSLs in the North Pacific and major U.S. haulouts and rookeries (50 CFR 226.202, 27 August 1993), as well as active Asian and Canadian (British Columbia) haulouts and rookeries. Black dashed line (144°W) indicates stock boundary and solid black line delineates U.S. Exclusive Economic Zone.

The western stock of SSLs decreased from an estimated 220,000 to 265,000 animals in the late 1970s to less than 50,000 in 2000 (Loughlin et al. 1984, Loughlin and York 2000, Burkanov and Loughlin 2005). Since 2003, the abundance of the western stock has increased, but there has been considerable regional variation in trend (Sease and Gudmundson 2002; Burkanov and Loughlin 2005; Fritz et al. 2013, 2016). The most recent comprehensive surveys of western SSLs in Alaska were conducted during the 2015 and 2016 breeding seasons (Fritz et al. 2016, Sweeney et al. 2016). Because current population size (N) and a pup multiplier to estimate N are not known, the best estimate of the total count of western SSLs in Alaska is used as the minimum population estimate (N_{MIN}). Western SSL pup and non-pup estimates in 2016 in Alaska were 12,631 and 40,672, respectively (Sweeney et al. 2016). These sum to 53,303, which will be used as the N_{MIN} for the U.S. portion of the western stock of SSLs (Wade and Angliss 1997). This is considered a minimum estimate because it has not been corrected to account for animals that were at sea during the surveys.

Using data collected through 2016, there is strong evidence that pup and non-pup counts of western stock SSLs in Alaska were at their lowest levels in 2002 and 2003, respectively, and have increased at 2.19% y^{-1} and 2.24% y^{-1}, respectively, between 2003 and 2016 (Sweeney et al. 2016). However, there are strong regional differences across the range in Alaska, with positive trends in the Gulf of Alaska and eastern Bering Sea east of Samalga Pass (~170°W) and generally negative trends to the west in the Aleutian Islands (Table 3-11). Trends in 2003-2016 in Alaska have a longitudinal gradient with highest rates of increase in the east (eastern Gulf of Alaska) and steadily decreasing rates to the west (Table 3-11).

Table 3-11 Trends (annual rates of change expressed as % y-1 with 95% credible interval) in counts of western SSL non-pups (adults and juveniles) and pups in Alaska, by region, for 2003-2016 (Sweeney et al. 2016).

		Non-pups				**Pups**		
Region	**Latitude Range**	**Trend**	**-95%**	**+95%**		**Trend**	**-95%**	**+95%**
Western Stock in Alaska	144°W-172°E	2.24	1.30	3.24		2.19	1.46	2.90
E of Samalga Pass	144°-170°W	3.40	2.29	4.67		3.71	2.80	4.59
Eastern Gulf of Alaska	144°-150°W	5.36	1.74	9.11		4.61	2.33	6.83
Central Gulf of Alaska	150°-158°W	4.33	2.45	6.16		4.22	2.35	6.29
Western Gulf of Alaska	158°-163°W	3.28	1.19	5.11		3.70	1.92	5.31
Eastern Aleutian Islands	163°-170°W	1.71	-0.26	3.67		2.83	1.60	4.04
W of Samalga Pass	170°W-172°E	-1.42	-2.99	0.27		-1.89	-2.99	-0.63
Central Aleutian Islands	170°W-177°E	-0.73	-2.48	1.12		-1.33	-2.58	0.03
Western Aleutian Islands	172°-177°E	-6.71	-8.46	-5.08		-6.94	-8.19	-5.75

Potential biological removal (PBR) is defined as the product of the minimum population estimate, one-half the maximum theoretical net productivity rate, and a recovery factor: $PBR = N_{MIN} \times 0.5R_{MAX} \times F_R$. The recovery factor ($F_R$) for this stock is 0.1, the default value for stocks listed as endangered under the ESA (Wade and Angliss 1997). Thus, for the U.S. portion of the western stock of SSLs, PBR = 320 sea lions (53,303 × 0.06 × 0.1).

From 2011 through 2015, mortality and serious injury of western SSLs was observed in 8 of the 22 federally-regulated commercial fisheries in Alaska that are monitored for incidental mortality and serious injury by fisheries observers resulting in a mean annual mortality and serious injury rate of 16 SSL (Muto 2018). The western SSL estimated total annual serious injury and mortality in state-managed salmon gillnet net fisheries (Prince William Sound drift gillnet fishery) is 15. The minimum estimated total annual serious injury and mortality from commercial fisheries for the western SSL stock is 31, which is less than 10% of the stock's PBR. Therefore, all commercial State and Federal commercial fisheries are considered to meet ZMRG for this stock.

3.4.1.3 Steller Sea lion Protection Measures in the Gulf of Alaska groundfish fisheries

The jeopardy and adverse modification finding in the 2010 FMP BiOp was based on potential connections between the continued decline of SSL WDPS populations in the western and central Aleutian Islands and the Aleutian Islands Atka mackerel and Pacific cod fisheries. NMFS subsequently modified the SSL protection measures in the Aleutian Islands Atka mackerel and Pacific cod fisheries in 2011 (75 FR 77535, December 13, 2010; corrected 75 FR 81921, December 29, 2010) and 2015 (79 FR 70286, November 25, 2014) to ensure the fisheries were not likely to jeopardize the continued existence of the WDPS or adversely modify its designated critical habitat.

NMFS has implemented protection measures to reduce potential competition for prey between the GOA Pacific cod fishery and SSLs since 1990 as described in section 1.2, History of the action. These measures have consistently been upheld to spatially and temporally disperse fishing to mitigate potential competition for prey resources between the Atka mackerel, Pacific cod, and pollock fisheries and SSLs. Dispersion is accomplished through closure areas, harvest limits, seasonal apportionment of harvest limits, and limits on participation in the fishery. No-transit areas were instituted in 1990, trawl closures in 1992, and other pollock and Pacific cod fishery measures in 2001. The following section summarizes SSL protection measures in the GOA pollock and Pacific cod fisheries, analyzed in the October 19, 2001 BiOp on the Authorization of BSAI and GOA Groundfish Fisheries, 2010 FMP BiOp, proposed (67 FR 56692, September 4, 2002) and final (68 FR 204, January 2, 2003) rules. The SSL Recovery Plan notes that the SSL protection measures in the Alaska groundfish fisheries should be maintained until it can be determined that reducing those protections would not reduce the likelihood for survival or increase the time to recovery, including protections developed to 1) avoid disturbance and competition around rookeries and major haulouts, 2) avoid competition during the early winter season, 3) disperse the fisheries spatially, and 4) disperse the fisheries temporally (NMFS 2008).

<u>Harvest Control Rule</u>

To protect prey abundance for the SSL WDPS, the harvest control rule stipulates for Pacific cod, pollock, and Atka mackerel in the BSAI and GOA, the target species' acceptable biological catch be reduced when that species' spawning biomass is estimated to be less than 40 percent of the unfished biomass. Directed fishing for the target species would be prohibited in the event the estimated spawning biomass is below 20 percent of the projected unfished biomass.

<u>Area Closure</u>

Numerous areas are closed to pollock and Pacific cod trawl harvest in the GOA to protect prey availability in important sea lion foraging areas. These areas can be found at § 679.22(b) and § 679 Tables 4 and 5.

<u>Vessel Monitoring</u>

Any vessel participating in the GOA Federal Pacific cod or pollock trawl fishery is required to have an operable vessel monitoring system (VMS) onboard when the directed fishery is open to ensure compliance with the SSL protection area restrictions. (See 67 FR 956, January 8, 2002).

Fishing Seasons

The annual GOA Pacific cod trawl fishery in the WGOA is divided into two seasons (50 CFR 679.23(d)(3)), and the WGOA pollock trawl fishery is divided into four seasons as described in chapter 2, Description of the Alternatives, above.

Seasonal Allocations

To disperse Pacific cod and pollock harvests over time and reduce the likelihood of localized depletions, the fisheries are divided into seasons with catch allocations split as follows: the GOA Pacific cod fishery is divided into two seasons with a 60% and 40% split and the pollock allocation is divided equally over four seasons as described above in chapter 2, Description of the Alternatives, above.

3.4.2 Effects on Marine Mammals

No 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. In this case, the prey availability is enhanced for these animals because they need less energy for foraging. However, that benefit may be offset by adverse effects from an increased potential for entanglement in the gear or other unknown risks from modified foraging behavior.

The following discussion focuses on the potential indirect effects of a change in the temporal dispersion of fishing effort on the western stock of SSLs. Additional consideration is given to the effects of the alternatives on marine mammal stocks that may be sensitive to disturbance of the benthic habitat.

3.4.2.1 Alternative 1

Maintaining the current fishery seasons and allocations for both Pacific cod and pollock in the WGOA would mean there would be no expected change in temporal or spatial dispersion of fishing effort as a result of this alternative. Under Alternative 1, there would be no expected changes in incidental take, prey availability, or disturbance effects.

Incidental Take Effects

The GOA pollock and Pacific cod trawl fisheries are listed in the proposed List of Fisheries for 2019 as Category III, with a remote likelihood of or no known interaction with any marine mammal species. As noted above, the minimum estimated total annual serious injury and mortality from the GOA pollock and Pacific cod trawl fisheries is 0 and 0.2, respectively for the 2011 through 2015 timeframe. There were no recorded ship strikes of SSL in these or any commercial fishery from 2011 and 2015 (Helker, et al. 2017).

For SSL, the minimum estimate of the total annual level of human-caused mortality and serious injury is not known to exceed the PBR, all commercial fisheries are considered to meet ZMRG for this stock, 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 from direct incidental take as a result of Alternative 1.

Prey Availability Effects

Indirect effects to marine mammals may result from harvest of marine mammal prey species by the GOA fisheries that may limit foraging success through localized depletion, overall reduction in prey biomass, and dispersion of prey. The result of such circumstances may make 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.

The 2010 BiOp discusses the impacts of prey availability to SSL that may arise from competition between fisheries and SSL and states, “Competition occurs if the fisheries reduce the availability of prey to the extent that sea lion condition, growth, reproduction, or survival is diminished, and population recovery is impeded.” Prey encountered by an individual foraging SSL in part determine its net gain in energy and nutrients that affects its condition, growth, reproduction, and survival. However, several studies on localized depletion suggest that the complex dynamics of competition between fisheries and SSL is as yet poorly understood. Connors and Munro (2008) have shown that the winter Pacific cod trawl fishery in their Bering Sea study area does not result in localized depletion of Pacific cod at the scale of the fishery removal. Thus, although the fishing removals may have an immediate localized effect on fish abundance, the effect may be obscured by characteristic rapid fish movement (less than one week) over a geographic scale greater than the fishery removal. Qualitative inference from the study area to other areas, including the WGOA, requires consideration of similarities in fishing pressure and Pacific cod behavior and movement. Similarly, a 2012 study in near Kodiak Island in the GOA did not detect direct short-term fishing effects on prey fields of pollock (localized depletion) (Walline, et al. 2012). As with the Connors and Munro study, qualitative inference from the study area to other areas requires consideration of similarities in fishing pressure and pollock behavior and movement.

Although additional information is needed on the size and duration of prey density decreases that impact SSL foraging success on a local scale, the findings of Connors and Munro (2008) and Walline, et al. (2012) suggest that potential effects on SSL from localized depletion of pollock and Pacific cod are not as straightforward as previously thought. However, temporal and spatial dispersion of harvest effort has been implemented as a major SSL protection measure as a precaution, since the complex dynamics between commercial fishery harvest and SSL population declines are so poorly understood. Regardless, previous ESA and NEPA analyses have concluded that the current pace and harvest levels of these fisheries under the current SSL protection measures do not have an adverse effect on SSL.

Several marine mammal species may be impacted indirectly by effects that fishing gear may have on benthic habitat. Pollock trawl gear is pelagic and, therefore, does not generally contact the bottom. Thus, this fishery has little to no effect on the benthic habitat or benthic dependent marine mammal foraging. Trawl gear for Pacific cod does make contact with the benthic environment. The severity of impacts from that gear effects depend on various characteristics of both the fishing and the habitat. The direct effects of trawling on particular habitat features are influenced by a complex combination of factors including: intensity, distribution and frequency of fishing events, the sensitivity of each habitat feature to contact with the trawls used in that area, and how fast each habitat feature can recover. Table 3-12 lists marine mammals that may depend on benthic prey and known depths of diving. Diving activity may be associated with foraging. Impacts to the benthic habitat from the status quo alternative have been assessed in previous NEPA (NMFS 2005) and ESA analyses (NMFS 2010) that have determined that the fisheries do not cause an impact of a magnitude that would decrease marine mammal prey base for these marine mammal stocks to the extent that it would impact survival rates or reproductive success. Overall, effects of Alternative 1 on prey availability for marine mammals are not likely to cause population level effects and are therefore not significant.

Table 3-12 Benthic dependent marine mammals, foraging locations, and diving depths

Species	Depth of diving and location
Ribbon seal	Mostly dive < 150 m on shelf, deeper off shore. Primarily in shelf and slope areas.
Harbor seal	Up to 183 m. Generally coastal.
Sperm whale	Up to 1,000 m, but generally in waters > 600 m.
Northern sea otter	Rocky nearshore < 75 m
Gray whale	Benthic invertebrates

Sources: Muto et al, 2018; Burns et al. 1981; http://www.adfg.state.ak.us/pubs/notebook/marine/rib-seal.php; http://www.afsc.noaa.gov/nmml/species/species_ribbon.php; http://www.adfg.state.ak.us/pubs/notebook/marine/harseal.php; http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.html.

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 interaction of the GOA groundfish fisheries with SSLs, which potentially compete for prey, is comprehensively addressed in the SSL Protection Measures EIS and the 2010 Biological Opinion (NMFS 2014; NMFS 2010) and is incorporated by reference. Additionally, current fishery closures exist to limit potential interactions between fishing vessels and marine mammals (e.g., 3-nm no groundfish fishing areas around SSL rookeries). NMFS concluded that status quo fisheries do not cause disturbance to marine mammals at a level that may cause population level effects.

3.4.2.2 Alternative 2

Incidental Take Effects

As described in Alternative 1, the GOA pollock trawl fishery is listed as Category III in the annual LOF. No SSL serious injury and mortality occurred in this fishery from 2011 through 2015. While SSL are occasionally incidentally taken in pollock trawl fisheries, the characteristics and specific causes of those takes have not been analyzed. It is assumed that SSL are attracted to the vessels due to the presence of live animals in the nets and offal discharge from the vessel. Once attracted, SSL are assumed to be depredating on live fish in the net. SSL would be caught that do not escape the net before it is hauled aboard a vessel or the net closed for delivery to a mothership. Such SSL may drown or be seriously injured and die in the net, but some have been known to be released alive. However, SSL are adept swimmers and likely often escape the net before being caught.

Under Alternative 2, the potential magnitude and direction of impacts on SSL depend on changes in fishing behavior, as well as how SSL respond to any changes in fishery behavior, both of which are difficult to predict and quantify. No change in actual gear or gear operations that could increase risk of entanglement would be expected to result from this alternative and its sub-options. Therefore, under alternative 2 an increase in the numbers of SSLs attracted to vessels in this fishery would likely be necessary to increase the level of incidental take in this fishery. Alternative 2 would not increase the annual TAC, and therefore, overall annual effort would be expected to remain similar to the status quo alternative. Any temporal shift in harvest effort resulting from adoption of Alternative 3 and its options could be accompanied by a spatial shift in harvest. Unless either of those shifts result in the fishery being prosecuted in proximity to higher concentrations of SSL that could be attracted to the vessels, an increase in incidental take of SSL would not be not expected as a result of this alternative. There were no recorded ship strikes of SSL in this or any commercial fishery from 2011 and 2015 (Helker, Muto, & Jemison 2017).

Prey Availability Effects

As noted above in section 3.4.2.1, the timing and location of key fisheries relative to foraging patterns of marine mammals and the abundance of prey species is likely an essential factor in whether competition exists between fisheries and SSL, thus potentially influencing adequate prey availability for SSL. Therefore, an assessment of the effects of this alternative on prey availability to SSL would require an understanding of the expected changes in the overall temporal and spatial distribution under the proposed seasonal pollock TAC allocation. Any changes would be compared to the temporal and spatial distribution under the status quo SSL protection measures to determine whether the WGOA pollock trawl fishery would continue to be dispersed temporally and spatially to ensure adequate prey availability to SSL.

Adequate prey availability to SSL is especially important in early winter, a sensitive period for SSL foraging, particularly around rookeries and major haulouts. If this alternative and a given selected sub-option resulted in a shift in harvest that, in turn, decreased prey availability to SSL in early winter, it could result in an adverse effect to the SSL in the WGOA. As such, if A and B seasons are combined and C and D seasons are combined with no change in the amount of unharvested pollock that can be reallocated from one (A/B) season to the following season (C/D) and fishing patterns remained as they currently are under status quo, there would likely be no effect to the prey availability to SSL, and thus no effect to SSL. However, if combining four seasons into two seasons resulted in less temporal dispersion of harvest, counter to the intent of the SSL protection measures, the potential exists for an adverse effect of the action on SSL. If the alternative and selected sub-option resulted in greater harvest effort in winter, especially early winter, a higher potential for greater adverse effect on SSL could exist. As such, the larger the reallocation of unharvested pollock from one (A/B) season to the later season (C/D) (20% vs 25% vs 30%) the greater the potential for a larger negative effect on SSL, if the harvest continued at a greater rate than status quo into early winter.

The intent of the existing SSL protection measures is also to maintain spatial dispersion of the fishery to avoid negatively affecting prey availability to SSL. Therefore, effects of the alternative on spatial dispersion of the fishery would follow a similar trajectory of impact on SSL as would the effects on temporal dispersion. If alternative 2 and sub-options cause greater spatial harvest concentration relative to the status quo, the potential exists for adverse effects to SSL where spatial concentration of harvest increases, particularly closer to critical habitat and areas closed for SSL protection.

The SSL population trend for non-pups in the western, central and eastern Gulf of Alaska management areas (610, 620, and 630, respectively) overall is positive (3.09% y^{-1} from 2002 through 2017), although the trend differs for each of those areas. The degree of positive SSL population trend for non-pups in each area declines from east to west with highest greatest positive trend in the eastern GOA (4.21% y^{-1} from 2002-2017), a slightly lower positive trend in the Central GOA (3.90% y^{-1} from 2002-2017), and the lowest positive trend of those three areas seen in the WGOA (3.01% y^{-1} from 2002-2017). Therefore, any temporal or spatial shift in harvest between those areas that reduces temporal or spatial dispersion such that it negatively affects prey availability in a given area, could have a greater negative impact on the weaker positive population trend of SSL in 610 compared to areas 620 and 630, with their stronger positive SSL population trends.

Table 3-12 lists marine mammals that may depend on benthic prey and known depths of diving. Diving activity may be associated with foraging. Temporal changes in harvest patterns in this fishery as a result of this alternative are not likely to have any effect on EFH compared to Alternative 1, the status quo, analyzed in previous NEPA and ESA documents, as described above. It is unlikely that this alternative would impact the benthic habitat in such a way that it would decrease marine mammal prey base to the extent that it would impact survival rates or reproductive success.

Disturbance Effects

Temporal and spatial shifts in harvest patterns may occur under alternative 2, however, this alternative does not change any area closures put in place for SSL protection, including in critical habitat and 0-3 nm from haulouts and rookeries where SSL concentrations may be higher. Therefore, it is unlikely that any temporal or spatial shifts in harvest patterns would have an effect on SSL disturbance not already analyzed in previous NEPA and ESA documents. Thus, alternative 2 would not be expected to have an effect on disturbance of SSL that differs from the status quo alternative and would not be expected to cause disturbance to SSL at a level that may cause population level effects.

As compared to the status quo, Alternative 2 may have an adverse effect on prey availability in the western GOA due to potential impacts on availability of pollock, but overall is not expected to result in significant population-level impacts to SSL.

3.4.2.3 Alternative 3

Incidental Take Effects

As described in Alternative 1, the GOA Pacific cod trawl fishery is listed as Category III in the annual LOF. One observed SSL incidental serious injury or mortality was observed in this fishery between 2011 and 2015 for an annual estimated average of 0.2 animals, or 0.06% of the western SSL PBR. While SSL are occasionally incidentally taken in Pacific cod trawl fisheries, the characteristics and specific causes of those takes have not been analyzed. It is assumed that SSL are attracted to the vessels due to the presence of live animals in the nets and offal discharge from the vessel. Once attracted, SSL are assumed to be depredating on live fish in the net. SSL would be caught that do not escape the net before it is hauled aboard a vessel or the net is closed for delivery to a mothership. Such SSL may drown or be seriously injured and die in the net, but some have been known to be released alive. However, SSL are adept swimmers and likely often escape the net before being caught.

As with Alternative 2, the potential magnitude and direction of impacts on SSL under Alternative 3 depend on changes in fishing behavior, as well as how SLL respond to any changes in fishery behavior, both of which are difficult to predict and quantify. No change in actual gear or gear operations that could increase risk of entanglement would be expected to result from this alternative and its options. Therefore, under alternative 3 an increase in the numbers of SSLs attracted to vessels in this fishery would likely be necessary to increase the level of incidental take in this fishery. Alternative 3 would not increase the annual TAC, and therefore, overall effort would be expected to remain similar to the status quo alternative. Any temporal shift in harvest effort resulting from adoption of Alternative 3 and its options could be accompanied by a spatial shift in harvest. Unless either of those shifts resulted in the fishery being prosecuted in proximity to higher concentrations of SSL that could be attracted to the vessels, an increase in incidental take of SSL would not be not expected as a result of this alternative. There were no recorded ship strikes of SSL in this or any commercial fishery in Alaska from 2011 and 2015 (Helker, Muto, & Jemison 2017). Alternative 3 would not change any current prohibitions on fishing in areas closed to protect SSL foraging, so the fishery would not be expected to occur in areas of higher SSL concentration. Therefore, no increase in incidental take or ship strikes of SSL would be expected as a result of this alternative.

Prey Availability Effects

As under alternative 2, adequate assessment of the effects of alternative 3 on prey availability to SSL would require an understanding of the expected changes in the overall temporal and spatial distribution under each of the potential changes to seasonal Pacific cod TAC allocation (Options 1-3). Any changes would be compared to the temporal and spatial distribution under the status quo SSL protection measures to determine whether the WGOA Pacific cod trawl fishery would continue to be dispersed temporally and spatially to ensure adequate prey availability to SSL. As noted in section 3.4.2.2 adequate prey availability to SSL is especially important in early winter, a sensitive period for SSL foraging, particularly around rookeries and major haulouts. If this alternative and the selected option resulted in decreased prey availability, particularly in early winter, it could result in an adverse effect to the SSL in the WGOA, for reasons described in section 3.4.2.2. Option 1 would reduce the allocation of Pacific cod in the WGOA later in the year compared with the status quo, which could potentially result in less negative impact on prey availability to SSL in early winter than exists under the current allocation structure for Pacific cod in the WGOA. As the allocation for B season is reduced under Options 2 and 3, a similar trend in reduction of potential negative impacts of the harvest on prey availability might be seen, especially if harvest were reduced later in the B season, the more sensitive period for SSL foraging. However, if the greater concentration of allocation in the A season resulted in harvest patterns of lower temporal or spatial dispersion compared to the status quo for A season, the potential for lower temporal and spatial dispersion exists, and therefore also for greater potential for an adverse effect on SSL.

As with the potential impacts from alternative 2, any temporal or spatial shift in harvest between areas 610, 620, and 630 as a result of this action that reduces temporal or spatial dispersion such that it negatively affects prey availability in a given area, could have a greater negative impact on the weaker positive population trend of SSL in 610 compared to areas 620 and 630, with their stronger positive SSL population trends.

Table 3-12 lists marine mammals that may depend on benthic prey and known depths of diving. Diving activity may be associated with foraging. Temporal changes in harvest patterns in this fishery as a result of this alternative are not likely to have any effect on EFH compared to Alternative 1, the status quo, analyzed in previous NEPA and ESA documents, as described above. It is unlikely that this alternative would impact the benthic habitat in such a way that it would decrease marine mammal prey base to the extent that it would impact survival rates or reproductive success.

Disturbance Effects

Temporal or spatial shifts in harvest patterns in the Pacific cod trawl fishery may occur under alternative 3, but it is unlikely that these changes in fishing activity would have any effect on SSL disturbance not already analyzed in previous NEPA and ESA documents. This alternative does not change any area closures put in place for SSL protection, including in critical habitat and 0-3 nm from haulouts and rookeries where SSL concentrations may be greater. Therefore alternative 3 would not be expected to have an effect on disturbance of SSL that differs from the status quo alternative and would not be expected to cause disturbance to SSL at a level that may cause population level effects.

As compared to the status quo, Alternative 3 may have an adverse effect on prey availability in the western GOA due to potential impacts on availability of Pacific cod, but overall is not expected to result in significant population-level impacts to SSL.

3.5 Seabirds

Thirty-eight species of seabirds breed in Alaska, and 5 additional species breed elsewhere but occur in Alaskan waters during the summer months (Table 3-13).

Table 3-13 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	
Cormorants	Pelagic	
	Red-faced	
	Double-crested	
Gulls	Glaucous-winged	
	Glaucous	
	Herring	
	Mew	
	Bonaparte's	
	Sabine	
	Ivory	
	Ross's	
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	Candidate
	Ancient	
Kittiwakes	Black-legged	
	Red-legged	
Auklets	Cassin's	
	Parakeet	
	Least	
	Whiskered	
	Crested	
	Rhinoceros	
Terns	Arctic	
	Aleutian	
Puffins	Horned	
	Tufted	

ESA-Listed Seabirds in the GOA

Several species of conservation concern occur in the GOA (Table 3-14). Short-tailed albatross is listed as endangered under the ESA, and Steller's eider is listed as threatened. Kittlitz's murrelet is a candidate species for listing under the ESA, and the USFWS is currently working on a 12-month finding for blackfooted albatross.

Table 3-14 ESA-listed and candidate seabird species that occur in the GOA.

Common Name	Scientific Name	ESA Status
Short-tailed Albatross	*Phoebaotria albatrus*	Endangered
Steller's Eider	*Polysticta stelleri*	Threatened
Kittlitz's Murrelet	*Brachyramphus brevirostris*	Candidate

Short-tailed albatross

Short-tailed Albatross (Phoebaotria albatrus) is listed as endangered under the ESA. Short-tailed albatross populations were decimated by feather hunters and volcanic activity at nesting sites in the early 1900s, and the species was reported to be extinct in 1949. In recent years, the population has recovered at a 7% to 8% annual rate. The world population of short-tailed albatross in 2009 was estimated at 3,000 birds. The majority of nesting occurs on Torishima Island in Japan, where an active volcano threatens the colony. No critical habitat has been designated for the short-tailed albatross in the United States, because the population growth rate does not appear to be limited by marine habitat loss (NMFS 2004b). Short-tailed albatross feeding grounds are continental shelf breaks and areas of upwelling and high productivity. Short-tailed albatross are surface feeders, foraging on squid and forage fish.

As part of a 5-year project, chicks have been translocated from Torishima Island to a new breeding colony on Mukojima in the Ogasawara Islands, which is not threatened by volcanic activity. In February 2011, researchers noted the first return of a short-tailed albatross chick to its hand-reared home on Mukojima, a promising sign that the chicks may return to Mukojima to breed.

Steller’s Eider
Steller’s eider (*Polysticta stelleri*) is listed as threatened under the ESA. While designated critical habitat for Steller’s eiders does overlap with fishing grounds in the Bering Sea, there has never been an observed take of this species off Alaska, and no take estimates are produced by AFSC. Therefore, impacts to Steller’s eider are not analyzed in this document.

Kittlitz's Murrelet
Kittlitz's murrelet (*Brachyramphus brevirostris*) is a small diving seabird that forages in shallow waters for capelin, Pacific sandlance, zooplankton, and other invertebrates. It feeds near glaciers, icebergs, and outflows of glacial streams, sometimes nesting up to 45 miles inland on rugged mountains near glaciers. Most recent population estimates indicate that it has the smallest population of any seabird considered a regular breeder in Alaska (9,000 to 25,000 birds). This species appears to have undergone significant population declines in several of its core population centers. USFWS believes that glacial retreat and oceanic regime shifts are the factors that are most likely causing population-level declines in this species. Kittlitz’s murrelet is currently a candidate species for listing under the ESA. No Kittlitz's murrelets were reported taken in the observed groundfish fisheries between 2007 and 2010.

3.5.1 Effects on Seabirds

Many seabird species utilize the marine habitat of the GOA. Several species of conservation concern and many other species could potentially interact with trawl cables. The AFSC estimates of incidental takes are small relative to total estimates of seabird populations. However, those estimates do not include cable-related trawl mortalities. Modeling suggests that even if there were to be a large increase in trawl cable incidental takes of short-tailed albatross (the only seabird listed as endangered under the ESA), it would have negligible effects on the recovery of the species.

3.6 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 April 2017, the Council took final action to modify the GOA Groundfish FMP to update descriptions and maps of Essential Fish Habitat (EFH). The Council reviewed an Environmental Assessment (EA) that, among other things, updated EFH definitions, analyzed impacts of non-fishing activities, and updated EFH research priorities in the FMPs. The 2017 update to EFH incorporated model-based definitions and maps of EFH for the Gulf of Alaska and incorporated results from the Fishing Effects model to assess the impacts of commercial fishing on EFH. The models incorporated a Catch-In-Areas (CIA) database to describe fishing effort with greater precision than previously allowed.

3.6.1 Effects on Habitat

The GOA trawl fisheries are prosecuted with pelagic and non-pelagic trawl gear. Year-round area closures protect sensitive benthic habitat. Appendix B to the EFH EIS (NMFS 2005) describes how non-pelagic and pelagic trawl gear impacts habitat. The long-term effects index (LEI) estimates the proportion of habitat attributes that would be lost if recent fishing patterns continued. In the GOA, estimated reductions of epifaunal and infaunal prey due to fishing are less than 1% for all substrate types. For living structure, LEI impacts ranged between 3% and 9% depending on the substrate.

Currently, non-pelagic and pelagic trawl gear is subject to a number of area closures in the GOA to protect habitat and marine species. If new information emerges to indicate that the GOA pollock and Pacific cod trawl fisheries are having more than a minimal impact on EFH, the Council may consider additional habitat conservation measures.

3.7 Ecosystem

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 GOA trawl fisheries potentially impact the GOA ecosystem by relieving predation pressure on shared prey species (i.e., species which are prey for both groundfish and other species), reducing prey availability for predators of target groundfish, altering habitat, imposing PSC and bycatch mortality, or by ghost fishing caused by lost fishing gear. Ecosystem considerations for the GOA groundfish fisheries are summarized annually in the GOA Stock Assessment and Fishery Evaluation report (Zador 2012). These considerations are summarized according to the ecosystem effects on the groundfish fisheries, as well as the potential fishery effects on the ecosystem.

3.7.1 Effects of the Alternatives on the Ecosystem

An evaluation of the effects of the GOA groundfish fisheries on the ecosystem is discussed annually in the Ecosystem Considerations sections of each chapter of the SAFE report (NPFMC 2017). The significance criteria used in that analysis are incorporated here by reference. The analysis concluded that the current GOA trawl fisheries do not produce population-level impacts to marine species or change ecosystem-level attributes beyond the range of natural variation. Consequently, Alternative 1 is not expected to have a significant impact on the ecosystem.

3.8 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 EA/RIR. The subsequent public review draft of this analysis will include responses to the 16 questions that must be considered in order to determine the intensity of impacts (FONSI or no FONSI).

4 Regulatory Impact Review

This Regulatory Impact Review (RIR) examines the benefits and costs of a proposed regulatory amendment to change seasonal TAC allocations for both the GOA pollock and Pacific cod fisheries.

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 nonetheless 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.

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, 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 this Executive Order.

4.1 Statutory Authority

Under the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) (16 U.S.C. 1801, *et seq*.), 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 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 pollock and Pacific cod fisheries in the EEZ off Alaska are managed under the FMP for Groundfish of the GOA. The proposed action under consideration would amend this FMP and Federal regulations at 50 CFR 679. Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of Federal law and regulations.

4.2 Purpose and Need for Action

The Council established the following purpose and need statement at its June 2018 meeting in Kodiak, Alaska:

Evaluation of the pollock and Pacific cod trawl fisheries in the Gulf of Alaska (GOA) indicates the seasonal distribution of pollock and cod may create inefficiencies for participants and there may be opportunities to improve management of the fisheries. Modifying the seasons or seasonal allocations of pollock and cod could increase fishery yield, particularly for roe quality and quantity of pollock, management flexibility and potentially decrease prohibited species catch. The Council intends to improve prosecution of these fisheries while not re-distributing allocations of pollock or cod between management areas or participants. The Council understand that this action may have implications for Steller sea lion management measures and would be reviewed consistent with the Endangered Species Act.

4.3 Alternatives

The Council established the following alternatives for analysis at its June 2018 meeting in Kodiak, Alaska.

Alternative 1. No action. (Status quo)

Alternative 2. Combine the A and B season into a single season, and combine the C and D season into a single season and allocate pollock among a combined A/B and C/D seasons 50% to the A/B season and 50% to the C/D season. This change is applicable to areas 610, 620, and 630.

Option: Increase the amount of unharvested pollock that may be reallocated from one season to the following season, or among areas, from 20% to:

Sub-option 1: 25%
Sub-option 2: 30%

Alternative 3. Modify the Western and Central Gulf of Alaska Pacific cod allocation for trawl catcher vessels among the existing A and B seasons as follows:

Option 1: A Season: 65%; B Season: 35%
Option 2: A Season: 70%; B Season: 30%
Option 3: A Season: 75%; B Season: 25%

The alternatives are described in detail in Sections 2.1, 2.2, and 2.3 of this document. Sections 2.1.1 and 2.1.2 describe the status quo management of GOA pollock and Pacific cod, respectively, including the seasonal apportionments that could be modified by the alternatives under consideration. Of note, Section 2.1.1 details the process by which NMFS inseason managers reallocate unharvested pollock from one season to the following season (to the same and/or other areas); this process is fundamental to understanding the effects of the Option to Alternative 2. Section 2.1.2 describes the fact that, depending on how amending language is specified, changing the seasonal apportionment of Pacific cod in terms of the 60%:40% ratio between the A and B seasons could affect gear sectors other than the trawl CVs. As part of its June 2018 meeting record, the Council directed staff on its preferred approach to translating the language of the Alternative 3 options into seasonal allocation percentages for the Western and Central trawl CV sectors in a manner that does not directly impact seasonal apportionments for other sectors. That method is detailed in Section 2.3. Finally, Section 2.1.2 notes that NMFS currently has a process by which inseason managers, at the direction of the Regional Administrator, may reallocate Pacific cod TAC that is uncaught or unlikely to be caught from one sector to another and that a hierarchy for considering inter-sectoral TAC reallocations is established in regulation. That hierarchy creates a preference for reallocation to CV sectors, followed by the combined CV/CP pot gear sector, finally followed by other CP sectors.

4.4 Methodology for analysis of impacts

The evaluation of impacts in this analysis is designed to meet the requirement of E.O. 12866, which dictates that an RIR evaluate the costs and benefits of the alternatives, to include both quantifiable and qualitative considerations. Additionally, the analysis should provide information for decisionmakers "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 costs and benefits of this action with respect to these attributes are described in the sections that follow, comparing the No Action Alternative 1 with the action alternatives. The analyst then provides a qualitative assessment of the net benefit to the Nation of each alternative, with "no action" as a baseline.

This analysis was prepared using data from the NMFS catch accounting system, which is the best available data to estimate total catch and PSC in the groundfish fisheries off Alaska. Total catch estimates are generated from information provided through a variety of required industry reports of harvest and at-sea discard, and data collected through an extensive fishery observer program. In 2003, NMFS changed the methodologies used to determine catch estimates from the NMFS blend database (1995 through 2002) to the catch accounting system (2003 through present). The catch accounting system was implemented to better meet the increasing information needs of fisheries scientists and managers. Currently, the catch accounting system relies on data derived from a mixture of production and observer reports as the basis of the total catch estimates. The 2003 modifications in catch estimation included providing more frequent data summaries at finer spatial and fleet resolution, and the increased use of observer data. Redesigned observer program data collections were implemented in 2008 and include recording sample-specific information in lieu of pooled information, increased use of systematic sampling over simple random and opportunistic sampling, and decreased reliance on observer computations. As a result of these modifications, NMFS is unable to recreate blend database estimates for total catch and retained catch after 2002. Therefore, NMFS is not able to reliably compare historical data from the blend database to the current catch accounting system. This analysis relies solely on total catch and PSC estimates during years more recent than 2003. For the most part, this analysis relies on fishery data beginning in 2012, at which time significant regulatory changes that affect how the GOA trawl fisheries are prosecuted had been implemented. Those changes include Pacific cod sector TAC allocations (GOA Amendment 83), the Central GOA Rockfish Program, halibut PSC limits, and Chinook salmon PSC limits for the GOA directed pollock fishery. Fishery data beginning in 2015 will reflect reduced halibut PSC limits and Chinook salmon PSC limits for GOA non-pollock trawl fisheries, both of which can affect the prosecution of the Pacific cod trawl CV sector.

Fishery data are provided through the Alaska Fisheries Information Network (AKFIN), which pulls together catch accounting system data, CFEC Fish Ticket data, and Commercial Operators Annual Report (COAR) data to supply catch and discard records, as well as estimates of gross ex-vessel and first wholesale revenues.

4.5 Description of Fisheries

4.5.1 Harvester Participation

4.5.1.1 Vessel Participation

GOA trawl fishing seasons for pollock and Pacific cod are defined as follows. The pollock fishery has four seasons (A, B, C, D).

A – January 20 to March 10 B – March 10 to May 31
C – August 25 to October 1 D – October 1 to November 1

The Pacific cod TAC for GOA trawl CVs is apportioned across two seasons. The A season runs from January 20 through June 10 and the B season runs from September 1 through November 1. (The A season for CVs deploying non-trawl gear begins on January 1, and the B season extends to December 31.) Seasonal TAC apportionments to these fisheries and the regulations that govern inseason reallocation of unharvested pollock TAC between seasons and areas are described in Chapter 2 of this document.

Vessel participation in the GOA pollock and Pacific cod fisheries is limited by the requirement to possess an LLP license and, for vessels deploying fixed-gear (pot and hook-and-line), an area/gear-based Pacific cod endorsement. Overall 124 CV LLPs are endorsed for GOA trawl fishing. Ninety-seven CV LLPs are endorsed for CGOA trawl fishing and 78 CV LLPs are endorsed for WGOA trawl fishing. Fifty-one LLPs are trawl-endorsed for both areas. Roughly one-third of those LLPs hold GOA Pacific cod fixed-gear endorsements. Table 4-1 shows the number of vessels that participated in 2017 Federally-managed GOA pollock and Pacific cod fisheries, by season and gear type. The table indicates that some vessels participate in the late-year fisheries (pollock C/D and Pacific cod B) that do not participate earlier in the year. NMFS's December 2017 end-of-year inseason management report counts the number of active vessels in each pollock season (A/B; C/D) dating back to 2010. From 2010 through 2016 participation in the A/B seasons ranged from 52 (2013) to 59 (2012). During that period participation in the C/D seasons ranged from 55 (2010) to 62 (2014 & 2016). In general, more vessels were active during the C/D seasons. Higher overall participation in the late-year fisheries likely owes to relatively higher pollock TAC for Area 610 C/D seasons or vessels that trawl for pollock in the BSAI during the A season but come to the GOA in the fall. On an annual basis, the number of trawl vessels participating in the GOA pollock fishery since 2003 has ranged from 59 (2007) to 73 (2003), and the number of trawl vessels in the Pacific cod fishery has ranged from 49 (2017) to 68 (2003). Given recent reductions in the GOA Pacific cod ABC and TAC, fewer vessels are expected to participate in those fisheries in the near-term future.

Table 4-1 Active GOA pollock and Pacific cod CVs by season and gear type, 2017

		A/B	C/D	Total
Pollock	Trawl	51	61	65
		A	B	Total
Pacific cod	Trawl	44	11	49
	Fixed-Gear	153	24	155

Table 4-2 shows the number of pollock vessels that fished in more than one regulatory area (i.e., some combination of Areas 610, 620, and 630) during the same half of the year during the 2016 to 2018 period. As the Council considers the net benefit of altering the regulations that govern the rollover of uncaught pollock TAC from one season/area combination to another (Option to Alternative 2), it may wish to consider that most pollock vessels move around a portion of the GOA throughout the fishing year. During the years in the table only a handful of vessels fished all three areas during the same half of the year. Vessels that participated in all three areas did so in the C/D season. Even fewer vessels fished a combination of Area 610 and 630 in the same half of the year. Most vessels that fish multiple areas fish in Area 620 and either Area 610 or Area 630. In that sense, Area 620 is uniquely accessible from the key landing ports in the GOA pollock fishery. Area 620 also receives a relatively high TAC due to the current biomass distribution regime. However, as is evident in Table 3-2 (Section 3.2.1.2), the pollock in Area 620 is not always accessible. CPUE might be poor or at least not economical enough to justify the distance from port. Since 2015, TAC utilization in Area 620 has been poor relative to historical levels.

Table 4-2 GOA pollock CVs that fished multiple regulatory areas in the same half of the year, 2016 through 2018

	# Vessels...	2016	2017	2018
A/B	Fished mult. areas	37	40	30
	Total	55	51	59
C/D	Fished mult. areas	34	35	40
	Total	62	61	61

Management actions that might make the GOA pollock or Pacific cod fisheries a more attractive or accessible opportunity in a particular season could induce additional effort from vessels that have historically focused on BSAI groundfish. However, vessels' ability to move between areas is limited by LLP license endorsements; of the 124 CV LLPs endorsed for GOA trawl gear, 48 are endorsed for BSAI trawl fishing. Vessels endorsed to fish pollock in both the BSAI and the GOA are limited by seasonal exclusivity regulations (§679.23(i)). CVs that participate in the BSAI pollock fishery A season may not participate in the GOA pollock fishery until the C/D season; likewise, vessels that fish in the GOA A/B season may not participate in the BSAI pollock fishery until that area's B season. (Vessels less than 125' LOA are exempt from this rule when fishing east of 157 degrees west longitude.) Vessels participating in Pacific cod are limited in their ability to switch areas by a mandatory stand down period (§679.23(h)). Vessels fishing Pacific cod in the BSAI or WGOA may not cross into the other FMP area to fish that species without taking a 72-hour stand down; vessels fishing in the CGOA must take a 48-hour stand down before fishing Pacific cod in the BSAI. These rules were enacted to slow the pace of the pollock fishery as an SSL mitigation measure, and to rationalize inseason management in the context of large effort influxes that could have potentially flowed between the BSAI and GOA after the American Fisheries Act (BSAI pollock) program was enacted.

Vessels' ability to move into fisheries or adjust annual plans to pursue a marginally more attractive opportunity are also limited by the portfolio of fisheries that they rely upon to make their business strategy work. Each fishing opportunity is constrained by regulatory season dates, expected fishing quality, and demand from their shoreside market (processing partner). Each vessel operator would consider how additional TAC in the Pacific cod A season or additional flexibility in the timing of their pollock fisheries interacts with the other opportunities that abut or overlap that pollock/cod season on the calendar. An operator would then consider when - *in that particular year* - the pollock/cod fishing will be most profitable; this could be measured in terms of roe quality, CPUE, market congestion, or weather (and safe access to preferred grounds) to name only a few factors. GOA pollock and cod trawl CVs are a diverse group. An increase in the A season Pacific cod TAC, for example might present a different set of opportunities and trade-offs to a 58' WGOA-based vessel than it would a larger trawl vessel that fishes year-round in the CGOA or a vessel that fishes in the GOA, the BSAI, and off the Pacific Northwest coast. While by no means a complete list of the fishery combinations and permutations that GOA trawl CVs exhibit, consider the following examples of "typical" fishing plans that a vessel in these fisheries might pursue -- these examples will help frame the consideration of how the alternatives affect different participants in the impacts section of this RIR (Section 4.6):

- A 58' CV based in a WGOA community might begin the year in the Federal pot cod fishery; move into Area 610/WGOA trawl pollock or Pacific cod on or after January 20 (depending on roe quality, fish aggregation, PSC, fleet agreements, and processor demand); return to pot gear for the state pot cod fishery in mid-March; seine for salmon in the summer; return to trawl gear for the Area 610 pollock C/D season.

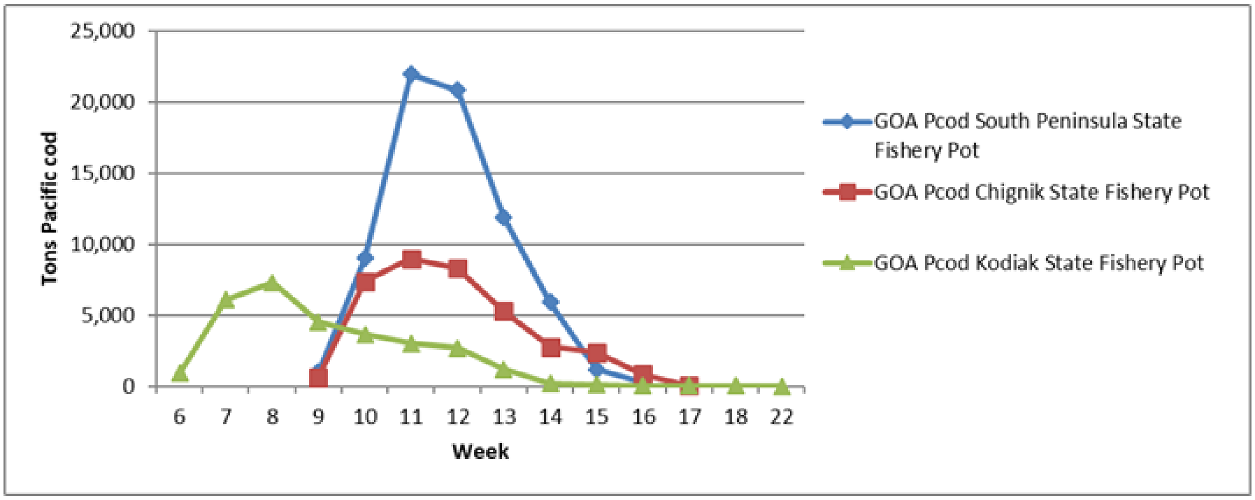
- A 90' CV based in Kodiak might begin the year on January 20 in the Area 620 or 630 pollock fishery; move into CGOA Pacific cod trawl as pollock roe or CPUE dissipates; experiment with CGOA flatfish if Pacific cod fishing is poor; return to Pacific cod trawl if halibut PSC is becoming a constraint or if cod fishing improves; fish flatfish in the late spring; participate in the CGOA Rockfish Program in May and June (and/or tender salmon throughout the summer); trawl for Area 620 or 630 pollock and CGOA Pacific cod in September and October; trawl for flatfish in October and November if markets available and PSC limits have not closed the non-pollock fisheries.
- A 90' CV based in Oregon might begin the year trawling for pollock or Pacific cod in the GOA or BSAI pollock; return to the Pacific Northwest in the late spring for whiting; and return to the North Pacific to participate in either the BSAI pollock fishery (mid-summer) or the GOA pollock and Pacific cod trawl fishery (late-summer/fall).

Note that not all fishing opportunities require an LLP license or endorsement – the most notable of which are the state-waters Pacific cod pot fisheries referenced above. Table 4-3 shows the number of vessels that trawled in each GOA area (WG/CG) and also participated in the state-waters pot fishery. The number of vessels that trawled in both GOA areas and fished state-waters pot cod ranged from zero to three, except for a spike to 10 such vessels in 2014. Shifting additional TAC into the Pacific cod trawl CV A season could lengthen the amount of time necessary to fully prosecute the trawl fishery in some years, causing vessel operators to choose when to switch back to pot gear. Figure 4-1 shows the timing of participation in state-water pot fisheries, aggregated over 2008 through 2017. The South Alaska Peninsula fishery opens on March 7 or seven days after the Western GOA Federal pot cod A season closes (whichever is later). The Chignik fishery opens on March 1 or seven days after the Central GOA Federal pot cod A season closes (whichever is later). The Kodiak fishery opens seven days after the Central GOA Federal pot cod A season closes. The GOA state-waters pot cod fisheries tend to wind down by the 16th week of the calendar year, which generally falls around mid-April. (The percentage of the Pacific cod ABC that is allocated to the South Alaska Peninsula GHL was increased by 5% in 2013, which extended the season by one to two weeks relative to earlier years.)

Table 4-3 Vessels participating in both the GOA Pacific cod trawl fishery and state-waters Pacific cod pot fishery, 2011 through 2016

	WG TRW & State POT	CG TRW & State POT
2011	14	5
2012	12	8
2013	10	5
2014	14	11
2015	11	3
2016	12	4

Source: CFEC Fish Ticket data provided by AKFIN.



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

Figure 4-1 Catch pattern of GOA state-waters Pacific cod pot fisheries, 2008 through 2017

4.5.1.2 Pollock and Pacific Cod Harvest

Pollock

Table 3-2 in Section 3.2.1.2 of this document shows GOA pollock TACs by area/season and the percentage of the initially specified TAC that was harvested from 2012 through 2017. The only year during that period during which overall GOA pollock TAC utilization was less than 80% was 2016 (73%). Pollock TAC utilization in specific area-season combination is somewhat more uneven. Low utilization might occur in the Area 610 A/B seasons when TACs are low and less effort is attracted relative to the Pacific cod A season or pot cod fishing; moreover, TACs are low because there is less biomass in the area so it should not be surprising that catch rates are also low. Utilization in Area 620 went through a decline in 2015 and 2016 after being near 100% in previous years and rebounding in 2017. Low utilization in that area could be a function of CPUE, or the fact that the TAC amount itself got much higher in an area that is logistically more challenging given its distance from processing ports. TAC utilization in Area 630 has remained high even as TAC levels increased, owing to proximity to the large Kodiak-based fleet and processors. Other factors that affect pollock utilization are less observable from NMFS catch reports. For instance, the fleet might have put a premium on TAC utilization during years that might have qualified for catch history under the considered GOA cooperative quota program. Utilization is also affected by demand from processing markets; new investments in higher-value pollock products in Kodiak might have marginally increased willingness to remain in the pollock fishery and even to tender pollock over greater distances.

Table 4-4 provides a way to look at whether a season closed on TAC or remained open for its duration, as well as the length of the gap between seasons that might be mitigated by proposed Alternative 2. The table shows situations where the time gap between the A and B or the C and D seasons was short. An interim closure caused by regulatory season dates can have a disruptive effect on the fishery and carries costs for the fleet, processors, and fishery managers who must close and open the fishery while coordinating around the requirement to publish public notices on weekdays. Closing the fishery for a few days while fishing is good carries an opportunity cost for vessels, might add run-time back to ports, and reduces the crew's labor productivity (earnings per amount of time spent working in the fishery). "Good" fishing might describe high catch per unit of effort, fish size, market prices, or weather. Mid-fishery closures could entail costs for shorebased processors in terms of idled equipment and labor.

Closures between the A and B seasons might result in a failure to achieve optimum yield since fishing is generally considered more productive near the end of the A season; if the A season TAC is underharvested and the amount that can be rolled into the B season is capped (20% of the B season TAC), harvest opportunities might be forgone. Three particularly short closures between the A and B seasons occurred in 620/630 in 2012 and 610 in 2017. Overall, the A season was closed 10 times during the analyzed six-year period. Interim closures at that time of year can affect fishery value by stopping operations during times of high roe content. In the WGOA especially, regulatory closures might affect processors' ability to coordinate product flow as they balance the trawl pollock and Pacific cod seasons in between the Federal and State pot-cod seasons. Processors that receive BSAI deliveries must also consider the BS pot cod fishery and the opilio crab season. In general, reducing the number of regulatory closures that might occur allows fishery participants and Federal managers to optimize the fishery for economic value and bycatch minimization. This policy option must be balanced against existing mitigation measures to protect Steller sea lions.

Closures between the C and D seasons might result in less total annual catch/production as fishing in the D season becomes more constrained by Chinook salmon PSC. In some cases, participants might prefer to continue fishing through late September rather than standing down until October 1. Delaying harvest of the D season TAC until October 1 might also prevent the fleet from having enough time and/or favorable weather to catch the TAC during the shortest of the four seasons (31 days)—particularly in the high-TAC years that have occurred in the recent past. The C season fishery closed in mid-September six times from 2012 through 2017 (610/620 in 2012; 620/630 in 2013; 620/630 in 2014). The table also shows multiple cases where the fishery closed on September 28th, 29th, or 30th only to re-open on October 1; this likely represents situations where NMFS had to close the fishery so that the C season TAC would not be exceeded over a weekend, meaning that fishing plans were disrupted due to a calendar idiosyncrasy. CGOA harvesters might be able to pursue Pacific cod or flatfish during a closure between the C/D pollock seasons, but WGOA vessels would be idled.

Table 4-4 Pollock season closures, 2012 through 2017

		610				620				630			
		Days Open	Days Closed	% Open	Closures	Days Open	Days Closed	% Open	Closures	Days Open	Days Closed	% Open	Closures
2012	A	50	0	100%	-	38	12	76%	2/28-3/10	12	38	24%	1/23-2/15; 2/26-3/9
	B	22	60	27%	4/1-5/31	7	75	9%	3/18-5/31	3	79	4%	3/10-3/21; 3/24-5/31
	C	16	21	43%	9/10-10/1	24	13	65%	9/19-10/1	37	0	100%	
	D	15	15	50%	10/12-10/19; 10/23-11/1	8	22	27%	10/2-10/24	19	11	63%	10/20-10/31
	Total	103	96	52%		77	122	39%		71	128		
2013	A	49	0	100%	-	15	34	31%	2/4-3/10	8	41	16%	1/22-2/8; 2/14-3/10
	B	20	62	24%	3/30-5/31	7	75	9%	3/17-5/31	4	78	5%	3/10-3/22; 3/26-5/31
	C	36	1	97%	9/30-10/1	19	18	51%	9/13-10/1	22	15	59%	9/16-10/1
	D	24	6	80%	10/12-10/19	15	15	50%	10/6-10/22	17	13	57%	10/8-10/22
	Total	129	69	65%		56	142	28%		51	147	26%	
2014	A	48	0	100%	-	48	0	100%	-	48	0	100%	-
	B	82	0	100%	-	31	51	38%	3/10-5/31	21	61	26%	3/31-5/31
	C	37	0	100%	-	22	15	59%	9/16-10/1	29	8	78%	9/23-10/1
	D	31	0	100%	-	31	0	100%	-	31	0	100%	-
	Total	198	0	100%		132	66	67%		129	69	65%	
2015	A	48	0	100%	-	48	0	100%	-	48	0	100%	-
	B	35	47	43%	4/15-5/31	76	6	93%	5/25-5/31	37	45	45%	4/16-5/31
	C	36	1	97%	9/30-10/1	36	1	97%	9/30-10/1	34	3	92%	9/28-10/1
	D	31	0	100%	-	27	3	90%	10/28-11/1	31	0	100%	-
	Total	150	48	76%		187	11	94%		150	48	76%	
2016	A	8	41	16%	1/29-3/10	50	0	100%	-	48	2	96%	1/27-1/29
	B	16	66	20%	3/10-3/12; 3/28-5/31	75	7	91%	5/24-5/31	3	79	4%	3/13-5/31
	C	35	2	95%	9/29-10/1	33	4	89%	8/25-8/27; 9/29-10/1	36	1	97%	9/30-10/1
	D	31	0	100%	-	29	2	94%	10/1-10/2	31	0	100%	-
	Total	90	109	45%		187	12	94%		118	81		
2017	A	22	27	45%	2/12-3/10	49	0	100%	-	9	40	18%	1/30-3/10
	B	21	61	26%	3/10-3/23; 4/13-5/31	81	1	99%	5/30-5/31	61	21	74%	5/12-5/31
	C	33	4	89%	9/28-10/1	26	11	70%	8/25-9/4	24	13	65%	8/25-9/6
	D	31	0	100%	-	29	1	97%	10/1-10/2	30	0	100%	-
	Total	106	92	54%		185	13	93%		124	74	63%	

Source: https://alaskafisheries.noaa.gov/sites/default/files/GOA_plk_seasons_thru_2017.pdf

Pacific Cod

Table 3-3 and Table 3-4 in Section 3.2.2.2 of this document show GOA Pacific cod TACs by season and the percentage of the final TAC that was harvested from 2012 through 2017. As opposed to the pollock fishery information referenced in Table 3-2, these tables report TAC after any inseason reallocations were made between sectors. The tables reflect that the percentage of the TAC that is harvested in the higher-volume directed fisheries is greater in the A season than the B season. Those directed Pacific cod fishing sectors include trawl CVs, the pot sector (CV/CP), and hook-and-line (HAL) CVs and CPs. Fishery participants report that Pacific cod TAC utilization in the B season is generally lower because the fish are not as aggregated as they are during the spawning season in February and March. Even so, sectors that deploy bait (pot and HAL) often have lower TAC utilization rates in the B season.

For the trawl CV sector, B season TAC utilization during the 2012 through 2017 period ranged from 77% (2015) to 16% (2017) in the CGOA and from 73% (2013) to 1% (2016 and 2017) in the WGOA.

Section 3.2.2.1 of this document describes the current GOA Pacific cod stock status, which has experienced a precipitous decline that was first reflected in harvest specifications for the 2018 fishing year. The stock's ABC was reduced by 80% in 2018. Given that, TAC and TAC utilization from 2012 to 2017 is not a reliable forecast of harvest for the present or near-term future. In some years, TAC may be set at a level that does not allow the fishery to operate in a manner reflective of its past.

4.5.1.3 Products and Value

The primary products produced from pollock include fillets, surimi, roe, and head-and-gut (H&G). H&G, surimi, and fillets combine to account for 85% of production and value (Table 4-5). The most valuable product form on a unit-basis is roe, which is produced only in the A season. The other higher-value product forms are surimi and fillets, a slight majority of which are produced during the B season (56% and 66%, respectively). The proportion of annual pollock production by month over the 2012 through 2017 period is summarized in Table 4-6.

Wholesale values for frozen pollock fillet product had been on a downward trend during 2016 and 2017, but industry reports indicate that 2018 prices rebounded to historical norms and the outlook for early 2019 should continue the increase. An October 2018 McDowell Group Report produced for the Alaska Seafood Marketing Institute (ASMI; provided to staff by the author) summarized wholesale pollock product prices year-on-year from 2016 to 2018 showing that prices were down at that time for all forms other than surimi. However, the outlook for pollock product prices is positive for the near future. In March 2018, UN FAO reported that 2018 prices for pollock products were expected to be strong due to high demand in the midst of a global reduction in wild caught groundfish.[13] A November 2018 news article noted that fillet blocks reached a low of $2,350/mt in the fall of 2017 but finished 2018 around $3,000/mt and could reach $3,500/mt in the upcoming season.[14] The price rebound for fillets and other products (notably surimi) is attributed to increased demand from new Asian markets that turned to Alaska product when prices were low and their traditional "warmwater surimi" markets lacked supply. A United Nations Food and Agriculture Organization (UN FAO) GLOBEFISH market report from October 2018 corroborated that the 2017 market lacked supply of non-Alaska surimi products.[15] Previous to that, UN FAO had reported in December 2017 that surimi markets were coming off of five flat years.[16] One product form that is not addressed in the cited market reports is roe. Demand for roe in traditional Asian markets is said to be on a downward trend in recent years, while production has been relatively high due to high TAC levels. The McDowell Group report that covers 2016 through 2018 wholesale values shows a per-ton decrease during that period ($7,948/mt to $6,623/mt), though 2018 was a 9% increase relative to 2017.

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[13] http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/1110417
[14] https://www.undercurrentnews.com/2018/11/19/only-way-is-up-for-pollock-prices-in-2019
[15] http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/1156016
[16] http://www.fao.org/in-action/globefish/market-reports/resource-detail/en/c/1071590

Table 4-5 GOA pollock trawl production and wholesale value by product type, 2012 through 2016

Product Type	Production (mt)	% Total	Wholesale Value	% Total	$/Pound
H&G	125,485	47%	$166 M	33%	0.60
Surimi	58,881	22%	$128 M	26%	0.99
Fillets	44,039	16%	$129 M	26%	1.33
Whole	18,203	7%	$11 M	2%	0.28
Roe	11,056	4%	$52 M	10%	2.14
Other	5,613	2%	$7 M	1%	0.59
Meal	2,490	1%	$4 M	1%	0.70
Oil	1,248	0%	$2 M	0%	0.58
Total	267,015		$498 M		0.85

“Other” includes belly flap, bones, cheeks, chins, heads, kirimi, flesh, stomachs, milt, pectoral girdle, and salted/split.

Table 4-6 GOA pollock production by month, 2012 through 2017

Month	H&G	Surimi	Fillets	Whole	Roe	Other	Meal	Oil	Total
JAN	5%	4%	4%	12%	5%	4%	1%	0%	5%
FEB	20%	14%	11%	26%	29%	12%	0%	0%	17%
MAR	25%	22%	15%	24%	55%	16%	13%	10%	23%
APR	5%	5%	4%	2%	9%	2%	0%	0%	5%
AUG	3%	4%	5%	2%	0%	5%	5%	8%	3%
SEP	17%	22%	29%	15%	1%	33%	41%	46%	20%
OCT	24%	28%	31%	16%	1%	27%	38%	33%	25%
NOV	1%	1%	1%	2%	0%	1%	2%	2%	1%
DEC	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	47%	20%	17%	8%	3%	2%	1%	1%	100%

Source: COAR data provided by AKFIN.

For Pacific cod, H&G and fillet products comprise the majority of production and value across all gears (Table 4-7). On a monthly basis, 75% of total annual production and 72% of wholesale value creation occurs from January to March. H&G production and value tracks those proportions exactly, and fillet production and value track slightly lower (71% and 69%, respectively). Roe is the main product category that occurs entirely in the A season, so increasing A season TAC could boost roe revenues; however—as opposed to pollock—cod roe accounted for only 3% of wholesale revenue from 2012 through 2016.

The UN FAO cited above group cod products with pollock in that prices were predicted to be stable or increasing in 2018, but for cod the reason was reduced supply in both the Pacific and the Atlantic. Russian cod were the only market with an increased catch limit in 2018 (roughly 3% higher than the previous year). Overall, cod products might be held up by reduced global whitefish supply combined with low quota, plus increased whitefish demand in Europe. The McDowell Group’s 2016 to 2018 Alaska market snapshot showed an 8% increase in cod H&G value/mt from 2016 to 2017 and a 12% increase from 2017 to 2018. Cod fillets, however, were reported down 7% since 2016.

Table 4-7 GOA Pacific cod production and wholesale value by product type, 2012 through 2016

Product Type	Production (mt)	% Total	Wholesale Value	% Total	$/Pound
H&G	49,963	39%	$127 M	27%	1.15
Fillets	42,895	34%	$287 M	60%	3.04
Other	23,651	19%	$43 M	9%	0.83
Roe	6,854	5%	$14 M	3%	0.95
Whole	4,399	3%	$6 M	1%	0.63
Total	127,761		$478 M		1.70

Source: COAR data provided by AKFIN.

The Council's alternatives could affect the timing of fishing. In the case of Pacific cod (Alternative 3), the effect would be directly applied by shifting trawl CV TAC toward the A season. The timing effect on pollock is indirect. Vessels might find more (or more appealing) fishing opportunities in the late-winter and spring if the A/B seasons are combined because the removal of a potential regulatory gap between the seasons can interfere with peak productivity in some circumstances. Vessels might also be more enticed or able to harvest the D season pollock quota during the earlier part of a combined C/D season, thus avoiding higher Chinook salmon PSC rates and poor fall weather. The June 2018 discussion paper[17] focused on the potential for seasonal effects in the wholesale prices of Alaska pollock and Pacific cod. This document summarizes the information gathered in that paper and directs the reader to Section 3.3.1 of that paper and to the more extensive tables in Appendix 3 of that paper for illustration of how the fishery accrues its annual value on a month-by-month basis.

A seasonal price effect would mean that pollock and Pacific cod products might be more valuable to harvesters and/or processors at a certain time of year. Were such an effect to exist, policies that shift harvest toward higher value opportunities could increase the overall productivity derived from the resource. The analysts considered market reports, export data, ADF&G Fish Ticket data, and purchasing records from the COAR data that are submitted by processors.

Figure 4-2 and Figure 4-3 use COAR data to track pollock and Pacific cod wholesale value per pound for the most common product forms on a monthly basis during the 2012 through 2016 period. The figures indicate that there is not a significant difference in product value between the two parts of the fishing year. The apparent downward trend in pollock roe value from January to April is actually reflecting lower annual values in 2014, 2015 and 2016 when production volume skewed later in the A season. Roe value has been on a downward trend in recent years; the cause is commonly attributed to decreasing demand as tastes have changed in key Asian markets. Though not shown, the analyst charted monthly wholesale product values disaggregated by year and no persistent trend in the two parts of the year is apparent.

[17] http://npfmc.legistar.com/gateway.aspx?M=F&ID=983eceaa-fc41-4d4e-8276-2820b9e951bf.pdf

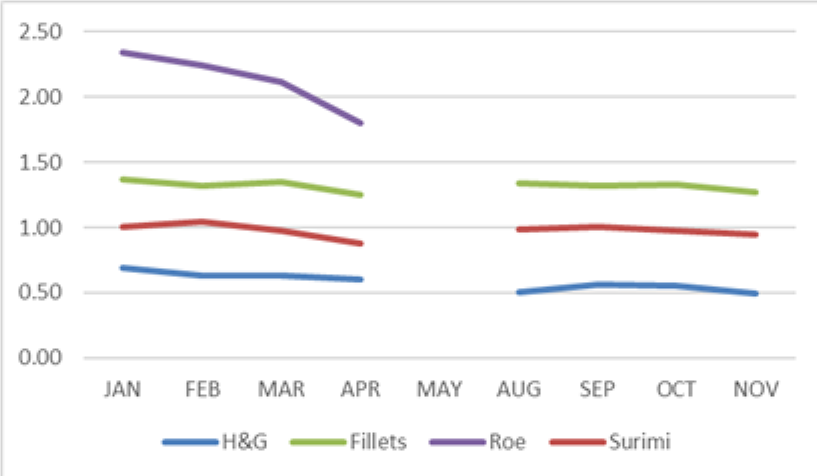


Figure 4-2 GOA pollock trawl wholesale value per pound, 2012 through 2016

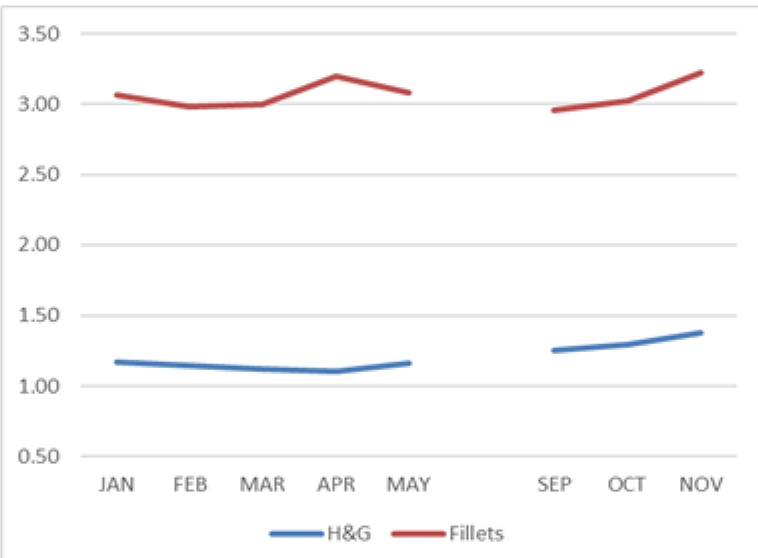
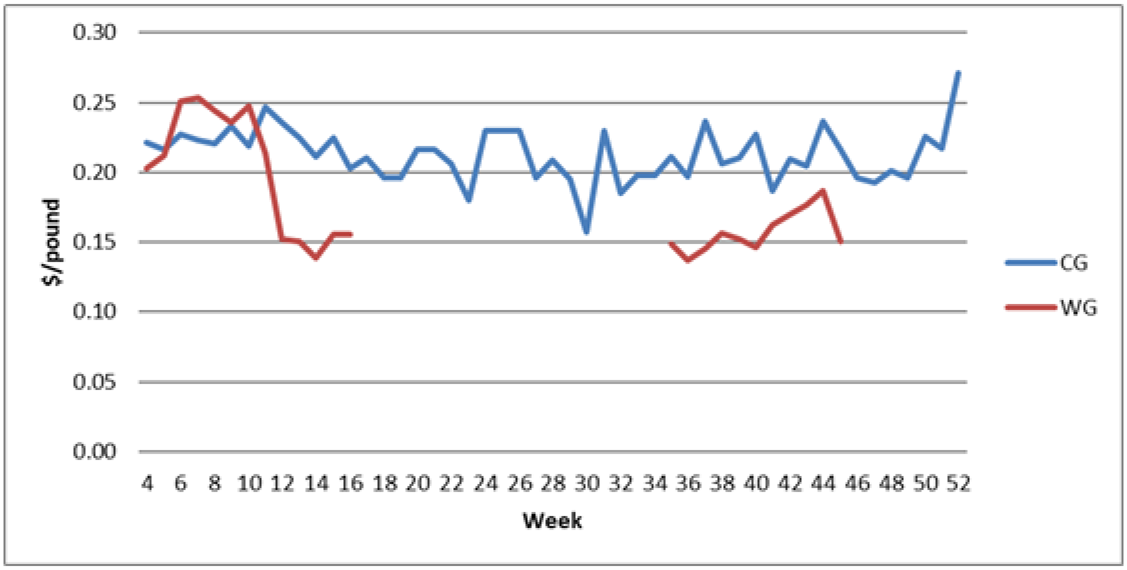


Figure 4-3 GOA Pacific cod wholesale value per pound (all gear sectors), 2012 through 2016

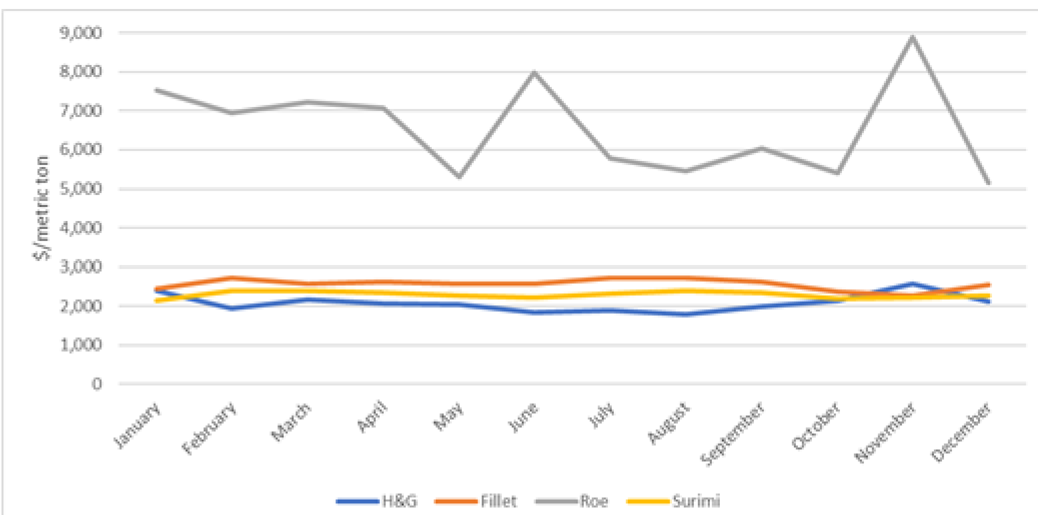
Figure 4-4 plots weekly average ex-vessel prices for GOA trawl-caught Pacific Cod over the 2013 through 2016 period. The figure illustrates that one should not expect a seasonal price effect at the ex-vessel level if CGOA TAC is shifted from the B season to the A season. The WGOA trend shows a price drop-off after the peak of the A season, likely due to the short nature of the WGOA Pacific cod trawl season and the limited number of processing markets. Shifting Pacific cod TAC into the only point in the year when some WGOA plants are setup to maximize value from cod deliveries could increase the potential value in the fishery, though that effect would be constrained by total processing capacity among the area’s cod processors.



Source: CFEC Fish Tickets, provided by AKFIN.
Note: Pacific cod deliveries shown in the middle of the calendar year (CG) and during the WG B season are likely incidental to other target fisheries.

Figure 4-4 Average price per pound (nominal $) for trawl-caught Pacific cod by GOA area, 2013 through 2016

The analysts also considered export data provided by NMFS Office of Science and Technology (OST). Export data is specific to Alaska but not to the GOA in particular. Moreover, monthly export data reflect when an export occurred but not necessarily when harvest or production occurred, as product can be held in cold storage prior to shipment. The discussion paper illustrated that export volumes generally tracks a one-month lagged pattern of Alaska groundfish harvest. Export values over the course of the calendar year do not show a discernable difference between the late-winter/spring and the late-summer/fall. Figure 4-5 shows the export value ($/mt) by month and by product for Alaska pollock from 2015 through March 2018.



Source: NMFS Office of Science & Technology Commercial Fisheries Statistics, available at: https://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/applications/monthly-product-by-summarized-countryassociation.

Figure 4-5 Alaska export value ($/mt) by product form, 2015 through March 2018

The analysts also compared ASMI reports covering 2015 to March 2018 on monthly year-to-date product value/mt. Comparing value/mt for only the first three months of the year versus value/mt covering the entire year did not yield a strong trend. The only notable conclusion from that exercise was a weak indication that Pacific cod fillet product were worth approximately $650/mt wholesale more (30 cents/lb.) when late-year months are included.

The Alaska Fisheries Science Center contributed an informal study to assist with the June 2018 discussion paper, regressing export values on the season while controlling for year effects and product type. For Pacific cod the regression also found higher value during the latter half of the year, with an effect size of $200/mt (9 cents/lb. wholesale) but low statistical significance. For pollock the regression indicated a higher value during the first part of the year with statistical significance, with an effect size of $315/mt wholesale (14 cents/lb.).

Finally, the analysts considered whether there is an expected difference in fish size across seasons, as larger fish might yield greater value in terms of recovery rates and the ability to produce higher-value product forms (e.g., fillets). Table 4-8 reports average fish size (kg) by month for the GOA pollock and cod fisheries from 2012 through 2017. The data captured in the table come from the North Pacific Observer Program; they include direct observations and expansion onto fish that were not directly sampled. Using the expanded data mimics how catch is estimated, though it might smooth size effects that emerge over a short timeframe such as a month within a particular year. Of the four fisheries shown in the table, the Pacific cod trawl and pot sectors approximate a trend where average fish size is greater during the A season than the B season. However, industry participants who were consulted for this paper did not report individual perceptions of larger cod in the fall, though they did remark on generally superior flesh quality and product recovery rates as the stock is farther removed from the energy-intensive spawning process.

Visual representations of this data on an annual basis is provided in Appendix 4 of the June 2018 discussion paper. When the years are disaggregated, the pollock trawl fishery shows an increasing intra-annual size trend in 2012, 2016 and 2017, but shows the opposite trend from 2013 through 2015. Monthly size data in the Pacific cod trawl fishery shows a visually discernible pattern, but one that is not statistically significant. For comparison, monthly size data in the Pacific cod hook-and-line fishery show no discernable trend; this could be an effect of selectivity based on hook size.

Table 4-8 Average fish size (kg) by month, 2012 through 2017

Fishery	Jan	Feb	Mar	Apr	Aug	Sept	Oct	Nov	Annual
Pollock TRW	0.56	0.71	0.78	0.79	0.81	0.71	0.75	0.89	0.74
PCod TRW	2.21	2.54	2.62	1.78	1.82	2.10	1.90	1.39	2.11
PCod POT	2.94	3.14	2.09	3.11		2.73	2.68	2.43	2.86
PCod HAL	3.15	3.29	3.36	3.06	3.15	3.45	3.08	2.92	3.22

Source: Observer Program data provided by AKFIN.

4.5.1.4 Prohibited Species Catch

The primary prohibited species catch (PSC) encountered by GOA trawl vessels are Chinook salmon and Pacific halibut. Both are highly valued species for their subsistence, recreational, and commercial uses. The management measures that limit and seek to minimize interactions with those species are more fully detailed in Section 3.3.1 (Chinook salmon) and Section 3.3.2 (halibut) of this document. Those sections also update the reader on the status of stocks for these intensely managed species, identifying cases where stock status is officially determined to be in decline or under threat. For both PSC species, the trawl fleet is limited by an amount of PSC mortality that will close directed fisheries if it is achieved.

Chinook Salmon

Chinook salmon PSC limits for the pollock trawl fishery are established separately for the CGOA and the WGOA. The Chinook PSC limit for non-pollock (i.e. Pacific cod, rockfish, and flatfish) trawl fishery is established GOA-wide, so encounters in one area could potentially constrain fishing opportunities in the other. It should be noted that GOA Amendment 103 gives NMFS the ability to reallocate a limited amount of Chinook PSC during the season between CV sectors (e.g., WGOA or CGOA pollock to the non-pollock trawl CV sector). However, such flexibility measures are not guaranteed to be available when a sector is constrained by Chinook PSC and thus cannot be counted upon; NMFS would not make such a reallocation if the sector to which the PSC was originally apportioned might need it later in the year to access a fishery. In many cases, a similar set of vessels make up the constituents of a given Chinook PSC limit -- for example, the vast majority of vessels that fish pollock also fish non-pollock (Pacific cod). As a result, *for the most part*, the GOA trawl CV fleet has a shared and constant interest in minimizing PSC and preserving it for later availability. However, exceptions always exist as individual vessels have different business plans. Because the Chinook PSC limits are a cumulative hard cap, vessels with little or no business interest in late-year GOA fisheries have a different incentive profile when it comes to taking individually costly actions to avoid Chinook salmon in the early part of the year. Such vessels might be those that fish BSAI fisheries in the fall, or WGOA vessels that only participate in non-pollock GOA fisheries (Pacific cod) in the A season.

Chinook PSC encounters in GOA trawl fisheries are highly variable from year to year. Dating back to 2000, approximately 70% of GOA trawl Chinook PSC occurs in the pollock fishery. The majority of those removals occur in the Central GOA, owing at least in part to the higher volume of the fishery and the year-round nature of the Kodiak trawl fleet. While the pollock fisheries encounter more Chinook PSC, they also have a higher PSC limit; the directed fishery has not been closed due to PSC since 2013 (the pollock Chinook PSC limit was implemented in 2012). The non-pollock Chinook PSC limit that could potentially close the Pacific cod fishery is set closer to historical use levels relative to the pollock fishery's limit, and it is shared across two GOA subareas that have substantially different levels of dependency on non-pollock trawl fishing during the fall. Due to these factors, the Pacific cod CV fishery has experienced the Chinook PSC limit as a more imminent constraint in recent years. Moreover, the non-pollock fishery's limit covers a diverse group of groundfish targets where effort can ebb and flow from one year to the next depending on TACs, market prices, and the paired constraint of the halibut PSC limit. In some years, poor cod fishing during the A season can induce vessels to shift focus to other groundfish that tend to incur higher PSC rates, giving the fleet less margin for bycatch when cod does become available. Table 4-9 shows the average and median Chinook PSC by month in the GOA trawl CV pollock and Pacific cod target fisheries over the 2012 through 2017 time period.

Table 4-9 Average and median Chinook salmon PSC by month in the GOA pollock and Pacific cod target CV fisheries, 2012 through 2017

			JAN	FEB	MAR	APR	AUG	SEP	OCT	NOV	Total
Pollock	WG (610)	Average	175	111	182	70	124	1,357	2,498	270	4,649
		Median	30	81	178	70	36	1,264	2,758	75	5,033
	CG (620/30)	Average	447	2,651	1,446	257	284	1,748	4,277	130	11,012
		Median	111	2,014	1,191	139	242	974	3,148	126	10,526
Pacific Cod	WG*	Average	60	369	36						465
		Median	0	6	1						22
	CG	Average	11	68	125	35		51	5	18	293
		Median	5	35	68	3		5	1	5	316

* WGOA trawl Chinook salmon PSC estimates are particularly volatile. From 2012 through 2017 the WG Chinook PSC estimate (# fish) has been: 1, 31, 1, 1056, 13, 1686. Higher estimates during the more recent years might reflect

increased observer coverage on the <60' WG trawl fleet, which makes up roughly 75% of WGOA trawl vessels; nevertheless, annual PSC estimates have continued to range widely year-on-year and without a discernable pattern.

Section 3.3.1.4 of the EA in this document describes the temporal distribution of Chinook PSC in GOA pollock fisheries. The EA finds evidence that Chinook PSC encounter rates are generally higher during the pollock D season than in the C season, but that the pattern does not hold in every year. Conclusions about the temporal relation between fishing and Chinook PSC are particularly clouded in the WGOA because PSC encounter tends to differ between larger and smaller trawl CVs (whether that has to do with net design, tow speed, fishing area, or other factors is not known with certainty). In the Central GOA, PSC rates (PSC as a ratio of target landings) for the pollock trawl fisheries tend to be greatest early in A season and in D season, as compared to rates in the B and C seasons (Figure 3-5). Table 4-10 shows Chinook PSC rates by month in the GOA pollock and Pacific cod trawl CV fisheries from 2012 through 2017.

Table 4-10 Chinook salmon PSC rate (# Chinook/mt groundfish) by month in the GOA pollock and Pacific cod target CV trawl fisheries, 2012 through 2017

	Area	JAN	FEB	MAR	APR	AUG	SEP	OCT	NOV
Pollock	WG (610)	0.22	0.12	0.05	0.08	0.08	0.11	0.21	0.72
	CG (620/30)	0.15	0.13	0.05	0.02	0.06	0.09	0.17	0.12
Pacific Cod	WG	0.14	0.08	0.02					
	CG	0.01	0.04	0.03	0.03		0.03	0.01	0.23

Source: Observer Program data provided by AKFIN.

The most recent Council documents that detail the interaction between GOA trawl fisheries and certain stocks (endangered, of management concern to the State of Alaska, or otherwise) are an April 2018 analysis[18] prepared by Council staff and an April report on genetic identification of trawl-caught Chinook salmon in the GOA[19]. The Council analysis includes extensive information on Chinook stock status in both Alaska and the Pacific Northwest/British Columbia. The genetics report identifies regions of origin for the Chinook encountered in the GOA trawl fishery, concluding that the majority originate in B.C. and the Northwest, but roughly 20% originate from GOA area systems (fewer than 1% are estimated to originate from western Alaska systems).

Pacific Halibut

Section 3.3.2 of this document details the management authority for halibut in the Federal fisheries off Alaska and the status of the halibut stock. For the purpose of this considered action, halibut PSC is primarily a concern for trawl CVs fishing for Pacific cod. The Pacific cod fishery can be limited by the mortality of its halibut PSC. The GOA trawl CV and CP sectors share a limit of 1,706 mt of halibut mortality, of which 191 mt is apportioned to the Central GOA Rockfish program, yielding an effective annual trawl limit of 1,515 mt before any rollovers might occur later in the year. That limit is divided into five seasonal apportionments of halibut PSC, as shown in Table 14 of the GOA harvest specifications.[20] The A season for the Pacific cod trawl fishery occurs within the first two seasonal halibut apportionments (January 20 to April 1, and April 1 to July 1). Unused seasonal apportionments of specified halibut PSC limits added are to the next season's apportionment during the same fishing year. As detailed in Section 3.3.2.4, seasonal PSC limits are further divided into deep- and shallow-water species complexes; halibut PSC taken while fishing for Pacific cod is deducted from the shallow-water complex apportionment. The Council has the ability to change seasonal and complex apportionments through the harvest specifications

[18] http://npfmc.legistar.com/gateway.aspx?M=F&ID=e0062177-6b46-48dc-8971-6e2afbef236e.pdf
[19] http://npfmc.legistar.com/gateway.aspx?M=F&ID=5cab3fe8-0eb3-49a9-bd72-299fcaf2bb6d.pdf
[20] https://alaskafisheries.noaa.gov/sites/default/files/17_18goatable14.pdf

process, and while that has not occurred in recent years it would be a tool at the Council's disposal if Alternative 3 were to result in a greater intensity of halibut PSC during the Pacific cod A season.

Table 3-6 and Table 3-7 in Section 3.3.2.4 provide monthly halibut PSC mortality (mt) and PSC rates for the 2012 through 2017 period. These tables and Figure 3-11 reflect that halibut PSC rates tend to track catch and effort in the Pacific cod fishery. The EA concludes that there is likely not a systematic temporal trend to halibut PSC encounter that can be relied upon by fishermen to predict PSC rates and avoid halibut.

4.5.2 Processor and Community Participation

Table 4-11 shows the number of inshore processors that received GOA pollock and Pacific cod deliveries from 2012 through 2017. For Pacific cod, the table includes processors that took deliveries from only non-trawl gear. Dating back to 2010, between 10 and 15 facilities took deliveries of trawl-caught Pacific cod. The number of shoreside facilities that took deliveries of GOA trawl-caught pollock and/or Pacific cod topped out at 22 plants in 2011 and 20 plants in 2012 but the number has been consistent at the 17 to 18 range since 2013. The table reflects the fact that the GOA processing sector for these species is relatively concentrated at the top end. From 2007 through 2017 the processing communities that received Central GOA pollock and Pacific cod included Kodiak, Sand Point, King Cove, Akutan, and floating processors owned by Washington-based companies. Processors that participated in the Western GOA fishery were located in Kodiak, Sand Point, King Cove, Unalaska, Akutan, False Pass, and on floating processors owned by Washington-based companies. The higher-volume processors for trawl deliveries are located in Kodiak, Sand Point, King Cove, Akutan, and Unalaska. The increasing proportion of pollock product produced by the top three processing facilities reflects some consolidation of facilities in Kodiak. The total number of processing companies (plant owners) that have taken GOA trawl groundfish deliveries since 2010 is nine, though the number of consistently active companies in more recent years is seven.

Table 4-11 GOA pollock and Pacific cod processing activity (all gears), 2012 through 2017

		2012	2013	2014	2015	2016	2017
Pollock	# Processors	15	16	16	17	14	14
	# Proc > 100 mt	12	13	12	10	11	11
	# Proc > 1,000 mt	10	9	8	8	10	8
	mt Product	37,954	39,550	54,303	59,785	75,423	80,036
	% Top 3	43%	46%	49%	60%	71%	66%
	Avg. Top 3	5,428	6,066	8,909	12,028	17,935	17,579
Pacific Cod	# Processors	35	31	32	33	33	31
	# Proc > 100 mt	19	18	19	19	14	17
	# Proc > 1,000 mt	11	8	9	8	6	5
	mt Product	30,992	21,885	27,849	28,870	18,942	14,341
	% Top 3	40%	44%	47%	41%	48%	53%
	Avg. Top 3	4,172	3,241	4,374	3,967	3,027	2,544

The set of facilities that process GOA trawl-caught pollock and/or Pacific cod are heterogeneous in terms of the percentage of their individual total processing revenues (nominal gross first wholesale value) for which trawl-caught groundfish account. Previous Council analyses of the GOA trawl groundfish fishery provided a detailed accounting of trawl revenues as a percentage of total revenues over the 2003 through 2015 period.[21] Across the set of all facilities participating in these fisheries, GOA trawl groundfish

[21] Gulf of Alaska Trawl Bycatch Management (GOATBM) Preliminary Economic Analysis, Section 1.3.4 (Dec. 2016), available at: http://npfmc.legistar.com/gateway.aspx?M=F&ID=0636d970-11cf-4f6a-8037-

accounted for an average of roughly 6% to 10% of total gross annual revenue. However, two plants generated more than 65% of total gross revenue from these fisheries, two plants generated more than 20% from these fisheries, and three generated more than 10%. Locality was a strong indicator of reliance on GOA trawl groundfish product for these processors, though due to confidentiality processors can only be categorized as Kodiak and non-Kodiak. Using 2003 through 2015 ex-vessel gross revenues generated by the landings at this set of processors as an indicator of reliance and diversification, the referenced study found that roughly one-third of revenues associated with landings at Kodiak facilities came from GOA trawl-caught groundfish. Revenue generated at plants in other communities with at least one processor accepting GOA trawl deliveries during the same period accounted for roughly three percent of ex-vessel gross revenues. There is, of course, additional heterogeneity among the latter group as some plants included in the count took trawl deliveries in only one year while others - especially in the Western GOA - participate regularly. Nonetheless, it is apparent that some plants rely on GOA groundfish (featuring pollock and Pacific cod) for as much as half of gross revenue production while others are primarily engaged in purchasing salmon, IFQ halibut, and crab.

The best available information on processing plant workers who participate in the GOA groundfish trawl fisheries (including pollock) is available in Section 5.2 of the Preliminary Social Impact Assessment that was prepared for the Council's consideration of the GOA Trawl Bycatch Management Program in December 2016 (referenced in the paragraph above). Table 4-12 provides labor payment information for processing workers at GOA shoreside processors that accepted trawl-caught groundfish deliveries in 2015. That study also reported total wages and salaries for non-processing employees at facilities that processed GOA trawl groundfish in 2015. Kodiak facilities employed 105 out of 792 non-processing workers, accounting for roughly $6 million in nominal earnings out of a total $17 million across all processing localities involved in the fishery that year. This 2015 snapshot illustrates the economic productivity of GOA trawl fishing in directly related shore-based businesses; it also shows Kodiak's unique position as a processing locality where shore-based workers live in the community and contribute to social and economic community health via their spending and participation in community life.

cfb9b7ca34a3.pdf; and GOATBM Preliminary Social Impact Assessment, Section 4.1.3 (Dec. 2016), available at: http://npfmc.legistar.com/gateway.aspx?M=F&ID=e3852a81-a379-4676-a27a-ef2d3938b3e1.pdf.

Table 4-12 GOA groundfish processor workers and labor hours/payments by month, 2015 (Source: Economic Data Reports)

Month	Number of Federal Processor Permits	Number of Groundfish Processing Employees	Processing Labor Person-Hours		Processing Labor Payment	
			Housed	Not Housed	Housed	Not Housed
Kodiak						
January	7	1,422	34,440	182,484	326,052	2,165,849
February	7	1,645	127,474	214,655	1,339,541	2,659,635
March	7	1,686	126,612	315,540	2,390,093	3,958,886
April	7	1,567	82,725	213,604	954,102	2,785,893
May	7	1,136	25,805	160,411	286,175	1,874,488
June	7	1,123	18,898	119,953	225,211	1,478,947
July	7	533	6,714	83,271	82,558	1,024,004
August	7	532	6,903	78,400	97,876	952,292
September	7	1,447	98,001	264,578	1,095,659	3,411,559
October	7	1,403	107,747	244,705	1,272,712	3,172,959
November	7	1,108	28,320	100,738	340,911	1,286,226
December	7	407	4,768	46,271	68,512	579,133
Total	--	--	**668,407**	**2,024,610**	**$8,479,402**	**$25,349,871**
All Other Geographies						
January	6	890	109,932	-	1,228,038	-
February	6	1,201	255,023	101	2,810,615	1,446
March	6	1,186	364,564	627	4,417,681	1,395
April	5	1,017	260,233	-	3,100,578	-
May	5	176	27,440	-	322,100	-
June	5	500	31,835	-	392,269	-
July	5	474	124,382	-	1,575,885	-
August	5	488	97,974	-	1,260,775	-
September	5	601	250,365	-	3,053,302	-
October	5	544	192,045	-	2,291,918	-
November	5	236	13,558	-	168,687	-
December	5	-	-	-	-	-
Total	--	--	**1,727,351**	**728**	**$20,621,848**	**$2,841**

4.6 Analysis of Impacts

This section discusses the three alternatives with respect to the Council's Purpose and Need statement, using the No Action alternative (Alternative 1) as the baseline against which the benefits and costs of the action alternatives should be considered. The Purpose and Need statement first calls out the desire to improve efficiency for participants, with the implied focus on harvesters and processors who take part in the fisheries and gear groups that would be directly regulated. The Council is also seeking management efficiency, which means both efficiency of agency operation and avoiding unintended impacts on fishery participants in the form of regulatory closures that might be avoided with different regulations. Part of management efficiency is flexibility within the confines of appropriate regulation; desirable flexibility could improve economic efficiency and could also allow vessels to minimize PSC. Third, the Council is interested in outcomes that allow participants the flexibility to increase fishery yield. Yield could be in the form of additional catch relative to No Action (metric tons of harvest) or additional value from the catch than would normally be expected, all things equal. Fourth, the Council seeks to avoid any action with an unintended redistribution effect from one area's fleet/processors to those of another. The Council took steps to reduce the likelihood of such outcomes when scoping these alternatives in June 2018; options that had clear distributional effects are noted in Section 2.4 of this document (Alternatives Considered but not Further Analyzed). Finally, the Council desires that any recommended action remain consistent with Steller sea lion (SSL) protection measures. The potential implications of this action on SSLs are discussed more fully in the EA (Section 3.4).

4.6.1 Alternative 1 - No action

Selecting the No Action alternative would maintain the status quo of four GOA pollock seasons with equal 25% TAC apportionments and two Pacific cod seasons for which TAC is apportioned at a 60%:40% ratio across all gear types to the A and B seasons in each FMP subarea (WGOA and CGOA). This section discusses the likely impacts of status quo management for the pollock and Pacific cod fisheries separately, though the analysts note that the harvesting, processing, and community stakeholders overlap in the fisheries to a great degree.

4.6.1.1 Pollock Fishery

4.6.1.1.1 Fishery Closures

Status quo management can result in time gaps between the A and B seasons and between the C and D seasons. The gaps vary in length depending on the pace of fishing and TAC utilization during the A and C season. Table 4-4 in Section 4.5.1.2 shows instances where fisheries were closed for up to 80% of a season when the TAC was taken quickly. Short closures can last for as little as one day as the fleet in an area approaches its TAC at the end of the season. The C season has closed for the final one to four days in Areas 610 and 630 on five occasions during the 2012 through 2017 time period. Sometimes these short gaps occur because Federal managers cannot issue proper notice to close the fishery over a weekend and must be precautionary if the TAC could be exceeded in a few days' effort.

Time gaps due to regulatory closures in what would otherwise likely be a continuous fishery present a range of inefficiencies. The nature of those inefficiencies varies depending on the length of the disruption and the other opportunities available to pollock harvesters, processors, and processing workers during the time of closure.

A short regulatory stand down primarily causes operational inefficiencies. These might be more acute for the harvesting sector (vessels) and for processors that are working with a single species at that time. For harvesters, operational inefficiencies could include direct fuel costs to transit back and forth to fishing grounds, lost labor productivity (more days to earn the same income), or missed windows of good weather, high CPUE, or times of valuable roe quality that fall between the A and B seasons. Processors also experience reduced productivity if labor and equipment is idled. Plants that house workers would continue to accrue labor overhead in addition to capital maintenance.

A longer regulatory stand down could also include some of these acute inefficiencies, but the overall effect on stakeholders is also determined by what other opportunities exist in that time and area or in other fisheries that a stakeholder can access. For example, processors experiencing a long closure between the Area 610 C and D seasons does not have other fisheries to prosecute; harvesters that are typically focused on the 610 fishery could move into 620 with market support and the necessary LLP endorsement, but historically only a minority of WGOA pollock vessels have participated in 620 and the distance to the grounds can be costly. By contrast, stakeholders experiencing a similarly timed closure of Area 630 could potentially turn to CGOA Pacific cod or flatfish if the necessary PSC limits are available. A gap between the A and B seasons also creates a different choice-set in each of the two GOA areas. At that time, Western GOA pollock vessels would be able to move into the Pacific cod fishery if fish are aggregated and markets are available. Smaller vessels that also participate in state-waters pot cod fisheries might lose an opportunity to return to the pollock fishery if they have already re-geared by the time the B season is reopened. In the Central GOA, pollock vessels could switch to Pacific cod or flatfish trawling. A fleet that moves together into competitive bottom-trawl fisheries due to a lack of options rather than by intent might, in some cases, encounter high PSC rates that jeopardize fishing opportunities later in the year, and if the pollock fishery remains closed the fleet lacks options to keep working while managing for PSC.

A long stand down also erodes the real-time knowledge of the fishing grounds that skippers develop over the course of a continuous season. That knowledge is often key to achieving higher CPUE and minimizing bycatch of non-target species and PSC.

Processors experiencing a longer stand down in the pollock fishery face some of the same choice sets in terms of what other fisheries are available in their area, though they are less constrained by the need to carry specific license endorsements. Processors might have a unique concern in that they have less certainty about how their delivering fleet will be comprised when fishing reopens. In addition to volume, processors also have to consider and optimize for the product mix that they can produce and sell. For example, a gap between the A and B season that encompasses the peak roe season costs wholesalers as well as skippers.

The regulatory requirement that 25% of annual TAC is apportioned to October (D season) could impact annual Chinook salmon PSC levels. The EA noted that, for Area 610 in particular, the D season is associated with higher rates *in some years*. The direct cause of this perception is not clear – it could be the result of a true seasonal environmental effect, or it could be that the WGOA pollock fleet of mostly smaller vessels is less able to travel to cleaner areas farther from port in poor fall weather. In any event, to the extent that fishing in October might increase Chinook salmon PSC, status quo season allocations could be increasing bycatch in some years.

4.6.1.1.2 Reallocation (Rollover) of Unharvested TAC

Section 2.1.1 of this document described the existing regulations and the process by which NMFS reallocates (rolls over) uncaught pollock TAC from one season to the next. As stated and shown in a numerical example, TAC that goes unharvested in a particular area must first be rolled over to that same area in the subsequent season, and only then is additional unharvested TAC available to that subsequent season in other GOA areas.

The status quo rollover regulations provide value to fishery participants in that, without them, all TAC that goes unharvested – for whatever reason – would constitute a permanently lost opportunity. The 20% rollover cap serves the purpose of limiting any incentive to let most or all TAC from one pollock season roll to the next if fishing or market conditions might be better at that time. An unlimited rollover could allow fishing effort to concentrate in time and space in a manner that might adversely impact prey availability for SSLs. However, the cap on rollovers can result in unharvested TAC that cannot be caught in the subsequent season. This can happen in two ways: (1) all eligible GOA areas have reached their 20% rollover cap but unharvested pollock from the previous season still remains, and (2) unharvested TAC is rolled over to the subsequent season in an area where it has a low probability of being caught. The Council's set of alternatives does not address the second eventuality. Changing the process by which NMFS executes inseason reallocations is not currently under consideration.

The NMFS inseason management team communicates with the pollock fleet throughout the fishing year. Agency staff informed the analysts that fishery participants manage the rollover limit, as it is currently defined, by working with the fishery managers to determine the maximum that could be rolled over to the following season if fishing or other conditions dictate that harvest in the current season is not optimal. Once the fleet knows the maximum rollover amount, it has no incentive to leave more than that amount of pollock in the water as it will be stranded if uncaught. The strategy of setting a floor and harvesting up to that floor (so long as the net cost of fishing does not incur a loss) is more often employed in Areas 630 and 610 because fishing grounds in those areas are available closer to port. Cost margins are wider when fishing close to port, so marginal trips to meet the rollover floor are at least profitable if not optimal. Fishing for poor marginal returns in Area 620 is less appealing due to its location; this may cause the fleet some frustration since such a large percentage of the A and B season TACs are allocated to Area 620 under the current seasonal biomass distribution regime (see Table 2-1).

Because the 20% rollover cap must be "filled" for the next season in the area where an underharvest occurred before additional TAC may be allocated to other areas, reallocations between areas are less frequent but not uncommon. The typical condition that leads to reallocations from one area to another is a TAC that far exceeds harvesting capacity. In the current regime, this is most likely to occur in Area 620. That said, NMFS staff was able to investigate their seasonal adjustment records and determine that reallocations have also been made to other areas from Area 610.

As noted above, the Area 620 A and B seasons are a focal point for where underharvest is likely to occur and be subject to a rollover – first to the next season in 620 and then to other areas. For that reason, the analysts looked at participation in the Area 620 A/B seasons in terms of vessels that fished multiple areas in that part of the year, and which other area that was (610 or 630). In 2016, 39 CVs fished the Area 620 A/B season. Thirty-seven of those vessels fished another area – 28 also fished in 630 and nine also fished in 610. In 2017, 42 CVs fished the Area 620 A/B season. Forty of those vessels fished another area – 36 also fished in 630 and four also fished in 610. In 2018, 51 CVs fished the Area 620 A/B season. Thirty of those vessels fished another area – 24 also fished in 630 and six also fished in 610. This snapshot tells the reader that most vessels who fish Area 620 pollock are also engaged in other areas, and that the cross-over is mostly between Areas 620 and 630. This information can be interpreted in two ways. First, unharvested 620 A season TAC that is rolled over to Area 620 B season is more likely to be accessed by the set of vessels that operates mainly in the Central GOA, though there is a small number of Western GOA vessels that work in 620. Second, the fact that the first-stage rollover has to stay in Area 620 rather than immediately rolling to areas where it is more likely to be caught during the B season, in a sense, deprives vessels and processors that do not access Area 620 of more easily accessible quota that could have added to total fishery productivity; the data from these three most recent years indicates that there is a relatively larger proportion of the WGOA-centric fleet that does not access Area 620.

NMFS inseason managers provided the analysts with two instances where the 20% rollover cap resulted in stranded pollock quota that could not be rolled over to the subsequent season in any area. The following applies the steps outlined in Section 2.1.1.

The first example occurred between the A and B seasons in 2016. The Area 620 A season had a large allocation (TAC = 42,040 mt) but the fleet in that area experienced dispersed pollock, a high proportion of non-marketable (small) pollock, and concerns about Chinook salmon PSC rates. As a result, the area was underharvested by 27,642 mt. Meanwhile, Areas 610 and 630 were harvested very close to their caps (610 was 247 mt under; 630 was 51 mt over). Area 620 was the only area for which the underharvested amount exceeded its own rollover cap, which equals 20% of the Area 620 B season TAC. The 620 B season received the maximum rollover of 10,149 mt and the TAC was set at 60,896 mt. At this point, 17,493 mt of the Area 620 A season underage remained unallocated. Because Areas 610 and 630 had small B season TACs set in harvest specifications (3,826 mt and 5,083 mt, respectively), the remainder after Area 620's rollover to its own B season is more than enough to max out the 610 and 630 20% rollover caps. This meant that roughly 16,000 mt of A season pollock quota was be stranded. To determine how that quota would have been allocated between 610 and 630, one can apply the ratio of the two area's B season biomass distribution percentages. The biomass distribution percentage for Area 610 was 6.41% and the percentage for Area 630 was 8.52%. That ratio leads to the conclusion that – absent the 20% rollover cap – Area 610 could have received an additional 6,992 mt (43% of 16,007 mt) and Area 630 could have received an additional 9,015 mt (57% of 16,007 mt).

The second example occurred between the C and D seasons in 2013, when all three areas started the C season with similar TACs and had similar D season TACs set in harvest specifications – all ranging from 7,600 mt to 9,800 mt. This example will demonstrate that an area does not have to have a large TAC to end up with a large underharvest that triggers a situation where the 20% rollover cap results in stranded pollock quota. The fleet in Area 610 had a difficult time finding aggregations of marketable size pollock, catching only 985 mt of the 9,760 mt TAC for an underage of 8,775 mt. The Area 620 and 630 fisheries came in near the TAC, with Area 620 under by 354 mt and Area 630 over by 359 mt. The Area 610 underage far exceeded its 20% rollover cap of 1,949 mt, meaning that the area received that cap amount added to its D season TAC. Again, the remainder after maximizing the Area 610 rollover is enough to max out all three areas and still leave an amount of pollock quota that will not be available in the D season. In this case the amount of stranded quota was 4,140 mt. By comparing the ratio of the D season seasonal biomass distributions for Areas 620 and 630, one finds that without a cap Area 620 would have received an additional 1,889 mt and Area 630 would have received an additional 2,251 mt.

In both examples above the underharvest in one area was extreme *and* neither of the other areas had a substantial harvest. That combination allowed both other areas to max out their 20% cap even after the initial underharvested area received its 20% cap, but this will not always be the case. When the remainder available to other areas is not enough to max out the 20% cap in one, both, or either of the other two areas then fishery managers will rely on the ratio between the seasonal biomass distribution percentages to determine how that remainder is divided. If those biomass distribution percentages are not similar then one area could receive a substantially greater rollover. While that might seem unequal on the page, it is in keeping with the purpose of the seasonal biomass distribution approach, which seeks to place TAC in the management areas where pollock are expected to be catchable.

In general, the 20% rollover cap will come into play when TAC in an area is extremely high, or when pollock catchability is extremely low (or when both factors occur together). Looking ahead, one might expect the cap to be a factor in the years following a large year class that contributes to high TAC levels while also injecting small fish into the fishing grounds. Absent those factors, it is possible to imagine a scenario where GOA-wide abundance is at a "normal" level but the seasonal biomass distribution places a large percentage of the TAC for a season into one area, and that area happens to be one where utilization is low for operational or economic reasons.

4.6.1.2 Pacific Cod Fishery

The dominant factor in the efficiency, yield, and socioeconomic productivity of the Western and Central GOA trawl CV fisheries is currently the low level of stock abundance. Low ABCs and TAC levels swamp what the impact of any quota that would have been stranded in the B season several years prior to the decline that began in 2018. The discussion in this section sets that recent shift aside for a more general discussion of how Pacific cod quota has been utilized during recent "normal" years.

GOA trawl CVs only directed fish for B season Pacific cod in the Central GOA. The Western GOA trawl CV sector receives 10.7% of the total annual Western GOA Pacific cod TAC (see Table 2-2) but it goes largely unharvested except as catch incidental to the C/D season pollock trawl fishery or as inseason reallocations that the NMFS Regional Administrator can make to other sectors. In the Central GOA, where the trawl CV fishery is prosecuted, TAC utilization in the B season lags A season utilization by a significant margin in percentage terms. Table 3-4 shows that Central GOA B season TAC utilization was typically below 50% and began to fall precipitously in the years leading up to the 2018 reduction in ABC.

While industry participants have reported that fish size and flesh quality can be better in the fall B season than in the late-winter A season due to the length of time removed from spawning activity, GOA cod do not tend to aggregate in the fall in a manner that lends itself to efficient harvest with trawl gear. Since NMFS implemented cod sector allocations in 2012 and with it the ability to make inter-sector inseason reallocations, all but one such transfer has occurred in the B season and the majority of those moved quota out of the trawl CV sector to other sectors where it might be utilized.

The stakeholders that participate in the WGOA Pacific cod A season do not overlap to a great extent with those that participate in the CGOA A season. In the WGOA smaller vessels are operating around Sand Point and King Cove during a short-peak trawl season. Those vessels tend to fish Federal pot cod before the trawl season and state pot cod afterwards. While the trawl season is occurring, those vessels might fish in the relatively low-TAC pollock A/B season if cod are not aggregated or if pollock roe is in season. Larger CVs might move between WGOA trawling and BSAI cod. There is not a substantial WGOA flatfish fishery in the WGOA, so vessels' competitive incentives to focus on the A season trawl CV TAC is driven by fish aggregation, market availability, the arrival of larger vessels from outside the area, and the need to harvest a share of the TAC before moving on to other fisheries. In the CGOA A season, vessels are choosing primarily between trawl cod and pollock depending of fishing conditions, what their market wants, and PSC constraints. CGOA vessels are relatively more likely to include B season cod and fall flatfish fisheries in their portfolio, so preservation of the non-pollock Chinook salmon PSC limit is an important consideration. CGOA vessels might use flatfish targets as a fallback option if cod CPUE is low, with the caveat that in some years incurring higher PSC rates in that fishery can constrain fishing plans for later in the year. In both areas, the early part of the A season (January 20 through April) is a congested schedule where vessels must be opportunistic about fishing conditions and markets while switching fisheries, to the extent they possess the endorsements and the gear, when PSC emerges as a constraint. In other words, there are many reasons that a vessel or the fleet as a whole might not prosecute the A season fishery to the fully extent of the TAC.

Selecting the No Action alternative would maintain the 60%:40% TAC apportionment across all gear sectors and the sector-level season allocation percentages that were implemented in 2012 under GOA FMP Amendment 83. As a result, Alternative 1 would not warrant further study of how the GOA Pacific cod fishery is affecting SSLs.

4.6.2 Alternative 2 - Combine A/B and C/D pollock seasons

The alternative to combine the A/B and C/D seasons is transparently intended to provide the fleet and processors with flexibility to prosecute the pollock fishery in a manner that maximizes yield and profitability within certain constraints that would not be removed by combining the seasons. The likelihood of maximizing fishery yield is improved when vessels have more latitude to choose when to fish. That choice is determined by fish aggregation, market availability, and – fundamentally – when the fishery is open. Alternative 2 could improve the chance that the fishery is open during high yield or profitable fishing times (e.g., roe season) by reducing the incidence of mid-season closures as a smaller seasonal TAC is approached or by eliminating the "gap" closures that sometimes fall between the current A/B and C/D seasons. Alternative 2 might also help keep the fishery open later in the year by giving the fleet more flexibility to mitigate high Chinook salmon PSC rates by standing down. A vessel is less likely to voluntarily stand down when a smaller seasonal TAC is nearing completion or if a regulated season end-date is approaching; this alternative would increase the size of seasonal TACs and reduce the number of season end-dates from four to two. In other words, relative to status quo, Alternative 2 would create fewer instances where vessels are forced to make suboptimal decisions because they are pitted against each other, against the season end-date, or against salmon avoidance by the force of the calendar.

Flexibility in timing might also increase the profitability of an individual vessel operator or a processing plant by allowing them to tune the timing of their participation to fit with their other fisheries while incurring less of an opportunity cost. For example, larger seasonal TACs that are less likely to go quickly could allow a vessel engaged in the WGOA Federal pot cod season to finish out that fishery before moving into the Area 610 pollock A/B season. Similarly, a vessel or a plant that participates in summer salmon fisheries would feel less pressure to switch into the pollock C/D season when it opens on August 25.

Tuning catch to market might also result in greater value for processors. A longer season might give plants and their delivering fleet more time to fish farther afield for larger fish that can be used in value added product forms, or it might allow plants to control product flow to achieve the same. However, unless a processor owns harvesting vessels, the ability to slow the fishery is constrained by vessels need to remain productive and get a return on their time. The analysts also acknowledge that not all plants are equally equipped to produce high value-added pollock products. At the most basic level, for a high-volume species like pollock the processing sector's greatest interest in a flexibility measure is likely to be increased TAC utilization; this could come as a result of fewer mid-year closures and less unharvested TAC stranded by the 20% rollover cap.

As alluded to above, combining seasons could occasionally mitigate a race for fish, which is often cited to the Council in public testimony as one of the best tools to minimize Chinook salmon PSC in an open access fishery. Aside from reducing the cost of PSC stand downs, combining the seasons could also allow vessels to reallocate their effort toward parts of the season that are historically correlated with lower Chinook PSC rates. Figure 3-7 in Section 3.3.1.4 suggests that the "A" part of the A/B season and the "D" part of the C/D season carry higher intrinsic PSC rates. Taken at face value, vessels might expect lower PSC rates if they focused effort away from those times. However, it is not clear that seasonality alone drives Chinook PSC. Rates might be higher at the beginning of the fishing year because skippers are learning the conditions on the grounds; rates could also be higher then because vessels are in competition for valuable roe pollock and the fleet is fishing with more effort and exposing itself to extrapolation of observed PSC events to a larger number of unobserved vessels. Higher PSC rates in the D season could be an environmental factor or it could be an effect of poorer weather limiting the ability of smaller vessels to fish farther from port in areas with less observed Chinook encounter. In any event, providing the option to fish what is currently the D season TAC before October 1 represents an additional tool for the fleet.

Many constraints that dictate the timing and pace of the pollock fishery would remain even if seasons were lengthened and the fleet had more available TAC at any given moment with which to optimize its fishing. Some of the natural time determinants for the fishery were already mentioned, such as fish aggregation and roe season. Factors that will slow the fishery include vessel capacities, the 300,000 lbs. trip limit, and processing capacity. On the other hand, factors that could prevent the combined season from stretching to its full length include opportunity costs in other fisheries that require re-gearing or moving out of the GOA, and processors' need to fill wholesale market demand at certain times while competing on a world market. The continued existence of timing and pacing constraints should prevent the larger TAC of a combined season from being harvested in a significantly different manner than history would suggest; rather, under Alternative 2 effort and productivity would be allowed to shift on the margins opportunistically. The maintenance of harvest patterns that are roughly similar to those observed in the past might reduce the risk of this action posing a new or heightened risk to prey availability for protected SSLs.

Although combining the GOA pollock seasons might make the fishery more attractive in some respects, the analysts do not expect Alternative 2 to create a large influx of new vessels entering the fishery. The GOA pollock fleet has remained relatively stable during the recent period of year-on-year TAC increases. Moreover, the current nature of seasonal biomass distribution is placing a large proportion of the TAC in Area 620, which has natural limiting factors in terms of operational efficiencies and profitability. Finally, season exclusivity regulations require AFA pollock vessels to forgo opportunities in the Bering Sea in order to participate in the GOA. AFA vessels tend to be committed to their Bering Sea business plans and would be unlikely to trade-off to participate in an open access fishery.

4.6.3 Alternative 2 Option - Increase the amount on unharvested pollock TAC that NMFS can reallocate to subsequent season

The Council's objective in considering raising the inseason reallocation cap from 20% to (options) 25% or 30% is to reduce the amount of pollock TAC that could be stranded if a season's TAC is severely underharvested in a particular area. Section 2.1.1 outlined the process by which these reallocations are determined, and Section 4.6.1.1 provided two examples of how such situations have arisen and been executed in the past. The efficacy of this option – and the appeal of choosing the suboption that implements the change to a lesser (25%) or greater (30%) extent – depends largely on how the Council chooses to consider the term "stranded." If "stranded" is to mean that pollock quota is lost to the system and *cannot possibly be fished*, then the option to increase the cap is inarguably appealing. However, if "stranded" is to mean that pollock quota is rolled over from an area with low TAC utilization to the subsequent season in the same area and that rolled-over quota is *unlikely to be fished*, then the choice is less clear and hinges on predicting which areas will experience consecutive seasons of poor TAC utilization in the future.

Presuming that this option can only be selected as part of a preferred alternative that includes Alternative 2 – the combining of the A/B and C/D seasons – the rollover cap only comes into play at one point in the year as opposed to three times under Alternative 1. The likelihood of an area experiencing extreme underharvest in two elongated seasons that are separated on the calendar is likely lower than the likelihood of poor harvest in two relatively short seasons that run consecutively. Table 3-2 in Section 3.2.1.2 shows TAC utilization by area and by season from 2012 through 2017. The table does not indicate any instances where an area failed to achieve 50% of its A/B season TAC and then went on to underharvest its C/D season TAC as well. One might presume that catchability improves or other changes occur in the environment or the behavior of fish in a given area as the annual cycle switches from late-winter spawning to the fall.

As noted in Section 4.6.1.1, rollovers from one area to another are not common as they require underharvest by a large margin. That is most likely to occur where TAC is very high, where fish are generally small and unmarketable, where effort is extremely low, or some combination thereof. In recent years, that description might best fit Area 620. However, biomass distributions and year class emergence could change in a cyclical manner over the lifetime of this regulation change (if implemented). Increasing the rollover cap raises the bar for the amount of underharvest required for a reallocation to first fill the underharvested area's cap and then roll the remainder to other areas. If the rollover cap is increased and Area 620 remains the most likely source of underharvest in the A/B season due to its large TAC apportionment, then the unharvested quota that gets reallocated to the 620 C/D season is most likely to be if fishing improves in the fall or if fishing is poor in the other areas (630 and 610).

If stakeholders in one area hope to benefit from underharvest in another area by receiving additional quota in their proximate waters, then the status quo option (20%) seems preferable. The analysts emphasize that the Council is not currently considering a reduction in, or elimination of, the 20% rollover cap in order to make inter-area rollovers more common. In the extreme, reallocating all underharvest to areas with higher expected TAC utilization could result in a higher proportion of the annual TAC being taken in a more concentrated time and space. That outcome – again, in the extreme – might increase the likelihood of adverse effects on prey availability for SSLs.

4.6.4 Alternative 3 - Modify seasonal allocation of Pacific cod TAC for trawl CVs

Alternative 3 would modify the seasonal allocation of Pacific cod for the Western and Central GOA trawl CV sectors. Section 2.3 of this document explains how the analysts have interpreted the language of the Council's alternative and arrived at trawl CV seasonal allocation percentages for each option, doing so without affecting seasonal allocations for other sectors. The potential seasonal allocations under each option are listed in Table 2-5. For simplicity, consider that for each area Option 1 shifts 2% of the B season TAC to the A season, Option 2 shifts 4% of the B season TAC to the A season, and Option 3 shifts 6% of the B season TAC to the A season. Table 4-13, below, translates the seasonal allocation shifts for each option into metric tons of quota based on the harvest specifications for 2016 through 2018. The column labeled "increment" shows the difference in metric tons between the A or B season under each option from the one before it, moving sequentially from left to right in the table (status quo, Option 1, Option 2, Option 3).

In order not to affect allocations for other sectors, this method allows Alternative 3 to alter the existing 60%:40% seasonal allocation ratio between the A and B seasons *across all sectors* in each area. For example, Option 3 would result in 66%:34% ratios between the A and B seasons across all sectors. Translating a shift of that size into a consultation on the potential for impacts on SSLs will require the Agency to consider *both* the magnitude of that percentage shift when translated into metric tons according to harvest specifications in a future year *and* the likelihood of that additional marginal quota actually being harvested in the A season.

The WGOA trawl CV sector fully utilized its A season TAC in 2016 and 2017, but caught only 87% under the lower TAC for 2018. The CGOA trawl CV sector caught 70% of its A season TAC in 2016 and 2017, but caught only 31% under the lower TAC for 2018. Based on that sample of years one might say that additional quota apportioned to the A season has a good chance of being caught during times of normal abundance, but that the GOA Pacific cod fishery is not currently in a normal cycle. Whether the stock rebounds in a matter of years or a matter of decades and whether the cod trawl fleet remains active with extremely low TACs are questions that are best answered several years from now. In terms of effort, it is likely that as TAC levels get lower the trawl fishery will treat cod as an incidental catch species for pollock, and flatfish.[22]

Table 4-13 Retrospective trawl CV TAC (mt) by area and option under Alternative 3, 2016 through 2018

		Status Quo		Option 1		Option 2		Option 3		*Increment*
		A	B	A	B	A	B	A	B	
CG	2016	7,738	7,487	8,502	6,726	9,263	5,965	10,024	5,203	*± 761*
	2017	6,933	6,708	7,617	6,026	8,299	5,344	8,981	4,662	*± 682*
	2018	1,274	1,233	1,400	1,107	1,525	982	1,650	857	*± 125*
WG	2016	7,579	2,928	8,104	2,402	8,629	1,877	9,155	1,352	*± 525*
	2017	6,861	2,650	7,337	2,175	7,812	1,699	8,288	1,224	*± 476*
	2018	1,543	596	1,650	489	1,757	382	1,864	275	*± 107*

To get a sense for the magnitude of the potential marginal wholesale value being added to the A season under each option, one can adjust the "increment" column in Table 4-13 by a scalar that represents expected utilization of the additional A season TAC and then multiply that product by an estimate of wholesale value per metric ton. For example, in 2017 moving from status quo to Option 1 would have increased the WGOA A season TAC by approximately 476 mt. Prior to the 2018 ABC reduction the WGOA tended to fully utilized its A season quota, so assume all of that cod was caught. The 476 mt can

[22] Note that the CGOA TAC numbers in this document are for CVs that are operating outside of the Rockfish Program.

be multiplied by the reader's preferred estimate of wholesale value/mt. For illustration, multiply 476 mt by $3,500/mt and find that the TAC reapportionment generated an estimated $1.67 million in wholesale value.[23] One could apply the same arithmetic to 2017 in the CGOA by adding a step where the "increment" is multiplied by 70% to account for lower expected TAC utilization. Estimates for the 2018 A season would use an adjustment factor of 87% for the WGOA and 31% for the CGOA. The Council will have a better understanding of GOA trawl CVs' A season TAC utilization in the post-2018 abundance regime after several more years of observation at lower levels.

For the following discussion of qualitative impacts on harvesters and processors, the analysts are referring to the general manner in which the fishery operated prior to the 2018 stock decline. Clearly as effort drops dramatically or if Pacific cod becomes a bycatch species for GOA trawl gear then the assertions that follow would need to be reconsidered.

During normal years, the timing of the GOA Pacific cod A season trawl fishery is driven by fish aggregation, roe content, and the pace of demand from processors during what can be a congested part of the year. Harvesters also consider PSC constraints for halibut and Chinook salmon. Bycatch of either PSC species in one GOA FMP subarea affects the ability of vessels in the other area to continue fishing, but the dynamic is slightly different for Chinook salmon. Much of the WGOA trawl CV fleet does not trawl for non-pollock groundfish later in the year, and because the Chinook PSC hard cap is applied cumulatively potential closures are more likely to affect opportunities that occur in the Central GOA (e.g., B season cod or fall flatfish). Halibut PSC can close the fishery for a shorter amount of time, but the first seasonal apportionment of halibut PSC for the shallow-water complex has to last until April 1 so it covers the most important part of the A season peak. A closure on halibut PSC could cause A season revenue to be forgone and vessels to switch into other targets or gear sectors. Moreover, because unused halibut PSC is rolled over from one season to the next, the first seasonal apportionment of the fishing year is the most likely to stop fishing because there is no additional PSC rolled in from a previous season. For Chinook salmon, increasing the A season TAC does not *necessarily* mean that higher PSC levels or PSC rates are expected because year-to-year trends in Chinook PSC are highly unpredictable. For halibut, on the other hand, the EA noted that PSC levels tend to track effort so increased TAC could put additional pressure on the first halibut seasonal apportionment. Increased halibut PSC use in the A season might decrease the comfort level for vessels that might otherwise experiment with flatfish trawling in late spring.

It is not obvious that a marginal increase to the A season TAC would lead to an increase in the number of vessels participating, as the capacity of this competitive fishery could be bounded by processing capacity. One might also consider that if processors are pushed to capacity, they might have less ability to focus on higher value product forms like fillets. Processors would have the ability to decide individually whether additional volume provides a net increase in profitability, all else equal. In the near-term, extremely low TAC levels make it highly unlikely that the fleet will experience any increase in participation under Alternative 3.

[23] The analysts used $3,500/mt as a coarse estimate for wholesale value based on an October 2018 McDowell Group report (produced for ASMI) that listed 2018 YTD wholesale value/mt for Alaska Pacific cod H&G ($3,400/mt) and fillet ($3,850/mt) products. The GOA product for mix reported in Table 4-7 of this document shows an approximately even split between H&G and fillet, so a good estimator should be between the two values. One could just as easily plug in wholesale values from any other year, and perhaps one should because 2018 is an aberrant year for Alaska Pacific cod. The analyst used a 2018 value estimate for this simple exercise because prices for H&G and fillets in previous years were more diverged (higher prices for fillets and lower prices for H&G); $3,500/mt would have been in between the two for each of 2016, 2017 and 2018.

4.7 Summation of the Alternatives with Respect to Net Benefit to the Nation

This section will be updated after the Council selects a preliminary preferred alternative.

5 Magnuson-Stevens Act and FMP Considerations

5.1 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, the Council must consider how to balance the national standards. After the Council completes an initial review of this analysis and potentially designates a preliminary preferred alternative, a brief discussion of how each alternative is consistent with the National Standards will be supplied.

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.

5.2 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 amendment. A fishery impact statement is required to assess, specify, and analyze the likely effects, if any, including the cumulative conservation, economic, and social impacts, of the conservation and management measures on, and possible mitigation measures for (a) participants in the fisheries and fishing communities affected by the plan amendment; (b) participants in the fisheries conducted in adjacent areas under the authority of another Council; and (c) the safety of human life at sea, including whether and to what extent such measures may affect the safety of participants in the fishery.

The EA/RIR/IRFA prepared for this plan amendment constitutes the fishery impact statement. The likely effects of the proposed action are analyzed and described throughout the EA/RIR/IRFA. The effects on participants in the fisheries and fishing communities are analyzed in the RIR/IRFA sections of the analysis. Based on the information reported in this section, there is no need to update the Fishery Impact Statement included in the FMP.

The proposed action affects the 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.

5.3 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.

In considering this action, the Council is being consistent with its ecosystem approach policy.

6 Preparers and Persons Consulted

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