Discussion Paper: Modifications to Gulf of Alaska Pollock and Pacific Cod Seasonal Allocation

May 25, 2018[1]

1 Actions Under Consideration 2
1.1 Pollock 2
1.2 Pacific Cod 3
2 Options to Modify Seasonal TAC Allocation 4
2.1 Status Quo TAC and Seasonal Allocation 5
2.2 Pollock Seasonal TAC Allocation (610/620/630) 7
2.3 Pacific Cod Seasonal TAC Allocation (WGOA/CGOA) 10
2.4 BSAI Amendment 110 Summary 13
3 Fishery Information 14
3.1 Fishery Participation 14
3.2 Harvest 16
3.3 Fishery Product Value 25
3.3.1 Product Mix and Value 25
3.3.2 Fish Size 29
4 Prohibited Species Catch 30
5 Steller Sea Lion Considerations 33
5.1 Description and Status of SSL Populations 33
5.2 ESA Section 7 Consultation Process 36
Appendix 1: Pollock Tables 37
Appendix 2: Pacific Cod Tables 40
Appendix 3: Product Form Volume & Value by Month 46
Appendix 4: Fish Size 47

In December 2017 the Council tasked staff to prepare a discussion paper on potential modifications to the GOA pollock and Pacific cod seasonal TAC allocations. The Council requested an overview of changes relative to status quo in available harvest by season, sector, and area, as well as a scoping of potential effects on fishery value, bycatch of prohibited species, and efficiency of inseason fishery management.

Gulf of Alaska (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.[2] Inshore pollock TAC is allocated equally (25%) across four seasons (A through D).[3] 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

[1] Prepared by Sam Cunningham (NPFMC). Contributors include Mike Fey (AKFIN); Obren Davis, Mary Furuness, Josh Keaton, and Bridget Mansfield (NMFS AKRO SF); Ben Fissel (AFSC)
[2] 66 FR 7278
[3] 68 FR 204, January 2, 2003; modified by 69 FR 56384, September 21, 2004.

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.

This tasking item arose from a series of four discussion papers that can be found under Agenda Items D-1 through D-4 on the December 2017 Council agenda.[4] The first three of those papers scoped the potential for net reductions in Chinook salmon and halibut prohibited species catch (PSC) as a result of changing GOA groundfish trawl season dates and/or the pollock catcher vessel (CV) trip limit. After reviewing those papers, the Council did not find a clear connection between season-date adjustments and PSC reduction; the Council also identified potential for indirect allocative effects between subsets of the GOA trawl fleet. The fourth paper addressed the amount of uncaught Pacific cod TAC in the B season (Sept. 1 through Dec. 31) in all gear sectors, and scoped opportunities for—and complications with—regulatory changes intended to increase TAC utilization.

The Council's task in reviewing this paper is to determine whether to formalize a set of alternatives and initiate an analysis of pollock and/or Pacific cod seasonal allocation changes. If the Council desires an analysis, this meeting should develop a record that will inform the purpose and need for the action. In other words, the Council's discussion should inform the public as to whether subsequent action is intended primarily to increase fishery yield, to provide flexibility in prosecuting the fishery under existing constraints (e.g., regulations, bycatch, and variations in the fishery and the environment), or to minimize bycatch. In the likely event that the Council has multiple goals, it should consider how it plans to balance the Magnuson-Stevens Act National Standards.

Section 1 describes the options under preliminary consideration in this paper, as well as issues in need of Council clarification. Section 2 describes the status quo of GOA pollock and Pacific cod allocations and reports the percentage-changes in area and seasonal TAC distribution under the considered options. Extensive tables showing how allocations would change (or would have changed) under the options are included in Appendices 1 and 2. Section 3 provides a brief overview of harvesting and processing participation in these GOA fisheries, TAC utilization, and product values (annual and seasonal). Section 4 reports Chinook salmon and halibut PSC levels and rates during recent years. Section 5 describes the current status of ESA-listed Steller sea lion populations in Alaska and lays out the process for analysis and consultation required for changes to seasonal groundfish TAC allocations.

1 Actions Under Consideration

The Council's motion proposes seasonal TAC allocation changes for both the GOA pollock and Pacific cod fisheries. A set of options for each fishery is presented separately below. Under each set of options, staff has identified one critical item of clarification that is needed before any subsequent analysis can proceed. For pollock, the Council should clarify whether it intends to consider any modification to management in Area 640. For Pacific cod, the Council should state whether it intends to confine the direct effect of any action to the trawl CV sector or whether a season allocation change might be applied across all GOA gear and operational types (including catcher/processors, pot gear, and hook-and-line gear).

1.1 Pollock

Council motion:

Pollock in Areas 610, 620, 630, and 640

[4] 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

Option 1: Modify the allocation of pollock among existing A, B, C, and D seasons as follows:
Suboption 1: A Season: 30%; B Season: 25%; C Season 25%; D season 20%
Suboption 2: A Season: 30%; B Season: 30%; C Season 20%; D season 20%

Option 2: Combine the A and B season into a single season, and combining the C and D season into a single season, and allocate pollock among a combined A/B and C/D seasons as follows:
Suboption 1: A/B Season: 50 %; C/D season 50%
Suboption 2: A/B Season: 55 %; C/D season 45%
Suboption 3: A/B Season: 60 %; C/D season 40%

Option 3: Increase the amount of unharvested pollock that may be reallocated from one season to the following season, or among areas, from 20% to:
Suboption 1: 25%
Suboption 2: 30%

Option 3 could be applied to the existing A, B, C, and D seasonal allocation, or to A/B and C/D allocations described in Options 1 and 2.

The Council's motion refers to Areas 610 through 640. Area 640 is the West Yakutat (WY) district of the Eastern GOA. The pollock TAC in Area 640 is not divided into seasonal allowances.[5] While TAC for Areas 610, 620, and 630 is divided first by season—25% to each of the A/B/C/D seasons—and then apportioned within each season according to seasonal biomass distribution, the 640 TAC is entirely allocated to the Inshore component. The WY pollock fishery is typically prosecuted by a small number of Kodiak-based CVs and catch equals only a small proportion of the TAC. 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). CPs targeting WY rockfish species in July take a small about of pollock.[6] Moreover, Chinook salmon taken in the WY area—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. **Staff recommends that the Council strike "640" from the header in its options for pollock fishery seasonal TAC allocations and focus on Areas 610, 620, and 630 if this action is to proceed.**

1.2 Pacific Cod

Council motion:

Pacific cod in the Western and Central GOA
Modify the allocation of Pacific cod 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 Council should clarify whether its intent is to modify the seasonal allocation of GOA Pacific cod TAC exclusively in the trawl CV sector or across all sectors for which a Pacific cod allocation is defined in regulation at §679.20(a)(12)(i). (Sector allocations are listed in Table 2 and Table 3 of this document). The effects of an action that includes not only trawl CVs but also trawl CPs and fixed-gear CVs and CPs

[5] Refer to Footnote 2 in Table 1 of the annual GOA harvests specifications, e.g., https://alaskafisheries.noaa.gov/sites/default/files/18_19goatable1.pdf.
[6] GOA inshore-offshore allocations are defined at §679.20(a)(6).

would be substantially more wide-ranging. The December 2017 discussion paper series that preceded this Council motion was a mixture of papers focused on minimizing trawl CV PSC and a paper about increased utilization of Pacific cod B season TAC across all sectors. The option presented above is crafted in relation to the status quo A/B seasonal allocation ratio of 60% to 40%, which connotes all GOA gear and operational-type sectors. The 60%:40% ratio between the A and B season only holds when all sector allocations are summed within an area (WGOA/CGOA) and season (A/B). The WGOA trawl CV sector's A season allocation is 27.70% of the total annual WGOA TAC and its B season allocation is 10.70% of the WGOA TAC. The CGOA trawl CV sector's A season allocation is 21.14% of the total annual CGOA TAC and its B season allocation is 20.45% of the CGOA TAC. As a result, the trawl CV sector does not have a 60/40 split. Rather, the status quo season allocation within the trawl CV sector is roughly 72%:28% in the WGOA and 51%:49% in the CGOA.

This discussion paper does not presume the Council's intent. This paper illustrates the potential effect of rebalancing seasonal allocations under three scenarios: (1) change at the season-level reflected across all sectors within an area; (2) change only the trawl CV sector's seasonal allocations in proportion to Options 1 through 3 (+/- 5% increments) while holding all other sector seasonal allocation percentages at status quo; and (3) change the trawl CV sector's seasonal allocations in proportion to Options 1 through 3 while adjusting other sectors' allocations such that a 60%:40% seasonal allocation ratio within each area is maintained.

Should the Council move forward with an action that would shift the relative allocation of Pacific cod TAC to sectors, it should bear in mind that 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 workplan 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.[7] In June 2017 NPFMC staff prepared a discussion paper that summarizes the allocation review policy and the steps to conducting a review.[8]

2 Options to Modify Seasonal TAC Allocation

This section considers the direct effects of reallocating Federally managed GOA pollock TAC from the C/D to the A/B season and GOA Pacific cod TAC from the B to the A season.[9] The first subsection describes the current seasonal allocations of GOA pollock and Pacific cod. The second and third subsections lay out the arithmetic of how pollock seasonal allocations would shift by regulatory area (610/620/630), and how Pacific cod allocations might shift by harvest sector depending on how the Council might structure the action. The fourth subsection provides a summary of the rationale for BSAI Groundfish FMP Amendment 110[10], which changed seasonal allocations in the Bering Sea to make more

[7] http://npfmc.legistar.com/gateway.aspx?M=F&ID=d58abe8d-6d7c-46db-be0c-77ef7d3b260d.pdf
[8] http://npfmc.legistar.com/gateway.aspx?M=F&ID=d4f2c89a-350b-462d-8578-ea94f8e56661.pdf
[9] The options considered would not impact harvest quotas for the Prince William Sound pollock GHL fishery or the state-managed fixed-gear Pacific cod fishery.
[10] 81 FR 37534, June 10, 2016 Final Rule to Implement Amendment 110 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area.

pollock TAC available for harvest earlier in the year. BSAI Amendment 110 provides a recent, relevant example of a Council action that shifted seasonal TAC allocation in the context of bycatch and protected species considerations. This information might be useful in foreshadowing the type of analysis that would be required to alter seasonal pollock and Pacific cod TACs in the GOA.

2.1 Status Quo TAC and Seasonal Allocation

GOA pollock and Pacific cod TACs are seasonally apportioned to slow the pace of the fishery and distribute catch throughout the calendar year so that the groundfish fisheries are not likely to cause jeopardy of extinction or adverse modification of critical habitat for SSLs. (Additional information on SSL status determination and protection measures is included in Section 5 of this document.)

Pollock

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. 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 1. It should be noted that the premise of basing area allocations on biomass distribution is to catch fish where they are estimated to be, so it is not suggested that the Council take any action to increase TAC apportionment to areas where catch rates would be expected to be poor. Nevertheless, the Council should be aware that the net result of actions shifting pollock TAC from the C/D to the A/B seasons results in a shift of available harvest from Areas 610 and 630 to Area 620; those calculations are provided in Section 2.2, below.

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 1 GOA pollock seasonal allocations, 2003 versus 2018

Season	Year	610	620	630
A	2003	25.0%	56.0%	19.0%
	2018	3.5%	72.5%	24.0%
B	2003	25.0%	66.0%	9.0%
	2018	3.5%	85.4%	11.1%
C	2003	47.0%	23.0%	30.0%
	2018	36.6%	26.6%	36.8%
D	2003	47.0%	23.0%	30.0%
	2018	36.6%	26.6%	36.8%

Germane to pollock Option 3, NMFS has the ability to roll over unharvested pollock to the next season in the same or other GOA regulatory areas. Regulations at §679.20(a)(5)(iv)(B) state that underharvested TAC may be added a subsequent seasonal allocation "in a manner to be determined by the Regional Administrator [NMFS], provided that any revised seasonal apportionment does not exceed 20 percent of the seasonal TAC apportionment for the statistical area." Staff has interpreted—and the Council has concurred—that 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. The paragraph goes on to state that underharvest would be applied first to the subsequent season in the same area, and any remaining portion could be further apportioned to other areas. Given NMFS's latitude to determine the manner of reallocation, the Agency is not bound to keep unharvested TAC within an area for which there is low effort or foreseeably low catch rates.

Pacific Cod

The GOA Pacific cod seasons for the WGOA and CGOA are defined as follows:

Trawl	Non-Trawl
A – January 20 to June 10	A – January 1 to June 10
B – September 1 to November 1	B – September 1 to December 31

Across all gear and operational-type 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 and Table 3). Sectors that receive a small percentage of the 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.

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.)

Table 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 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."[11] 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.[12] 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.

2.2 Pollock Seasonal TAC Allocation (610/620/630)

Option 1

Option 1 proposes shifting pollock TAC towards the A and B seasons, relative to the status quo under which each of the four seasons receives 25% of the annual GOA-wide TAC before intra-season allocations are made to the three regulatory areas based on biomass distribution. Relative to status quo, Suboption 1 shifts 5% more TAC from the C/D seasons to the A/B seasons; Suboption 2 shifts and additional 5% to the A/B seasons. Table 4 shows the change in annual TAC that each area would experience under Suboptions 1 and 2. In all cases, shifting TAC to the A/B seasons increases the allocation for Area 620 and decreases TAC in 610 and, to a lesser extent, 630. The difference in the percent-change between 2017 and 2018/2019 is the result of different seasonal biomass distribution estimates. The shift towards Area 620 is more dramatic in 2018/2019 relative to 2017 because the A and

[11] Section 679.20(a)(12)(ii)
[12] https://alaskafisheries.noaa.gov/sites/default/files/GOA_Pcod_reallocation_2012-2016.pdf

B allocation percentage to Area 610 fell from 4.67% to 3.50%, while the B season allocation percentage to Area 630 fell from 12.85% to 11.11%. The difference in the gross change (mt) between 2018 and 2019 is the result of a lower overall GOA pollock TAC projected for 2019.

Table 5 shows how each area's pollock TAC is distributed across the four seasons under the status quo and the two suboptions. All areas would have a higher percentage of their annual TAC in the A and B seasons under the suboptions. The "% Annual" row reads horizontally to equal 100% for each year; comparing those rows across suboptions reflects that the total TAC for the three areas shifts toward Area 620 under the suboptions. For Area 610, the difference between status quo and Suboption 2 is roughly 3% to 4% less TAC. For Area 630 the difference is roughly 2% less TAC. For Area 620 the difference is roughly 5% more TAC.

Refer to the **Appendix 1** for more extensive tables that show each area's seasonal TAC allocations across all suboptions, reflecting the actual 610/620/630 TACs and biomass distribution estimates from 2017 through 2019.

Table 4 Option 1: Change in annual pollock TAC allocation by regulatory area

			Relative to Status Quo…		
			610	620	630
Subopt. 1	2017	mt	-3,467	4,442	-975
		%Change	-8.0%	4.5%	-2.0%
	2018	mt	-2,492	3,461	-968
		%Change	-8.3%	4.4%	-2.4%
	2019	mt	-1,644	2,284	-639
		%Change	-8.3%	4.4%	-2.4%
Subopt. 2	2017	mt	-6,934	9,858	-2,924
		%Change	-15.9%	10.0%	-6.0%
	2018	mt	-4,984	7,889	-2,904
		%Change	-16.5%	9.9%	-7.1%
	2019	mt	-3,289	5,206	-1,916
		%Change	-16.5%	9.9%	-7.1%

Table 5 Option 1: Change in seasonal distribution of pollock TAC by regulatory area

		2017			2018/19		
		610	620	630	610	620	630
Status Quo	Season	% Area TAC			% Area TAC		
	A	5%	35%	23%	4%	34%	22%
	B	5%	40%	13%	4%	40%	10%
	C	45%	13%	32%	46%	13%	34%
	D	45%	13%	32%	46%	13%	34%
	% Annual	23%	52%	26%	20%	53%	27%
Subopt. 1	Season	% Area TAC			% Area TAC		
	A	7%	40%	28%	6%	40%	27%
	B	6%	38%	13%	5%	39%	10%
	C	49%	12%	33%	50%	12%	35%
	D	39%	10%	27%	40%	10%	28%
	% Annual	21%	54%	25%	18%	55%	27%
Subopt. 2	Season	% Area TAC			% Area TAC		
	A	7%	38%	29%	6%	38%	28%
	B	7%	44%	16%	6%	44%	13%
	C	43%	9%	28%	44%	9%	29%
	D	43%	9%	28%	44%	9%	29%
	% Annual	19%	57%	24%	17%	58%	25%

Option 2

Option 2 proposes combining the A/B seasons and the C/D seasons. Suboption 1 is analogous to the status quo, with a 50%:50% TAC allocation between the two segments of the year as opposed to the 25%/25%/25%/25% allocation that currently exists across four seasons. Suboption 2 is analogous to Option 1 Suboption 1 (55% of TAC in the A/B season; 45% in the C/D season). Suboption 3 is analogous to Option 1 Suboption 2 (60% of TAC in the A/B season; 40% in the C/D season).

Table 6 and Table 7 mirror the two tables under the Option 1 heading and show the same directional shift in TAC relative to status quo. Table 6 uses Suboption 1 as the baseline for comparison because of its similarity to status quo. For situations where an area's A and B or C and D biomass distribution percentages are not the same, staff has applied an average of the two connected seasons' distributions. This is the case for the A/B seasons in Area 620 and 630. As under status quo, the distribution percentages across the three areas still sum to 100% within each season.

As with Option 1, refer to the **Appendix 1** for more extensive tables that show each area's seasonal TAC allocations across all suboptions, reflecting the actual 610/620/630 TACs and biomass distribution estimates from 2017 through 2019.

Table 6 Option 2: Change in annual pollock TAC allocation by regulatory area

			Relative to Suboption 1…		
			610	620	630
Subopt. 2	2017	mt	-3,467	4,929	-1,462
		%Change	-8.0%	5.0%	-3.0%
	2018	mt	-2,492	3,945	-1,452
		%Change	-8.3%	5.0%	-3.5%
	2019	mt	-1,644	2,603	-958
		%Change	-8.3%	5.0%	-3.5%
Subopt. 3	2017	mt	-6,934	9,858	-2,924
		%Change	-15.9%	10.0%	-6.0%
	2018	mt	-4,984	7,890	-2,904
		%Change	-16.5%	9.9%	-7.1%
	2019	mt	-3,289	5,206	-1,916
		%Change	-16.5%	9.9%	-7.1%

Table 7 Option 2: Change in seasonal distribution of pollock TAC by regulatory area

		2017			2018/19		
		610	620	630	610	620	630
	Season	% Area TAC			% Area TAC		
Subopt. 1	A/B	10%	75%	35%	9%	75%	32%
(~status	C/D	90%	25%	65%	91%	25%	68%
quo)	% Annual	23%	52%	26%	20%	53%	27%
	Season	% Area TAC			% Area TAC		
Subopt. 2	A/B	12%	79%	40%	10%	78%	37%
	C/D	88%	21%	60%	90%	22%	63%
	% Annual	21%	54%	25%	18%	55%	27%
	Season	% Area TAC			% Area TAC		
Subopt. 3	A/B	15%	82%	45%	13%	82%	42%
	C/D	85%	18%	55%	87%	18%	58%
	% Annual	19%	57%	24%	17%	58%	25%

2.3 Pacific Cod Seasonal TAC Allocation (WGOA/CGOA)

The Council proposed three options for shifting Pacific cod TAC from the B season to the A season. Option 1 shifts 5% more TAC to the A season relative to status quo, and Options 2 and 3 shift more TAC to the A season in 5% increments. Option 3 represents the greatest shift, resulting in 75% of the TAC in the A season and 25% in the B season. As described in Section 2.1, the Pacific cod TAC within each area (WGOA/CGOA) and each season (A/B) is further allocated across gear and operational type sectors. This section traces out how each sector's A and B season TAC would change under the three options. Because it is unclear whether the Council intended to confine this action to the trawl CV sector or let it apply to all sectors that make up the 60%:40% season-split, staff has shown three different approaches: (A) apply the Options at the area/season level, across all sectors; (B) change only the Trawl CV sector's A/B allocation

using 5% increments; (C) same as 'B' but with proportional adjustments to maintain an overall area/season ration 60%:40%. All calculations were performed after removing the jig gear TAC set-aside from the annual WGOA and CGOA TACs.[13]

This paper does not analyze the environmental effects of shifting Pacific cod harvest to the A season. However, having communicated with GOA Pacific cod stock assessors, staff notes that any future analysis should consider whether additional harvest concentrated around the time that Pacific cod aggregate to spawn would have an adverse impact on the recovery of a stock that is currently at a low level of abundance.

For each of the three options, Table 8 through Table 10 show the percentage change in seasonal TAC by sector relative to status quo. The three tables reflect the three approaches to the TAC shift that are described above. The "CG Total" and "WG Total" rows in each table reflect the deviation from the current 60%:40% seasonal allocation at the area level across all sectors. Complete tables showing these TAC reallocation scenarios for each sector expressed in terms of metric tons of Pacific cod are provided in **Appendix 2**.

Approach A (Table 8) shows a pure shift in seasonal allocation. Under that approach, the marginal +/- 5% change in each option is distributed across the sectors in proportion to how much of that area/season's TAC each sector currently receives. For example, the CGOA Trawl CV sector currently receives 35% of the A season TAC and 51% of the B season TAC; under Option 1, that sector's A season TAC is increased by 35%*5% and the B season TAC is decreased by 51%*5%. Option 3 represents the largest possible shift relative to the status quo. Across all CGOA sectors, Option 3 would have shifted 5,492 mt of Pacific cod from the B season to the A season in 2016, 4,920 mt in 2017, and 904 mt in 2018. Across all WGOA sectors, Option 3 would have shifted 4,104 mt of Pacific cod from the B season to the A season in 2016, 3,715 mt in 2017, and 836 mt in 2018. Because of the way that TAC is allocated across sectors within each season, the effect on each sector is not a direct transfer within-sector from B to A. Using 2017 as an example, the sector with the largest net gain in the CGOA is hook-and-line CVs ≥ 50'—losing 134 mt in the B season but gaining 460 mt in the A season (net change of +326 mt). The CGOA sector with the greatest reduction is trawl CVs—losing 2,515 mt in the B season and gaining 1,734 mt in the A season (net change of -781 mt). By contrast, the trawl CV sector would have been the largest net gainer in the WGOA (net change of +721 mt) while the pot sector would experience the largest reduction (net change of +464 mt).

[13] The CGOA jig set-aside was 1.0% of the TAC from 2016 through 2018. In the WGOA, the jig set-aside was 3.5% of TAC in 2016, 2.5% in 2017, and 1.5% of TAC in 2018.

Table 8 Approach A: Percent change in seasonal TAC by sector, relative to status quo

		Option 1		Option 2		Option 3	
		A	B	A	B	A	B
CG	HAL CV < 50	0.77%	-0.66%	1.55%	-1.32%	2.33%	-1.98%
	HAL CV ≥ 50	0.47%	-0.14%	0.93%	-0.28%	1.40%	-0.41%
	HAL CP	0.34%	-0.13%	0.68%	-0.25%	1.03%	-0.38%
	Trawl CV	1.76%	-2.56%	3.52%	-5.11%	5.28%	-7.67%
	Trawl CP	0.17%	-0.27%	0.33%	-0.55%	0.50%	-0.82%
	Pot (CV/CP)	1.48%	-1.25%	2.97%	-2.49%	4.45%	-3.74%
	CG Total	5%	-5%	10%	-10%	15%	-15%
WG	HAL CV	0.06%	-0.09%	0.12%	-0.18%	0.18%	-0.26%
	HAL CP	0.91%	-1.11%	1.82%	-2.23%	2.73%	-3.34%
	Trawl CV	2.31%	-1.34%	4.62%	-2.68%	6.92%	-4.01%
	Trawl CP	0.07%	-0.19%	0.15%	-0.38%	0.23%	-0.56%
	Pot (CV/CP)	1.65%	-2.28%	3.30%	-4.55%	4.95%	-6.83%
	WG Total	5%	-5%	10%	-10%	15%	-15%

Approach B (Table 9) shows a shift for only the trawl CV sector. Because that sector does not currently have a 60%:40% seasonal allocation ratio, the table shows incremental shifts of +/- 5% of that sector's internal A/B season split. For example, the CGOA trawl CV sector is currently allocated 21.14% of the A season TAC and 20.45% of the B season TAC. Those two figures are at a 51%:49% ratio to each other. The table below shows the result of increasing that ratio to 56%:44% (Option 1), 61%:39% (Option 2), and 66%:34% (Option 3). Because only one sector's seasonal allocation is changed, the area-wide A/B season split is altered from the 60%:40% ratio. For example, under Option 3 the A/B season split across all gear sectors would be 66%:34% in each area. Using Option 3 as an endpoint, the tables in the Appendix show that the CGOA trawl CV TAC would have shifted 2,286 mt from the B season to the A season in 2016, 2,048 mt in 2017, and 376 mt in 2018. The WGOA trawl CV TAC would have shifted from B to A by 1,576 mt in 2016, 1,427 mt in 2017, and 321 mt in 2018.

Table 9 Approach B: Percent change in seasonal TAC by sector, relative to status quo

		Option 1		Option 2		Option 3	
		A	B	A	B	A	B
CG	HAL CV < 50	0%	0%	0%	0%	0%	0%
	HAL CV ≥ 50	0%	0%	0%	0%	0%	0%
	HAL CP	0%	0%	0%	0%	0%	0%
	Trawl CV	2.08%	-2.08%	4.16%	-4.16%	6.24%	-6.24%
	Trawl CP	0%	0%	0%	0%	0%	0%
	Pot (CV/CP)	0%	0%	0%	0%	0%	0%
	CG Total	2%	-2%	4%	-4%	6%	-6%
WG	HAL CV	0%	0%	0%	0%	0%	0%
	HAL CP	0%	0%	0%	0%	0%	0%
	Trawl CV	1.92%	-1.92%	3.84%	-3.84%	5.76%	-5.76%
	Trawl CP	0%	0%	0%	0%	0%	0%
	Pot (CV/CP)	0%	0%	0%	0%	0%	0%
	WG Total	2%	-2%	4%	-4%	6%	-6%

Approach C (Table 10) applies the same methodology as Approach B but counterbalances the shift of trawl CV TAC towards the A season by reducing other sectors' A season allocation and increasing their B

season allocation. The amount by which each non-trawl CV sector's TAC is increased or decreased is proportional to how much of that season's non-trawl CV TAC is currently allocated to the sector. For example, the WGOA pot sector is allocated 61% of all the A season TAC that is *not* allocated to the trawl CV sector, so 61% of the adjustment necessary to maintain the overall 60% A season allocation in that area is taken from the pot sector. Conversely, the WGOA pot sector is allocated 62% of all the B season TAC that is not allocated to the trawl CV sector, so 62% of the adjustment necessary to maintain the overall 40% B season allocation in that area is given to the pot sector. Again, using Option 3 as an endpoint, the shift in seasonal TAC for the trawl CV sector is the same as under Approach B (above). Among the other sectors, the largest net gain would occur in the trawl CP sector in both the CGOA and the WGOA. Because the proportionally weighted adjustments to the non-trawl CV sectors are cuts to the A season and additions to the B season, the sectors with a larger proportion of their annual quota in the B season tend to benefit. The sectors that would experience a net reduction in annual TAC are the hook-and-line CVs ≥ 50' and the hook-and-line CPs in the GOA, and the hook-and-line CPs in the WGOA. In 2017 those sectors would have experienced a net reduction in annual TAC of -179 mt, -109 mt, and -48 mt, respectively.

Table 10 Approach C: Percent change in seasonal TAC by sector, relative to status quo

		Option 1		Option 2		Option 3	
		A	B	A	B	A	B
CG	HAL CV < 50	-0.50%	0.56%	-1.00%	1.13%	-1.50%	1.69%
	HAL CV ≥ 50	-0.30%	0.12%	-0.60%	0.23%	-0.90%	0.35%
	HAL CP	-0.22%	0.11%	-0.44%	0.21%	-0.66%	0.32%
	Trawl CV	2.08%	-2.08%	4.16%	-4.16%	6.24%	-6.24%
	Trawl CP	-0.11%	0.23%	-0.21%	0.47%	-0.32%	0.70%
	Pot (CV/CP)	-0.95%	1.06%	-1.91%	2.12%	-2.86%	3.18%
	CG Total	0%	0%	0%	0%	0%	0%
WG	HAL CV	-0.04%	0.05%	-0.08%	0.09%	-0.12%	0.14%
	HAL CP	-0.65%	0.58%	-1.30%	1.17%	-1.94%	1.75%
	Trawl CV	1.92%	-1.92%	3.84%	-3.84%	5.76%	-5.76%
	Trawl CP	-0.05%	0.10%	-0.11%	0.20%	-0.16%	0.29%
	Pot (CV/CP)	-1.18%	1.19%	-2.35%	2.39%	-3.53%	3.58%
	WG Total	0%	0%	0%	0%	0%	0%

2.4 BSAI Amendment 110 Summary

BSAI Amendment 110 was centrally focused on minimizing Chinook and chum salmon bycatch in the BS pollock fishery. As part of that action, the allocation of BS pollock TAC between the A season (Jan. 20 through June 10) and the B season (June 10 through Nov. 1) was shifted towards the A season such that 45% of the TAC is available in the A season and 55% is available in the B season (the final rule maintained the ability to roll over unharvested A season TAC back to the B season). That action was taken in conjunction with AFA cooperative plan agreements to shift effort from the later portion of the B season to the earlier portion, when historical Chinook bycatch rates in the BS are lower. The analysis prepared for the action notes that while season-wide Chinook PSC rates in the BS A season are higher than in the B season, the *late* B season PSC rate was more than three times that of the A season (2011-2014 data); as a result, shifting fishing out of September and October should provide a net salmon

savings.[14] Moreover, the rationale in the Final Rule notes that BS pollock is more valuable in the A season, so the action could increase the total value of the fishery and offset industry costs sustained to avoid Chinook salmon.

The Amendment 110 EA addressed the effects of the BS pollock fishery on prey availability for SSLs (Section 3.7.1) The EA notes that SSL protection measures were implemented in that fishery in 2003 (68 FR 204). Those measures included the closure of important nearshore sea lion sites, a critical habitat harvest limit for the Sea Lion Conservation Area, other area restrictions, and the modified season dates and seasonal TAC allocations. A 2010 Biological Opinion (BiOp) found that groundfish fisheries did jeopardize the Western distinct population segment of SSLs, but that BiOp did not implicate the BS pollock fishery; rather, it was focused on the Aleutian Islands Pacific cod and Atka mackerel fisheries, for which new SSL protection measures were set in 2011 and 2015 (75 FR 77535 & 81921, and 79 FR 70286). The analysis found that the BS pollock A season is more temporally compressed than the B season, so moving additional TAC to the A season might affect SSL prey availability in a manner that was not considered in the 2010 BiOp. As a result, NMFS conducted an informal consultation under section 7 of the ESA to determine whether (a) the proposed modification to the season allocations would be likely to adversely affect Steller sea lions, and (b) would require formal consultation and issuance of a biological opinion. The informal consultation considered the high historical TAC utilization rate in the A season and assumed that the additional 5% of TAC moved to that season would be harvested in the future, and that the A season would be extended by approximately three weeks, dissipating in late April). By contrast, the B season would end three weeks earlier (mid-September). The total duration of the BS pollock season was not expected to change. The consultation concluded that shifting fishing effort from October to April reduces competition for prey during a critical time for SSLs to feed, thus providing a net reduction in potential adverse impacts. Finally, the consultation found that the inter-seasonal TAC reallocation would not alter the spatial distribution of the BS pollock fishery, and thus would not affect critical habitat area closures and harvest limits.

In terms of process, the "action agency" (NMFS Alaska Region Sustainable Fisheries) consulted with the "consulting agency" (NMFS Alaska Region Protected Resources) on the potential effects of Amendment 110 on SSLs. AKRO SF sent a memo with a Biological Assessment to AKRO PR that outlined the action and made an assessment of potential effects on SSLs. The memo concluded that the action was not likely to modify the pollock fishery or designated critical habitat in a manner that had *not* been considered in previous ESA section 7 consultations. AKRO PR issued a Letter of Concurrence with that assessment, and thus no further consultation was required. Had AKRO PR not concurred, a formal consultation would have been initiated, including the writing of a Biological Determination with an in-depth analysis of the action's potential to create jeopardy and adverse modification to critical habitat.

3 Fishery Information

3.1 Fishery Participation

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, 97 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 11 shows the number of vessels that participated in 2017 Federally-managed GOA pollock and Pacific cod fisheries, by season and gear type.

[14] NMFS. 2016. Environmental Assessment and Regulatory Impact Review for Amendment 110 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Island Area. NMFS, P.O. Box 21668, Juneau, Alaska 99801. Available at: https://alaskafisheries.noaa.gov/sites/default/files/analyses/bsai110finalearir.pdf

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.[15] 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. 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).

Table 11 Active GOA pollock and Pacific cod vessels 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

Future analysis will consider the potential for vessels to shift effort between GOA areas (e.g., from pollock Area 610 to 620). Regulations limit the number of CVs that participate in the GOA pollock and Pacific cod fisheries through seasonal exclusivity in the pollock fishery (§679.23(i)) and a mandatory stand down period in the Pacific cod fishery (§679.23(h)). 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 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.

Table 12 shows the number of processors that received GOA pollock and Pacific cod deliveries from 2012 through 2017 (Pacific cod processing is aggregated across all gear types.) The table reflects the fact that the GOA processing sector for these species is relatively concentrated at the top end. The higher-volume processors are located in Kodiak, Sand Point, King Cove, Akutan, and Unalaska/Dutch Harbor. The increasing proportion of pollock product produced by the top three processing facilities reflects some consolidation of deliveries in Kodiak.

[15] http://npfmc.legistar.com/gateway.aspx?M=F&ID=efbe8240-bc47-4006-92d2-c5ac6d061a06.pdf

Table 12 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

3.2 Harvest

Pollock

Table 13 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%). NMFS staff notes that catch accounting reports for pollock are generated based upon the initially specified TAC, and that changes to area/season allocations via inseason rollovers are tracked manually. 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 (610/20/30) TAC has not been exceeded.

Underharvest in the A or C seasons followed by complete harvest or overharvest in the B or D seasons might suggest a situation where the 20% rollover cap resulted in stranded TAC. For subsequent analysis, NMFS staff would be able to recreate and identify situations where the rollover cap had a limiting effect. From this table, examples of situations where the 20% cap might have constrained harvest potential include the 2012 through 2015 A season in Area 610, and the 2015 through 2017 C season in Area 620. Table 14 shows that the 610 A seasons from 2012 through 2015 were followed by B seasons in most or all areas that were fully harvested and that experienced TAC closures as early as mid-March. Aside from the 2014 B season in 610 and the 2015 B season in 620, B season pollock fisheries were open for less than 50% of the season during that period. The C seasons in 620 during 2015 and 2016 were followed by under harvest in the 620 D season, but the Area 610 and 630 D seasons were well-harvested; however, Table 14 shows that those seasons did not close on TAC so there is less of a case to be made that additional roll-over TAC from 620 could have been harvested in those areas. The D season in Areas 610 and 630 has not closed since 2013, and the D season in Area 620 has been open for over 90% of days in all years during that period. Underharvest in the D season can be a factor of fish aggregation, market demand, and Chinook PSC constraints, so it is not necessarily solved by uncapping rollovers of uncaught C season TAC. Nevertheless, increasing the cap could provide NMFS with an additional tool to better achieve optimum yield. A clear opportunity for such a move would be if one GOA subarea (WGOA or CGOA) is at or near its Chinook salmon PSC limit heading into the D season; NMFS and the fleet might recognize that effort in one area will be constrained and thus would prefer to roll-over uncaught C season TAC into a different area.

Table 13 GOA pollock TAC and percent caught by area and season, 2012 through 2017 (seasons and years with <50% TAC utilization highlighted 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.

Table 14 can also be used to identify 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 better and 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. 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

(see Section 4); in some cases, fishery 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.

Table 14 shows that 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 14 also identifies short closures between the A and B seasons. Three examples in the table include 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 ESA-listed SSLs (see Section 5).

Table 14 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

Figure 1 and Figure 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 WGOA 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). This type of spatial effort data might be of interest in future analyses that assess local seasonal prey availability for protected marine mammals (e.g., Steller sea lions).

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

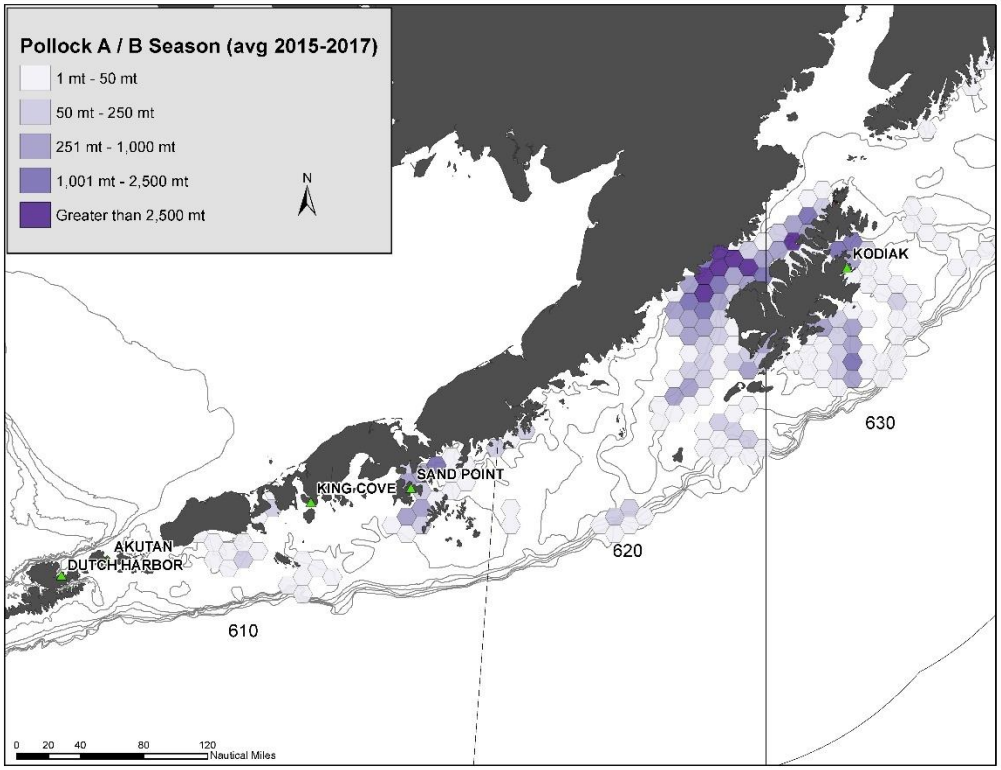
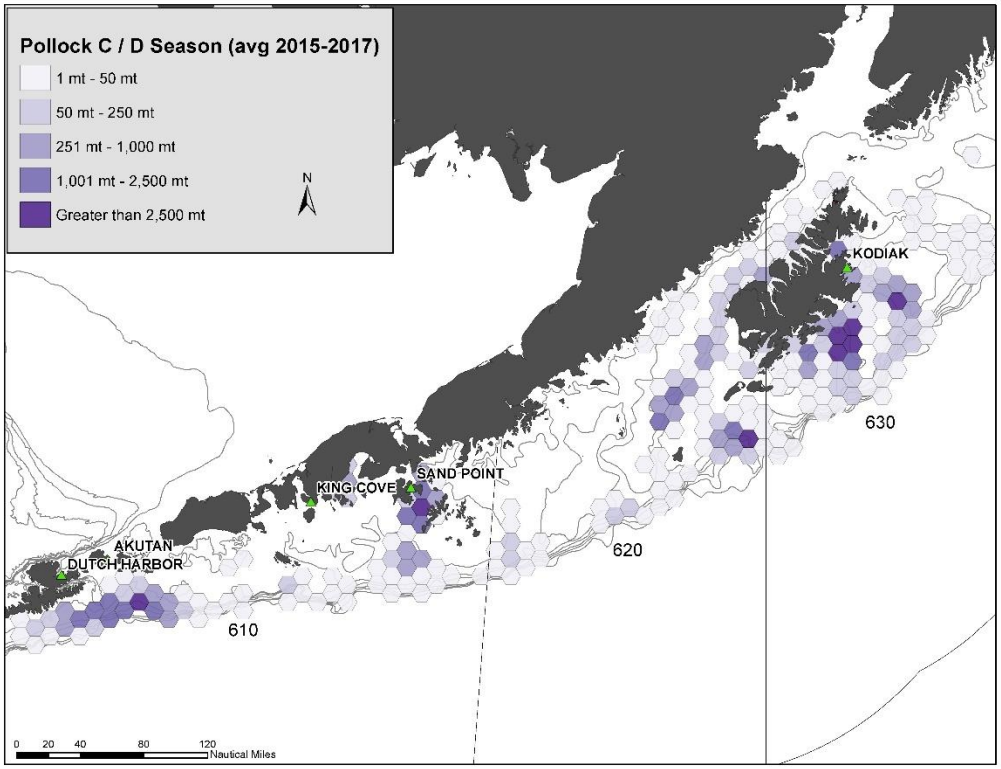


Figure 2 Spatial distribution of C/D season GOA pollock trawl harvest, 2015 through 2017



Pacific cod

Table 15 and Table 16 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 shown in Table 13, 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 15 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 16 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 through Figure 6 show seasonal and spatial effort patterns in the GOA Pacific cod fishery for trawl and fixed-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. Both the trawl and fixed-gear maps show generally the same fishery footprint in the A and B season.

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

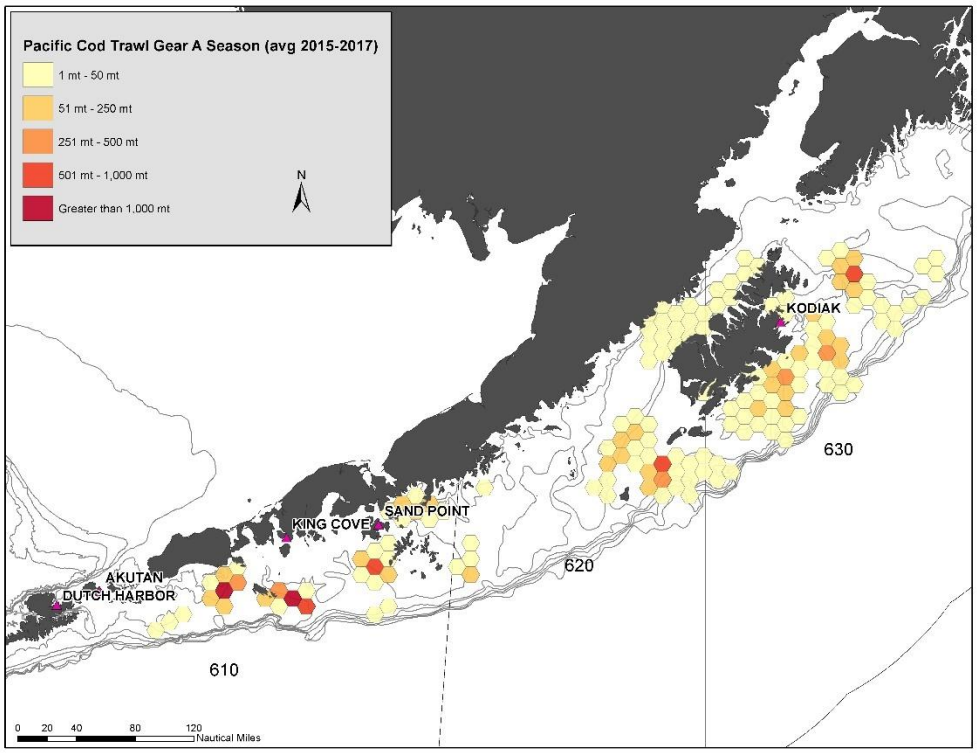


Figure 4 Spatial distribution of B season GOA Pacific cod trawl harvest, 2015 through 2017

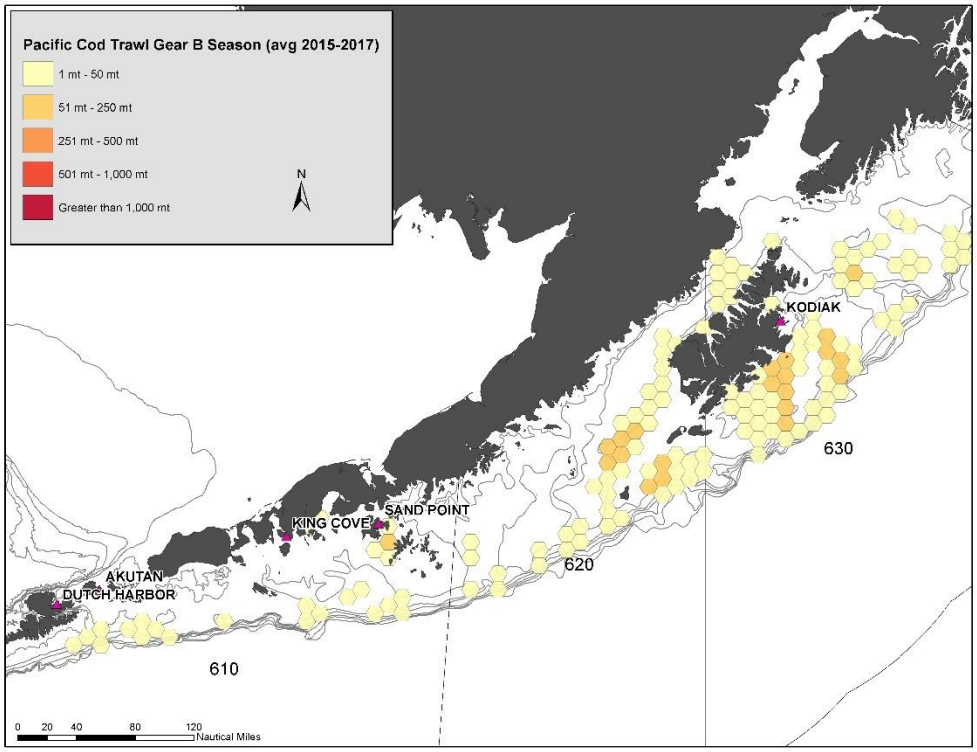


Figure 5 Spatial distribution of A season GOA Pacific cod fixed-gear harvest, 2015 through 2017

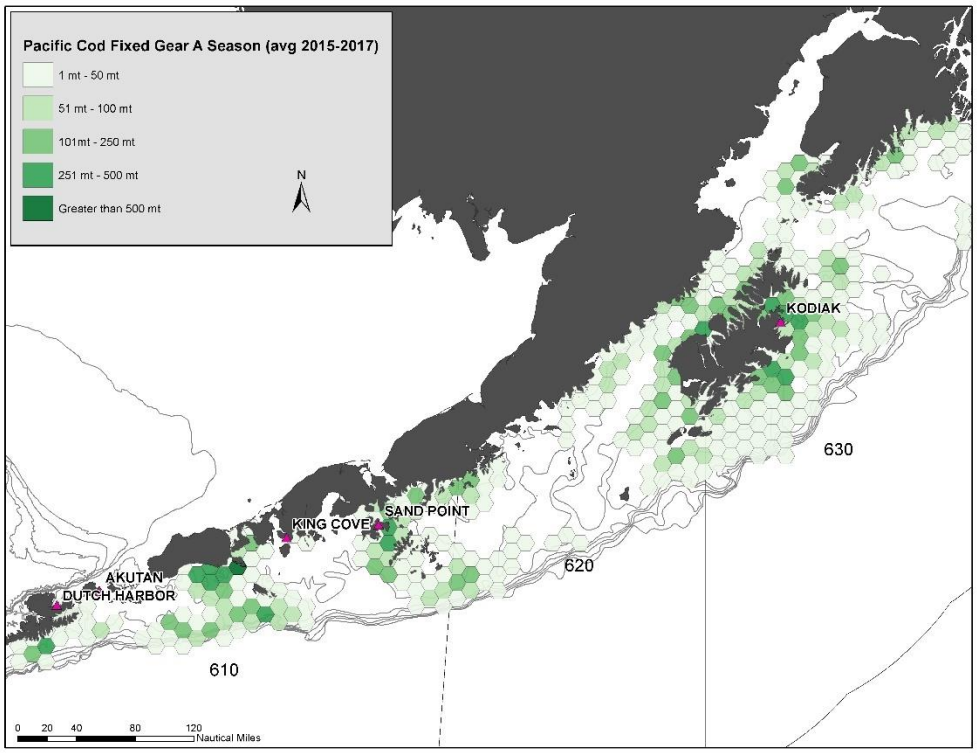
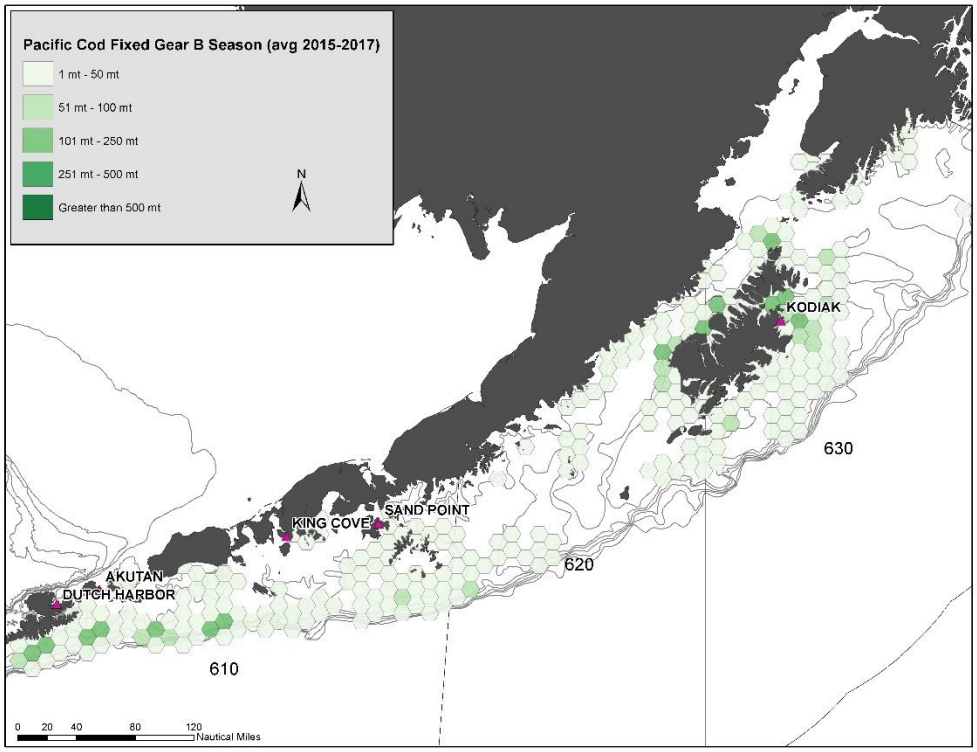


Figure 6 Spatial distribution of B season GOA Pacific cod fixed-gear harvest, 2015 through 2017



3.3 Fishery Product Value

This section explores the value of pollock and Pacific cod products over the course of the calendar year. The Council might consider seasonal differences in product values—if any exist—when determining the net benefit of an action to reallocate TAC from the late-summer/fall to the late-winter/spring. This section also explores 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). In summary, the exploratory efforts described below did not find strong indications of intra-annual variation in pollock and Pacific cod value. The greatest opportunity for increasing the economic productivity of the fishery might simply be to increase gross production (TAC utilization) by allocating harvest quotas to times of year when catch rates are higher, PSC is less constraining, or weather is more conducive. Regulations that can result in stranded TAC—such the 20% rollover cap for GOA pollock seasons—represent a direct loss in potential production volume.

While export data provides another useful view into the annual trends in groundfish values, it is not likely that managers could proactively increase the value of the fishery by timing production to global market demand. Global demand is a function of many factors beyond the control of the Council and responsible U.S. agencies—e.g., production of Russia pollock or Atlantic cod, and/or holdover storage from previous seasons. On the supply side, a marginal shift in GOA groundfish TAC is unlikely to change global markets in a manner that is detectable or has a price effect.

3.3.1 Product Mix and Value

COAR Data

The data in this subsection are provided by AKFIN; they include purchasing records from the Commercial Operator Annual Reports (COAR) that are submitted by processors. This data set draws revenue data from ADF&G Fish Tickets (price paid for a delivery divided by pounds delivered). However, not all Fish Tickets are filled out with complete ex-vessel values. For example, approximately 30% of Fish Tickets from 2016 GOA Pacific cod trips did not include pricing. When information is missing CFEC backfills the record with an average annual price for the species and area-fished to the extent practicable. One drawback to the cleaned CFEC data is that applying annual average prices to missing Fish Ticket values might have a smoothing effect on intra-annual trends that would otherwise be apparent. A benefit of using COAR data as opposed to pure Fish Ticket data is that it includes end-of-year adjustments for bonuses such as those paid in the pollock roe season.

Table 17 shows that head-and-gut (H&G), surimi, and fillets combine to account for 85% of pollock production and value. The most valuable product form is roe, which is produced only in the A season. Of the higher value product forms, a greater percentage of surimi and fillets are produced during the B season (56% and 66%, respectively). If the reason for higher surimi and fillet production in the fall is based on season-effect such as flesh quality or processing volume, then shifting TAC to the A/B seasons could suppress production of these value-added forms. As noted in Section 2.2, shifting TAC to the A/B season increases the proportion of total catch that would occur in Area 620, largely at the expense of Area 610. Future analysis would consider whether the processing operations that receive deliveries from Area 620 are more or less likely to create value added products, and if there are areas in which the pollock catch is more likely to result in low-value forms (H&G and whole). Proportions of annual pollock production and value by month are included in **Appendix 3**.

Table 17 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 18 shows that H&G and fillet products comprise the majority of Pacific cod production and value. 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. Proportions of annual Pacific cod production and value by month are included in **Appendix 3**.

Table 18 GOA Pacific cod production and wholesale value by product type (all gear sectors), 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

Figure 7 and Figure 8 track pollock and Pacific cod wholesale value per pound for the most common product forms on a monthly basis from 2012 through 2016. The figures indicate that there is not a significant difference in value for the A season versus the B season. 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 A versus B season was apparent.

Figure 7 GOA pollock wholesale value per pound, 2012 through 2016

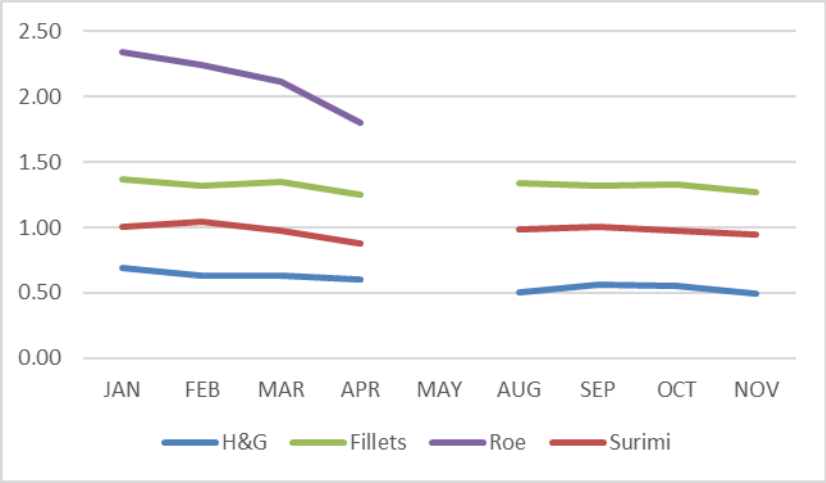
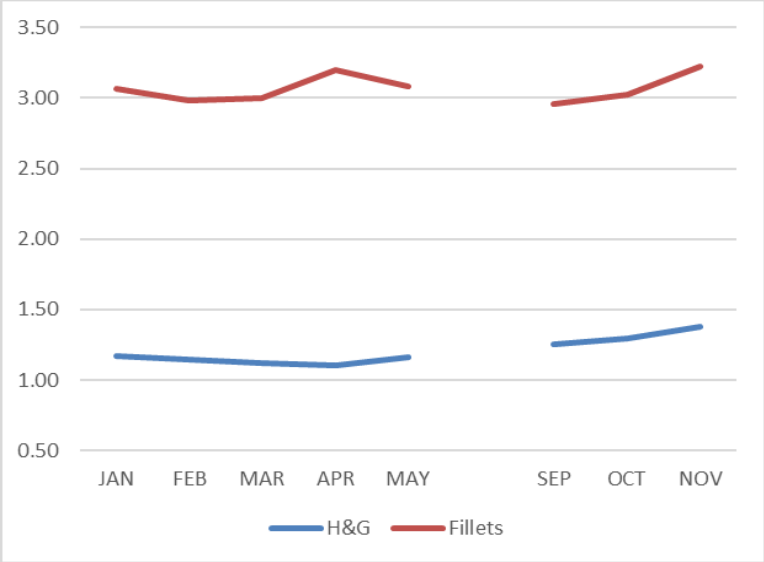


Figure 8 GOA Pacific cod wholesale value per pound (all gear sectors), 2012 through 2016



In addition to the AKFIN data discussed above, the Alaska Fisheries Science Center's (AFSC) REFM staff collaborated on a one-off exploration of intra-annual value trends using Fish Ticket and export data (export results are discussed below). For pollock, the AFSC review found no statistically significant difference in wholesale value between the two portions of the calendar year. For Pacific cod, AFSC focused on a non-random sample of three high-volume GOA trawl CVs (trawl and pot gear) for which complete Fish Ticket information was available in 2016. For those vessels, ex-vessel values were higher in the latter portion of the year, but the price effect was small (0.5 to 2.0 cents) and the result was only marginally statistically significant.

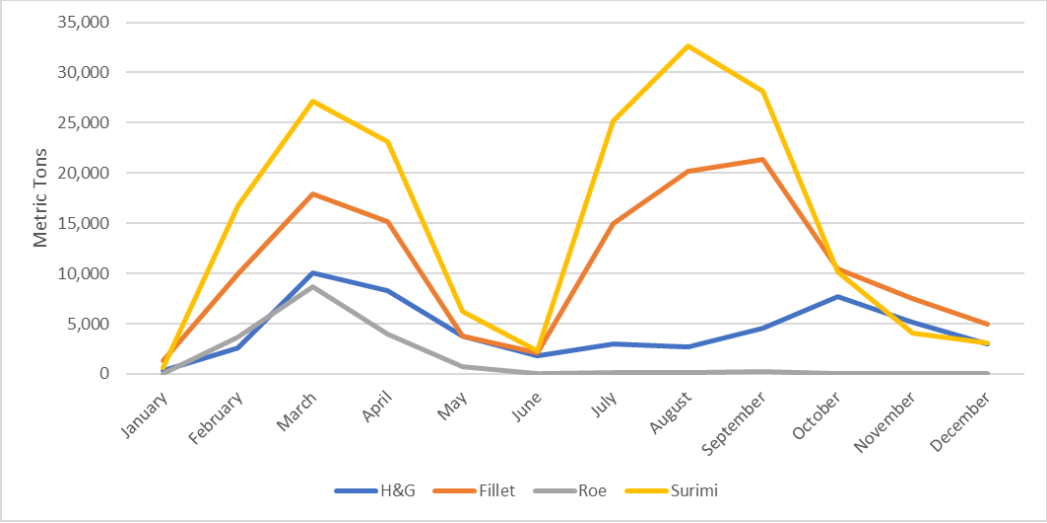
Export Value

This section considers the value of U.S. exports ($/mt) as a measure of seasonal differences in fishery value. The reader should note that export data is not specific to the GOA and does not distinguish between Pacific cod gear sectors. Moreover, the following monthly data reflect when an export occurred and not necessarily when harvest or production occurred, as product can be held in cold storage prior to

shipment. Figure 9 and Figure 10 use data from NMFS Office of Science & Technology, available on OST's Commercial Fisheries Statistics web portal. Figure 9 illustrates 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. Table 19 summarizes two independent reports to the Alaska Seafood Marketing Institute (ASMI) from a private analyst.[16] The first report captured year-to-date average export values/mt from January through March, and the second captured January through September. If product values on the export market were significantly higher for the latter, it would reflect a better export market later in the year. The most notable difference between the two averages in the ASMI data is the higher average value/mt of Pacific cod fillets—a difference of roughly $650/mt, or 30 cents/lb. The only other positive difference of more than $100/mt is a higher price for pollock roe in the January-to-June average (difference of roughly $275/mt, or 12 cents/lb.), but roe production and shipment after April is very low-volume; the analyst does not suggest any benefit to shifting roe exports to later in the year based on this data.

AFSC's REFM staff made a separate informal study of Alaska-wide export values over the two halves of the calendar year. The study regressed export values on the season while controlling for year effects and product type. 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 (14 cents/lb. wholesale). For Pacific cod the regression indicated higher value during the latter half of the year, with an effect size of $200/mt (9 cents/lb. wholesale).

Figure 9 Metric tons of pollock exports, by month and by product form, 2015 through March 2018 (NMFS OST)



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

[16] McDowell Group, LLC. Provided with permission.

Figure 10 Alaska export value ($/mt) by product form, 2015 through March 2018 (NMFS OST)

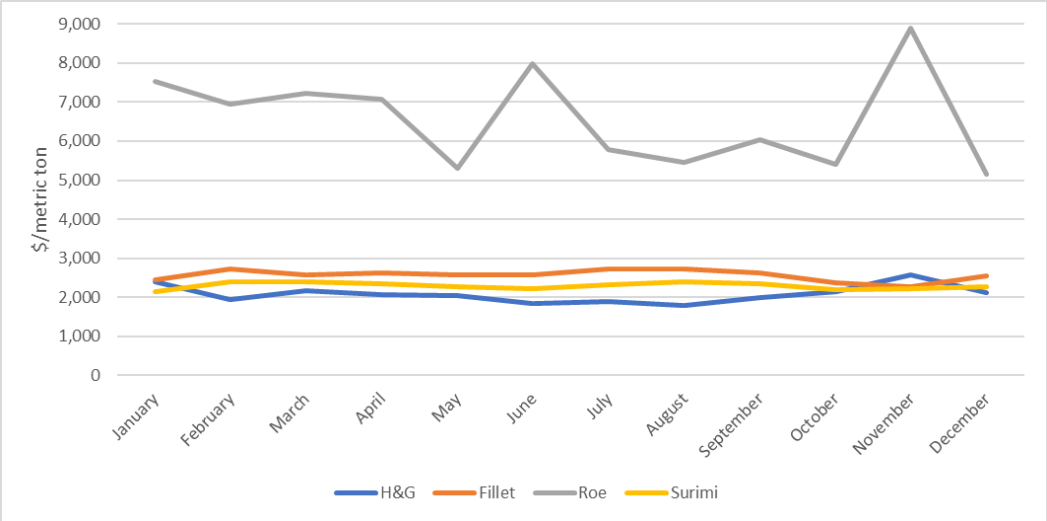


Table 19 Alaska export value ($/mt) by product form, 2015 through March 2018 (McDowell Group)

Product		Period	2015	2016	2017	2018	Average
Pollock	**Fillet**	Jan-Mar		2,649	2,652	2,410	2,570
		Jan-Sept	2,792	2,625	2,621		2,679
	Surimi	Jan-Mar		2,428	2,269	2,525	2,407
		Jan-Sept	2,391	2,369	2,310		2,357
	Roe	Jan-Mar		7,988	6,175	6,456	6,873
		Jan-Sept	7,498	7,903	6,051		7,151
	H&G	Jan-Mar		2,297	2,232	1,793	2,107
		Jan-Sept	2,036	2,027	2,144		2,069
Pacific Cod	**Fillet**	Jan-Mar		3,470	3,182	3,514	3,389
		Jan-Sept	3,773	4,243	4,093		4,036
	H&G	Jan-Mar		2,820	3,068	3,318	3,069
		Jan-Sept	2,887	2,870	3,069		2,942

Source: Reports produced by McDowell Group, LLC. for the Alaska Seafood Marketing Institute, provided to NPFMC via personal communication.

3.3.2 Fish Size

Table 20 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.

When years are disaggregated, the pollock trawl fishery shows an increasing annual trend in 2012, 2016 and 2017, but shows the opposite in 2013 through 2015. Monthly size data in the Pacific cod hook-and-line fishery show no discernable trend, which could be an effect of selectivity based on hook size. Monthly size data in the Pacific cod trawl fishery shows a visually discernable pattern, but one that is not statistically significant. 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**.

Table 20 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 Prohibited Species Catch

This section includes an overview of how Chinook salmon and halibut PSC is managed in the GOA groundfish fisheries and data on monthly PSC and PSC rates (bycatch/tons of groundfish). The data presented are limited to trawl fisheries, as that is the only sector for which regulations limit bycatch of Chinook salmon and halibut. The options considered in this paper propose shifting a greater proportion of annual pollock and Pacific cod TACs to the early part of the calendar year. Overall, monthly PSC levels tend to track groundfish effort. However, the PSC rates reported in Table 22 and Table 24 give some indication that encounters with PSC species on the traditional GOA trawl fishing grounds tend to be higher during certain times of year. The reasons for such differences are less clear; the issue was well explored in the D1 and D2 discussion papers from the Council's December 2017 agenda.[17]

The D1 paper found relatively higher halibut PSC rates on directly observed trawl trips at the beginning of the Pacific cod A season. That paper offers three potential explanations for this trend: vessel operators have to experiment with real-time halibut bycatch rates at the beginning of a new season; halibut and Pacific cod are more closely intermingled during that time of year; and Pacific cod are less aggregated at the start of the season thus more tow-time is required to catch the target and the number of opportunities to encounter halibut rise in accordance. This intra-season trend warrants further investigation but should not necessarily affect a future decision about the reallocation of fishing effort from the A season to the B season. Future analysis of this issue would include potential explanations for the relatively high halibut PSC rates posted in September and October (Table 24).

The D2 paper found that Chinook salmon PSC levels by week generally track groundfish harvest when aggregated across years, but that pattern is less reliable on an annual basis. More importantly, the paper shows a trend during recent years where the Chinook PSC rate increases later in the calendar year, suggesting that fishing later into September and October raises the baseline probability of encountering Chinook salmon. That trend is most apparent in the WGOA, as shown below in Figure 11.

Chinook salmon

GOA trawl Chinook salmon PSC limits are applied on an annual basis, as opposed to seasonally. The CGOA pollock fishery has a limit of 18,316 Chinook and the WGOA pollock fishery has a limit of 6,684 Chinook. Pacific cod falls under a GOA-wide non-pollock trawl fishery PSC limit of 3,900 for CVs (including the CGOA Rockfish Program fishery) and 3,600 for CPs. Early-year PSC affects the constraint on late-year fisheries. The Council might consider whether increasing A season Pacific cod TAC could increase the chance that the tightly PSC-constrained non-pollock non-Rockfish Program CV sector—limit

[17] 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

of 2,700 Chinook per year—closes before the fall CGOA Pacific cod and flatfish fisheries are fully prosecuted.

Table 21 Average and median Chinook salmon PSC by month in the GOA pollock and Pacific cod target CV fisheries, 2012 through 2017

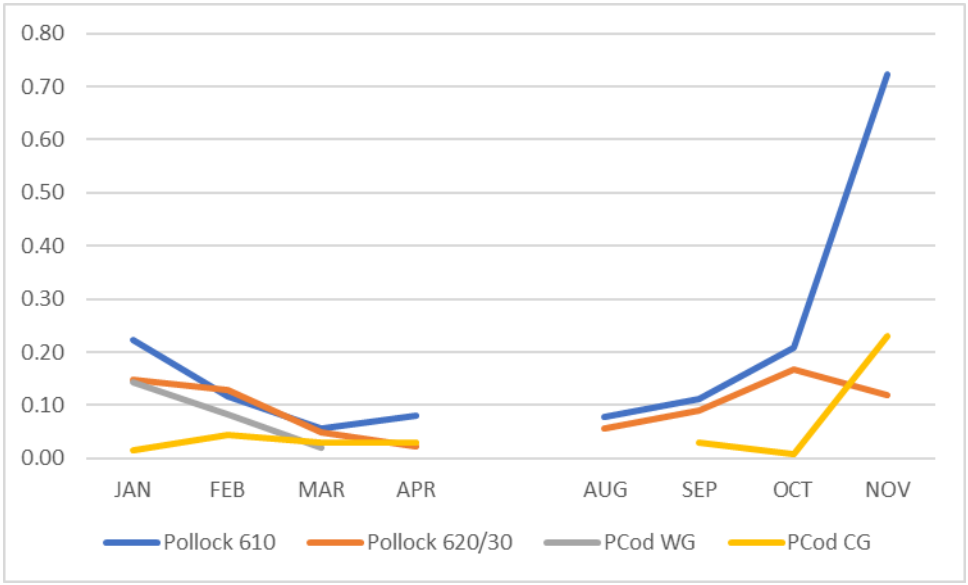
			JAN	FEB	MAR	APR	AUG	SEP	OCT	NOV	Total
Pollock	WG (610)	Average	175	111	182	70	124	1,357	2,498	270	4,649
		Median	30	81	178	70	36	1,264	2,758	75	5,033
	CG (620/30)	Average	447	2,651	1,446	257	284	1,748	4,277	130	11,012
		Median	111	2,014	1,191	139	242	974	3,148	126	10,526
Pacific Cod	WG*	Average	60	369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

Table 22 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

Figure 11 Chinook salmon PSC rate (# Chinook/mt groundfish) by month in the GOA pollock and Pacific cod target CV trawl fisheries, 2012 through 2017



Halibut

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.[18] 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 will be added to the next season's apportionment during the same fishing year. The first four halibut seasonal apportionments are further divided into PSC amounts for the deep-water and shallow-water species complexes, as shown in harvest specs Table 15.[19] Halibut PSC taken while fishing for Pacific cod is counted against the limit for the shallow-water complex.[20] Seasonal and deep/shallow-water complex apportionments are set annually in consultation with the Council through the harvest specifications process. As a result, 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. Many of the listed factors are germane to a discussion of halibut PSC rates and management actions that could be taken to target Pacific cod when those rates might be lower:

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.

Table 23 Average and median halibut PSC (mt mortality) by month in the GOA Pacific cod target CV fishery, 2012 through 2017

			JAN	FEB	MAR	APR	AUG	SEP	OCT	NOV	Total
Pacific Cod	WG	Average	6	60	11						77
		Median	4	63	7						81
	CG	Average	22	29	73	22	1	77	22	2	263
		Median	12	25	39	26	1	45	13	1	261

Table 24 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

[18] https://alaskafisheries.noaa.gov/sites/default/files/17_18goatable14.pdf
[19] https://alaskafisheries.noaa.gov/sites/default/files/17_18goatable15.pdf
[20] Note that from May 15 through June 30, which falls within the Pacific cod A season and the second seasonal apportionment of halibut PSC, NMFS manages deep-water and shallow-water PSC apportionments jointly.

5 Steller Sea Lion Considerations

Modifying seasonal allocations of pollock and/or Pacific cod could trigger consultation under the ESA because of the potential effect on SSLs. The Council should be aware that an ESA consultation is not necessarily limited to a particular management question and could consider the full range of existing management measures that might affect the listed SSL stock. The following subsections provide a description of listed SSL populations and their status, as well as an overview of the ESA Section 7 consultation process. Should the Council pursue an action on seasonal TAC allocations, NMFS Sustainable Fisheries would engage with NMFS Protected Resources Division during the development of an initial review document.

5.1 Description and Status of SSL Populations

Steller sea lions in Alaska are currently managed as two distinct population segments. Before 1997, Steller sea lions in Alaska were managed as a single population and were listed as threatened under the Endangered Species Act (ESA) in 1990. New genetics information revealed further population structure, with the eastern and western population segments delineated at Cape Suckling, 144 deg. west longitude (Figure 12). In 1997, NOAA scientists recognized two distinct population segments and listed the western DPS as endangered, while the eastern DPS remained listed as threatened. In 2013, NOAA Fisheries concluded that the eastern DPS of Steller sea lions had recovered and the population was removed from the list of threatened species. The western DPS remains listed as endangered. The ESA requires management at the species or population segment level, in this case the Eastern and Western DPS, and the Recovery Plan for the Steller Sea Lion recognizes those distinct eastern and western population segments. The Recovery Plan identified a series of Recovery Criteria that must be met to consider downlisting (Endangered to Threatened) or delisting (removed from the list) either DPS.

To consider **downlisting** the western DPS, the following conditions must be met:

1. The population in the US region has increased (statistically significant) for 15 years on average;
2. The trends in non-pups in at least 5 of the 7 sub-regions are consistent with the trend under condition 1. The population trend in any two adjacent sub-regions cannot be declining significantly.

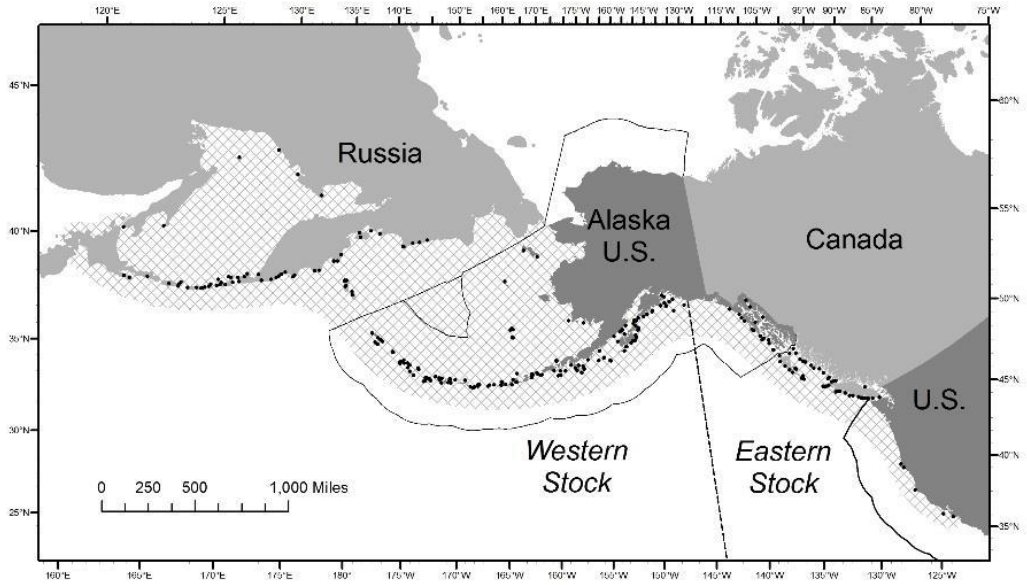
The second condition is problematic for the downlisting the western DPS. The western Aleutian sub-region is declining significantly; the central Aleutian population is also declining or stable; the eastern Aleutian and Bering Sea sub-region is stable or increasing. So, until at least five of the seven sub-regions are increasing statistically significantly, with no two adjacent sub-regions declining significantly, the western DPS cannot be considered for downlisting. Also note that if a DPS is downlisted from endangered to threatened critical habitat designation and protection measures are still required.

To consider **delisting** the western DPS the following conditions must be met:

1. The population in the US region has increased (statistically significant) for 30 years (at an average annual growth rate of 3%);
2. Trends in non-pups in at least 5 of the 7 sub-regions are stable or increasing, consistent with the trend observed under criterion 1. The population trend in any 2 adjacent sub-regions cannot be declining significantly. The population trend in any sub-region cannot have declined by more than 50%.

The western Aleutian sub-region is very near, or has already surpassed a 50% decline, so until that population has increased considerably, the population will not be a candidate for delisting, even if the other criteria are met.

Figure 12 At-sea and breeding ranges (rookeries) of western and eastern DPS of Steller sea lions in the North Pacific Ocean



Population estimates

Two types of counts are used to study trends in Steller sea lion populations: counts of pups up to 1 month of age and counts of non-pups (1+ year olds). NMFS monitors Steller sea lion status in Alaska by counting animals during the breeding season at trends sites in conjunction with the State of Alaska and other partners. Trend sites are a set of terrestrial rookeries and haulouts where surveys have been consistently undertaken for many years. The estimated ratio of pups to non-pups in Steller sea lion populations can be used to estimate population size. Population trend is calculated by plotting non-pup counts over time.

Western DPS

The western DPS of Steller sea lions declined from an estimated 220,000 to 265,000 animals in the late 1970s to fewer than 50,000 in 2000. Since 2000, the abundance in the western DPS has increased, overall (Figure 13), but there is considerable regional variation in trend. The most recent estimate of total western DPS population comes from surveys in 2014 and 2015, which resulted in a minimum population estimate of 50,983.

The most recent survey of the western DPS of Steller sea lions was conducted in late June through mid-July 2016. A total of 21,969 live non-pups were counted on 117 sites, a total of 587 non-pups were counted in the western Aleutians. For the western DPS in Alaska overall, non-pup counts increased at 2.24% per year between 2003 and 2016. However, the regional pattern of western DPS non-pup count trends is similar to previous years' assessments: generally decreasing west of Samalga Pass and increasing to the east (Figure 14). Samalga Pass lies to the west of Umnak and Unalaska Islands, meaning that Western GOA trawl activity occurs in the eastern portion of the Western Steller sea lion DPS. Steep declines continued in the western Aleutian Islands (-6.94% per year). Because of the steep, significant declines in the western Aleutian Islands, the western DPS is not meeting its recovery goals and remains classified as endangered under the U.S. Endangered Species Act.

Figure 13 Counts of western Steller sea lion non-pups in Alaska, 2003-2016

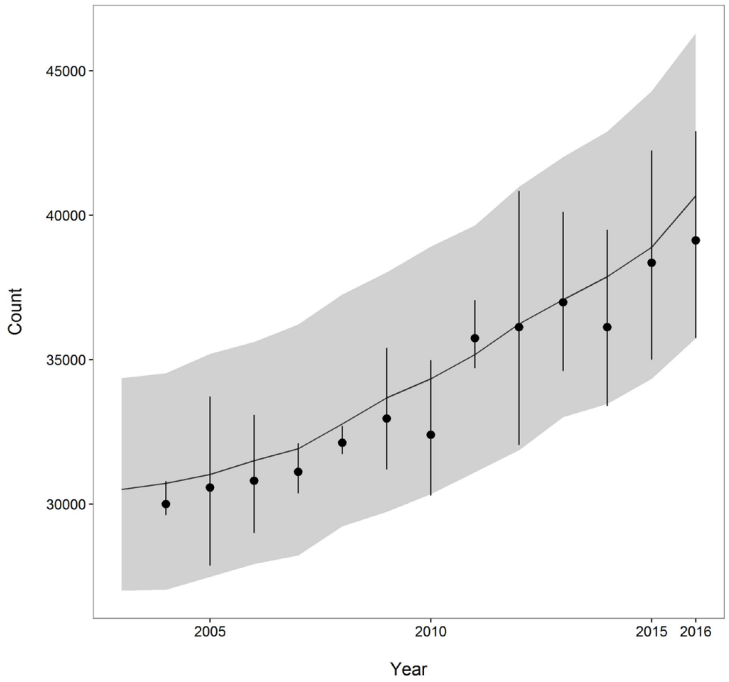
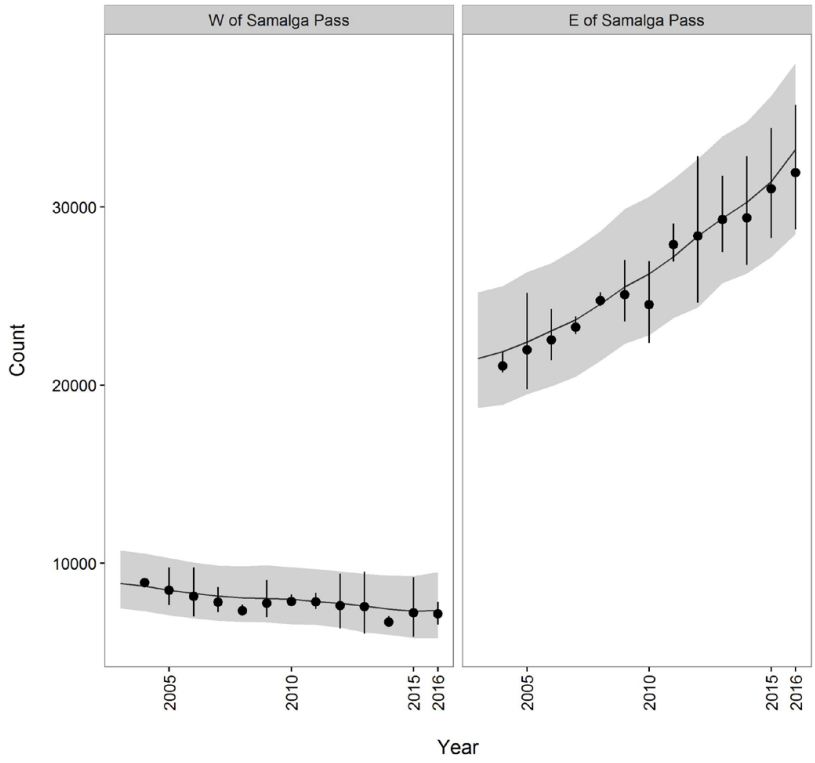


Figure 14 Trends of Steller sea lion counts west and east of Samalga Pass, Alaska, 2003-2016

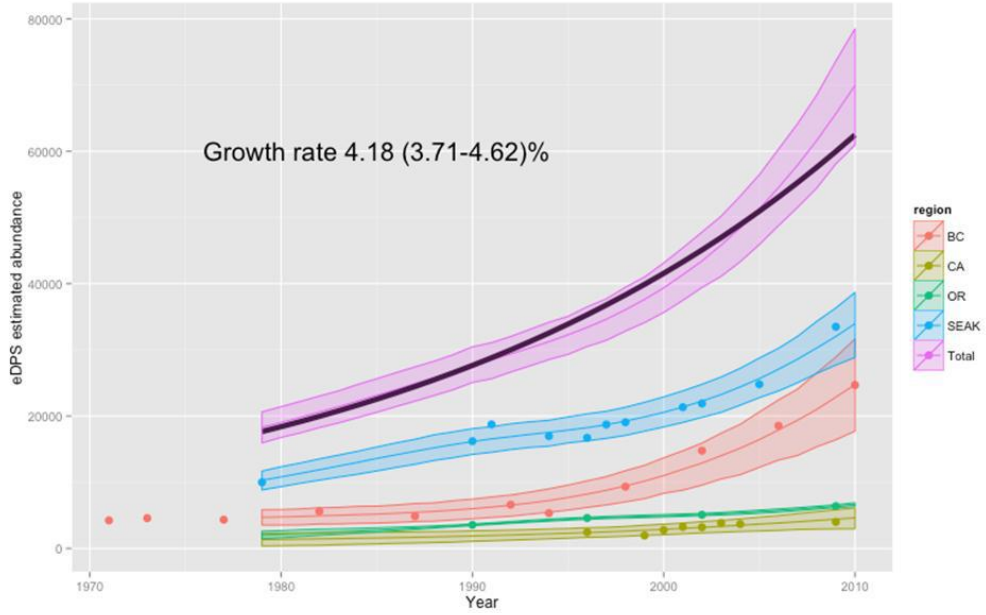


Eastern DPS

The best available information indicates that the overall abundance of Steller sea lions in the eastern DPS increased for a sustained period of at least three decades, and pup production increased significantly,

especially since the mid-1990s. Analysis of growth trends of the eastern DPS from 1979-2010 concluded that the eastern DPS increased from an estimated 18,313 animals in 1979 to an estimated 70,174 in 2010, which results in an estimated rate of growth of nearly 4.2% per year (Figure 15). Based on these rates of growth, and other criteria identified in the Steller sea lion Recovery Plan, the eastern DPS was delisted in 2013.

Figure 15 Estimated abundance of the eastern DPS of Steller sea lion, in sub-regions and in total, based on pup counts from 1979-2012



5.2 ESA Section 7 Consultation Process

- Under the ESA Federal agencies have a mandate to conserve listed species and Federal actions, activities, and authorizations (Federal actions) must be in compliance with the provisions of the ESA. Section 7 of the ESA provides a mechanism for consultation by the Federal action agency with the appropriate consulting agency (NMFS or USFWS).
- NMFS would not initiate an ESA section 7 consultation on a suite of alternatives for a proposed action but could initiate consultation once the Council has identified a preferred alternative and takes final action on an issue.
- Once the Council has taken final action on an issue, NMFS AKR Sustainable Fisheries Division would prepare a biological assessment to determine if the proposed action would adversely impact the listed species or adversely modify critical habitat. The biological assessment contains an analysis based on biological studies of the likely effects of the proposed action on the species or habitat.
- Informal consultations are conducted for Federal actions that are believed to have no adverse effects on the listed species, nor destroy or adversely modify its designated critical habitat.
- Formal consultations, resulting in biological opinions, are conducted for Federal actions that may have an adverse effect on the listed species.
- Through the biological opinion, a determination is made about whether the proposed action poses "jeopardy" or "no jeopardy" of extinction or adverse modification or destruction of designated critical habitat for the listed species.

- If the determination is that the proposed or on-going action will cause jeopardy or adverse modification of critical habitat, reasonable and prudent alternatives may be suggested that, if implemented, would modify the action to no longer pose the jeopardy of extinction or adverse modification to critical habitat for the listed species. These reasonable and prudent alternatives must be incorporated into the Federal action, if it is to proceed.
- A biological opinion with the conclusion of no jeopardy or adverse modification of critical habitat may contain conservation recommendations intended to further reduce the negative impacts to the listed species. These recommendations are advisory to the action agency (50 CFR 402.14(j)). If the likelihood exists of any take[21] occurring during promulgation of the action, an incidental take statement may be appended to a biological opinion to provide for the amount of take that is expected to occur from normal promulgation of the action. An incidental take statement is not the equivalent of a permit to take a listed species.

Appendix 1: Pollock Tables

Pollock allocations under **Option 1**, 2017 through 2019 (reference Section 2.2)

2017		Area 610		Area 620		Area 630		Total W&C GOA	
	Season	mt	%	mt	%	mt	%	mt	%
Status quo	A	2,232	4.67%	34,552	72.29%	11,012	23.04%	47,796	25.00%
	B	2,232	4.67%	39,422	82.48%	6,142	12.85%	47,796	25.00%
	C	19,568	40.94%	12,341	25.82%	15,887	33.24%	47,796	25.00%
	D	19,568	40.94%	12,341	25.82%	15,887	33.24%	47,796	25.00%
	Total	**43,599**		**98,655**		**48,929**		**191,183**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 1	A	2,678	4.67%	41,462	72.29%	13,215	23.04%	57,355	30.00%
	B	2,232	4.67%	39,422	82.48%	6,142	12.85%	47,796	25.00%
	C	19,568	40.94%	12,341	25.82%	15,887	33.24%	47,796	25.00%
	D	15,654	40.94%	9,873	25.82%	12,710	33.24%	38,237	20.00%
	Total	**40,132**		**103,097**		**47,953**		**191,183**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 2	A	2,678	4.67%	41,462	72.29%	13,215	23.04%	57,355	30.00%
	B	2,678	4.67%	47,306	82.48%	7,370	12.85%	57,355	30.00%
	C	15,654	40.94%	9,873	25.82%	12,710	33.24%	38,237	20.00%
	D	15,654	40.94%	9,873	25.82%	12,710	33.24%	38,237	20.00%
	Total	**36,665**		**108,514**		**46,004**		**191,183**	**100.00%**

[21] The term "take" under the ESA means "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" (16 USC §1532(19)).

2018		Area 610		Area 620		Area 630		Total W&C GOA	
Status quo	Season	mt	%	mt	%	mt	%	mt	%
	A	1,318	3.50%	27,315	72.54%	9,026	23.97%	37,656	25.00%
	B	1,318	3.50%	32,154	85.39%	4,184	11.11%	37,656	25.00%
	C	13,778	36.59%	10,013	26.59%	13,865	36.82%	37,656	25.00%
	D	13,778	36.59%	10,013	26.59%	13,865	36.82%	37,656	25.00%
	Total	**30,192**		**79,495**		**40,939**		**150,622**	**100.00%**
Suboption 1	Season	mt	%	mt	%	mt	%	mt	%
	A	1,582	3.50%	32,778	72.54%	10,831	23.97%	45,187	30.00%
	B	1,318	3.50%	32,154	85.39%	4,184	11.11%	37,656	25.00%
	C	13,778	36.59%	10,013	26.59%	13,865	36.82%	37,656	25.00%
	D	11,023	36.59%	8,010	26.59%	11,092	36.82%	30,124	20.00%
	Total	**27,700**		**82,955**		**39,971**		**150,622**	**100.00%**
Suboption 2	Season	mt	%	mt	%	mt	%	mt	%
	A	1,582	3.50%	32,778	72.54%	10,831	23.97%	45,187	30.00%
	B	1,582	3.50%	38,585	85.39%	5,020	11.11%	45,187	30.00%
	C	11,023	36.59%	8,010	26.59%	11,092	36.82%	30,124	20.00%
	D	11,023	36.59%	8,010	26.59%	11,092	36.82%	30,124	20.00%
	Total	**25,208**		**87,383**		**38,035**		**150,622**	**100.00%**

2019		Area 610		Area 620		Area 630		Total W&C GOA	
Status quo	Season	mt	%	mt	%	mt	%	mt	%
	A	870	3.50%	18,025	72.54%	5,956	23.97%	24,849	25.00%
	B	870	3.50%	21,218	85.39%	2,761	11.11%	24,849	25.00%
	C	9,092	36.59%	6,607	26.59%	9,149	36.82%	24,849	25.00%
	D	9,092	36.59%	6,607	26.59%	9,149	36.82%	24,849	25.00%
	Total	**19,924**		**52,458**		**27,016**		**99,395**	**100.00%**
Suboption 1	Season	mt	%	mt	%	mt	%	mt	%
	A	1,044	3.50%	21,630	72.54%	7,147	23.97%	29,819	30.00%
	B	870	3.50%	21,218	85.39%	2,761	11.11%	24,849	25.00%
	C	9,092	36.59%	6,607	26.59%	9,149	36.82%	24,849	25.00%
	D	7,274	36.59%	5,286	26.59%	7,319	36.82%	19,879	20.00%
	Total	**18,279**		**54,742**		**26,377**		**99,395**	**100.00%**
Suboption 2	Season	mt	%	mt	%	mt	%	mt	%
	A	1,044	3.50%	21,630	72.54%	7,147	23.97%	29,819	30.00%
	B	1,044	3.50%	25,462	85.39%	3,313	11.11%	29,819	30.00%
	C	7,274	36.59%	5,286	26.59%	7,319	36.82%	19,879	20.00%
	D	7,274	36.59%	5,286	26.59%	7,319	36.82%	19,879	20.00%
	Total	**16,635**		**57,664**		**25,099**		**99,395**	**100.00%**

Pollock allocations under **Option 2**, 2017 through 2019 (reference Section 2.2)

2017		Area 610		Area 620		Area 630		Total W&C GOA	
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 1 (~Status Quo)	A/B	4,464	4.67%	73,973	77.39%	17,154	17.95%	95,592	50.00%
	C/D	39,135	40.94%	24,682	25.82%	31,775	33.24%	95,592	50.00%
	Total	**43,599**		**98,655**		**48,929**		**191,183**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 2	A/B	4,911	4.67%	81,371	77.39%	18,869	17.95%	105,151	55.00%
	C/D	35,222	40.94%	22,214	25.82%	28,597	33.24%	86,032	45.00%
	Total	**40,132**		**103,584**		**47,466**		**191,183**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 3	A/B	5,357	4.67%	88,768	77.39%	20,585	17.95%	114,710	60.00%
	C/D	31,308	40.94%	19,745	25.82%	25,420	33.24%	76,473	40.00%
	Total	**36,665**		**108,514**		**46,004**		**191,183**	**100.00%**

2018		Area 610		Area 620		Area 630		Total W&C GOA	
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 1 (~Status Quo)	A/B	2,636	3.50%	59,473	78.97%	13,210	17.54%	75,311	50.00%
	C/D	27,556	36.59%	20,025	26.59%	27,730	36.82%	75,311	50.00%
	Total	**30,192**		**79,498**		**40,939**		**150,622**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 2	A/B	2,899	3.50%	65,420	78.97%	14,531	17.54%	82,842	55.00%
	C/D	24,801	36.59%	18,023	26.59%	24,957	36.82%	67,780	45.00%
	Total	**27,700**		**83,443**		**39,487**		**150,622**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 3	A/B	3,163	3.50%	71,368	78.97%	15,851	17.54%	90,373	60.00%
	C/D	22,045	36.59%	16,020	26.59%	22,184	36.82%	60,249	40.00%
	Total	**25,208**		**87,388**		**38,035**		**150,622**	**100.00%**

2019		Area 610		Area 620		Area 630		Total W&C GOA	
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 1 (~Status Quo)	A/B	1,739	3.50%	39,246	78.97%	8,717	17.54%	49,698	50.00%
	C/D	18,184	36.59%	13,215	26.59%	18,299	36.82%	49,698	50.00%
	Total	**19,924**		**52,461**		**27,016**		**99,395**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 2	A/B	1,913	3.50%	43,171	78.97%	9,589	17.54%	54,667	55.00%
	C/D	16,366	36.59%	11,893	26.59%	16,469	36.82%	44,728	45.00%
	Total	**18,279**		**55,064**		**26,057**		**99,395**	**100.00%**
	Season	mt	%	mt	%	mt	%	mt	%
Suboption 3	A/B	2,087	3.50%	47,095	78.97%	10,460	17.54%	59,637	60.00%
	C/D	14,547	36.59%	10,572	26.59%	14,639	36.82%	39,758	40.00%
	Total	**16,635**		**57,667**		**25,099**		**99,395**	**100.00%**

Appendix 2: Pacific Cod Tables

Pacific cod allocations under **Approach A**, 2016 through 2018 (reference Section 2.3)

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%	10.09%	4.63%	10.87%	3.97%	11.65%	3.31%
	HAL CV ≥ 50	5.61%	1.10%	6.08%	0.96%	6.54%	0.83%	7.01%	0.69%
	HAL CP	4.11%	1.00%	4.45%	0.88%	4.79%	0.75%	5.14%	0.63%
	Trawl CV	21.14%	20.45%	22.90%	17.89%	24.66%	15.34%	26.42%	12.78%
	Trawl CP	2.00%	2.19%	2.17%	1.92%	2.33%	1.64%	2.50%	1.37%
	Pot (CV/CP)	17.83%	9.97%	19.31%	8.72%	20.80%	7.48%	22.28%	6.23%
	CG Total	60%	40%	65%	35%	70%	30%	75%	25%
WG	HAL CV	0.70%	0.70%	0.76%	0.61%	0.82%	0.53%	0.88%	0.44%
	HAL CP	10.90%	8.90%	11.81%	7.79%	12.72%	6.68%	13.63%	5.56%
	Trawl CV	27.70%	10.70%	30.01%	9.36%	32.32%	8.03%	34.63%	6.69%
	Trawl CP	0.90%	1.50%	0.98%	1.31%	1.05%	1.13%	1.13%	0.94%
	Pot (CV/CP)	19.80%	18.20%	21.45%	15.93%	23.10%	13.65%	24.75%	11.38%
	WG Total	60%	40%	65%	35%	70%	30%	75%	25%

2016		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	3,411	1,936	3,696	1,695	3,980	1,453	4,265	1,211
	HAL CV ≥ 50	2,054	402	2,225	352	2,396	302	2,567	252
	HAL CP	1,504	365	1,630	320	1,755	275	1,881	229
	Trawl CV	7,738	7,487	8,384	6,552	9,029	5,616	9,674	4,680
	Trawl CP	734	804	793	702	854	601	915	501
	Pot (CV/CP)	6,528	3,652	7,071	3,194	7,615	2,738	8,159	2,282
	CG Total	21,969	14,646	23,799	12,815	25,630	10,984	27,461	9,154
WG	HAL CV	192	192	207	168	223	144	239	120
	HAL CP	2,982	2,435	3,231	2,131	3,479	1,826	3,728	1,522
	Trawl CV	7,579	2,928	8,210	2,562	8,842	2,196	9,473	1,830
	Trawl CP	246	410	267	359	287	308	308	257
	Pot (CV/CP)	5,417	4,980	5,869	4,357	6,320	3,735	6,772	3,112
	WG Total	16,416	10,944	17,784	9,576	19,152	8,208	20,520	6,840

2017		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	3,056	1,734	3,312	1,518	3,566	1,301	3,821	1,085
	HAL CV ≥ 50	1,840	360	1,993	316	2,147	271	2,300	226
	HAL CP	1,347	327	1,460	287	1,573	246	1,685	205
	Trawl CV	6,933	6,708	7,511	5,870	8,089	5,031	8,667	4,193
	Trawl CP	657	720	711	629	765	539	820	449
	Pot (CV/CP)	5,849	3,272	6,335	2,862	6,823	2,453	7,310	2,044
	CG Total	19,682	13,121	21,323	11,481	22,963	9,841	24,603	8,201
WG	HAL CV	173	173	188	152	202	130	217	108
	HAL CP	2,700	2,204	2,925	1,929	3,150	1,653	3,375	1,378
	Trawl CV	6,861	2,650	7,433	2,319	8,005	1,988	8,576	1,656
	Trawl CP	223	372	241	325	260	279	279	232
	Pot (CV/CP)	4,904	4,508	5,313	3,944	5,722	3,381	6,130	2,817
	WG Total	14,861	9,908	16,100	8,669	17,338	7,431	18,577	6,192

2018		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	562	319	609	279	655	239	702	199
	HAL CV ≥ 50	338	66	366	58	394	50	423	41
	HAL CP	248	60	268	53	289	45	310	38
	Trawl CV	1,274	1,233	1,380	1,079	1,486	925	1,593	770
	Trawl CP	121	132	131	116	141	99	151	83
	Pot (CV/CP)	1,075	601	1,164	526	1,254	451	1,343	376
	CG Total	3,618	2,411	3,918	2,110	4,220	1,808	4,521	1,507
WG	HAL CV	39	39	42	34	46	29	49	24
	HAL CP	607	496	658	434	709	372	759	310
	Trawl CV	1,543	596	1,672	522	1,801	447	1,929	373
	Trawl CP	50	84	54	73	59	63	63	52
	Pot (CV/CP)	1,103	1,014	1,195	887	1,287	761	1,379	634
	WG Total	3,343	2,229	3,622	1,950	3,900	1,672	4,179	1,393

Pacific cod allocations under **Approach B**, 2016 through 2018 (reference Section 2.3)

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%	9.32%	5.29%	9.32%	5.29%	9.32%	5.29%
	HAL CV ≥ 50	5.61%	1.10%	5.61%	1.10%	5.61%	1.10%	5.61%	1.10%
	HAL CP	4.11%	1.00%	4.11%	1.00%	4.11%	1.00%	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%	2.00%	2.19%	2.00%	2.19%	2.00%	2.19%
	Pot (CV/CP)	17.83%	9.97%	17.83%	9.97%	17.83%	9.97%	17.83%	9.97%
	CG Total	60%	40%	62%	38%	64%	36%	66%	34%
WG	HAL CV	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
	HAL CP	10.90%	8.90%	10.90%	8.90%	10.90%	8.90%	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%	0.90%	1.50%	0.90%	1.50%	0.90%	1.50%
	Pot (CV/CP)	19.80%	18.20%	19.80%	18.20%	19.80%	18.20%	19.80%	18.20%
	WG Total	60%	40%	62%	38%	64%	36%	66%	34%

2016		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	3,411	1,936	3,412	1,937	3,412	1,937	3,412	1,937
	HAL CV ≥ 50	2,054	402	2,054	403	2,054	403	2,054	403
	HAL CP	1,504	365	1,505	366	1,505	366	1,505	366
	Trawl CV	7,738	7,487	8,502	6,726	9,263	5,965	10,024	5,203
	Trawl CP	734	804	732	802	732	802	732	802
	Pot (CV/CP)	6,528	3,652	6,528	3,650	6,528	3,650	6,528	3,650
	CG Total	21,969	14,646	22,733	13,884	23,495	13,123	24,256	12,361
WG	HAL CV	192	192	192	192	192	192	192	192
	HAL CP	2,982	2,435	2,982	2,435	2,982	2,435	2,982	2,435
	Trawl CV	7,579	2,928	8,104	2,402	8,629	1,877	9,155	1,352
	Trawl CP	246	410	246	410	246	410	246	410
	Pot (CV/CP)	5,417	4,980	5,417	4,980	5,417	4,980	5,417	4,980
	WG Total	16,416	10,944	16,941	10,419	17,467	9,893	17,992	9,368

2017		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	3,056	1,734	3,057	1,735	3,057	1,735	3,057	1,735
	HAL CV ≥ 50	1,840	360	1,840	361	1,840	361	1,840	361
	HAL CP	1,347	327	1,348	328	1,348	328	1,348	328
	Trawl CV	6,933	6,708	7,617	6,026	8,299	5,344	8,981	4,662
	Trawl CP	657	720	656	718	656	718	656	718
	Pot (CV/CP)	5,849	3,272	5,849	3,271	5,849	3,271	5,849	3,271
	CG Total	19,682	13,121	20,368	12,439	21,050	11,757	21,732	11,075
WG	HAL CV	173	173	173	173	173	173	173	173
	HAL CP	2,700	2,204	2,700	2,204	2,700	2,204	2,700	2,204
	Trawl CV	6,861	2,650	7,337	2,175	7,812	1,699	8,288	1,224
	Trawl CP	223	372	223	372	223	372	223	372
	Pot (CV/CP)	4,904	4,508	4,904	4,508	4,904	4,508	4,904	4,508
	WG Total	14,861	9,908	15,337	9,432	15,813	8,956	16,288	8,481

2018		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	562	319	562	319	562	319	562	319
	HAL CV ≥ 50	338	66	338	66	338	66	338	66
	HAL CP	248	60	248	60	248	60	248	60
	Trawl CV	1,274	1,233	1,400	1,107	1,525	982	1,650	857
	Trawl CP	121	132	121	132	121	132	121	132
	Pot (CV/CP)	1,075	601	1,075	601	1,075	601	1,075	601
	CG Total	3,618	2,411	3,743	2,286	3,868	2,160	3,993	2,035
WG	HAL CV	39	39	39	39	39	39	39	39
	HAL CP	607	496	607	496	607	496	607	496
	Trawl CV	1,543	596	1,650	489	1,757	382	1,864	275
	Trawl CP	50	84	50	84	50	84	50	84
	Pot (CV/CP)	1,103	1,014	1,103	1,014	1,103	1,014	1,103	1,014
	WG Total	3,343	2,229	3,450	2,122	3,557	2,015	3,664	1,908

Pacific cod allocations under **Approach C**, 2016 through 2018 (reference Section 2.3)

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%	8.82%	5.85%	8.32%	6.42%	7.82%	6.98%
	HAL CV ≥ 50	5.61%	1.10%	5.31%	1.22%	5.01%	1.33%	4.71%	1.45%
	HAL CP	4.11%	1.00%	3.89%	1.11%	3.67%	1.21%	3.45%	1.32%
	Trawl CV	21.14%	20.45%	23.22%	18.37%	25.30%	16.29%	27.38%	14.21%
	Trawl CP	2.00%	2.19%	1.89%	2.42%	1.79%	2.66%	1.68%	2.89%
	Pot (CV/CP)	17.83%	9.97%	16.88%	11.03%	15.92%	12.09%	14.97%	13.15%
	CG Total	60%	40%	60%	40%	60%	40%	60%	40%
WG	HAL CV	0.70%	0.70%	0.66%	0.75%	0.62%	0.79%	0.58%	0.84%
	HAL CP	10.90%	8.90%	10.25%	9.48%	9.60%	10.07%	8.96%	10.65%
	Trawl CV	27.70%	10.70%	29.62%	8.78%	31.54%	6.86%	33.46%	4.94%
	Trawl CP	0.90%	1.50%	0.85%	1.60%	0.79%	1.70%	0.74%	1.79%
	Pot (CV/CP)	19.80%	18.20%	18.62%	19.39%	17.45%	20.59%	16.27%	21.78%
	WG Total	60%	40%	60%	40%	60%	40%	60%	40%

2016		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	3,411	1,936	3,230	2,143	3,047	2,349	2,865	2,555
	HAL CV ≥ 50	2,054	402	1,944	446	1,834	488	1,724	531
	HAL CP	1,504	365	1,424	405	1,344	444	1,263	483
	Trawl CV	7,738	7,487	8,502	6,726	9,263	5,965	10,024	5,203
	Trawl CP	734	804	693	887	654	972	615	1,058
	Pot (CV/CP)	6,528	3,652	6,179	4,039	5,830	4,427	5,481	4,815
	CG Total	21,969	14,646	21,972	14,646	21,972	14,646	21,972	14,646
WG	HAL CV	192	192	180	204	169	217	157	229
	HAL CP	2,982	2,435	2,805	2,595	2,628	2,754	2,450	2,914
	Trawl CV	7,579	2,928	8,104	2,402	8,629	1,877	9,155	1,352
	Trawl CP	246	410	232	437	217	464	202	491
	Pot (CV/CP)	5,417	4,980	5,095	5,306	4,773	5,632	4,451	5,958
	WG Total	16,416	10,944	16,416	10,944	16,416	10,944	16,416	10,944

2017		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	3,056	1,734	2,894	1,920	2,730	2,105	2,567	2,289
	HAL CV ≥ 50	1,840	360	1,742	399	1,643	438	1,545	476
	HAL CP	1,347	327	1,276	363	1,204	398	1,132	433
	Trawl CV	6,933	6,708	7,617	6,026	8,299	5,344	8,981	4,662
	Trawl CP	657	720	621	795	586	871	551	948
	Pot (CV/CP)	5,849	3,272	5,536	3,618	5,223	3,966	4,910	4,314
	CG Total	19,682	13,121	19,686	13,122	19,686	13,122	19,686	13,122
WG	HAL CV	173	173	163	185	153	196	142	207
	HAL CP	2,700	2,204	2,539	2,349	2,379	2,493	2,218	2,638
	Trawl CV	6,861	2,650	7,337	2,175	7,812	1,699	8,288	1,224
	Trawl CP	223	372	210	396	196	420	183	445
	Pot (CV/CP)	4,904	4,508	4,613	4,803	4,321	5,099	4,030	5,394
	WG Total	14,861	9,908	14,861	9,908	14,861	9,908	14,861	9,908

2018		Status Quo		Option 1		Option 2		Option 3	
		A	B	A	B	A	B	A	B
CG	HAL CV < 50	562	319	532	353	502	387	472	421
	HAL CV ≥ 50	338	66	320	73	302	80	284	87
	HAL CP	248	60	234	67	221	73	208	80
	Trawl CV	1,274	1,233	1,400	1,107	1,525	982	1,650	857
	Trawl CP	121	132	114	146	108	160	101	174
	Pot (CV/CP)	1,075	601	1,017	665	960	729	902	793
	CG Total	3,618	2,411	3,617	2,411	3,617	2,411	3,617	2,411
WG	HAL CV	39	39	37	42	34	44	32	47
	HAL CP	607	496	571	528	535	561	499	593
	Trawl CV	1,543	596	1,650	489	1,757	382	1,864	275
	Trawl CP	50	84	47	89	44	95	41	100
	Pot (CV/CP)	1,103	1,014	1,038	1,081	972	1,147	907	1,213
	WG Total	3,343	2,229	3,343	2,229	3,343	2,229	3,343	2,229

Appendix 3: Product Form Volume & Value by Month

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%

GOA pollock wholesale value by month, 2012 through 2016

Month	H&G	Surimi	Fillets	Whole	Roe	Other	Meal	Oil	Total
JAN	5%	4%	3%	3%	5%	5%	1%	1%	4%
FEB	19%	14%	11%	19%	27%	13%	0%	0%	16%
MAR	28%	24%	18%	26%	58%	17%	31%	23%	27%
APR	6%	5%	5%	3%	9%	3%	0%	0%	5%
AUG	3%	4%	6%	3%	0%	6%	6%	8%	4%
SEP	16%	21%	26%	17%	1%	31%	36%	41%	19%
OCT	23%	26%	30%	26%	1%	24%	24%	26%	23%
NOV	1%	1%	1%	3%	0%	1%	2%	2%	1%
DEC	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	33%	26%	26%	2%	10%	1%	1%	0%	100%

GOA Pacific cod production by month, 2012 through 2017

Month	H&G	Fillets	Other	Roe	Whole	Total
JAN	14%	16%	22%	12%	12%	16%
FEB	20%	23%	28%	31%	25%	23%
MAR	41%	33%	29%	52%	37%	36%
APR	5%	7%	5%	4%	8%	6%
MAY	2%	2%	1%	0%	3%	2%
JUN	1%	1%	0%	0%	1%	1%
SEP	6%	7%	4%	0%	4%	6%
OCT	5%	6%	4%	0%	4%	5%
NOV	2%	3%	3%	0%	3%	2%
DEC	2%	3%	3%	1%	4%	3%
Total	37%	35%	19%	6%	3%	100%

GOA Pacific cod wholesale value by month, 2012 through 2016

Month	H&G	Fillets	Other	Roe	Whole	Total
JAN	15%	17%	23%	13%	11%	17%
FEB	19%	21%	28%	27%	23%	21%
MAR	40%	31%	30%	54%	36%	34%
APR	5%	7%	4%	4%	11%	6%
MAY	2%	2%	1%	0%	3%	2%
JUN	1%	1%	0%	0%	1%	1%
SEP	7%	8%	4%	0%	5%	7%
OCT	6%	6%	3%	0%	3%	6%
NOV	2%	4%	3%	0%	2%	3%
DEC	2%	3%	3%	1%	3%	3%
Total	27%	60%	9%	3%	1%	100%

Appendix 4: Fish Size

The following figures refer to the "Fish Size" heading in Section 3.3.