Chinook Salmon Bycatch in the GOA Pollock Fishery

In April 2011, the Council identified a preliminary preferred alternative for this analysis, as follows. Final action for this amendment is scheduled for June 2011.

Preliminary preferred alternative: Chinook salmon PSC limit and increased monitoring

Component 1: 22,500 Chinook salmon PSC limit

Apportion limit between Central and Western GOA - annual PSC limits:

Central GOA: 15,816 Chinook salmon
Western GOA: 6,684 Chinook salmon

PSC limits are derived as a combination of options (a) and (b) at a ratio of a:b equal to 50:50

a) proportional to the historical pollock TAC (2001-2010 average, drop 2007 and 2010).

b) proportional to historical average bycatch number of Chinook salmon (2001-2010 average, drop 2007 and 2010).

Central and Western GOA PSC limits would be managed by area (measures to prevent or respond to an overage would be applied at the area level, not Gulf-wide). Chinook salmon PSC limits shall be managed by NMFS in-season similar to halibut PSC limits.

If it is not possible to implement a Chinook salmon PSC limit in the first year for the full calendar year, it shall be implemented midyear for C and D seasons. The PSC limits under this scenario for C and D seasons, combined, will be as follows:

Central GOA: 7,710 Chinook salmon
Western GOA: 5,598 Chinook salmon

The preliminary preferred alternative (PPA) PSC limits for the first year under a midyear implementation are the result of the PPA annual PSC level in each area multiplied by the average bycatch taken in the C and D seasons within each area across the years noted in the PPA, and adjusted upward by 25%.

Midyear PSC limit calculation:

Central GOA: (15,816 x 0.39) x 1.25 = 7,710 Chinook salmon
Western GOA: (6,684 x 0.67) x 1.25 = 5,598 Chinook salmon

Component 2: Improved Chinook salmon PSC estimates

Extend existing 30% observer coverage requirements for vessels 60'-125' to trawl vessels less than 60' directed fishing for pollock in the Central or Western GOA.

Require full retention of all salmon in pollock trawl fisheries

NMFS shall work with the processors to evaluate and address the quality of sorting at the plants to assist improvements in observer salmon estimates. The Council encourages NMFS to apply lessons learned from the BSAI to the GOA where applicable.

Processing plants, with assistance from NMFS, should endeavor to ensure their fish tickets accurately reflect the species and number of salmon, which will be delivered and sorted as salmon bycatch at their facilities.

NMFS is also encouraged to collaborate with industry to facilitate information sharing in order to speed delivery of in-season data (total catch and salmon counts, by species) for the NORPAC data system and Catch Accounting System.

Environmental Assessment/ Regulatory Impact Review/ Initial Regulatory Flexibility Analysis for Amendment 90 to the Fishery Management Plan for Groundfish of the Gulf of Alaska

Chinook Salmon Bycatch in the Gulf of Alaska Pollock Fishery

Public Review Draft

May 2011

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Executive Summary

This amendment package proposes management measures that would apply exclusively to the directed pollock fishery in the Western and Central Gulf of Alaska (GOA). The measures under consideration include setting prohibited species catch (PSC) limits in the Central and Western GOA for Chinook salmon (*Oncorhynchus tshawytscha*), which would close the directed pollock fishery in those regulatory areas if attained, and increased observer coverage on vessels under sixty feet. At the time that the North Pacific Fishery Management Council (Council) initiated this analysis, they identified that this amendment package should be moved forward on an expedited timeframe as the highest priority of Council actions currently under consideration. In April 2011, the Council identified a preliminary preferred alternative. The Council plans to take final action on this issue in June 2011, which could allow implementation of the proposed action in mid-2012.

Council Problem Statement

Magnuson-Stevens Act National Standards require balancing optimum yield with minimizing bycatch and minimizing adverse impacts to fishery dependent communities. Chinook salmon bycatch taken incidentally in GOA pollock fisheries is a concern, historically accounting for the greatest proportion of Chinook salmon taken in GOA groundfish fisheries. Salmon bycatch control measures have not yet been implemented in the GOA, and 2010 Chinook salmon bycatch levels in the area were unacceptably high. Limited information on the origin of Chinook salmon in the GOA indicates that stocks of Asian, Alaska, British Columbia, and lower-48 origin are present, including Endangered Species Act-listed stocks.

The Council is considering several management tools for the GOA pollock fishery, including a hard cap and cooperative approaches with improved monitoring and sampling opportunities to achieve Chinook salmon PSC reductions. Management measures are necessary to provide immediate incentive for the GOA pollock fleet to be responsive to the Council's objective to reduce Chinook salmon PSC.

Alternatives

The Council adopted the following alternatives for analysis.

Alternative 1: Status quo
Alternative 2: Establish a Chinook salmon PSC limit for the directed pollock fishery (hard cap, by regulatory area) and increase observer coverage on vessels under 60 foot

Under Alternative 2, the range of PSC limits to be analyzed for the directed pollock fishery includes 15,000; 22,500; or 30,000 Chinook salmon, applied to the Western/Central GOA fisheries as a whole. These limits would be apportioned among regulatory areas based on the relative historical pollock catch in each regulatory area, the relative historical Chinook salmon catch amounts in each area, or a weighted ratio of the two (see Table ES- 1). In order to reduce the uncertainty associated with Chinook salmon catch estimates, expanded observer coverage could be required for under 60 foot vessels as an interim measure, until the observer program restructuring amendment is implemented.

Table ES- 1 Options ranked by the Chinook allowance to each area, percentage of total allowance, and the total number of Chinook salmon allowed GOA-wide (15,000, 22,500, or 30,000 fish)

		Central Gulf (620 & 630)					Western Gulf (610)				
Alternatives	Years	Rank	%	15,000	22,500	30,000	Rank	%	15,000	22,500	30,000
Option b	2001-2006, 2008-2009	1	77%	11,612	17,418	23,224	18	23%	3,388	5,082	6,776
Option b	2006 & 2008 & 2009	2	75%	11,246	16,870	22,493	17	25%	3,754	5,630	7,507
Option c(i)	2001-2006, 2008-2009	3	74%	11,078	16,617	22,156	16	26%	3,922	5,883	7,844
Option c(i)	2006 & 2008 & 2009	4	72%	10,785	16,177	21,570	15	28%	4,215	6,323	8,430
Option c(ii)	2001-2006, 2008-2009	5	70%	10,544	15,816	21,089	14	30%	4,456	6,684	8,911
Option c(ii)	2006 & 2008 & 2009	6	69%	10,324	15,485	20,647	13	31%	4,676	7,015	9,353
Option b	2001-2010	7	67%	10,068	15,102	20,136	12	33%	4,932	7,398	9,864
Option c(iii)	2001-2006, 2008-2009	8	67%	10,010	15,016	20,021	11	33%	4,990	7,484	9,979
Option c(i)	2001-2010	9	66%	9,920	14,880	19,840	10	34%	5,080	7,620	10,160
Option c(iii)	2006 & 2008 & 2009	10	66%	9,862	14,793	19,724	9	34%	5,138	7,707	10,276
Option c(ii)	2001-2010	11	65%	9,772	14,658	19,544	8	35%	5,228	7,842	10,456
Option c(iii)	2001-2010	12	64%	9,624	14,437	19,249	7	36%	5,376	8,063	10,751
Option a	2001-2010	13	63%	9,477	14,215	18,953	6	37%	5,523	8,285	11,047
Option a	2006-2010	14	63%	9,401	14,101	18,802	5	37%	5,599	8,399	11,198
Option c(iii)	2006-2010	15	62%	9,331	13,997	18,662	4	38%	5,669	8,503	11,338
Option c(ii)	2006-2010	16	62%	9,261	13,892	18,522	3	38%	5,739	8,608	11,478
Option c(i)	2006-2010	17	61%	9,191	13,787	18,383	2	39%	5,809	8,713	11,617
Option b	2006-2010	18	61%	9,122	13,682	18,243	1	39%	5,878	8,818	11,757

Source: NOAA Catch Accounting Data

Preliminary Preferred Alternative

In April 2011, the Council selected a preliminary preferred alternative, as follows.

Preliminary preferred alternative: Chinook salmon PSC limit and increased monitoring

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Apportion limit between Central and Western GOA - annual PSC limits:

Central GOA: 15,816 Chinook salmon
Western GOA: 6,684 Chinook salmon

PSC limits are derived as a combination of options (a) and (b) at a ratio of a:b equal to 50:50

a) proportional to the historical pollock TAC (2001-2010 average, drop 2007 and 2010).

b) proportional to historical average bycatch number of Chinook salmon (2001-2010 average, drop 2007 and 2010).

(Note, the tables throughout this analysis also refer to the preliminary preferred alternative as Option c(ii) 2001-2006, 2008-2009, using the 22,500 Chinook salmon allowance.)

Central and Western GOA PSC limits would be managed by area (measures to prevent or respond to an overage would be applied at the area level, not Gulf-wide). Chinook salmon PSC limits shall be managed by NMFS in-season similar to halibut PSC limits.

If it is not possible to implement a Chinook salmon PSC limit in the first year for the full calendar year, it shall be implemented midyear for C and D seasons. The PSC limits under this scenario for C and D seasons, combined, will be as follows:

Central GOA: 7,710 Chinook salmon
Western GOA: 5,598 Chinook salmon

The preliminary preferred alternative (PPA) PSC limits for the first year under a midyear implementation are the result of the PPA annual PSC level in each area multiplied by the average bycatch taken in the C and D seasons within each area across the years noted in the PPA, and adjusted upward by 25%.

Midyear PSC limit calculation:
Central GOA: (15,816 x 0.39) x 1.25 = 7,710 Chinook salmon
Western GOA: (6,684 x 0.67) x 1.25 = 5,598 Chinook salmon

Component 2: Improved Chinook salmon PSC estimates:

Extend existing 30% observer coverage requirements for vessels 60'-125' to trawl vessels less than 60' directed fishing for pollock in the Central or Western GOA.

Require full retention of all salmon in pollock trawl fisheries

NMFS shall work with the processors to evaluate and address the quality of sorting at the plants to assist improvements in observer salmon estimates. The Council encourages NMFS to apply lessons learned from the BSAI to the GOA where applicable.

Processing plants, with assistance from NMFS, should endeavor to ensure their fish tickets accurately reflect the species and number of salmon, which will be delivered and sorted as salmon bycatch at their facilities.

NMFS is also encouraged to collaborate with industry to facilitate information sharing in order to speed delivery of in-season data (total catch and salmon counts, by species) for the NORPAC data system and Catch Accounting System.

Regulatory Impact Review

Status Quo – Alternative 1

Vessels participating in the central Gulf pollock fishery averaged 36,051 mt of pollock catch from 2003 to 2010. Pollock catch in the central Gulf was greatest in 2005, when 46,802 mt were caught. Pollock catch was least in 2009 when 22,700 mt were taken. Those vessels were estimated to take as few as 2,123 Chinook salmon (2009), and as many as 31,647 Chinook salmon (2007) from 2003 to 2010, while fishing for pollock in the central Gulf. Over those years the fleet was estimated to average taking 12,607 Chinook salmon per year. When the Chinook salmon prohibited species catch is compared to the pollock catch, the number Chinook salmon per metric ton ranged from 0.09 Chinook salmon/mt of pollock in 2009 to 0.98 Chinook salmon /mt of pollock in 2007. On average, 0.35 Chinook salmon/mt of pollock was taken from 2003-2010.

In the western Gulf, the pollock fleet caught between 14,010 mt (2009) and 30,756 mt (2005) of pollock, while averaging 20,773 mt of pollock catch from 2003-2010. Over that same period of time the fleet was estimated to take from 441 Chinook salmon (2009) to 31,581 Chinook salmon (2010), while fishing for pollock in the western Gulf. The fleet was estimated to take an average of 6,380 Chinook salmon per year from 2003-2010. Comparing Chinook salmon prohibited species catch to the pollock catch indicates that 0.03 Chinook salmon/mt of pollock were taken in 2009. That ratio increased to 1.23 Chinook salmon/mt of pollock in 2010. So, from 2003 through 2010 the smallest ratio and largest ratio of Chinook salmon prohibited species catch to pollock catch, occurred in consecutive years.

Selecting the status quo alternative will not impact the costs or revenues that would be expected to accrue to the harvesters, processors, consumers, and communities that rely on pollock, harvested from the central and western Gulf of Alaska. Individuals, businesses, communities, and specific fish stocks that rely on Chinook salmon that may be caught in the central and western Gulf pollock fisheries will continue to rely on the pollock fleet to minimize their Chinook salmon prohibited species catch [1]. However, vessels working independently in relatively short fisheries without a Chinook salmon allowance do not have the

[1] National Standard 9 requires the fleets to minimize bycatch to the extent practicable.

correct economic incentives to stop fishing in an area to reduce their Chinook salmon prohibited species catch. To stop fishing would result in reduced gross revenue (and likely net revenue) if other participants continue to fish - the TAC is harvested - and their catch is reduced. So, while harvesters may experience political and peer pressure to reduce Chinook salmon prohibited species catch under the status quo, the desire to maximize profits could lessen the reductions in Chinook salmon prohibited species catch that could be achieved.

Chinook Salmon Allowance (15,000 Fish) – under Alternative 2

Under this option the total Chinook salmon PSC limit for the central and western Gulf is set at 15,000 fish. Because the total allowance is set at 15,000 fish, any increase to one area results in an equal decrease to the other area. An option that gives the central Gulf the largest Chinook salmon allowance gives the western Gulf their smallest allowance. Table ES- 1 shows the options considered by the Council ranked from low to high Chinook salmon allowance in the central Gulf and from high to low in the western Gulf. Option b (2006-2010) would generate the smallest allowance for the central Gulf. Participants in the central Gulf would be allowed to catch up to 9,122 Chinook salmon (61% of the allowance). Western Gulf participants would be allowed to catch up to 5,878 Chinook salmon (39%). Option b (2001-2006 & 2008-2009) would allow central Gulf participants to catch the most Chinook salmon. That option would generate a Chinook salmon allowance of 11,612 fish (77%) in the central Gulf. The western Gulf would have their smallest allowance 3,388 Chinook salmon (23%). All of the other options considered would fall within the range of Option b (2006-2010) and Option b (2001-2006 & 2008-2009).

Central Gulf

Selecting Option A with a 15,000 Chinook salmon PSC limit and requesting NMFS to manage to that amount, would result in the central Gulf pollock fishery being closed because the allowance was taken during five of the eight years from 2003-2010[2]. The earliest the fishery would have closed was February 26th (during 2005). A closure that early would shut the fishery down during the higher valued roe-season. Closing the fishery in March 2007 could also impact the roe-season. Closures that would have occurred during 2004, 2006, and 2010 would have occurred during the "D" season and would not have affected the higher value roe-season.

In the central Gulf the PSC allowance was not exceeded during 2003, 2008, or 2009. PSC allowances would be exceeded under all of the options during 2005, 2007 and 2010. Only the largest Chinook salmon allotment would not have been exceeded during 2004 and 2006.

Had the PSC limits been in place and NMFS was able to close the fishery precisely when the limit was reached, the maximum Chinook salmon savings would have exceeded 10,000 fish during 2005, under most options, and 20,000 Chinook salmon under all options in 2007. That year a savings of 20,000 Chinook salmon to 22,500 Chinook salmon would have been realized, depending on the option selected. During 2004, 2006, and 2010 the Chinook salmon savings would vary from 0 fish to just over 3,200 fish depending on the year and option selected.

If one of the two areas is closed to pollock fishing while the other remains open, NMFS has the authority to roll-over up to 20% of the TAC of the area receiving the allocation. NMFS has not used this authority under the status quo, because Gulf pollock fisheries were only closed by the TAC being harvested or reaching the date the season ends. Under the proposed program, a fishery could be closed in one area because the Chinook salmon allowance is taken before the start of the "B", "C", or "D" season. The authority for these transfers is found at §679.20 (a)(5)(iv)(B). For example, the central Gulf pollock

[2] Closure date estimates assumed no changes in fishing behavior. If fishery participants are able to reduce Chinook salmon prohibited species catch, the impacts would be overstated. However, increases in future pollock TAC amounts would result in the impacts being understated.

fishery was projected to close during the "B" season in 2007. Chinook PSC allowances were not taken in the western Gulf. To maximize OY, the western Gulf TAC for the "C" season and "D" season would be increased to 120% of the original amount. The 20% increase in pollock would come from the unused "C" season and "D" season central Gulf TAC.

The amount of pollock that is estimated have been foregone in the central Gulf ranged from about 30,000 mt in 2005 to no pollock being foregone in 2003, 2008, and 2009. During 2005 every option was estimated to be reduced by 14,141 mt. The 2010 pollock catch was estimated to be reduced under every option considered. Reductions ranged from about 200 mt to about 5,200 mt. During 2004 and 2006 the four largest Chinook salmon allowances, resulted in no pollock reductions. All of the other options considered would reduce the pollock harvested by a range of about 1,200 mt to 6,500 mt.

Gross exvessel revenue forgone as a result of the PSC allowance being imposed was estimated by multiplying the pollock foregone by the exvessel pollock prices reported in the Economic SAFE document. Those prices do not account for price differences in the roe and non-roe seasons. Therefore, if all of the reductions occurred in the non-roe season the average exvessel price applied may over estimate actual gross exvessel revenue foregone. Because 2010 prices were not available when the analysis was conducted, estimates of gross exvessel revenue foregone during 2010 were not calculated.

The greatest gross exvessel revenue reductions were estimated to occur in 2005, when between $6 million and $9 million decreases were projected. In 2007, the reduction was estimated to be about $4.5 million under every option. All of the other years and options were projected to reduce fross exvessel revenue by less than $2 million.

First wholesale prices from the Economic SAFEs were multiplied by the 98% of the metric tons of pollock estimated to be foregone to estimate the gross first wholesale value of pollock foregone. Only 98% of the pollock catch was used because the first wholesale price was based on retained catch. Discards of pollock in the pollock fishery are reported to be about 2% annually[3]. Therefore, the catch amount was reduced by 2% to account for the pollock that may have been discarded. Using the 2% estimate of discards may slightly overestimate or underestimate the actual discards, but is expected to provide a reasonable estimate.

In the central Gulf the gross first wholesale revenue foregone ranged from about $18.9 million to about $27.6 million during 2005, depending on the option selected. During 2007, about $11.0 million was foregone under every option considered. The revenue foregone in 2006 ranged from $0 to about $4.5 million.

Western Gulf

The western Gulf pollock fishery was projected to close because their PSC allowance is reached during either two or three of the eight years, depending on the option selected. The Western Gulf pollock fishers were estimated to reach their proposed PSC allowance under every option during 2005 and 2010. The 2005 fishery would reach the PSC allowance during the week ending on October 15th. The fishery would have closed the week ending on October 8th, under the two smallest allotments (Option b – using both time period but excluding 2007 and 2010 data). During 2010, all of the closure dates are in the "D" season (October) except the smallest allotment (Option b – excluding 2007 and 2010 from the 2001-2010 time period). Only the five smallest allotments would be triggered a closure in 2006. That year the fishery would have closed either two or four weeks into the "D" season.

[3] Pollock may only be discarded if they are the incidental catch of dead or decomposing fish or fish parts that were previously caught and discarded at sea.

In the western Gulf the bulk of the savings would have occurred in 2010. That year the Chinook savings would have been over 25,000 fish. Under the other years and options when savings were estimated, the savings were always less than 2,600 fish. In most cases no Chinook savings were estimated, and when they were estimated they were generally less than 1,000 fish.

Pollock foregone in the western Gulf predominately occurred in 2010, when 7,210 mt of pollock were estimated to be forgone. The smallest PSC allowance would have resulted in the 2005 pollock fishery being closed with 5,251 mt of pollock catch remaining. Pollock fishing in 2006 would have closed with relatively small amounts of pollock left unharvested. All other years considered would not have been affected by the proposed PSC allowances.

From 2003 through 2009, the proposed options would have had little impact on gross exvessel revenue. The five options that generate the smallest western Gulf Chinook PSC allowances would have reduced 2006 gross exvessel revenue. Gross exvessel revenue would have been decreased during 2005 under the two smallest PSC limits. All other years and options would not have resulted in a decrease in gross exvessel revenue. The greatest impact would likely have been seen in 2010, the only year that gross exvessel prices were not available. To provide some context of the reduction in revenue that may have occurred, the metric tons of pollock foregone was multiplied by the smallest and largest gross exvessel price from 2003-2009. The range of exvessel prices result in a $1.5 million to $2.9 million reduction in gross exvessel revenue. Given, the change in exvessel prices that were reported between 2003 and 2009, and preliminary indications of 2010 prices, the actual value is expected to fall within that range.

Gross first wholesale pollock revenue foregone in the Western Gulf was estimated to be relatively small from 2003 through 2009. The two suboptions under Option b were estimated to reduce processor's 2005 revenue by about $4.5 million. No other options were estimated to reduce gross first wholesale revenue that year. During 2006 the five smallest PSC allotments would reduce revenue in the Western Gulf by $1.0 million or less. As discussed under the exvessel revenue section, the largest reductions would have occurred during 2010. However, first wholesale prices are not yet available for that year. To estimate a range of the gross revenue reductions that may have occurred in 2010, the lowest and highest annual price from 2003-2009 were multiplied by the metric tons foregone. That calculation yields an estimated reduction in gross first wholesale revenue of $5.4 million to $7.1 million.

25% Overage Provision

The Council included an option that would allow a Chinook salmon PSC allowance to be exceeded by up to 25% in one of three consecutive years. This provision is applied by area. Because participants are only allowed to exceed their PSC limit every third year it will require NMFS to more closely enforce the limit during years it cannot be exceeded. The alternative also implies that exceeding the cap by just one Chinook would trigger the requirement that the cap is not exceeded the following two years. Therefore, the cap should not be viewed as allowing the vessels in the area to take full advantage of a 25% overage of the cap every third year.

It is assumed that NMFS will manage the Chinook PSC allowance so that it does not exceed 125% of the limit during years the buffer is available. During years the buffer is not available the pollock fisheries will be managed to keep the Chinook catch within the 100% of the set allowance. Under this interpretation, if the "C" season closed with 10 Chinook remaining under the limit, the "D" season would be opened using the 25% buffer that is available. Assuming that more than 10 Chinook were taken in the "D" season and the PSC limit was exceeded, the pollock fishery would be managed more tightly the following two years to ensure that the fleet does not exceed the PSC limit selected.

The central Gulf fleet would have exceeded the PSC allowance for some options from 2004 through 2007. Option a, Option b (without the suboption - to drop 2007 and 2010 data), Option c(i) (without the suboption), Option c(ii), and Option c(iii) would have exceeded the PSC allowance in 2004. Because they were also over the PSC allowance in 2005 and 2006, they would have been managed not to exceed the allowance those years. Because the fleet was only over their allowance by 588 Chinook to 1,534 Chinook they would not have utilized their entire 25% buffer that would have allowed them to harvest 2,300 Chinook to 2,800 Chinook over the allowance. However, it would allow them to use the 25% buffer again in 2007 after two years had elapsed. Because the fleet did not exceed their PSC allowance in 2008 or 2009, they would have been eligible to use the 25% buffer again in 2010.

Option b (using the suboption to drop 2007 and 2010 data) and Option c(i) (with the suboption) would have allowed the fleet to stay within their PSC allowance in 2004. In 2005 they were over the allowance by about 10,000 Chinook. That year the pollock fleet would have been allowed to use the 25% buffer, which would have allowed the fleet to harvest about 1,000 mt more pollock.

The impact of the 25% buffer is somewhat limited in the western Gulf. From 2003 through 2010 the fleet would not have been prohibited from fishing pollock because of Chinook allowance under all but two options. Option b (with suboptions) would have exceeded the Chinook PSC allowance in 2005, 2006, and 2010. Using the buffer in 2005 would have likely allowed the fleet to harvest the 5,251mt of pollock that would have been foregone. In 2006 they would have still been required to stop fishing early, and would have foregone either 308 mt of pollock (Option b and Option c(i) – both using 2006, 2008, and 2009 data and Option c(i) and Option c(ii) – both using 2001-2006 and 2008-2009 data) or 1,401mt of pollock (Option b – using 2001-2006 and 2008-2009 data). If the 25% buffer were utilized in 2010 the Chinook allowance may have allowed the fishery to stay open so that about 6,500 mt more pollock would be harvested. However, more than 21,000 Chinook were estimated to be caught during the next to last week of the fishing year. So the 25% buffer would have been exceeded by a substantial amount unless NMFS had more timely/accurate information on Chinook catch rates and could close the fishery earlier in the week, when it was determined the PSC allowance would be exceeded.

Chinook Salmon Allowance (22,500 Fish) – under Alternative 2

A Chinook salmon allowance of 22,500 fish would provide a range of 13,682 fish to 17,418 fish to participants in the central Gulf. The range in the western Gulf would be 8,818 fish to 5,082 fish. Table ES- 1 shows the Chinook salmon allowance that results from each of the options considered. The Council's PPA is based on Option c(ii) 2001-2006, 2008-2009. That option sets the Chinook salmon PSC allowance at 15,816 fish in the central Gulf and 6,684 fish in the western Gulf.

Central Gulf

The central Gulf pollock fishery is estimated to have closed in 2005 as early as March 19th and as late as October 8th, depending on the option selected. The large difference in dates indicates that less than 4,000 Chinook salmon were taken over that time period. The Council's PPA was estimated to close the fishery on October 1st. In 2007, the fishery is projected to have closed on March 24th under every option. A single closure date for all options indicates that more Chinook salmon was estimated to have been taken that week than the range between the smallest and largest Chinook PSC allowances.

If the proposed PSC allowances had been in place in 2005, between 4,011 Chinook (Option b with suboption using 2001-2006 and 2008-2009 data) and 7,747 Chinook (Option b using 2006-2010 data) would have been harvested in excess of the PSC limit. An estimated 5,613 Chinook salmon were harvested under the Council's PPA. More Chinook were caught during 2007, so the PSC limit was exceeded by 14,229 Chinook (Option b with suboption using 2001-2006 and 2008-2009 data) to 19,965

Chinook (Option b using 2006-2010 data). The PSC limit was exceeded by 15,831 fish under the Council's PPA.

Pollock would only be foregone in the central Gulf during the 2005 and 2007 fishing years. The amount of pollock that would have been foregone ranged from a low of 2,470mt to a high of 12,092mt, depending on the option selected. A total of 5,998 mt of pollock were estimated to be foregone in 2005 under the Council's PPA. During 2007 all of the options considered are estimated to decrease the amount of pollock that would have been harvested by 14,141mt. All other years the options considered would have provided the Central Gulf pollock fleet a sufficient number of Chinook salmon to harvest the pollock caught that year.

Gross exvessel pollock revenue foregone in 2005 ranged from $0.68 million to $3.31 million, depending on the option selected. The Council's PPA reduced the gross exvessel pollock revenue by $1.64 million. Gross exvessel pollock revenue foregone in 2007 was $4.49 million under all options, and gross exvessel revenue foregone in 2010 cannot be estimated because the price data are not available. Based on the information provided in this table, the total amount of gross exvessel revenue foregone by the Central Gulf pollock fleet would have ranged from just over $5 million to just under $8 million, from 2003 through 2009, if the proposed Chinook PSC limits had been in place during that time period. Based on the Council's PPA the total gross revenue forgone from 2003 through 2009 was $6.13 million.

Processors are estimated to lose between $2.09 million and $10.25 million in gross first wholesale revenue during 2005, if one of the PSC allowances under Council consideration were in place that year. The Council's PPA is estimated to reduce gross first wholesale revenue in 2005 by $5.09 million. All of the options the Council is considering are projected to reduce first wholesale revenue by $10.9 million in 2007. The PSC limit was not exceeded any other year, so the gross first wholesale revenue is not reduced. Based on the Council's PPA, the total amount of gross first wholesale revenue foregone from 2003 through 2009 is estimated to be $16.05 million.

Western Gulf

The western Gulf pollock fishery is projected to close because the PSC allowance is reached under some options in 2005 and all options in 2010. The 2005 pollock fishery was not projected to close under the Council's PPA. The fishery is always projected to close after the "D" season had been opened. The 2005 fishery would reach the PSC limit under the three smallest Chinook salmon PSC allowances. The fishery is projected to have closed on October 15th, if these three options were in place. During 2010, all of the closure dates are in the "D" season (October 2nd or October 9th). The closure date under the Council's PPA was October 9th.

Option b, when the 2007 and 2010 data are excluded from the two PSC allowance calculations, and Option c(i), when 2007 and 2010 data are excluded from the 2001 through 2010 time series, are the only three options that would not provide sufficient Chinook salmon PSC to cover the estimated Chinook salmon take in the pollock fishery. Under those three options, the PSC allowance was exceeded by 68 to 869 fish. Given the lag in time before Chinook salmon catch is reported, those options may not have resulted in any Chinook salmon savings unless the fishery was managed very conservatively. Estimated Chinook salmon PSC exceeded all of the PSC allowance options in 2010. That year the PSC allowance was exceeded by 22,763 Chinook salmon to 26,499 Chinook salmon, depending on the option selected. The PSC allowance was estimated to be exceeded by 24,897 fish. It was estimated that over 21,000 Chinook salmon were caught the week that fishery would close. About 4,000 Chinook salmon were caught the following week, so the actual expected Chinook salmon savings is between 4,000 fish and the amount the PSC limit was exceeded. The actual savings would depend on NMFS' ability to close the pollock fishery when the PSC allowance is reached.

All of the PSC allowances were sufficient to allow all the pollock to be taken from 2003 through 2009. This assumes the fishery would close to directed fishing at the end of the week the PSC allowance is taken. During 2010 the fishery would have closed with between 6,119 mt and 7,210 mt of pollock not harvested. Under the Council's PPA amount of pollock foregone was estimated to have been 6,119 mt.

The proposed Chinook salmon PSC allowances are estimated to have been a constraint only during 2010. Exvessel price data are not available for that year. However, if lowest exvessel price ($209/mt from 2003–2009) were multiplied by the smallest estimate of harvest foregone in 2010 (6,119 mt) the fleet would have lost about $1.3 million in gross revenue. If the highest exvessel price ($399/mt) were multiplied by the largest estimate of pollock foregone in 2010 (7,210 mt) the fleet would have lost about $2.9 million in gross revenue. So, the amount of gross exvessel revenue lost as a result of the PSC allowances considered for the western Gulf may be between $1.3 million and $2.9 million.

Proposed PSC allowance options only reduce pollock harvest during the 2010 fishing year. Because first wholesale prices are not available for 2010, the projections were not made. However, if the smallest reduction in pollock harvest during 2010 (6,119 mt) were multiplied by the lowest first wholesale price from 2003-2009 ($752/mt) the reduction in gross first wholesale revenue is $4.6 million. Multiplying the largest reduction in pollock harvested (7,201 mt) by the greatest price ($988/mt) yields an estimated $7.1 million reduction in gross first wholesale revenue. The actual result is likely between those two estimates.

Chinook Salmon Allowance (30,000 Fish) – under Alternative 2

The central Gulf Chinook salmon allowance ranged from 18,243 fish to 23,224 fish, depending on the option selected. Western Gulf Chinook salmon allowances ranged from 6,776 fish to 11,757 fish, depending on the option selected. Table ES- 1 reports the Chinook salmon allowance by area for all the options that are considered in this analysis.

In the central Gulf the PSC allowance was estimated to be taken during two of the eight years, from 2003-2010. The 2005 fishery is projected to have closed on October 22nd under all of the five largest Chinook salmon allowances. The four largest allowances would provide sufficient Chinook salmon to prevent the allowance from being exceeded. The fifth largest allowance would have resulted in the fishery closing a week later than the other options. The 2007 fishery is projected to have closed on March 24th under every option, just as it did under the 22,500 Chinook salmon allowance and the 15,000 Chinook salmon allowance. A single closure date for all PSC allowances and options indicates that more Chinook salmon were estimated to have been taken that week than the range between the smallest Chinook salmon PSC allowance proposed using the 15,000 Chinook salmon PSC allowance and the largest option using the 30,000 Chinook salmon allowance.

The western Gulf pollock fishery is projected to close because the PSC allowance is reached under all options during 2010. The fishery is always projected to close on October 9th, after the "D" season had been opened. Chinook salmon PSC allowances proposed would be been sufficient to cover Chinook salmon catch in the pollock fishery during all other years considered.

Central Gulf

PSC allowances considered would have been exceeded under all options except the four largest allowances in 2005. All Chinook PSC allowances would only have been exceeded during 2007. That year the PSC limits were exceeded by an estimated 8,423 Chinook salmon to 13,404 Chinook salmon, depending on the option selected. The PSC allowances were only exceeded those two years in the central Gulf.

In the central Gulf the PSC allowances were estimated to reduce the amount of pollock harvested during 2005 and 2007. PSC allowances were not constraining for any option in any other year considered. During 2005 the reduction was estimated to be 641 mt under the 13 options that generate the smallest PSC allowances. Pollock harvests were estimated to be reduced by 14,141 mt under all the options considered for 2007. That is the same reduction that was estimated under the 22,500 Chinook salmon cap for all the options in 2007. Therefore, the only difference between the 22,500 Chinook salmon allowance and the 30,000 Chinook salmon allowance in the central Gulf (over the years considered) is the pollock harvest in 2005. The difference in 2005 ranged from about 2,400 mt to over 11,000 mt.

Reduction in gross exvessel revenue is estimated to be about $180,000 under the 13 options that generate the smallest PSC allowances in 2005. The remaining five options would not reduce the gross exvessel revenue. When the 22,500 Chinook salmon allowance was considered, the reduction in gross exvessel revenue ranged from $680,000 to $3.31 million, depending on the alternative selected. The gross exvessel revenue reduction in 2007 is estimated to be $4.49 million for every option under Council consideration. This is the same gross exvessel revenue reduction that was estimated under the 22,500 Chinook salmon allowance. Gross exvessel revenue is not reduced under any of the other options in any of the years considered

Estimates of gross first wholesale revenue reductions for 2005 were either $0 or $540,000, depending on the option. Gross first wholesale revenue was estimated to decline by $10.96 million, for all options, in 2007. No other year/option combination was projected to decrease gross first wholesale revenue in the central Gulf.

Virtually all of the gross first wholesale revenue foregone by processors in the central Gulf would take place at Kodiak plants. Central Gulf pollock was processed in Kodiak except for limited amounts in Seward, King Cove, and Sand Point.

Western Gulf

The only year the PSC limit was estimated to be exceeded was 2010. That year the limit was exceeded by 19,824 Chinook salmon to 24,805 Chinook salmon , depending on the option selected. The majority of those fish were caught over a two week period during the "D" season.

The reduction in pollock catch is estimated to be the same under the 14 largest allowances as they were when the overall Chinook salmon PSC allowance was based on 22,500 Chinook salmon. Under those options the estimated pollock catch was reduced by 6,119 mt. The options that yielded the four smallest PSC allowances also reduced the estimated pollock catch by 6,119 mt under the 30,000 Chinook salmon allowance options. When the overall allowance was 22,500 Chinook salmon, the options that yielded the four largest PSC allowances reduced pollock catch by 7,210 mt. So, the difference between the 22,500 Chinook salmon allowance and the 30,000 Chinook salmon allowance over the years considered in the western Gulf is about 100 mt of pollock from 2003 through 2010.

Estimates of reduction in gross exvessel revenue are not provided. Reductions were estimated to only take place during 2010, and price data are not available for that year. However, all of the options that year were estimated to reduce pollock catch by 6,119 mt. If the smallest and largest exvessel prices over the 2003 through 2009 period were used to calculate the gross exvessel revenue foregone, the estimates would be $1.3 million and $2.4 million. The actual reduction in gross exvessel revenue may fall within that range.

Gross first wholesale revenue reductions in the western Gulf only occurred during 2010, when price data are not available. If the smallest and largest first wholesale price from 2003 through 2009 were used to

calculate the foregone gross revenue, the estimates would be $4.6 million and $6.0 million. The actual result will fall within that range, if the 2010 price is within the 2003-2009 range of prices.

Mid-year Implementation under Alternative 2

During their February 2011 meeting, the Council requested that if the proposed PSC allowances are implemented during a fishing year, that the annual limits be reduced by the number of Chinook salmon that are estimated to have been used during the seasons that are over, based on historic data used to determine the PSC limits. Based on that direction, it was assumed that the program would be implemented between one of the four pollock seasons that have been established for the Gulf. Therefore this analysis considered the number of salmon that were added to the Chinook PSC limit during the "A", "B", "C", and "D" pollock seasons in the Central and Western Gulf. If the program is implemented after the "B" season, for example, only the Chinook for the "C" and "D" seasons would be available to the harvesting fleet during that year.

Table ES- 2 shows the percentage of the total PSC allowance that that would be available period to the start of each season. To calculated the seasons, it was assumed that all catches with a week ending date before March 10th is "A" season catch; all remaining catch with a week ending date before August 25th is "B" season catch; all remaining catch with a week ending data before October 1st is "C" season catch; and all other catch with a week ending date on October 1st or later in the year is "D" season catch. However, the tables with the actual numbers of Chinook salmon are provided in Appendix 2.

Table ES- 2 Percentage of Chinook PSC cap by season for each alternative

		Percentage of Areas Total Chinook Allocation by Season							
		Central Gulf (620 & 630)				Western Gulf (610)			
Alternatives	Years	"A" Season	"B" Season	"C" Season	"D" Season	"A" Season	"B" Season	"C" Season	"D" Season
Option a (based	2006-2010	100%	76%	37%	22%	100%	82%	58%	32%
on pollock TAC)	2001-2010	100%	76%	35%	19%	100%	79%	62%	34%
Option b (based	2006-2010	100%	88%	30%	17%	100%	90%	83%	77%
on Chinook	2001-2010	100%	74%	34%	22%	100%	89%	82%	74%
Suboption:	2006 & 2008 & 2009	100%	77%	40%	19%	100%	69%	50%	39%
exclude 2007	2001-2006, 2008-2009	100%	63%	39%	26%	100%	80%	67%	56%
Option c(i)	2006-2010	100%	83%	32%	19%	100%	88%	77%	66%
Using 25% from	2006 & 2008 & 2009	100%	77%	40%	20%	100%	72%	52%	37%
Option a and 75%	2001-2010	100%	74%	34%	21%	100%	87%	77%	64%
from Option b	2001-2006, 2008-2009	100%	67%	38%	24%	100%	80%	66%	51%
Option c(ii)	2006-2010	100%	81%	34%	20%	100%	86%	71%	55%
Using 50% from	2006 & 2008 & 2009	100%	77%	39%	21%	100%	76%	54%	36%
Option a and 50%	2001-2010	100%	75%	34%	21%	100%	84%	72%	54%
from Option b	2001-2006, 2008-2009	100%	70%	37%	22%	100%	80%	65%	45%
Option c(iii)	2006-2010	100%	79%	35%	21%	100%	84%	65%	43%
Using 75% from	2006 & 2008 & 2009	100%	77%	38%	22%	100%	79%	56%	34%
Option a and 25%	2001-2010	100%	76%	35%	20%	100%	82%	67%	44%
from Option b	2001-2006, 2008-2009	100%	73%	36%	21%	100%	79%	64%	39%
Maximum Allowance		100%	86%	40%	26%	100%	90%	83%	77%
Minimum Allowance		100%	63%	30%	17%	100%	69%	50%	32%
Mean Allowance		100%	76%	36%	21%	100%	81%	66%	49%
Median Allowance		100%	76%	36%	21%	100%	81%	66%	44%

Source: NOAA Catch Accounting Data

After the Council reviewed this information at their April 2011 meeting, they selected a PPA that would only allow mid-year implementation of the program between the "B" and "C" seasons of the Gulf pollock fisheries. The Chinook salmon allowance would be established as 7,710 fish in the central Gulf and 5,598 fish in the western Gulf. From 2003 through 2010, the PSC allowance of 7,710 Chinook salmon for the central Gulf would have been sufficient to allow the available pollock to be harvested. However, in 2010 the number of Chinook salmon PSC not taken was estimated to be only 131 fish. Chinook salmon PSC catch remaining from 2004 through 2006 was approximately 1,000 to 2,000 fish. In the western Gulf the mid-year PSC allowance awould have been exceeded only during 2010. The only other year where PSC taken and the PPA allowance were relatively close was during 2005 (588 Chinook salmon PSC under the

allowance). Western Gulf pollock TACs for the 2011 combined "C" and "D" seasons are reported to be 17,458 mt. Given the PPA mid-year PSC allowance of 5,598 Chinook salmon, a Chinook salmon per metric ton of pollock catch rate of 0.32 or less would be needed to harvest the entire TAC.

Other Impacts of Alternative 2

Pollock Harvesters

If participants in one of the Gulf pollock fisheries were forced to stop fishing because the Chinook salmon allowance was taken would they have the opportunity to increase effort in other fisheries to recoup some of the foregone revenue? Most of these central Gulf vessels also participate in the Gulf Pacific cod and flatfish fisheries. Because they are involved in the Pacific cod fishery they are unlikely to increase participation in that fishery. They may be able to slightly increase participation in the flatfish fisheries, but those fisheries are driven by PSC allowances and the opportunity to utilize these fisheries to increase revenue is thought to be minimal for most participants. Western Gulf vessels participate in the early Pacific cod seasons. However, sea lion regulations have limited their ability to participate in the later Pacific cod fisheries. These vessels would have very limit opportunities to harvest other groundfish species if the pollock fishery were to close after the "B" season. Perhaps the best opportunity to increase revenue is to fish in another Gulf pollock fishery. The West Yakutat fishery could realize increased effort but it has a relatively small TAC and vessels that are participating in that fishery also typically fish the central or central and western Gulf pollock fisheries, if their LLP is endorsed to fish those areas. The 2010 West Yakutat TAC was 2,031 mt. Increased effort in that fishery could displace current participants, because of the small TAC. Another option is for persons that fish in the central Gulf pollock fishery could move to the western Gulf or vice versa. However, markets could constrain entry into those fisheries. In summary, vessels that are displaced because of a Chinook salmon PSC allowance closing their fishery are not expected to be able to recoup that revenue in other fisheries.

Close monitoring of the Chinook salmon PSC allowances and time lags from when Chinook salmon are caught and offloaded from the vessel and counted, may result in the pollock fishery being closed before the Chinook salmon PSC allowance is taken. NMFS may then need to reopen the fishery if a sufficient number of Chinook salmon remain unharvested. If that type of closure occurred at the end of fishing season, the amount of pollock that may be rolled over to the next season could be limited by Stellar Sea Lion regulations. Regulations pertaining to the central and western regulatory areas found at §679.20 (a)(5)(iv)(B) state that pollock may be rolled over so long as *any revised seasonal apportionment does not exceed 20 percent of the seasonal TAC apportionment for the statistical area. So* if a season was closed too early, given uncertainty with the number of Chinook salmon caught, the amount of pollock that may be rolled over to the following season is limited to no more than 20% of the seasonal apportionment. However, the regulations leave the option open to rollover some of the underharvest to the other statistical area. For example, if the central Gulf were closed (or closed too soon) up to 20% western Gulf area's pollock TAC could be rolled over from the Central Gulf to the Western Gulf.

Pollock Processors

In addition to the reductions in first wholesale revenue described above, two other impacts on processors are discussed in terms of early closures. The first is how can processors utilize outside workers that are brought in to process pollock if the pollock fishery closes early? The second is impacts on markets if processors are unable to fulfill contracts because the pollock fishery is closed early.

When processors prepare for a fishing year, they determine the number of workers that are needed to process the deliveries that are expected. Because of the remote locations and the relatively small communities the processors operate, they are required to bring in labor from outside the local community. Closing the pollock fishery early could require the management/ownership of the plant to determine how those employees should be utilized. Employees could be given different jobs, if there are other species

being processed or cleanup/maintenance is needed, or they would be sent home. Employees would be sent home if the cost of keeping them at the plant exceeded the cost sending them home and bringing them back when the fishery reopens.

Pollock fishery closures may also impact markets. Processors typically estimate the amount of product that will be produced from a fishery and begin marketing that product before the season. If the pollock fishery was closed early because of Chinook salmon allowances being taken, processors may not able to fulfill their contracts to deliver product. The uncertainty created could result in the loss of market share.

PSC allowances that are taken before the pollock TAC is caught also increase the fixed cost per unit of production. Increasing fixed cost per unit of production will decrease profitability, all else being equal.

Chinook Salmon Users

The lack of information on the origins and return rates of Chinook salmon taken in the Central Gulf and Western Gulf pollock fisheries, limits the analyst's ability to draw conclusions on the impacts to Chinook salmon user groups. Reduction in the number of Chinook salmon caught in the pollock fisheries are provided in this document for each option considered by the Council. However, those estimates are not intended to indicate the number of additional Chinook salmon that will be available to the subsistence, sport, and commercial users will increase by that number.

Chinook salmon taken in the pollock trawl fishery are generally smaller than fish utilized by those groups. Observer program estimates of the average size of a Chinook salmon taken in the pollock trawl fishery is approximately 7.6 lbs[4]. Natural mortality of these smaller fish will reduce returns to the terminal fisheries. Estimates of the natural mortality rates are unknown.

The locations where Chinook salmon will return - those not caught because of the proposed PSC allowances – cannot be determined with data that are currently available. Information on the origin of Chinook salmon taken in the Bering Sea trawl fisheries allowed a more detailed analysis to be conducted for those fisheries (NPFMC 2010). Models were developed that allowed estimates to be generated on the number of Chinook salmon that would return to specific locations. Data required to derive those estimates must be collected from Chinook salmon taken as prohibited species catch in the Gulf pollock fishery before similar projections can be generated.

Chinook Salmon Stocks

The impact of reducing Chinook salmon prohibited species catch in the Gulf pollock fisheries on Chinook stocks will depend on the stocks of origin of the prohibited species catch. Reducing prohibited species catch of stocks listed and threatened or endangered will have a greater impact than reducing the prohibited species catch of hatchery released fish. However, until additional information is available conclusions cannot be made for specific stocks.

Increasing Observer Coverage on the < 60' Fleet under Alternative 2

This alternative would extend the existing 30% observer coverage requirements for vessels 60'-125' to trawl vessels less than 60' directed fishing for pollock in the central or western GOA. These increased coverage requirements would be replaced if the Observer Restructuring amendment approved by the Council during their October 2010 meeting is implemented by Secretary of Commerce. Therefore, the duration of the increased costs estimated in this section may only be in place for about one year.

[4] Personal communication with Michael Fey, based on 2003 to present observer data.

A total of 20 unique vessels, less than 60 ft in length, fished pollock in the central and western GOA during 2007-2009. Between 16 and 18 unique vessels participated in this fishery within any given year. The effort of an average vessel in this fleet can be characterized as taking between 7 and 12 trips a year, each trip lasting between 2.1 and 2.5 days for a total of 17.6 to 24.8 days per year. Assuming a 30% sampling fraction by observers in terms of days per year, it can be estimated that the average vessel would be required to obtain between 5.3 and 7.4 days of observer coverage. Fleet-wide, these calculations translate to between 95 and 119 total days of observer coverage for the less than 60 ft fleet, with a mean value of 107 days. Assuming that these vessels operate out of King Cove and Sand Point, the estimated daily cost of observer coverage is $467. Multiplying 107 days by $467/day equals about $50,000 per year in increased observer costs. If this amout were divided over 17 vessels that average cost per vessel would have been about $3,000. This cost would only be incurred until the revised observer program is implentented. At that time, all catcher vessels in this class would be subject to a 1.25% exvessel fee. The 1.25% observer fee is less than the averge pay-as-you-go cost for this fleet if they land less than $235,000 of pollock. Given that the 2011 western Gulf TAC is about 35,000 mt, and exvessel prices have historically been more than $200/mt it is likely that the daily cost of observer coverage under this amendment would be less than the 1.25% fee that will be imposed under the observer restructuring amendment.

Alternative 2 Component 2 Cost to the Industry: NMFS estimates that the daily cost of observers on vessels operating out of King Cove and Sand Point would be $467.17. An average of 17 vessels less than 60' in length directed fishing for pollock in the Central or Western GOA would incur the full cost of carrying an observer for 30% of the estimated average of 108 fishing days. The average total cost for that observer coverage would be $50,221 (range = $44,228 to $55,500). The average cost of observer coverage per vessel would be $2,954 (range = $2,460 to $3,469).

Alternative 2 Component 2 Cost to NMFS: NMFS estimates that each day of additional observer coverage costs the agency $130. Based on the 2007 to 2009 data, we may expect an increase of about 108 observer days if the existing 30% observer coverage requirements for vessels 60'-125' were extended to trawl vessels less than 60' directed fishing for pollock in the Central or Western GOA. These additional observer coverage days would cost NMFS $13,975 on average, a cost that is not currently identified in NMFS's budget.

Environmental Assessment

Pollock

Under the status quo, pollock is not overfished nor approaching an overfished condition. Catch quotas have been increasing since 2009, and the most recent stock assessment indicates that the trend of increasing TACs is expected to continue into the immediate future. The catch quota is apportioned spatially and temporally to reduce potential impact on Steller sea lions, and this action would not affect this apportionment. Under Alternative 2, a lower hard cap may result in the pollock fishery closing before the TAC is reached, while a higher hard cap would allow for pollock fishing at current levels, and impacts would likely be similar to the status quo fishery. If the pollock TAC is not fully harvested, fishing will have less impact on the stock, and there will be no adverse impact on the pollock stock from the fishery. Any changes in fishing patterns that may result from the alternatives, however, would be monitored and updated in future stock assessment.

Chinook salmon

The pollock fishery has an adverse impact on Chinook salmon through direct mortality due to prohibited species catch. Under the status quo, there are no additional management measures to reduce prohibited species catch of Chinook salmon in the GOA groundfish fisheries, however, Chinook salmon are a

prohibited species, and it is incumbent upon fishermen, under the regulations, to avoid catching Chinook salmon. The EIS also considered impacts of the fisheries on the genetic structure of the population, reproductive success, and habitat, and concluded that it is unlikely that groundfish fishing has indirect impacts on these aspects of Chinook salmon sustainability. The pollock fishery also incidentally catches salmon prey species, including squid, capelin, eulachon, and herring, however the catches of these prey species are very small relative to the overall populations of these species. Thus, pollock fishing activities are considered to have minimal and temporary effects on prey availability for salmon (NMFS 2005). With respect to direct mortality, the 2007 analysis indicates that there is insufficient information available to directly link groundfish prohibited species catch to salmon stock biomass levels. The first priority of the State of Alaska in managing Chinook salmon is to meet spawning escapement goals, in order to sustain salmon resources for future generations. Salmon surplus above escapement needs are made available for subsistence and other uses. The 2007 analysis concludes that minimum escapement had generally been met in the preceding years, despite increasing levels of Chinook and chum salmon prohibited species catch in the Bering Sea pollock fishery.

Since 2007, there have been below average Chinook salmon runs in western Alaska. In 2010, Chinook salmon run size was also below average in most of the GOA, except in Chignik and Southeast Alaska where escapement goals were largely met (Table 71). The Chinook stock composition of the GOA pollock fishery prohibited species catch is not available, however the fishery has been documented to catch Chinook salmon both from Southeast Alaska (where escapement levels have been largely met) and Cook Inlet (where many of the escapement goals were not met in 2010), in the GOA. Chinook salmon prohibited species catch since 2007 was high in the central GOA in 2007, particularly low in 2008 and 2009, and high again in 2010, largely due to high prohibited species catch in the D season in the western GOA. It is not possible to draw any correlation between patterns of prohibited species catch and the status of salmon stocks, especially given the uncertainty associated with estimates of prohibited species catch in the groundfish fisheries, and the lack of data on river of origin of Chinook salmon caught in the prohibited species catch. There is also no evidence to indicate that the groundfish fisheries' take of Chinook salmon is causing escapement failures in Alaska rivers. Beginning in 2011, efforts are underway to improve genetic sampling of salmon prohibited species catch in the GOA pollock fishery, which should, in time, allow for a better understanding of the stock composition of prohibited species catch in the GOA pollock fishery.

Alternative 2 would establish a PSC limit that would be an upper limit on the prohibited species catch of Chinook salmon in the GOA pollock fisheries in the Western and Central GOA. This limit would represent an upper threshold of Chinook salmon prohibited species catch in the GOA pollock fisheries, as the pollock fisheries will be closed when the limit is reached. The analysis looks retrospectively at Chinook salmon prohibited species catch levels from 2003 to 2010, to see how many Chinook salmon would not have been caught had the cap been in place. This, of course, assumes that there would have been no change in fleet behavior under a PSC limit, which is unlikely. It does, however, provide some sense of whether a PSC limit would have resulted in salmon savings during a particular year.

In the Central GOA, 2007 was the year of highest Chinook salmon prohibited species catch, and 2005 was also a higher year. Under all PSC limit and apportionment options (except the 30,000 Chinook salmon PSC limit using the options that generate the largest allocation to the Central GOA in 2005), the fishery would have closed early in those years, and salmon savings would have varied from 0 to 22,525 Chinook salmon. In other years the PSC limit would not have been triggered under some or all of the PSC limit apportionment options. In the Western GOA, 2010 was the year of highest Chinook salmon prohibited species catch in the Western GOA, and the fishery would have closed early in 2010 under all PSC limit options. Salmon savings would have varied from 19,824 to 28,193 fish in 2010. In 2005, the Chinook savings under the 15,000 Chinook PSC limit ranged from 73 to 2,563 fish; in 2006, the savings

was 0-1,141 fish, depending on the option selected. PSC limits more than 15,000 fish resulted in small or no Chinook savings in years other than 2010.

Had the Council's PPA been in effect in the Central GOA from 2003 through 2010, an estimated 5,613 fewer Chinook salmon would have been intercepted in 2005, and 15,831 fewer Chinook salmon would have been lost in 2007, due to the fishery closure when the PSC limit was reached, all else being equal. In the Western GOA pollock fishery, 24,897 Chinook salmon would have been saved in 2010 had the Council's PPA been effect, all else equal. That was the only year Chinook salmon PSC removals exceeded the maximum allowance for that area and savings from a closure were estimated to have occurred. Combining the savings from the two areas yields a total of 46,341 Chinook salmon from 2003 through 2010. That total equates to an average savings of about 5,800 Chinook salmon per year.

Evaluating what salmon savings may occur under the alternatives does not necessarily provide insight into potential impacts to the Chinook salmon stocks, however. The PSC limit and potential salmon savings in years of high prohibited species catch do not translate directly into adult salmon that would otherwise have survived to return to its spawning stream. As described in Section 4.3.2.1, salmon caught as prohibited species catch in the GOA pollock fisheries are generally immature salmon, with an average weight varying between 6 and 9 pounds. Some proportion of the Chinook salmon prohibited species catch would have been consumed as prey to other marine resources, or been affected by some other source of natural or fishing mortality.

In the Bering Sea Chinook salmon prohibited species catch analysis (NMFS 2009b), an adult equivalent (AEQ) model was used to estimate a) how many of the bycaught salmon were likely to have returned to their streams as adults, and b) to which river system or region they would likely have returned. Many more Chinook salmon samples have been taken in the Bering Sea pollock fishery, which is subject to much higher levels of observer coverage. Consequently, in the Bering Sea, sufficient age and length data were available to construct a model estimating how many salmon are likely to have survived to adults. Additionally, prohibited species catch composition estimates were available to provide some indication as to the origin of Chinook salmon prohibited species catch. This meant that the Bering Sea analysis could include a quantitative impact analysis of salmon savings on salmon fisheries or communities. This analysis was not without controversy, since the underlying data was largely obtained from relatively small sample sizes, collected opportunistically. For this GOA pollock analysis, we do not have sufficient data to develop an AEQ model. It is assumed that the pollock fishery could be catching Chinook salmon that originate from anywhere in Alaska or elsewhere (see Section 4.3.3), and it is not possible to estimate the proportion any stock has contributed to the prohibited species catch. Therefore our ability to assess the impacts of reducing salmon prohibited species catch on salmon populations is constrained.

Some information is available from coded wire tag recoveries in GOA groundfish fisheries and research surveys (see Section 4.3.3.1 and Appendix 7). CWT recoveries provide reliable documentation of the presence of a specific salmon stock in the prohibited species catch, although the recoveries, to date, cannot be used to establish the relative abundance of stocks in the prohibited species catch, nor to estimate the number harvested from any one stock as prohibited species catch, due to sampling issues. There are also likely to be other Chinook salmon stocks that are taken in the GOA pollock fishery that originate in river systems with no tagging program. Since 1995, however, CWTs of Chinook salmon recovered in the GOA groundfish fisheries have originated from British Columbia, Alaska, Oregon, Washington, and Idaho.

While it is not possible to assess the impacts to individual Chinook salmon stocks that are being taken in the GOA pollock fisheries, nonetheless, it is possible to develop general conclusions for the action that is being proposed. If Chinook salmon prohibited species catch is reduced as a result of this action, it would likely have beneficial impacts on Chinook salmon stocks, and the harvesters and consumers of Chinook

salmon, compared to the status quo. With a PSC limit in place, it is likely that Chinook salmon prohibited species catch will be curtailed in years of otherwise high prohibited species catch, such as 2010 in the Western GOA, and 2005 and 2007 in the Central GOA. To the extent that this alternative reduces a source of direct mortality on Chinook salmon stocks, the impact to Chinook salmon overall is likely to be beneficial. Because we do not know the relative abundance of these stocks in the GOA pollock fishery prohibited species catch, however, it is not possible to determine which, nor to what degree, individual stocks are likely to be affected.

There are currently no specific prohibited species control measures in place for Chinook salmon in the GOA pollock fishery, although the regulations require that the capture of Chinook salmon be minimized. The Council's consideration of this amendment has emphasized the importance of Chinook salmon avoidance among the pollock fleet. Under a PSC limit, and especially if the attainment of the threshold appears to be imminent, the pollock fleet is likely to be active in making efforts to avoid high prohibited species catch rates, in order to preserve the opportunity to fully harvest the pollock TAC. Efforts to avoid Chinook prohibited species catch could take a variety of forms. Particularly at the outset, these efforts may have limited effect, as participants have little understanding of means of avoiding Chinook prohibited species catch. Yet, the adoption of a Chinook PSC limit likely will prompt efforts to gain better information concerning Chinook avoidance, improving the ability of participants to avoid Chinook in the long run. As information concerning Chinook avoidance is improved, participants may use that information to redirect effort to times and areas with lower Chinook catch rates. Over time, effort should become more concentrated in areas that experience lower Chinook salmon prohibited species catch rates and decrease (or perhaps eliminated altogether) in areas of higher Chinook salmon catch rates. The extent of any redistribution of effort is difficult to predict and will depend not only on the distribution of Chinook salmon catch rates on the fishing grounds, but also the participants' ability to accurately estimate Chinook salmon catch rates. It is possible that shifting the spatial or temporal distribution of the pollock fishery may impact some particular Chinook salmon stocks more than others, but as we do not currently know how effort may shift in the pollock fishery, nor the stock composition of Chinook salmon prohibited species catch, this impact is not possible to assess.

Under Alternative 2, it appears unlikely that Chinook salmon prohibited species catch would increase from the status quo. Any impact to the Chinook salmon stocks as a whole, is likely to represent either no change from the status quo, or to be beneficial, as prohibited species catch levels either remain the same or are reduced.

Other resource components

Under the status quo, marine mammal and seabird disturbance and incidental take are at low levels and are mitigated by current spatial restrictions on the GOA pollock fisheries. Under either of the alternatives, disturbance or incidental take is not expected to increase to a level that would result in population level effects on marine mammals or seabirds. Additionally, marine mammals and seabirds may be affected by changes in prey availability or prey density due to fishing, or benthic habitat alteration. In years where the hard cap constrains fishing, Alternative 2 may reduce the potential effects of the pollock fishery on prey availability. If the fleet spends longer time fishing in areas with low pollock catch rates to avoid salmon, there may be some increase to benthic habitat impacts and potential removals of marine mammal and seabird prey. However, this increase is unlikely to result in population level effects.

Previous analyses have found no substantial adverse effects to habitat in the GOA caused by fishing activities. Alternative 2 may reduce any effects on habitat that are occurring under the status quo. The potential effects on an area would be constrained by the amount of the pollock TAC and by the existing habitat conservation and protection measures. Overall, the combination of the direct, indirect, and

cumulative effects on habitat complexity for both living and non-living substrates, benthic biodiversity, and habitat suitability is not likely to be significant under any of the alternatives.

Management and Enforcement Considerations

NMFS estimates Chinook salmon prohibited species catch for the Gulf of Alaska (GOA) pollock fishery based on data from the North Pacific Groundfish Observer Program (Observer Program) and mandatory fishing industry reports. The catch estimation methods are designed to provide a quick turnaround of the information so that NMFS has catch, bycatch, and prohibited species catch estimates as quickly as possible. The system makes maximum use of small amounts of observer data as soon as they are available (at coarser aggregation levels), and the estimates are updated and refined as more data becomes available. There is, however, a greater prevalence of smaller vessels participating in the GOA groundfish fisheries than in the Bering Sea fisheries, particularly catcher vessels less than 60 feet LOA, which are unobserved.

The GOA pollock fisheries are considered high-pulsed fisheries due to the amount of seasonal allocations and the catch rates of the fleet. The seasons usually open only a few days at a time, and NMFS usually announces the closure date of pollock fisheries before the fishery actually opens. High-pulsed fisheries are challenging to manage.

Management of a hard cap under Alternative 2

Alternative 2 would implement Chinook salmon prohibited species catch caps (PSC limits) in the Central and Western GOA pollock fisheries. This action will not incorporate sophisticated management and enforcement protocols such as have been implemented under Amendment 91 in the Bering Sea. Although some modifications will be required to the Catch Accounting System (CAS), simple caps by area are not complicated and will not require a large programming effort. However, prohibited species catch estimates change on a regular basis and there can be large variations in the estimates as more observer data becomes available, quality controls are performed, and the observer data are finalized. The fluctuations in the prohibited species catch estimates may make it difficult to manage a hard cap.

NMFS will only be able to determine the amount of Chinook salmon prohibited species catch while fishing is occurring if the fishery lasts longer than approximately seven days. However, even in this scenario, a large proportion of the Chinook salmon prohibited species catch will be derived from prohibited species catch rates and the prohibited species catch estimates will change as more observer data and catch data enters the CAS. As a result, NMFS will have limited options for managing a hard cap. The most likely management strategy will be to allow the pollock fishery to occur, allow time for all the data to enter the CAS so the prohibited species catch estimate can be derived, and then determine whether to open subsequent seasons. When deciding about whether to open the subsequent seasons, NMFS will project the amount of Chinook salmon likely to be harvested in the season and determine if enough Chinook salmon hard cap remain to support the expected pollock catch. Reopenings will also be affected by this management strategy and the timeliness of processing a reopening may be delayed until observer data has been received from the prior opening to determine total Chinook salmon prohibited species catch.

Improved Chinook salmon prohibited species catch estimates under Alternative 2

This component considers extending the existing 30% observer coverage requirements for vessels 60 feet to 125 feet LOA to trawl vessels less than 60 feet LOA that are directed fishing for pollock in the Central or Western GOA. The majority of the vessels that directed fish for pollock in the Western GOA are less than 60 feet LOA, and deliver their catch to tender vessels. Few, if any, of the vessels that directed-fish for pollock in the Central GOA fall into the less than 60 feet LOA category. In general, observers are usually able to work within the existing layout of vessels. Federal regulations require that all vessels

requiring observer coverage must pass a USCG Commercial Fishing Vessel Safety Examination prior to an observer boarding the vessel. The dockside examinations are free and provide a thorough vessel check including examination of all safety equipment.

Under observer restructuring, NMFS has developed a method and timeline for preparing vessels less than 60 feet LOA to obtain observer coverage. The affected fleet in this action fishes during a relatively short time period, and the ports they deliver to may be remote. Obtaining observer coverage on short notice may be difficult without the structure that will be in place under the restructured observer program. NMFS anticipates implementing the restructured observer coverage requirements in either 2013 or 2014, depending on the availability of federal funding for the start-up year. Therefore, increases in observer coverage for vessels less than 60' LOA under Alternative 2 likely would be superceded by different observer coverage requirements, under observer restructuring, sometime within 6 to 18 months after implementation of the GOA Chinook salmon management measures. In addition, fee proceeds for observer program restructuring would be impacted should the Council decide to extend observer coverage to vessels less than 60 feet LOA through this action. If federal funding is not obtained for the initial year of the restructured program, fee proceeds to implement the program would be reduced as fewer vessels would pay the full exvessel value fee in the year prior to deploying observers under the restructured program.

Extending the existing 30% observer coverage requirements will increase the amount of information that is available for prohibited species catch estimates including Chinook salmon. However, the majority of the fleet that would be affected by increased coverage would be vessels less than 60 feet LOA in the Western GOA, and some of these vessels deliver their catch to tender vessels instead of shoreside processing facilities. NMFS will continue to estimate prohibited species catch using the available observer data, whether it comes from a census at the shoreside processor or is extrapolated from at-sea sampling. For observed deliveries to tender vessels, the prohibited species catch estimates will be based on expanded estimates of salmon prohibited species catch from the at-sea samples. With the short timeline for implementation for this action, NMFS is not contemplating changing observer data collection methods on CVs that deliver to tender vessels. Increased observer coverage on the less than 60 feet LOA fleet would result in more trips being observed which may provide increased coverage in the Western GOA. However, the additional coverage may not increase the precision of prohibited species catch estimates, since the PSC estimates will be based on at-sea sampling for Chinook salmon, which is a relatively uncommon species.

Another aspect of this component will require full retention of all salmon in the Western and Central GOA pollock fisheries. NMFS supports that as part of this action, the regulations are modified to require full retention of all salmon. Current regulations differentiate when retention of salmon is required based on whether an observer is onboard. Detecting salmon as the pollock are brought aboard and stowed is not practical, and is considered generally unsafe due to deck space limitations and stability concerns. It is important to note, however, that regulations for full retention will not modify the observer duties, beyond the possibility of an increase in biological sampling at the plants. NMFS will have no way of verifying that full retention of salmon has occurred aboard unobserved vessels.

The final aspect of this alternative recommends NMFS to work with industry to improve the delivery and quality of inseason data available from observers and reported on fish tickets. In order to improve sorting at the shoreside processors, NMFS suggests several monitoring provisions to improve the likelihood of a vessel observer obtaining an unbiased count of salmon. Although this action is specific to GOA Chinook salmon prohibited species catch, identifying salmon to species is difficult unless the observer has the salmon in hand. Therefore, each of these provisions includes salmon of all species. In addition, it may be possible to improve the reporting of essential information for NMFS and industry by placing an additional responsibility on plant observers to report the number of salmon that were in observed deliveries. NMFS

will consider this possibility in the future as they work with industry to improve the timeliness of reporting.

Roadmap to the document

The document begins by describing the purpose for this amendment (Section 1) and a description of the alternatives (Section 2). The Regulatory Impact Review begins in Section 3, and provides background information for the economic analysis, describes how fleet behavior may change as a result of the alternatives, and evaluates the economic and socioeconomic impacts of the action.

Section 4 discusses the environmental impacts of the proposed action and alternatives for the environmental assessment. The management and enforcement considerations for this action are addressed in Section 5.

The document also contains an Initial Regulatory Flexibility Analysis (Section 6), which evaluates the impact of the action on small businesses. Sections 7 and 8 discuss the alternatives with respect to the requirements of the Magnuson-Stevens Act and other analytical considerations.

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C-3(b) GOA Chinook salmon bycatch, motion
April 2, 2011

The Council adopts the preliminary preferred alternative (PPA) and changes to alternatives and options described below. The Council requests staff revise the analysis and address SSC minutes, as practicable, and release the document for public review. Options that comprise the PPA are in bold.

Problem statement:

Magnuson-Stevens Act National Standards require balancing optimum yield with minimizing bycatch and minimizing adverse impacts to fishery dependent communities. Chinook salmon bycatch taken incidentally in GOA pollock fisheries is a concern, historically accounting for the greatest proportion of Chinook salmon taken in GOA groundfish fisheries. Salmon bycatch control measures have not yet been implemented in the GOA, and 2010 Chinook salmon bycatch levels in the area were unacceptably high. Limited information on the origin of Chinook salmon in the GOA indicates that stocks of Asian, Alaska, British Columbia, and lower-48 origin are present, including ESA-listed stocks.

The Council is considering management tools for the GOA pollock fishery, including a hard cap with improved monitoring and sampling opportunities to achieve Chinook salmon prohibited species catch (PSC) reductions. Management measures are necessary to provide immediate incentive for the GOA pollock fleet to be responsive to the Council's objective to reduce Chinook salmon PSC.

Alternatives:

Alternative 1: Status quo.

Alternative 2: Chinook salmon PSC limit and increased monitoring.

Component 1: PSC limit: 15,000, **22,500**, or 30,000 Chinook salmon PSC limit.

Option: The PSC limit may be exceeded by up to 25 percent one out of three consecutive years. If the PSC limit is exceeded in one year, it may not be exceeded for the next two consecutive years.

Apportion limit between Central and Western GOA

a) proportional to the historical pollock TAC (2006-2010 or **2001-2010 average**).
b) proportional to historical average bycatch number of Chinook salmon (2006-2010 or **2001-2010 average**).
   Option: **drop 2007 and 2010 from both regulatory time series.**
c) **as a combination of options (a) and (b) at a ratio of a:b equal to**
   Suboption i: 25:75
   Suboption ii: 50:50
   Suboption iii: 75:25

Central and Western GOA PSC limits and the 25 percent buffer would be managed by area (measures to prevent or respond to an overage would be applied at the area level, not

Gulfwide). A 25 percent buffer would not apply in the first year of the program if a PSC limit is implemented midyear.

Chinook salmon PSC limits shall be managed by NMFS in-season similar to halibut PSC limits.

If it is not possible to implement a Chinook salmon PSC limit in the first year for the full calendar year, it shall be implemented midyear for C and D seasons. The PSC limits under this scenario for C and D seasons, combined, will be as follows:

Central GOA:	**7,710 Chinook salmon**
Western GOA:	**5,598 Chinook salmon**

Component 2: Improved Chinook salmon PSC estimates:

Extend existing 30% observer coverage requirements for vessels 60'-125' to trawl vessels less than 60' directed fishing for pollock in the Central or Western GOA.

Require full retention of all salmon in pollock trawl fisheries.

NFMS shall work with the processors to evaluate and address the quality of sorting at the plants to assist improvements in observer salmon estimates. The Council encourages NMFS to apply lessons learned from the BSAI to the GOA where applicable.

Processing plants, with assistance from NMFS, should endeavor to ensure their fish tickets accurately reflect the species and number of salmon, which will be delivered and sorted as salmon bycatch at their facilities.

NMFS is also encouraged to collaborate with industry to facilitate information sharing in order to speed delivery of in-season data (total catch and salmon counts, by species) for the NORPAC data system and Catch Accounting System.

C-3(b) Motion Attachment

Preliminary preferred alternative Chinook salmon annual PSC limit:

Central GOA: 15,816
Western GOA: 6,684

Preliminary preferred alternative for a Chinook salmon PSC limit for a midyear implementation:

The preliminary preferred alternative (PPA) PSC limits for the first year under a midyear implementation are the result of the PPA annual PSC level in each area multiplied by the average bycatch taken in the C and D seasons within each area across the years noted in the PPA and adjusted upward by 25 percent.

According to Table 50 on page 76, the average level of bycatch 2001-2010, drop 2007 and 2010, for the C and D seasons was 39 percent in the Central GOA and 67 percent in the Western GOA.

Midyear PSC limit calculation:

Central GOA: (15,816 x 0.39) x 1.25 = 7,710
Western GOA: (6,684 x 0.67) x 1.25 = 5,598

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Alaska Fisheries Science Center
7600 Sand Point Way N.E.
Bldg. 4, F/AKC
Seattle, Washington 98115-0070

May 11, 2011

Chris Oliver
Executive Director
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, Alaska 99501-2252

Dear Mr. Oliver,

We are writing in response to your letter of April 20, 2011 regarding the status of sampling and reporting for chinook salmon taken in the BSAI and GOA groundfish fisheries, and the analysis of those samples towards an understanding of the stock composition of the bycatch. You posed several specific questions so we will respond to each point.

1. **"The Council is particularly interested to know what type of information can be gleaned from the genetics samples from prior years, and from those collected beginning in 2011."**

As you are aware, we initiated a new sampling protocol for chinook salmon in the Bering Sea pollock fishery at the start of the 2011 fishing year when Amendment 91 was implemented. This protocol was designed to conform with recommendations provided in the report "Sampling Considerations for Estimating the Geographic Origins of chinook Salmon Bycatch in the Bering Sea Pollock Fishery by Jerome J. Pella and Harold J. Geiger. This new protocol includes a complete census of salmon bycatch in the pollock fishery which is then sampled systematically by observers. Observers are now identifying and counting all salmon in each haul or delivery and taking a tissue sample, to be used for genetic analysis, from every 10th chinook salmon encountered.

We have been unable to implement a similar protocol in the GOA pollock fishery because we do not have a census of the salmon bycatch, and we only have observers on a portion of the fishing trips. The majority of GOA trips are unobserved, and current regulations require salmon to be discarded at sea.

While we are currently unable to implement the Pella-Geiger recommended sampling protocols in the GOA, we recognized that increased sampling for genetic tissues would still be helpful. Thus, we took the opportunity in 2011 to instruct observers in the GOA pollock deliveries to collect genetic samples systematically from all observed GOA pollock deliveries. The genetic samples which are being collected in the GOA will be valuable in helping to identify which stocks are present in the GOA bycatch, even though they cannot be used to determine the relative abundance of chinook stocks in the bycatch as a whole. The 2011 genetic analysis will supplement the presence-absence information on chinook stocks which has been provided over many years from coded wire tag returns.

Nonetheless, we emphasize that the genetic samples collected from the GOA chinook salmon bycatch during 2007 - 2011 are not representative of the bycatch as a whole. Thus, estimates of the stock composition of the 2011 GOA chinook salmon bycatch as a whole will not be forthcoming.

To enable stock composition in the future, NMFS would need 1) to ensure that all salmon were retained and delivered to a shoreside processing plant for sorting, 2) implement protocols at the shoreside plants to ensure that salmon were sorted and retained until sampled by an observer, and 3) ensure that observers are available to conduct the sampling at the shoreside plants for all pollock deliveries.

2. **"Additionally, we understand that there are chinook salmon scale samples available from the GOA, going back further in time, and it would be helpful to understand what information may be realized by aging these samples."**

The historic scale samples from the GOA were collected in an ad hoc manner as their purpose was to verify species identifications. Thus, aging of these scale samples is unlikely to allow a better understanding of the age composition of the salmon bycatch due to the lack of representative sampling.

3. **"With respect to genetic samples collected under the new 2011 protocol, the Council would like to understand what a likely timeline might be for preparing the samples for processing, and then for using that data to develop a preliminary stock composition of bycatch in the observed GOA pollock fisheries."**

The genetic analysis of the salmon bycatch samples from the 2011 GOA pollock fisheries will be completed 6 to 9 months after all of the tissue samples have been received by the AFSC Genetics Laboratory in Juneau. It is expected to take 6-9 months to process the samples, complete necessary controls, and produce a draft report for review by the cooperating government agencies and university-based investigators prior to release. This report will provide information on the stock composition of the samples because our ability to make inferences about the stock composition of the bycatch is limited by the current sampling protocol. As is standard practice with time-sensitive products for NPFMC, preliminary results will be made available to concerned NPFMC and NMFS staff as soon as the analysis can be reasonably verified. All increases in sample processing will, of course, incur incremental costs and we will endeavor to factor these increases into our budget requests.

4. **"...including genetic analysis of chinook and chum salmon stocks in the Bering Sea pollock fisheries, and it would be helpful to understand how meeting these priorities trades off with genetic analysis work in the GOA."**

Genetic analysis of the Bering Sea chinook and chum salmon bycatch samples is not expected to be limited by the addition of GOA salmon bycatch samples, as the total expected number of samples is well within the genotyping capacity of the AFSC Genetics Laboratory. In fact, since all samples are shipped from the Observer Program together, it is most efficient for all samples to be processed simultaneously.

5. **"Under a full retention requirement, it may be possible, in time, to expand the sampling program to incorporate chinook salmon caught as bycatch on unobserved pollock vessels. We would be interested to hear how full retention might change the type of information that could result from a comprehensive sampling program in the GOA, and whether the agency has any sense of the timeline or feasibility for developing such a plan."**

A requirement for full retention of salmon in the GOA trawl pollock fishery would provide NMFS the ability to sample from all of the chinook salmon delivered as they are sorted at the offload. This would enable application of the sampling protocol implemented this year in the Bering Sea under Amendment 91. Genetics, coded wire tags (CWT) and other biological samples could be collected from both observed and unobserved deliveries. NMFS would endeavor to make these data collections utilizing the plant observers currently required, or those that will be required under the restructured program. We would also need to ensure that the plant observer encounters all salmon in the delivery as they do in the Bering Sea. While this method of sampling will allow for estimating stock composition of the bycatch, there will be bias concerns when sampling catch from unobserved deliveries so analysts would need to consider this possibility in working with these samples. Bias will be a concern as a salmon cap could provide incentive for some vessels to discard salmon on unobserved trips, even with a full retention requirement. As such, NMFS Catch Accounting System would only use salmon census information from observed trips for management. This potential for bias would need to be considered and analyzed in any stock composition analysis. Ensuring compliance with retention requirements could be monitored by expanded observer coverage or video systems and the feasibility of this approach could, perhaps, be evaluated through an EFP. The timing of any expansion in sampling would coincide with the implementation of regulations associated with this action, or shortly thereafter.

6. **"The council would be interested to know about planned improvements to the estimation process for coded wire tags."**

All CWTs collected in the Bering Sea in 2011 will be processed following the same protocol used for genetics samples (1/10 fish will be examined). Because the number of chinook salmon examined for tags and the total number of chinook salmon captured will both be known, calculating the sample expansion factors necessary to estimate the total number of each tagged stock taken in the bycatch will be possible. In the GOA, retention of salmon is not required and unobserved trips are not sampled at the processing plant. In all cases however, the statistical validity of the estimates depends on sample size. Sample sizes from the GOA in 2011 are unlikely to meet the minimum numbers required for statistical validity. In a given season the minimum sample size required for comparable expansions will vary, so implementing the Pella-Geiger sampling approach in the GOA in future years, with expanded observer coverage, would insure that the bycatch is sampled at a rate high enough to produce a sample size on which reliable statistics could be based.

7. **"It is our understanding that the backlog analysis of chinook and chum salmon genetic samples from the Bering Sea pollock fishery has now been caught up. The Council looks forward to hearing the annual report later this year."**

Preliminary information concerning the stock composition of samples from the 2010 GOA bycatch (116 from area 610 and 45 from area 620) will be available for the June Council meeting. These samples are

not representative of the bycatch, but a preliminary analysis can give an indication of the presence of regional stock aggregations. Analysis of the 2007-2009 GOA salmon bycatch samples is not scheduled at this time. The analysis of 2007-2009 samples would be expected to add very little, if any, information of relevance to the decisions on GOA salmon bycatch now before the Council due to the above referenced sampling issues, including the limitations on the stock composition estimates imposed by small sample sizes.

8. **"It is our understanding that the backlog analysis of chinook and chum salmon genetic samples from the Bering Sea pollock fishery has now been caught up. The Council looks forward to hearing the annual report later this year."**

The Council's understanding is correct that the genetic analysis is complete for the backlog of samples from the Bering Sea salmon bycatch. Over the last year, the AFSC Genetics Laboratory provided the Council with reports on results as they became available, and AFSC is now in process of publishing three years of Bering Sea chum bycatch sample analyses as NOAA Technical Memoranda. The 2010 draft annual report on the genetic stock composition of the Bering Sea salmon bycatch will be available for review in August of this year, and we expect to have a final version available for the Council's meeting in February 2012.

I hope that this provides you helpful information on progress with chinook salmon genetic sampling and the analysis of those samples. We have collectively come a long way in a very short amount of time on this issue. We are looking forward to continuing these efforts into the future to help inform the Council on salmon bycatch issues. If you have any further questions, please do not hesitate to ask.

Sincerely

Douglas P. DeMaster, Ph.D.
Science & Research Director,
Alaska Region

cc: AKR: James Balsiger
Mary Grady
Melanie Brown
AKC: William Karp
Martin Loefflad
Phil Mundy

May 31, 2011

Genetic Stock Composition Analysis of Chinook Salmon Samples Collected from the Bycatch of the 2010 Gulf of Alaska Trawl Fishery

Jeffrey R. Guyon
Charles M. Guthrie III
Hanhvan T. Nguyen

Auke Bay Laboratories, Alaska Fisheries Science Center, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, 17109 Point Lena Loop Rd., Juneau, Alaska, 99801

In 2010, there were an estimated 54,183 Chinook salmon taken as bycatch in the Gulf of Alaska (GOA) pelagic and non-pelagic trawl fisheries (Table 1). The majority were from statistical area 610 and most of those were estimated to have been caught during week 41 (21,064). Genetic samples were collected from Chinook salmon taken in the bycatch of the 2010 GOA trawl fisheries. The samples include 116 from statistical area 610 and 45 from statistical area 620 (Table 1). Sample locations were inferred for some samples using cruise, date, haul and offload information. No samples were collected from statistical area 630 or 640 (Table 1). The overall fraction sampled was 0.4% and did not exceed 0.8% for any area (Table 1). The target species for the pelagic trawl fishery was predominantly pollock accounting for an estimated 42,461 Chinook salmon in the bycatch. In some non-pelagic trawl fisheries in areas 620 and 630, pollock were also a target species where 1,894 Chinook salmon were estimated to be taken in the bycatch.

Table 1. Estimated number of Chinook salmon taken as bycatch in the 2010 Gulf of Alaska pelagic (PTR) and non-pelagic (NPT) trawl fisheries by statistical area, the number of available genetic samples, and the fraction sampled. Fraction sampled is calculated based on the bycatch from the pelagic trawl fishery.

Statistical Area	NPT + PTR	PTR	Genetic Samples	Fraction Sampled
610	32,855	31,579	116	0.4%
620	8,574	5,517	45	0.8%
630	12,247	5,042	0	0.0%
640	507	479	0	0.0%
Total	54,183	42,617	161	0.4%

The lack of representative samples and small sample sizes (see Table 1 and Figure 1) preclude calculating statistically reliable stock composition estimates of the 2010 GOA Chinook salmon bycatch as a whole. Nonetheless the stock composition of 2010 GOA Chinook salmon bycatch samples was estimated for the information of the NPFMC. The statistical area 610 sample set of 116 samples originated from 5 cruises from 34 offloads/hauls. The statistical area 620 sample set of 45 samples originated from 5 cruises (36 were from 1 cruise) from 9 hauls/offloads. A comparison of the sample distribution with the total GOA Chinook salmon bycatch estimate by time and area is shown in Figure 1.

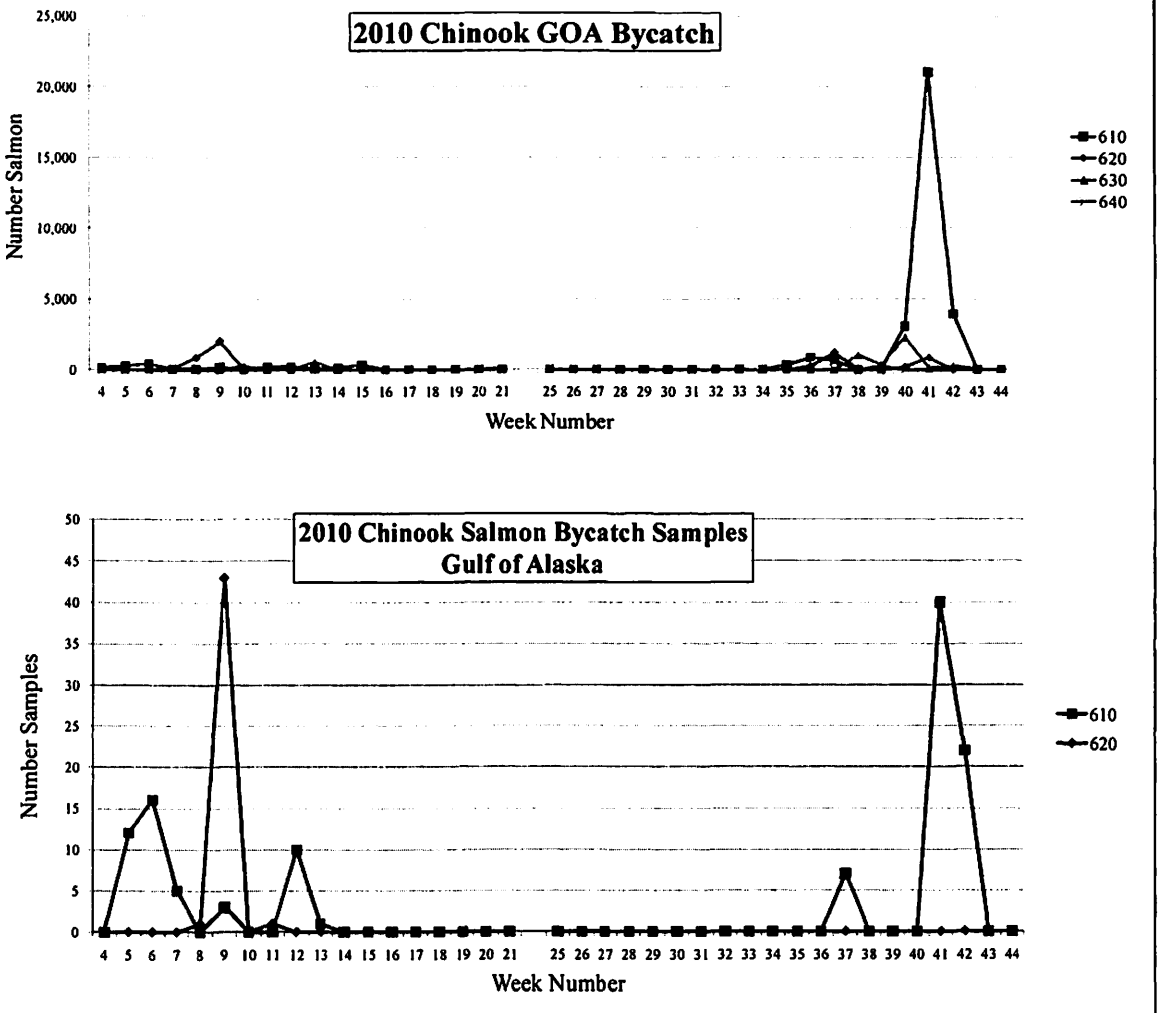

Figure 1. Temporal distribution of Chinook salmon bycatch from the GOA pelagic trawl fishery and available genetic samples. Statistical areas are designated by different colors.

Samples were genotyped for 43 single nucleotide polymorphism (SNP) markers represented in the Alaska Department of Fish and Game (ADF&G) coastwide Chinook salmon baseline (Templin et al., 2011). C programs were written to format genotypes into both SPAM and BAYES mixture files. Sample compositions were determined by comparing mixture genotypes with those from reference baseline populations with both SPAM (maximum likelihood) and BAYES (Bayesian analysis) software using previously published procedures. The 2010 GOA samples were predominantly from stocks from the Pacific Northwest, British Columbia, and Coastal SE Alaska (Tables 2 and 3). The results provide "presence" indicators rather than relative abundance. While these results suggest that stocks of salmon from the Pacific Northwest, British Columbia, and Coastal SE Alaska are caught in the GOA bycatch, they do not represent a stock composition of the entirety of Chinook salmon bycatch from the 2010 GOA trawl fishery due to the lack of representative samples and small sample sizes (see Table 1 and Figure 1). In addition to increased sampling effort and improved sample design, further delineation of additional Pacific Northwest salmon stocks in the future will require increasing the number of Pacific Northwest

(PNW) baseline populations in the coastwide SNP baseline (Templin et al., 2011). Currently, 14 PNW stocks are represented in the baseline.

Table 2. Regional SPAM and BAYES stock composition estimates for the 116 Area 610 Chinook salmon samples from the bycatch of the 2010 GOA trawl fishery. Standard deviations for the SPAM estimates were determined by the analysis of 1000 bootstrapping resamplings of the mixture. The BAYES mean estimates are provided with standard deviations (SD), 95% credible intervals, and the median estimate. "Other" includes regional groups from Russia, Upper/Middle Yukon River, North Alaska Peninsula, NW Gulf of Alaska, Copper River, and NE Gulf of Alaska.

	SPAM		BAYES				
Region	**Estimate**	**SD**	**Mean**	**SD**	**2.5%**	**Median**	**97.5%**
West Coast US	**0.148**	0.035	**0.175**	0.037	0.108	0.173	0.253
BC	**0.688**	0.048	**0.648**	0.057	0.535	0.649	0.757
Coast SE AK	**0.065**	0.031	**0.066**	0.042	0.000	0.063	0.157
Coast W AK	**0.058**	0.023	**0.075**	0.028	0.029	0.072	0.138
Other	**0.042**	0.022	**0.036**	0.023	0.002	0.033	0.090

Table 3. Regional SPAM and BAYES stock composition estimates for the 45 Area 620 Chinook salmon samples from the bycatch of the 2010 GOA trawl fishery. Standard deviations for the SPAM estimates were determined by the analysis of 1000 bootstrapping resamplings of the mixture. The BAYES mean estimates are provided with standard deviations (SD), 95% credible intervals, and the median estimate. "Other" includes regional groups from Russia, Upper/Middle Yukon River, North Alaska Peninsula, NW Gulf of Alaska, Copper River, and NE Gulf of Alaska.

	SPAM		BAYES				
Region	**Estimate**	**SD**	**Mean**	**SD**	**2.5%**	**Median**	**97.5%**
West Coast US	**0.453**	0.079	**0.436**	0.077	0.287	0.435	0.588
BC	**0.488**	0.079	**0.437**	0.083	0.278	0.436	0.602
Coast SE AK	**0.037**	0.034	**0.093**	0.056	0.009	0.085	0.224
Coast W AK	**0.000**	0.000	**0.008**	0.016	0.000	0.001	0.056
Other	**0.022**	0.022	**0.026**	0.025	0.000	0.019	0.091

C-5 GOA Chinook salmon bycatch
FINAL Council motion

December 12, 2010

The Council adopts the following problem statement and moves the following alternatives for initial review.

Problem statement:

Chinook salmon bycatch taken incidentally in GOA groundfish fisheries is a concern, and no salmon bycatch control measures have been implemented to date. Current observer coverage levels and protocols in some GOA groundfish trawl fisheries raise concerns about bycatch estimates and may limit sampling opportunities. Limited information is available on the origin of Chinook salmon taken as bycatch in the GOA; it is thought that the harvests include stocks from Asia, Alaska, British Columbia, and lower-48 origin. Despite management actions by the State of Alaska to reduce Chinook salmon mortality in sport, commercial, and subsistence fisheries, minimum Chinook salmon escapement goals in some river systems have not been achieved in recent years. In addition, the level of GOA Chinook salmon bycatch in 2010 has exceeded the incidental take amount in the Biological Opinion for ESA-listed Chinook salmon stocks. The sharp increase in 2010 Chinook bycatch levels in the GOA fisheries require implementing short-term and long-term management measures to reduce salmon bycatch to the extent practicable under National Standard 9 of the Magnuson-Stevens Act. In the short term, measures focused on the GOA pollock fisheries are expected to provide the greatest savings. In the long term, comprehensive salmon bycatch management in the GOA is needed.

Alternatives for expedited review and rule making:

The below alternatives apply to directed pollock trawl fisheries in the Central and Western GOA.

Alternative 1: Status quo.

Alternative 2: Chinook salmon PSC limit and increased monitoring.

Component 1: 15,000, 22,500, or 30,000 Chinook salmon PSC limit (hard cap).

Option: Apportion limit between Central and Western GOA

a) proportional to the pollock TAC.
b) proportional to historic average bycatch rate of Chinook salmon (5 or 10-year average).
c) proportional to historic average bycatch number of Chinook salmon (5 or 10-year average).

Component 2: Expanded observer coverage.

Extend existing 30% observer coverage requirements for vessels 60'-125' to trawl vessels less than 60' directed fishing for pollock in the Central or Western GOA.

Alternative 3: Mandatory salmon bycatch control cooperative membership.

In order to fish in the Central or Western GOA pollock fisheries a vessel must be a member of a salmon bycatch control cooperative for the area where they are participating. Cooperative formation will be annual with a minimum threshold (number of licenses).

Cooperative contractual agreements would include a requirement for vessels to retain all salmon bycatch until vessel or plant observers have an opportunity to determine the number of salmon and collect any scientific data or biological samples. Cooperative contractual agreements would also include measures to control Chinook salmon bycatch, ensure compliance with the contractual full retention requirement, promote gear innovation, salmon hotspot reporting, and monitoring individual vessel bycatch performance.

Annual cooperative reports to the Council would include the contractual agreements and successes and failures for salmon bycatch controls by season and calendar year.

The Council requests staff explore options related to the following aspects of mandatory cooperative formation:

- Minimum number of licenses required to promote meaningful exchange of information and cooperation to avoid bycatch under the current directed fishery management structure. (Minimum threshold for cooperative formation should be set to ensure all eligible licenses have a reasonable opportunity to participate).
- Evaluate the costs and benefits of minimum thresholds of cooperative membership that would allow for no more than 1 or 2 cooperatives in each region.
- Options to ensure participants outside of a bycatch control cooperative would be subject to regulatory bycatch controls if it is determined mandatory cooperative membership is not possible.
- Appropriate contract elements and reporting requirements.

Alternatives for regular review and rule making track:

The below alternatives apply to non-pollock trawl fisheries in the Central and Western GOA.

Alternative 1: Status quo.

Alternative 2: 5,000, 7,500, or 10,000 Chinook salmon PSC limit (hard cap).

Option 1: Apportion limit between Central and Western GOA.

Option 2: Apportion limit by directed fishery.

Applies to both options: Apportion proportional to historic average bycatch of Chinook salmon (5 or 10-year average).

Alternative 3: Mandatory salmon bycatch control cooperative membership.

In order to fish in the Central or Western GOA trawl fisheries a vessel must be a member of a salmon bycatch control cooperative for the area where they are participating. Cooperative formation will be annual with a minimum threshold (number of licenses).

Cooperative contractual agreements would include measures to control Chinook salmon bycatch, promote gear innovation, salmon hotspot reporting, and monitoring individual vessel bycatch performance. Annual cooperative reports to the Council would include the contractual agreements and successes and failures for salmon bycatch controls by season and calendar year.

The below alternatives applies to all trawl fisheries in the Central and Western GOA.

Alternative 4: Full retention of salmon.

Vessels will retain all salmon bycatch until the number of salmon has been determined by the vessel or plant observer and the observer's collection of any scientific data or biological samples from the salmon has been completed.

Option: Deploy electronic monitoring or observers to monitor for discards in order to validate salmon census data for use in catch accounting.

The Council also requests staff to provide the following:

- Chinook salmon bycatch rate data for each GOA groundfish fishery by month and area.
- Correlation between bycatch rates and time of day (based on observer data or anecdotal information).
- Correlation between bycatch rates and time of year (based on observer data or anecdotal information).
- Information on the flexibility under Steller sea lion measures to adjust season dates.
- Current trip limit management and implications of lowering GOA pollock trip limits.
- Information on current excluder use, effectiveness of salmon excluders, and deployment of excluders on smaller trawl vessels.
- A discussion of potential benefits, with respect to available bycatch measures and salmon savings, of a cooperative management structure for the GOA pollock fisheries. The discussion should assume a cooperative program for the Central and Western GOA directed pollock catcher vessels. Licenses qualifying for the program would annually form cooperatives that would receive allocations based on the catch histories of members. Catcher vessel cooperatives would be required to associate with a shore-based processor in the GOA, but members may change cooperatives and cooperatives may change processor associations annually without penalty.
- Analysis of management alternatives should include potential impacts of those actions on subsistence users.

Chinook salmon bycatch in the GOA pollock fishery, as a proportion of total Chinook salmon bycatch in all GOA groundfish targets, 2003-2011*.

Area		Year	GOA pollock fishery		Total Chinook salmon bycatch in all GOA groundfish fisheries
			Number of Chinook salmon taken as bycatch	Bycatch as a % of total GOA Chinook salmon bycatch	
Western GOA	610	2003	738	26%	2,860
		2004	2,327	56%	4,182
		2005	5,951	79%	7,567
		2006	4,529	93%	4,880
		2007	3,359	92%	3,663
		2008	2,116	88%	2,398
		2009	441	79%	558
		2010	31,704	96%	32,980
		AVERAGE 2003-2010	*6,396*	*87%*	*7,386*
		2011	469	54%	870
Central GOA	620	2003	1,207	31%	3,876
		2004	5,052	95%	5,316
		2005	6,770	97%	6,987
		2006	4,857	86%	5,678
		2007	28,035	97%	28,941
		2008	6,696	93%	7,173
		2009	1,359	45%	3,041
		2010	6,377	74%	8,570
		AVERAGE 2003-2010	*7,544*	*87%*	*8,698*
		2011	2,077	64%	3,223
	630	2003	2,351	28%	8,437
		2004	5,603	69%	8,089
		2005	14,659	91%	16,170
		2006	6,281	77%	8,169
		2007	3,612	47%	7,707
		2008	1,275	22%	5,730
		2009	764	18%	4,168
		2010	5,957	49%	12,238
		AVERAGE 2003-2010	*5,063*	*57%*	*8,839*
		2011	298	8%	3,650

Source: NMFS Alaska Region Catch Accounting System, data compiled by AKFIN in Comprehensive_PSC
* 2011 data reported through May 23, 2011.

C-4 GOA Chinook salmon PSC motion
June 12, 2011

The Council adopts the preferred alternative described below. Additions to the Council's April preliminary preferred alternative are shown underlined and deletions are shown in strikethrough.

Problem statement:

Magnuson-Stevens Act National Standards require balancing optimum yield with minimizing bycatch and minimizing adverse impacts to fishery dependent communities. Chinook salmon ~~bycatch~~ prohibited species catch (PSC) taken incidentally in GOA pollock fisheries is a concern, historically accounting for the greatest proportion of Chinook salmon taken in GOA groundfish fisheries. Salmon bycatch control measures have not yet been implemented in the GOA, and 2010 Chinook salmon bycatch levels in the area were unacceptably high. Limited information on the origin of Chinook salmon in the GOA indicates that stocks of Asian, Alaska, British Columbia, and lower-48 origin are present, including ESA-listed stocks.

The Council is ~~considering~~ implementing initial Chinook salmon PSC management measures ~~tools~~ for the GOA pollock fishery, including a hard cap and full retention requirement with improved monitoring and sampling opportunities, to ~~achieve~~ limit Chinook salmon ~~prohibited species catch (PSC)~~ and support development of a sampling protocol to determine the stock of origin of Chinook taken by the GOA pollock fleet~~reductions~~. Management measures are necessary to provide immediate incentive for the GOA pollock fleet to be responsive to the Council's objective to ~~reduce~~ minimize Chinook salmon PSC.

Preferred Alternative:

~~Alternative 2:~~ Chinook salmon PSC limit and increased monitoring.

Component 1: PSC limit:

22,500 Chinook salmon PSC limit.

Apportion limit between Central and Western GOA

~~a)~~ proportional to the historical pollock TAC (2001-2010 average)~~.~~ and

~~b)~~ proportional to historical average bycatch number of Chinook salmon (2001-2010 average).

~~Option:~~ drop 2007 and 2010 from both regulatory time series.

~~c) as a combination of options (a) and (b)~~ at a ratio of ~~a:b equal to~~

~~Suboption ii:~~ 50:50

Chinook salmon PSC limits shall be managed by NMFS in-season similar to halibut PSC limits.

If it is not possible to implement a Chinook salmon PSC limit in the first year for the full calendar year, it shall be implemented midyear for C and D seasons. The PSC limits under this scenario for C and D seasons, combined, will be as follows:

Central GOA: 7,710 Chinook salmon
Western GOA: 5,598 Chinook salmon

Component 2: Improved Chinook salmon PSC estimates:

Extend existing 30% observer coverage requirements for vessels 60'-125' to trawl vessels less than 60' directed fishing for pollock in the Central or Western GOA no later than January 1, 2013. Observer deployment under the restructured North Pacific Groundfish Observer Program will supersede expansion of coverage under this action.

Require full retention of all salmon in pollock trawl fisheries.

NFMS shall work with the processors to evaluate and address the quality of sorting at the plants to assist improvements in observer salmon estimates. The Council encourages NMFS to apply lessons learned from the BSAI to the GOA where applicable.

Processing plants, with assistance from NMFS, should endeavor to ensure their fish tickets accurately reflect the species and number of salmon, which will be delivered and sorted as salmon bycatch at their facilities.

NMFS is also encouraged to collaborate with industry to facilitate information sharing in order to speed delivery of in-season data (total catch and salmon counts, by species) for the NORPAC data system and Catch Accounting System.

C-4 GOA Chinook salmon PSC motion, attachment

~~Preliminary~~ preferred alternative Chinook salmon annual PSC limit:

Central GOA: 15,816
Western GOA: 6,684

~~Preliminary~~ preferred alternative for a Chinook salmon PSC limit for a midyear implementation:

The ~~preliminary~~ preferred alternative (~~P~~PA) PSC limits for the first year under a midyear implementation are the result of the ~~P~~PA annual PSC level in each area multiplied by the average bycatch taken in the C and D seasons within each area across the years noted in the ~~P~~PA and adjusted upward by 25 percent.

According to Table 50 on page 76, the average level of bycatch 2001-2010, drop 2007 and 2010, for the C and D seasons was 39 percent in the Central GOA and 67 percent in the Western GOA.

Midyear PSC limit calculation:

Central GOA: (15,816 x 0.39) x 1.25 = 7,710
Western GOA: (6,684 x 0.67) x 1.25 = 5,598