

# GOA Chinook Salmon Bycatch – All trawl fisheries

## Discussion paper for December 2011 Council meeting

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## 1 Introduction

In December 2010, the Council initiated two amendments to address GOA Chinook salmon bycatch. The first amendment package was expedited, and addressed Chinook salmon bycatch in the GOA pollock fisheries through the implementation of a prohibited species catch (PSC) limit for that target fishery, in the western and central GOA. A longer-term amendment package was also initiated at the same time, to address comprehensive Chinook salmon bycatch management in all the GOA trawl fisheries, and evaluate a broader suite of management measures to reduce bycatch.

In June 2011, the Council took final action on Amendment 93 to the GOA Groundfish FMP, which established an overall PSC limit for the Central and Western GOA pollock fisheries of 25,000 Chinook salmon. Specifically, the Central GOA annual PSC limit was set at 18,316 Chinook salmon, and the Western GOA PSC limit was set at 6,684 Chinook salmon. A provision was made to implement the PSC limits in mid-2012, and reduced PSC limits were established for the C and D seasons of the implementation year. Additional provisions ensured some form of observer coverage on all vessels fishing for pollock no later than January 1, 2013, either through the restructured North Pacific Groundfish Observer Program, or through extending existing coverage requirements for 60' to 125' trawl vessels to the under 60' trawl fleet. Also, the Council required full retention of all salmon taken in the pollock trawl fishery, in order to allow NMFS to implement a robust sampling protocol for Chinook salmon, and allow for genetic stock identification of Chinook salmon taken as bycatch. As reported at the June 2011 Council meeting, the GOA pollock industry is actively working with NMFS to develop a cooperative system to allow collections of samples from all pollock deliveries (not just those that are observed), so that extended sampling can begin in 2012. A joint (industry and NMFS) grant for funding stock of origin analysis has also been submitted to the Alaska Sustainable Salmon Fund. The notice of availability and proposed rule for Amendment 93 will shortly be published.

With respect to the longer-term amendment package, which is the subject of this discussion paper, the Council has expressed several intentions. The analysis was initiated with a specific suite of alternatives, addressing the implementation of PSC limits for the GOA non-pollock trawl fisheries, the establishment of a bycatch cooperative for these fisheries, and full retention of salmon in all the GOA trawl fisheries. Additionally, the Council identified several other items for which they requested further information, presumably with a view to determining whether those items should be included in the suite of alternatives. Finally, during the development of Amendment 93, the Council discovered that an element of the original amendment analysis for pollock PSC limits, namely a requirement for membership in a mandatory bycatch cooperative by pollock fishery participants, could not be implemented in the straightforward manner conceived of in the alternative. Therefore, the Council deferred discussion of this proposal, along with any other comprehensive tools that could improve the ability of pollock fishery participants to avoid Chinook salmon, to the current amendment package.

Given these diverse intentions, staff deemed it advisable to present the Council with a discussion paper addressing these various issues, and to ask for clarification with respect to the alternatives for moving ahead with this second Chinook salmon bycatch amendment package for the Central and Western GOA trawl fisheries. At the December 2011 Council meeting, the Council may wish to consider revising the alternatives, and perhaps the problem statement, for this analysis.

## 2 Problem statement from the Council's December 2010 motion

In December 2010, the Council developed a problem statement for the combined GOA Chinook bycatch actions, both the expedited amendment focusing on PSC limits for the GOA pollock fisheries, and the regular track, comprehensive amendment. During the course of the first analysis, the Council articulated a more specific problem statement that specifically addressed GOA pollock PSC limits. In proceeding with the this second amendment, the Council may again find it appropriate to articulate a focused problem statement for this specific action. The December 2010 problem statement is as follows:

### **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.*

### 3 Alternatives and discussion items in the Council's December 2010 motion

The alternatives and discussion items that were included in this amendment package by the Council in their December 2010 motion are included below. Staff have inserted some annotations in italic boxes. The alternatives and discussion items are discussed in detail in the sections that follow, and have been reorganized into components that are specific to the pollock fishery (Section 5), and those that are specific to the non-pollock fishery (Section 6).

#### 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.

*Note, a similar provision was also included in Amendment 93 for the GOA pollock fishery, and it was determined that the alternative cannot be implemented as the Council intended. Other avenues for Council consideration will be discussed below.*

The below alternative 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.

*Note, full retention of salmon in the pollock fishery was already approved by the Council in Amendment 93, the GOA pollock Chinook salmon PSC limit amendment.*

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.

*Note, this item has been advanced independently of this amendment package as a Council discussion paper, reviewed in October 2011.*

- 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.

*Note, the impacts of the alternatives on subsistence users will be covered in the analysis, and are not addressed in this discussion paper.*

#### 4 Chinook salmon bycatch data, by fishery

In the GOA, Chinook salmon bycatch primarily occurs in the Western and Central regulatory areas, and corresponds to the locations of the trawl fisheries. The eastern regulatory area salmon bycatch is less than 2% of total Chinook bycatch, and since 1998, a large part of this area has been closed to all trawling. Consequently, the Council focused this amendment on trawl fisheries in the Western and Central regulatory areas.

Table 1 lists Chinook salmon bycatch in the Western and Central GOA by target fishery, from 2003 to 2011 (through October 29, 2011). In both the Western and Central GOA, the majority of Chinook salmon bycatch is taken in the pollock target fishery. Table 2 identifies the proportion of the Western and Central GOA trawl fishery Chinook salmon bycatch total that is attributable to each fishery, and while there is annual variability, the pollock fishery accounted for 87% of all Chinook salmon bycatch in the Western GOA between 2003 and 2011, and 71% in the Central GOA.

**Table 1 Chinook salmon bycatch in the Western GOA (WG) and Central GOA (CG) trawl fisheries, by regulatory area and aggregated target fishery, 2003 to 2011.**

Regulatory area and target fishery	2003	2004	2005	2006	2007	2008	2009	2010	2011 *through 10/29/11	Average 2003- 2011
<b>Western GOA</b>										
Pollock	738	2,327	5,951	4,529	3,359	2,116	441	31,761	5,079	6,256
Flatfish	1,907	1,755	1,616	150	85	125		984	15	737
Pacific Cod	215	95		201	200	108	10		336	129
Rockfish					19	49	107	292	225	77
<b>WG TOTAL</b>	<b>2,860</b>	<b>4,176</b>	<b>7,567</b>	<b>4,880</b>	<b>3,663</b>	<b>2,398</b>	<b>558</b>	<b>33,037</b>	<b>5,655</b>	<b>7,199</b>
<b>Central GOA</b>										
Pollock	3,557	10,655	21,429	11,138	31,647	8,014	2,215	12,300	10,379	12,371
Flatfish	5,003	1,046	1,237	1,759	2,569	2,679	3,780	6,766	4,212	3,228
Pacific Cod	2,952	813	41	687	424	328	101	435	900	742
Rockfish	801	885	450	263	2,007	1,908	1,159	1,236	847	1,062
<b>CG TOTAL</b>	<b>12,313</b>	<b>13,398</b>	<b>23,157</b>	<b>13,847</b>	<b>36,647</b>	<b>12,929</b>	<b>7,256</b>	<b>20,737</b>	<b>16,338</b>	<b>17,402</b>
<b>Grand Total</b>	<b>15,172</b>	<b>17,575</b>	<b>30,724</b>	<b>18,727</b>	<b>40,310</b>	<b>15,327</b>	<b>7,813</b>	<b>53,774</b>	<b>21,993</b>	<b>24,602</b>

Source: NOAA catch accounting.

**Table 2 Proportional contribution of each target fishery's Chinook salmon bycatch to the total Western or Central GOA bycatch**

	2003	2004	2005	2006	2007	2008	2009	2010	2011 *through 10/29/11	Average 2003- 2011
<b>Western GOA</b>										
pollock as % of total WG	26%	56%	79%	93%	92%	88%	79%	96%	90%	87%
flatfish as % of total WG	67%	42%	21%	3%	2%	5%	0%	3%	0%	10%
<b>Central GOA</b>										
pollock as % of total CG	29%	80%	93%	80%	86%	62%	31%	59%	64%	71%
flatfish as % of total CG	41%	8%	5%	13%	7%	21%	52%	33%	26%	19%
cod as % of total CG	24%	6%	0%	5%	1%	3%	1%	2%	6%	4%
rockfish as % of total CG	7%	7%	2%	2%	5%	15%	16%	6%	5%	6%

Source: NOAA catch accounting.

After the pollock target fishery, the fisheries that contribute the most to Chinook salmon bycatch are the flatfish fisheries, which target the shallow water flatfish complex (predominantly rock sole, rex sole, flathead sole, and arrowtooth flounder). Table 3 breaks out the Chinook salmon bycatch attributable to each of the flatfish fisheries. The inter-annual variability does not particularly correlate with high and low bycatch years for the pollock target fishery. In the Western GOA, the arrowtooth flounder fishery fairly consistently takes Chinook salmon, while Chinook salmon takes are sporadic in other flatfish fisheries. Flatfish TACs are generally much lower in the Western GOA than in the Central GOA. In the Western GOA, the arrowtooth flounder target fishery also has the highest bycatch rate, averaged over 2003 to 2011 (Table 4 provides the bycatch rate for all GOA trawl fisheries, showing the number of Chinook salmon taken per metric ton of groundfish catch).

In the Central GOA, the pollock fishery has the highest average bycatch rate (Table 4). While the flatfish fisheries account for the second highest total Chinook salmon bycatch in the Central GOA (Table 2), the Pacific cod and rockfish fisheries have the highest average bycatch rates, after the pollock fishery (Table 4). All the flatfish fisheries except flathead sole take Chinook salmon bycatch in most years, and the arrowtooth flounder and rex sole fisheries have the highest average Chinook salmon bycatch, from 2003 to 2011 (Table 3). The average bycatch rates for arrowtooth, rex sole, and the shallow water flatfish complex, however, are comparable (Table 4).

**Table 3 Chinook salmon bycatch in the Western and Central GOA flatfish target fisheries, 2003 to 2011.**

Flatfish target fishery	2003	2004	2005	2006	2007	2008	2009	2010	2011 *through 10/29/11	Average 2003- 2011
<b>Western GOA</b>										
Shallow Water Flatfish	1	4	8		0					2
Rex Sole	27	127	170	43	39					45
Flathead Sole		1,348	16	54				144	15	175
Arrowtooth Flounder	1,878	276	1,422	53	46	125		840	0	516
<b>Central GOA</b>										
Shallow Water Flatfish	114	494	48		437	208	1,749	1,012		451
Rex Sole	2,791	371	812	1,402	675		1,907	2,299	1,354	1,290
Flathead Sole	598	98		2			118	352	21	132
Arrowtooth Flounder	1,499	83	377	355	1,456	2,471	6	3,103	2,837	1,354

Source: NOAA catch accounting.

**Table 4 Chinook salmon bycatch per mt groundfish catch, in the Western GOA (WG) and Central GOA (CG) trawl fisheries, by regulatory area and aggregated target fishery, 2003 to 2011.**

Regulatory area and target fishery	2003	2004	2005	2006	2007	2008	2009	2010	2011 *through 10/29/11	Average 2003- 2011
<b>Western GOA</b>										
Pollock	0.09	0.15	0.36	0.29	0.39	0.22	0.05	1.04	0.28	0.32
Shallow Water Flatfish	0.04	0.13	0.22		0.01					0.04
Rex Sole	0.24	1.05	0.61	0.26	0.24					0.27
Flathead Sole		0.49	1.03	0.13				0.38	0.18	0.25
Arrowtooth Flounder	0.54	0.41	1.98	0.28	0.12	0.23		1.73	0.01	0.59
Pacific Cod	0.73	0.19		0.14	0.20	0.03	0.02		0.39	0.19
Rockfish					0.01	0.27	0.38	0.18	1.57	0.27
<b>WG TOTAL</b>	<b>0.31</b>	<b>0.34</b>	<b>0.53</b>	<b>0.27</b>	<b>0.31</b>	<b>0.20</b>	<b>0.06</b>	<b>0.96</b>	<b>0.35</b>	<b>0.37</b>
<b>Central GOA</b>										
Pollock	0.19	0.44	0.72	0.68	2.24	0.62	0.15	0.42	0.52	0.66
Shallow Water Flatfish	0.70	0.75	0.05		0.15	1.28	0.53	0.22		0.41
Rex Sole	0.59	0.14	0.51	0.35	0.31		0.27	0.50	0.50	0.35
Flathead Sole	0.45	0.40		0.05			0.47	0.24	0.04	0.18
Arrowtooth Flounder	0.88	0.13	0.52	0.22	0.52	0.52	0.07	0.40	0.43	0.41
Pacific Cod	1.26	0.70	0.22	0.36	0.81	0.18	0.23	0.34	0.43	0.50
Rockfish	0.31	0.30	0.12	0.11	0.32	0.66	1.00	1.57	0.28	0.52
<b>CG TOTAL</b>	<b>0.47</b>	<b>0.42</b>	<b>0.61</b>	<b>0.51</b>	<b>1.15</b>	<b>0.54</b>	<b>0.28</b>	<b>0.55</b>	<b>0.45</b>	<b>0.55</b>
<b>Grand Total</b>	<b>0.47</b>	<b>0.42</b>	<b>0.61</b>	<b>0.51</b>	<b>1.15</b>	<b>0.54</b>	<b>0.28</b>	<b>0.55</b>	<b>0.45</b>	<b>0.55</b>

Source: NOAA catch accounting.

## 5 GOA pollock fishery

None of the four alternatives that are currently included in this amendment package apply to the GOA pollock fishery, as Alternatives 2 and 3 address the non-pollock fisheries, and Alternative 4 has already been approved for the pollock fishery under the previous GOA Chinook action. It was, however, the Council's stated intent that this amendment package consider tools that would improve the GOA pollock fleet's ability to maintain its Chinook salmon take levels within the PSC limits that have been recommended by the Council in Amendment 93. The discussion items that are relevant to the pollock fishery are the following:

- Bycatch cooperative (from the first Chinook amendment package – opt out clause)
- Trip limits
- Cooperative management of the pollock fishery
- Correlation between bycatch rates and time of day or season
- Effectiveness of salmon excluders in the GOA

### 5.1 Chinook salmon bycatch cooperative

As a part of an earlier action to set Chinook PSC limits in the Gulf of Alaska pollock fisheries (Amendment 93), the Council considered the development of Chinook PSC cooperatives. Cooperatives would be intended to facilitate a coordinated effort among participants in the fisheries to avoid Chinook salmon. The Council evaluated an alternative where cooperative membership would be required for

participation in the Gulf pollock fisheries. The alternative included options that would require at least one-quarter of the active participants in the pollock fishery for cooperative formation. If multiple cooperatives formed, those cooperatives would be required to have an intercooperative agreement, which would be used to ensure that the Chinook avoidance measures adopted by a cooperative would not disadvantage that cooperative's members relative to the members of other cooperatives.

The approach embodied in the cooperative structure is premised on two characteristics of Chinook avoidance efforts. First, information sharing is believed to be critical to Chinook avoidance. Participants in the fishery could share information concerning Chinook avoidance measures, as well as information concerning the timing and location of Chinook bycatch to allow scheduling of fishing activity to avoid Chinook. To form an effective cooperative for Chinook avoidance would require a substantial share of the participating vessels. Second, the incentive to avoid Chinook salmon could be reduced considerably, if Chinook avoidance is not mandated for each participant. Most Chinook avoidance measures are likely to reduce catch rates. For example, if a vessel delays fishing or moves from an area of relatively high Chinook catches, that vessel would lose fishing time relative to other vessels that might choose not to alter their fishing. A structure that allows for multiple cooperatives is believed to allow for more experimentation with Chinook avoidance measures. Consequently, the options defining a threshold for cooperative formation were low enough to allow multiple cooperatives to form. To maintain the incentive for experimentation, the alternative required that the cooperatives develop an intercooperative agreement. The intercooperative agreement would provide each cooperative with the opportunity to negotiate terms that would allow it to pursue Chinook avoidance measures without compromising its members' opportunity in the fishery.

In considering the alternative, NOAA Fisheries suggested that given the mandatory cooperative membership, in the absence of specific approval of annual cooperative contracts and any penalties for violations of those contracts, NMFS' management authority over the fishery may not be adequately maintained. In essence, allowing cooperatives to define certain management measures and define and enforce penalties for failure to comply with those measures without agency oversight could be considered a delegation of management authority in the fishery. Specifically, annual cooperative formation approval would require that NMFS review each contract making an independent assessment of whether 1) the Chinook avoidance measures proposed are permitted measures (as defined by the cooperative alternative) and, 2) those measures serve the intended bycatch control purpose. Whether these fact-based assessments can be completed in a timely manner that allows a cooperative to be approved prior to the fishery opening is uncertain.

A second issue certain to arise is that cooperative penalties would need to be administered in a manner that provides an opportunity for hearing consistent with the applicable provisions of the Magnuson Stevens Act and the Administrative Procedures Act. Certain of these notice and hearing requirements would likely apply to most standdown and financial penalties. The effectiveness of a cooperative might depend on a system of penalties that are efficiently and predictably administered. For example, a penalty for failing to suspend fishing in a hotspot could be a standdown. Such a penalty may not be consistent with NMFS' system of penalties, adding substantial uncertainty concerning the consequences of failing to comply with a cooperative measure. In addition, imposition of the penalty could be delayed, as its imposition is likely to require compliance with NMFS administrative processes. These delays may make time sensitive penalties (such as standdowns) wholly ineffective. Monitoring by the cooperative might also need to comply with NMFS' standards for penalties to be enforceable. Whether the benefits of a cooperative program could be achieved, given these requirements is questionable.<sup>1</sup>

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<sup>1</sup> An additional concern arose from a requirement that cooperative members report catch data to the cooperative. Any such reporting requirement would need to comport with data confidentiality constraints. Whether

While accommodating agency approval of all measures and penalties would restrict cooperatives from exercising the flexibility that justifies development of a cooperative alternative, it may be possible to develop a cooperative alternative that maintains NMFS management authority while providing that flexibility. This authority could be maintained by developing the alternative in a manner that allows for fishing outside of a cooperative. Under other cooperative programs created by the Council, eligible permit holders are able to participate in a fishery outside of a cooperative under an alternative management structure, such as individual fishing quotas or a limited access fishery. Under this cooperative alternative (as defined in the development of the Gulf Chinook PSC action), no opportunity to fish outside of a cooperative would be permitted. At the time of its previous action concerning Chinook PSC in the Gulf pollock fisheries, the Council elected not to develop such an alternative, as doing so would likely have required extensive analysis over the course of multiple meetings. If this amendment proceeds at a slower pace, more time may be available for development of a workable bycatch cooperative alternative.

The specific requirements for fishing outside of a cooperative should balance that opportunity against the cooperative fishing opportunity in a manner that allows cooperatives to achieve their objective. As previously defined by the Council, the cooperatives would be required to adopt the following measures:

- A system of information sharing among vessels to provide timely information concerning salmon bycatch;
- Full salmon retention until salmon can be counted by plant observers and scientific and biological sampling can be taken;
- Vessel reporting to identify hotspots and an appropriate set of measures to limit fishing in hotspots;
- A monitoring program to:
  - Ensure compliance with the full retention requirement;
  - Catalogue gear use and fishing practices and their effects on Chinook salmon bycatch;
  - Ensure compliance with reporting requirements and hotspot program limits;
  - Determine compliance with gear use and fishing practice requirements; and
  - Verify vessel performance and implement any system of rewards and penalties related to vessel performance; and
- A set of contractual penalties for failure to comply with cooperative requirements.

In addition, a cooperative would be permitted to establish rules that:

- Promote gear innovations and the use of gear and fishing practices that contribute to Chinook salmon avoidance; and
- A system of vessel performance standards that create individual incentives for Chinook salmon avoidance, including rewards and penalties based on Chinook salmon bycatch.

Since no fishing opportunity outside of cooperatives was provided for in the alternative, a cooperative would be prohibited from adopting any measures beyond those specifically authorized and would be specifically prohibited from adopting any allocations (including allocations of portions of the total allowable catch or Chinook salmon PSC limit). Cooperatives also would not be permitted to disadvantage any member for not having an established Chinook salmon PSC history in the fishery. These last two prohibitions were included in an attempt to avoid a conclusion that the cooperative had effectively defined fishing opportunities for all participants. While allocations might be decided by a cooperative that any participant can voluntarily enter or quit, requiring cooperative membership to participate in a fishery and allowing that cooperative that to define allocations would clearly defer allocations to the cooperative.

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confidentiality requirements could be satisfied was uncertain. A cooperative requirement to share these data with a private entity (i.e., the cooperative) raises questions concerning whether a person would be required to divulge confidential information by requiring cooperative membership to participate in the fishery.



If the Council were to develop a program structure that allowed for fishing outside of a cooperative, this provision may not be needed, as persons dissatisfied with their position in the cooperative could opt to fish outside of the cooperative. In essence, the cooperative would not be in a position to impose allocations on participants, since a participant dissatisfied with the allocation offered by the cooperative would have an opportunity to fish outside of the cooperative.<sup>2</sup>

The difficulty in the development of a non-cooperative fishing opportunity (in comparison to other cooperative programs) is the absence of allocations of harvest shares. In other programs, eligible vessels are permitted to fish their allocations either in a cooperative, as an IFQ, or by pooling the allocation with allocations of others in a limited access fishery. Although limited access participants confronted uncertainties from that type of management, the allocations defined the non-cooperative fishing opportunity. Without allocations, the Council must attempt to balance the fishing opportunity in a cooperative with the opportunity outside of a cooperative through other measures (such as standdowns or other effort or catch limits).

In attempting to develop a non-cooperative fishing opportunity, the complication arises from uncertainties and the likelihood that additional information will be developed concerning bycatch over time. If the Council anticipates certain bycatch efforts from cooperatives, it could adopt specific management measures that balance the cooperative fishing opportunity with the opportunity outside of the cooperative. Yet, bycatch measures and their effects on performance in the fishery are likely to change over time. For example, a cooperative may choose to have its members standdown when certain bycatch levels are reached. If bycatch rates fluctuate annually, the tendency to reach those limits and impose standdowns on members will change. In other words, measures intended to provide reasonable fishing opportunities for non-cooperative members are likely to constrain their catches more some years than others. More problematic is that the opportunity to fish may be greatest for these non-cooperative vessels in years of high bycatch. Assuming non-cooperative vessels fish during a portion of the cooperative's standdown (or in areas closed under the cooperative agreement), non-cooperative vessels will likely catch both more pollock and Chinook, increasing their share of the pollock and the total amount of Chinook caught in the fishery. Clearly, if cooperative Chinook avoidance measures change over time (in a manner that either allows the cooperative to fish more rapidly or slowly) the balance of fishing opportunities will change. While the Council could choose to advance a bycatch cooperative alternative for analysis, whether an alternative can be developed that maintains Chinook avoidance incentives for cooperatives while maintaining a reasonable fishing opportunity for vessels that choose not to join a cooperative is not certain.

## 5.2 Trip limits

The Council has expressed an interest in exploring the potential use of trip limits to address Chinook bycatch in fisheries. This suggestion is likely premised on the assumption that trip limits will slow the prosecution of the fishery in a manner that ensures that managers have more timely information concerning Chinook bycatch rates. It may be thought that if the trip limits reduce the rate of catch, they could result in more timely information for inseason managers. Managers would then be able to more precisely manage the fishery to Chinook bycatch limits (should those limits be constraining).

Currently, vessels in the Gulf of Alaska pollock fisheries are subject to a 300,000 pound (or 136 metric ton) trip limit. The limit prohibits a vessel from:

1. having on board more than 300,000 pounds of fish at any time;
2. delivering more than 300,000 pounds of fish during any day; and

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<sup>2</sup> The initial review analysis of Chinook bycatch in the GOA pollock fishery from the April/March 2011 meeting includes a more complete description of these requirements.

3. delivering more than 300,000 pounds times the number of days in a season during that season (see 50 CFR 679.7(b)(2)).

Despite the limit, few trips appear to be constrained (see Table 5).<sup>3</sup> In area 610, fewer than 5 percent of trips exceeded 275,000 pounds and fewer than 10 percent of trips exceeded 250,000 pounds in the years 2007 through 2010. In area 620, average trips are substantially larger, likely as a result of the greater distance from the ground in that area and active processors. Yet, only during one year (2007) were more than one half of the trips in excess of 200,000 pounds. In that year, almost 25 percent of the trips exceeded 275,000 pounds and almost 40 percent exceeded 250,000 pounds. In 2010, a slightly lower percentage of trips exceeded 275,000 pounds (approximately 17 percent) or 250,000 pounds (approximately 30 percent). In 2008 and 2009, fewer than 5 percent of the trips exceeded 275,000 pounds and fewer than 18 percent and 7 percent of trips exceeded 250,000 pounds, respectively. In area 630, fewer than 15 percent of annual trips exceeded 275,000 pounds in the years 2007 through 2010. Only in 2010 did more than 15 percent of trips exceed 250,000 pounds. Although trip sizes vary across the areas, trip limits appear to constrain fewer than half of the trips in any area in any year.

**Table 5 Trip size by GOA pollock management area, 2007 to 2010.**

Year	Trip size	Management Area		
		610	620	630
2007	less than 100,000	97	27	113
	between 100,000 pounds and 200,000	145	43	80
	200,000 pounds or more	37	107	39
	Total	279	177	232
2008	less than 100,000	59	96	78
	between 100,000 pounds and 200,000	111	70	74
	200,000 pounds or more	46	75	44
	Total	216	241	196
2009	less than 100,000	83	81	71
	between 100,000 pounds and 200,000	77	66	52
	200,000 pounds or more	52	36	42
	Total	212	183	165
2010	less than 100,000	240	74	68
	between 100,000 pounds and 200,000	184	88	81
	200,000 pounds or more	38	141	84
	Total	462	303	233

Source: ADF&G Fish Tickets.

Reviewing the current system for Chinook accounting is helpful for considering whether trip limits could benefit of in season management of Chinook limits. NMFS estimates Chinook salmon prohibited species catch for the 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.

<sup>3</sup> In addition, tenders are subject to a trip limit that prohibits their having onboard in excess of 600,000 pounds (or 272 metric tons) of unprocessed pollock. Tenders are only permitted to operate west of 157° 00' W longitude, limiting tendering almost exclusively to area 610.

Federal regulations (50 CFR 679.50) define observer sampling in the Gulf pollock fisheries based on vessel size, as follows<sup>4</sup>:

- Catcher vessels 125 feet in length or greater are required to carry an observer during all of their fishing days (100 percent coverage).
- Catcher vessels greater than 60 feet in length and up to 125 feet in length are required to carry an observer at least 30 percent of their fishing days in each calendar quarter, and during at least one fishing trip in each target fishery category (30 percent coverage).
- Catcher vessels less than 60 feet in length are not required to carry an observer.<sup>5</sup>

Data from observed vessels are used to estimate the numbers of salmon, by species, taken as prohibited species catch in the Alaska groundfish fisheries. Data from the observer program and mandatory fishing industry reports are the two sources of information used to estimate catch, bycatch, and prohibited species catch in the groundfish fisheries. Industry reports of landings and production are generated for all fishing activity in federal groundfish fisheries through a web-based interface known as eLandings. In the Gulf fisheries, eLandings are not used for estimating salmon prohibited species catch. Instead, NMFS' estimates of prohibited species catch are derived from independent observer data. In the catch accounting system, observer data are used to create prohibited species catch rates (a ratio of the estimated prohibited species catch to the estimated total catch in sampled hauls). For trips that are unobserved, the prohibited species catch rates are applied to industry supplied landings of retained catch. Depending on the observer data that are available, the extrapolation from observed vessels to unobserved vessels is based on varying levels of post-stratification. Data are matched based on processing sector (e.g., catcher vessels), week, fishery (e.g., pollock), gear (e.g., pelagic trawl), and federal reporting area. If data are not available from an observed vessel within the same sector, then rates are applied based on observer data from all sectors in the target fishery, using the same gear, and fishing in the same area. If observer data are not available from the same week, then a three-week average or a three-month average is used. Finally, if data from the same federal reporting area are not available, then observer data from the pollock fishery in the GOA, as a whole, will be applied.

Because the composition of catch in the pollock fishery is almost 100 percent pollock, species composition sampling generally works well for common species. However, for uncommon species such as salmon, a larger sample size is desired. Large sample sizes are generally not logistically possible on the catcher vessels. Instead, whenever possible, estimates of salmon prohibited species catch by catcher vessels are based on a full count or census of the salmon prohibited species catch at the shoreside processor. Operators of observed vessels are prohibited from discarding salmon at sea until the number of salmon has been determined and the collection of any scientific data or biological samples has been completed by the vessel observer, either on the vessel or at the shoreside processor. Any salmon reported as discarded at sea by the observer are added into the observer's count of salmon at the shoreside processor.

When a catcher vessel offloads at a shoreside processor, salmon (as prohibited species) are identified and enumerated by the vessel observer during the offload. Thus the vessel observer monitors the entire offload and attempts to count every salmon to generate a census of salmon. Salmon census tally at the shoreside processor are added to any discarded salmon at sea to obtain a final census of all salmon in each observed

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<sup>4</sup> In October 2010, the Council took final action to restructure the Observer Program for vessels and processors that are determined to need less than 100 percent observer coverage (NPFMC 2010). The restructured program is intended to provide NMFS with the flexibility to deploy observers in response to fishery management needs and to reduce the bias inherent in the existing program, to the benefit of the resulting data. While the program will bring important changes to the observer program in the near future, it will not directly affect the implications of trip limits for Chinook prohibited species catch estimates, and is therefore, omitted from further discussion here.

<sup>5</sup> Regulations allocate all Gulf pollock to the inshore component, in which catcher processor activity is limited to vessels less than 125 feet in length that process less than 126 metric tons (round weight equivalent) per week (50 CFR 679.2). This limitation has effectively removed catcher processors from the fishery.

delivery. Shoreside processors in the Gulf are not required to sort and weigh all catch by species prior to entering the factory. Therefore, several Gulf shoreside processors do not have a dedicated sorting operation and the vessel observer is frequently the only person sorting out the salmon from a delivery. In some facilities, the majority of the sorting of prohibited species catch from a pollock delivery occurs inside the processing area of the shoreside processor.<sup>6</sup> Under this protocol, salmon that are missed during sorting end up in the processing facility, which requires special treatment by the shoreside processor and the observers to ensure they are counted. These “after-scale” salmon (so called because they were initially weighed along with pollock) creates tracking difficulties for the shoreside processor and the observer. Although after-scale salmon are required to be given to an observer, there is no direct observation of salmon once they are moved past the observer and into the processing facility. Vessel observers currently record after-scale salmon as if they had collected them. However, such salmon can better be characterized as shoreside processor reported information. The vessel observer will generally only receive this information from the plant observer, if the plant observer is present. Further complications in shoreside processor based salmon accounting occur when multiple vessels are delivering simultaneously, making it difficult or impossible to determine to which vessel’s trip these salmon should be assigned. Shoreside processor personnel may not be saving after-scale salmon for observers at this stage of sampling and after-scale salmon numbers are difficult to quantify.<sup>7</sup>

In the Gulf pollock fishery, observers transmit all offload related data, including the salmon census information, once they have received the copy of the landing report information. Because observers must wait until they have the landing report information from the shoreside processor, it may take anywhere from a few days to over a week to send in all of their data to NMFS. This process can be further delayed, if observers do not have access to the data entry software, ATLAS, and electronic transmission capability. In the Gulf pollock fishery, the vast majority of observer data are submitted via fax.

The catch estimation methods are designed to provide an estimate of catch, bycatch, and prohibited species catch as quickly as possible, so that inseason managers have information to make decisions. The system makes use of observer data as soon as they are available, but the estimates are updated and refined as more observer data becomes available. In the Gulf pollock fishery, it may take anywhere from a few days to over a week for NMFS to receive preliminary observer data. After deployment in the field, which maybe as long as three months, observers review their data with FMA Division staff and ensure that data were collected following NMFS protocols. It is normal for there to be many data modifications during this “debriefing” and quality control process. For all of these reasons, PSC estimates change on a regular basis, and there can be large variations in the estimates until the observer data are finalized in late February to early March of the year following the fishery.

Reducing trip limits is likely conceived as a means of slowing the pace of catches in the fishery, which, in turn, could be believed to improve the timing of observer reports used to manage the fishery. In considering this line of thought, one should consider the reason for delayed reporting. The current delay in information arises from the need for an observer wait for a copy of the entire landing report prior to

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<sup>6</sup> This is very different from BSAI shoreside processors which are required by regulations to provide NMFS with a Catch Monitoring and Control Plan that details how the processor will ensure that all species are sorted and weighed within view of the observer. A Catch Monitoring and Control Plan requires the processor to identify a designated sorting area that precedes the fish holding bins and processing equipment and allows an observer to monitor all locations where catch could be sorted. Under a Catch Monitoring and Control Plan, no other species besides pollock are allowed to enter the processing area without first being sorted and weighed.

<sup>7</sup> There are rare circumstances where the off-load census is not completed, for example if a vessel observer was ill and could not monitor offload, and a plant observer was not available to assist with the offload sampling. Another instance when a full census is not possible is when an observed vessel delivers its catch to a tender at sea. Monitoring the offload of pollock onto a tender does not allow for the observer to count salmon prohibited species catch. Pollock hauls from both observed and unobserved vessels are mixed in the tender’s hold, therefore it is also not possible to distinguish what prohibited species catch was derived from the observed vessel once the tender delivers catch to the plant. If the census data are not available, then NMFS uses the at-sea samples and extrapolates that sample to the entire delivery, and this estimate is used to create PSC rates that are applied to unobserved vessels.

submitting their data and accessing equipment to transmit those data. The greatest delays arise in cases when a vessel departs on a new trip prior to the entire landing reporting coming available. In these instances, the observer must wait until after that new trip to submit data from the preceding trip. A vessel operator has an incentive to make a quick turnaround from a delivery to gain access to a greater share of the available total allowable catch.

While a lower trip limit might reduce the quantity of fish landed by any vessel on a given day, given the pace of the fishery, it may not reduce total daily landings. In most cases, processing capacity is said to constrain landings. Consequently, trip limits may have little effect on landings rates in the fisheries. Landings data suggest that trips of less than 100,000 pounds are typical in most areas and years (see Table 5). To meaningfully slow the rate of landings would likely require a trip limit of substantially less than that amount. Even under such a low limit, vessels are likely to make shorter trips, which could maintain relatively high daily landing rates.

To the extent that lower trip limits could increase the incentive for vessels to race for fish, they may exacerbate the greatest source of information delays to in season managers. Specifically, lags in development of prohibited species catch estimates are currently caused primarily by observers needing to wait for the full landing report to submit data from a landing. In some instances, observers are unable to wait for that information, as vessels will leave for their next trip prior to that information coming available. In these instances, the observer will submit those data after the subsequent trip. To the extent that a trip limit may induce vessels to shorten the time between a landing and beginning the subsequent trip, the trip limit may lead to further lags in observer data submissions and less timely in season management estimates of prohibited species catch. As a consequence, it is possible that trip limits might reduce the NMFS' ability to manage the fleet to the prohibited species catch limits.

### 5.3 Cooperative management of the pollock fishery

The Council has also suggested that the development of a cooperative management program for the pollock fishery could aid industry in meeting Chinook avoidance goals. Specifically, exclusive allocations of important target species and exclusive apportionments of prohibited species catch limits allow participants to adopt bycatch avoidance measures without concern that their access to the fishery may be compromised. In addition, a cooperative program could offer the opportunity to develop innovative management measures to increase incentives for bycatch reduction. For example, in the Bering Sea pollock fishery bycatch of Chinook salmon is subject to a limit that is relaxed for participants that join an incentive plan agreement that creates incentives for Chinook avoidance at all abundance levels. In addition, failure to meet a performance standard, which is applied over a series of consecutive years, results in a decrease in the limit. The intended effect is to create an incentive for participants to avoid Chinook regardless of whether the limit is likely to be binding. Similarly, in the Central Gulf rockfish program, a portion of the unused halibut PSC limit available to cooperatives is made available in year-end fisheries after the rockfish season ends. This structure is intended to increase the incentive for halibut avoidance in the rockfish fishery, while ensure overall halibut savings. A cooperative program could increase the ability of the Council to create a management program that maintains incentives to reduce prohibited species catch when fixed limits are not binding.

Although a cooperative program may provide opportunities for the Council to improve incentives for bycatch reduction, a host of social and equitable considerations must be confronted. Vessel owner and processor interests and the interests of their crews must be considered. Regional and community interests must also be considered, as well as the interests of operators of small vessels. Entry opportunities must also be considered. While a catch shares program may yield a variety of benefits (including benefits

arising from bycatch reductions), the Council will need to invest substantial efforts in the development of such a program to ensure those benefits are realized.<sup>8</sup>

In developing a cooperative program, the Council should consider the following elements:

- Applicable species, areas, operation types, and gear types
- Basis for program – allocations of quota shares or as appurtenances of licenses
- Possible set asides – to facilitate entry or incidental catch in other fisheries
- Program eligibility – typically based on historical participation or licenses
- Allocations of target species – typically based on historical catches during a defined qualifying period
- Management/allocations of incidental catch species
- Management/apportionments of prohibited species catch limits
- Cooperative formation and annual allocation rules – formation thresholds
- Fishing opportunities outside of cooperatives (IFQ or limited access component)
- Processor components or allocations
- Crew/captain components or allocations
- Regional or community landing requirements
- Community components or allocations
- Share transferability (annual, long term, post-delivery)
- Inter-sectoral transfers – across operation or gear types
- Cooperative reporting requirements
- Excessive share caps – (individual share holdings and use, cooperative share holdings and use, vessel use – grandfather)
- Season openings and closings
- Program review
- Share duration
- Cost recovery
- Sideboards
- Observer coverage

Given the breadth of issues that are likely, the Council should consider the appropriate process for the development of these program elements. In the past, the Council has relied on stakeholder proposals, committees, and staff discussion papers and preliminary analyses for development of these complex programs. Those methods (or some combination of them) are most likely to provide the Council with input needed for the development of alternatives for the development of a cooperative program.

## 5.4 Correlation between bycatch rates and time of day or season

In December 2010, the Council requested that staff bring back a discussion of any correlation between bycatch rates in the pollock fisheries, and both time of day and season. The latter discussion item was then advanced independently by the Council, as a separate Council discussion paper, which was reviewed in October 2011. The Council reviewed issues involved in redistributing D-season pollock TAC to the A-, B-, and C-seasons in the GOA. It was noted that any reallocation of TAC likely will require formal consultation under Section 7 of the ESA to ensure the action does not result in findings of Jeopardy or Adverse Modification for Steller sea lions. The Council requested an expanded discussion paper to

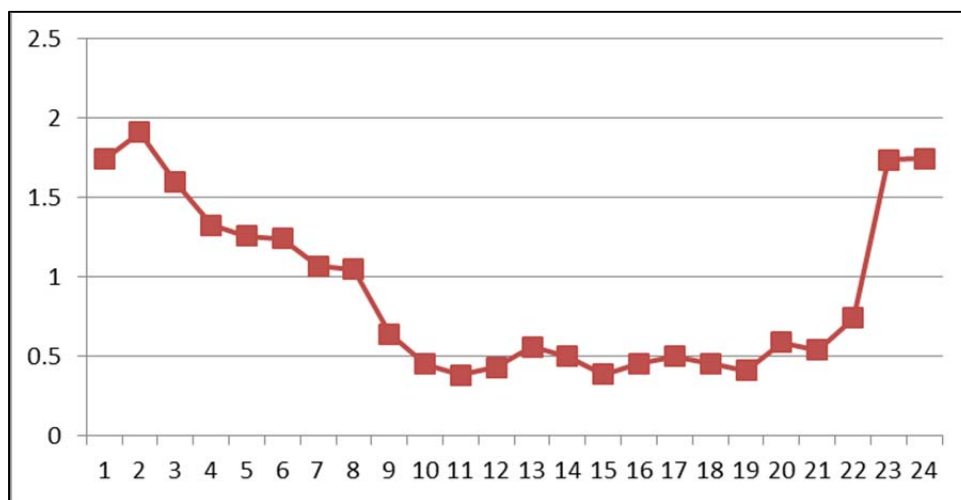
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<sup>8</sup> The Magnuson Stevens Act, as reauthorized, requires the Council to consider a variety of elements and factors. Should the Council elect to proceed with the development of a cooperative program, those considerations will be enumerated in analyses and discussion papers.

examine alternative methods of apportioning pollock TAC in the Western and Central GOA to improve the fishery and protect Chinook salmon. The discussion paper would include Chinook salmon bycatch data from 2011 and a summary of current Steller sea lion telemetry data from the Western and Central GOA. The discussion paper is currently scheduled to come back before the Council in April 2012; interactions between that discussion paper and the current amendment package will be addressed appropriately.

With respect to the correlation of bycatch rates with time of day of fishing, the Council heard testimony in December 2010, particularly from fishermen in the Western GOA, that in the D season (October 1<sup>st</sup> to November 1<sup>st</sup>) of 2010, Chinook salmon bycatch rates appeared to be higher at night than they were during the day. Staff have attempted to look at the available data to see whether it is possible to verify such a correlation. The investigation relies on observer data, which identifies the start and end time of each tow that is made on the observed vessel. There are many factors which make it difficult to determine whether there is a clear difference in bycatch rate between night and day. Especially in the Western GOA, a large portion of the fleet is unobserved, because there are a number of small (less than 60') vessels participating in the fishery that are not required to carry observers. Also, the duration of each tow is variable. Tows may last anywhere between 1 and 16 hours. In an attempt to address this issue, staff divided the number of Chinook salmon taken as bycatch by the total hours of towing, in order to arrive at an hourly bycatch rate for comparison. Figure 1 shows the Chinook bycatch rate for the Western GOA pollock D season in 2010, by hour of the day. The graph indicates that bycatch rates did appear to be lower during the daytime hours (9am to 9pm) versus nighttime hours.

**Figure 1** Chinook bycatch rate (Chinook salmon per ton of groundfish; y-axis) in the Western GOA 2010 D-season (October 1<sup>st</sup> to November 1<sup>st</sup>), during each hour of the day (using a 24 hour clock; x-axis).



Assigning the hourly bycatch rate is imprecise, however, and requires averaging across tows that occurred in both time periods. Consequently, staff also looked at the data another way. Of 213 observed tows occurring in the 2010 D season, 88 occurred entirely within the time period 7 am to 7 pm, and were classified as day tows, and 5 occurred entirely within the time period 7 pm to 7 am, and were classified as night tows. The daytime tows had an average bycatch rate of 0.57 Chinook salmon per mt groundfish, while the nighttime tows had a higher average bycatch rate of 2.10 Chinook salmon per mt of groundfish. However, the dataset for the nighttime tows is small, and it appears that two tows in that data are influencing the average.

Staff also looked at a similar query for the Central GOA, and in the 2010 D-season, the rate was highly variable across the hours of the day, with the largest spike in the bycatch rate occurring around 3 pm. Using the second approach (classifying tows as exclusively day or night tows), there was virtually no difference in the daytime and nighttime bycatch rates (0.27 versus 0.29 Chinook salmon per mt groundfish).

Staff also looked at the bycatch rate by time of day across all seasons and years, and there was no correlation between time of day and bycatch rate.

## 5.5 Salmon excluders

The Council also asked for further information on the effectiveness of salmon excluders in the GOA. The excluders have been developed for the Bering Sea pollock fleet, where they have been tested and refined over many years, and where they have at last been widely adopted. To date, there has been no fieldwork done in the GOA for testing salmon excluders in the GOA pollock fishery, which has different vessel classes, and operates on different fishery grounds. According to Dr Craig Rose, Alaska Fisheries Science Center, who helped develop the excluder and who will be involved with the testing the excluder in the GOA, he does not anticipate that there will be significant implementation problems in transferring the salmon excluders to the smaller GOA vessels (as, for example, have arisen with attempts to transfer sweep elevation technology), as the use of the excluders should not significantly change vessel machinery or operational requirements (personal communication 10/21/11). However, in 2011, some Bering Sea vessels participated in the GOA pollock fishery using their salmon excluders, and reportedly still had some tows with relatively high Chinook salmon bycatch. Segments of the GOA pollock fleet are exploring the use of salmon excluders on the smaller GOA vessels. To that end, four GOA pollock constituents recently participated in flume tank testing of the excluder in a midwater pollock net, along with Bering Sea constituents. An Exempted Fishing Permit is also in the process of being developed for the GOA, to test the excluder in the GOA pollock fishery, hopefully in the fall of 2012.

## 6 GOA non-pollock fisheries

As the amendment package currently stands, the suite of alternatives applies only to the non-pollock groundfish fisheries. Alternative 2 would create PSC limits for the non-pollock fisheries, with the option for them to be subdivided by management area and target fishery. Alternative 3 would create a mandatory Chinook salmon bycatch cooperative, however it was determined that the alternative cannot be implemented as the Council intended. Other avenues for meeting the Council's intent are discussed below in Section 6.2. Alternative 4 would require full retention of Chinook salmon by all trawl vessels. This requirement has already been approved by the Council for the pollock fishery in Amendment 93, so in this amendment package this would apply specifically to the non-pollock trawl fisheries. Some of the management implications of this requirement are addressed in Section 0.

### 6.1 PSC limits

The Council's proposed Alternative 2 would establish annual Chinook salmon PSC limit(s) for the GOA non-pollock trawl fisheries in the Central and Western GOA.



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).

The PSC limit would be a hard cap, meaning that any fishery to which the PSC limit applied would be closed for directed fishing, once the PSC limit was reached in a particular year. The PSC limit thresholds that are under consideration in Alternative 2 are 5,000; 7,500; or 10,000 Chinook salmon. The limit could be applied to all Western and Central GOA non-pollock trawl fisheries combined, or it could be divided between the two regulatory areas, establishing separate PSC limits for each area (under Option 1). The PSC limit could also be divided among the directed fisheries (Option 2). Options 1 and 2 could also be applied in combination, with separate limits applied to each directed non-pollock trawl fishery in the Western and Central GOA regulatory areas. Under either apportionment option (Option 1 or Option 2), the PSC limit would be apportioned proportionally to the historic average bycatch, using either a 5- or a 10-year average.

Table 6 provides the Chinook salmon bycatch for each year, 2002-2011, which would be used to calculate apportionments under Options 1 and 2.<sup>9</sup> The proportion available to each regulatory area or directed fishery is then used in Table 7 to calculate the proposed PSC limits under each option in Alternative 2. For example, based on the information in Table 6, the Western GOA accrued an average of 8% of the total Chinook salmon bycatch taken in the non-pollock trawl fisheries in the last five years, or 18% based on the ten-year average. Therefore, under Alternative 2, Option 1, the Western GOA would receive a PSC limit for the non-pollock trawl fisheries equivalent to 8% or 18% of the overall GOA non-pollock trawl PSC limit (5,000, 7,500, or 10,000 Chinook salmon; Table 7), which would result in a PSC limit of between 401 and 1,774 Chinook salmon.

Using the two tables together, one can determine the extent to which the proposed limits would have constrained fisheries from 2002 through 2011, had the limits been in place and fishing behavior remained the same. For all non-pollock trawl fisheries combined, a 10,000 Chinook salmon PSC limit would have been constraining in 2003 only; a 7,500 Chinook salmon PSC limit would have been constraining in 2003, 2010, and 2002; and a 5,000 Chinook salmon PSC limit would have been constraining in all years except 2004 through 2006.

Under Option 1, the PSC limits would be apportioned between the Western and Central GOA non-pollock trawl fisheries. In the Western GOA, there is an evenly-split pattern of high bycatch years (e.g., 2002 to 2005, and 2010), and very low bycatch years (e.g., 2006 to 2009). As a result of averaging the bycatch, the Western GOA would be apportioned a PSC limit that would have been adequate in the low bycatch years, but constraining in the other half of the years, under any overall GOA cap level. For the Central GOA, the overall GOA-wide 10,000 or 7,500 Chinook salmon PSC limit would have been constraining in up to two years (2003 and 2010). Under the overall 5,000 Chinook salmon PSC limit, the Central GOA non-pollock trawl fisheries would have been constrained in 7 of 10 years.

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<sup>9</sup> Note, the data for 2011 is preliminary, as only bycatch through October 29 is included in the table. Therefore, this table will be updated before it is used for analysis.

**Table 6 Chinook salmon bycatch for GOA non-pollock trawl fisheries, 2002 to 2011, including 5- and 10-year averages used for calculating apportionment options under Alternative 2.**

Fishery	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011*	5-year average (2007-2011)		10-year average (2002-2011)	
All GOA non-pollock trawl	7,758	10,877	4,593	3,343	3,060	5,304	5,197	5,157	9,713	6,535	6,381	100%	6,154	100%
WG non-pollock trawl	2,420	2,122	1,850	1,616	351	304	282	117	1,277	577	511	8%	1,091	18%
CG non-pollock trawl	5,338	8,755	2,743	1,728	2,709	5,000	4,916	5,040	8,437	5,958	5,870	92%	5,062	82%
WG & CG														
Shallow Water Flatfish	462	116	498	56	0	438	208	1,749	1,012	0	681	11%	454	7%
Rex Sole	1,593	2,819	498	982	1,444	714	0	1,907	2,299	1,354	1,255	20%	1,361	22%
Flathead Sole	0	598	1,446	16	56	0	0	118	496	36	130	2%	277	4%
Arrowtooth Flounder	388	3,377	359	1,798	408	1,502	2,596	6	3,943	2,837	2,177	34%	1,721	28%
Pacific Cod	4,066	3,167	908	41	888	624	436	111	435	1,236	568	9%	1,191	19%
Rockfish	1,250	801	885	450	263	2,026	1,958	1,266	1,529	1,072	1,570	25%	1,150	19%
WG														
Shallow Water Flatfish	3	1	4	8		0					0	0%	2	0%
Rex Sole	17	27	127	170	43	39					8	2%	42	4%
Flathead Sole			1,348	16	54				144	15	32	6%	158	14%
Arrowtooth Flounder	46	1,878	276	1,422	53	46	125		840	0	202	40%	469	43%
Pacific Cod	2,354	215	95		201	200	108	10		336	131	26%	352	32%
Rockfish						19	49	107	292	225	139	27%	69	6%
CG														
Shallow Water Flatfish	459	114	494	48		437	208	1,749	1,012		681	12%	452	9%
Rex Sole	1,576	2,791	371	812	1,402	675		1,907	2,299	1,354	1,247	21%	1,319	26%
Flathead Sole		598	98		2			118	352	21	98	2%	119	2%
Arrowtooth Flounder	342	1,499	83	377	355	1,456	2,471	6	3,103	2,837	1,975	34%	1,253	25%
Pacific Cod	1,712	2,952	813	41	687	424	328	101	435	900	437	7%	839	17%
Rockfish	1,250	801	885	450	263	2,007	1,908	1,159	1,236	847	1,431	24%	1,081	21%

\* 2011 data through October 29, 2011. For analysis, these numbers would be updated with the entire 2011 calendar year.  
 Note, in the 5- and 10-year average columns for Options 1 and 2, the percentage number indicates what proportion of the total 5- or 10-year average bycatch is represented by that regulatory area or directed fishery. Under the rows for Options 1 and 2 combined, the percentage number indicates what proportion of the total 5- or 10-year average bycatch in each regulatory area (Western or Central GOA) is represented by that directed fishery bycatch amount.  
 Source: NOAA catch accounting data.

**Table 7 Proposed PSC limits under Alternative 2 and Options 1 and 2**

		5-year average				10-year average				
		%	10,000	7,500	5,000	%	10,000	7,500	5,000	
<b>Alt 2</b>	All GOA non-pollock trawl	100%	10,000	7,500	5,000	100%	10,000	7,500	5,000	
<b>Option 1</b>	Western GOA non-pollock trawl	8%	801	601	401	18%	1,774	1,330	887	
	Central GOA non-pollock trawl	92%	9,199	6,899	4,599	82%	8,226	6,170	4,113	
<b>Option 2</b>	WG & CG	Shallow Water Flatfish	11%	1,068	801	534	7%	737	553	369
		Rex Sole	20%	1,966	1,475	983	22%	2,212	1,659	1,106
		Flathead Sole	2%	204	153	102	4%	450	337	225
		Arrowtooth Flounder	34%	3,411	2,558	1,706	28%	2,797	2,098	1,399
		Pacific Cod	9%	890	668	445	19%	1,935	1,452	968
		Rockfish	25%	2,460	1,845	1,230	19%	1,869	1,401	934
<b>Option 1 and 2</b>	WG	Shallow Water Flatfish	0%	0	0	0	0%	3	2	1
		Rex Sole	2%	12	9	6	4%	69	51	34
		Flathead Sole	6%	50	37	25	14%	256	192	128
		Arrowtooth Flounder	40%	317	238	158	43%	761	571	381
		Pacific Cod	26%	205	154	102	32%	572	429	286
		Rockfish	27%	217	163	109	6%	113	84	56
	CG	Shallow Water Flatfish	12%	1,068	801	534	9%	735	551	367
		Rex Sole	21%	1,954	1,466	977	26%	2,143	1,607	1,071
		Flathead Sole	2%	154	116	77	2%	193	145	97
		Arrowtooth Flounder	34%	3,094	2,321	1,547	25%	2,036	1,527	1,018
		Pacific Cod	7%	686	514	343	17%	1,364	1,023	682
		Rockfish	24%	2,243	1,682	1,122	21%	1,756	1,317	878

Under Option 2, or Options 1 and 2 combined, the PSC limit would be apportioned to individual directed fisheries. The GOA non-pollock trawl fisheries comprise six different target fisheries: four targeting flatfish (shallow water complex, rex sole, flathead sole, and arrowtooth flounder), Pacific cod, and rockfish. As can be seen in Table 7, the PSC limits to each fishery, especially under Options 1 and 2 combined, can end up being quite small, which may be challenging given the inter-annual variability of target TACs and bycatch patterns in these fisheries. These small apportionments are likely to be unmanageable, in some cases. For the Central GOA rockfish fishery, the Council may also want to consider apportioning PSC limits directly to the rockfish cooperatives.

Many of the problems associated with monitoring and extrapolation of Chinook salmon bycatch that were discussed in Amendment 93, the GOA pollock PSC limit analysis, and in previous discussion papers on this subject, are exacerbated in the GOA non-pollock trawl fisheries. For all GOA trawl fisheries, observers collect random samples at-sea, from an observed haul that is brought on board. These samples are used to determine the species composition of the observed fishing trip. This kind of species composition sampling generally works well for common species. However, for uncommon species such as salmon, a larger sample size is desired. Large sample sizes are generally not logistically possible on catcher vessels (see the comprehensive discussion of observer sampling in Amendment 93). For the pollock fishery, the at-sea sampling on observed vessels is supplemented by a full count or census of salmon taken in the fishery, which occurs at the shoreside processor. In the majority of the non-pollock trawl fisheries, this type of census is not practiced. The exception is the Central GOA rockfish fishery, where there is a higher level of observer coverage, and processors have in place a catch monitoring control plan. In the absence of better information, reliance on at-sea sampling could lead to unpredictable outcomes in management of these fisheries. In addition to complications arising from small apportionments and unpredictable extrapolations, trip target determinations are developed by complicated

algorithms that may add to unpredictability. These assignments could lead to inaccuracies in the using the historical assignments of Chinook salmon takes to the various targets as a means to develop PSC limits for the directed fisheries, and unpredictable assignments of Chinook salmon takes to those PSC limits in the future.

The Amendment 93 analysis also raised another aspect with respect to implementation of PSC limits, namely the ability of the agency to manage the PSC limits inseason. While not all of the non-pollock trawl fisheries are subject to the very short seasons that occur in the pollock fishery, nonetheless, NMFS will likely face limitations in their ability to manage PSC limits precisely. Once the PSC limits are being approached, NMFS will likely allow fisheries to occur, and they will then allow time for all the data to enter the catch accounting system so that the prohibited species catch estimate can be derive. Based on this information, they will then be able to determine whether to reopen the fisheries.

## **6.2 Chinook salmon bycatch cooperative for non-pollock fisheries**

As discussed in Section 5.1 above, a system of bycatch cooperatives (without allocation of catch shares) must maintain NOAA Fisheries management authority over the fishery. In other words, one or more cooperatives cannot be provided the authority to define fishing rules for all participants. Given the need for a large number of vessels for effective information sharing, a relatively large minimum membership should be defined for a cooperative. To avoid cooperatives assuming management functions, the program would need to include an outside opportunity for persons who elect not to join a cooperative. The difficulty in defining that management opportunity is that bycatch conditions in a fishery are unlikely to be static. So, an outside fishing opportunity that provides reasonable fishery access for non-cooperative participants in one year may provide that participant with little or no opportunity in the next year. For example, a trip or weekly limit on catches may provide a reasonable opportunity in a year of high bycatch when cooperatives are employing standdowns and area closures to reduce bycatch. In a year of low bycatch (when the cooperative does not need to employ standdowns and area closures), those non-cooperative participants could be effectively precluded from participating by the same limits. Given these uncertainties, it is unlikely that the Council could develop a management structure that provides an adequate opportunity to non-cooperative participants, while still maintaining an appropriate incentive for cooperatives to adopt effective Chinook avoidance measures.

## **6.3 Full retention of Chinook salmon**

The Council's current Alternative 4 requires full retention of all salmon in all GOA trawl fisheries. However, the Council's recent action in approving Amendment 93 included a provision that required full retention of all salmon in the GOA pollock trawl fisheries. The purpose of full retention is to allow an expanded sampling program, which will allow for genetic analysis of Chinook salmon taken as bycatch in the pollock trawl fisheries.

As was discussed under Amendment 93 with respect to retention for the pollock trawl fisheries, the salmon that would be retained, should this alternative be adopted, would support an expanded sampling program to determine stock of origin of Chinook salmon taken as bycatch in the GOA trawl fisheries. The full retention requirement would not modify observer duties or the methods by which NMFS calculates fleet-wide Chinook salmon PSC estimates. Observer sampling protocols would not be changed, other than the potential that there may be an increase in biological sampling at the plants. NMFS would continue to calculate Chinook salmon PSC numbers, and would manage PSC limits for Chinook salmon, using the existing system of extrapolating catch rates from observed vessels to the unobserved portion of the fleet. This is due to the fact that NMFS will have no way of verifying that full retention of salmon has occurred

aboard unobserved vessels, and there is only partial observer coverage on most GOA trawl vessels. An exception is in the Central GOA rockfish program, where there is a higher threshold of observer coverage, and plants that receive rockfish have a catch monitoring and control plan in place. The differences among the fisheries, and any ramifications for how this may affect sampling, will be discussed further as the analysis of this alternative progresses.

## **7 Council action**

This amendment package was initiated by the Council with four alternatives in December 2010. At the December 2011 Council meeting, the Council may wish to consider revising the alternatives, and perhaps the problem statement, for this analysis. At a minimum, the Council may wish to revise Alternative 3, which deals with the mandatory bycatch cooperative that has been demonstrated to have difficulties with implementation, and Alternative 4, part of which has already been addressed through a previous Council action. The Council may also wish to include additional alternatives to address any of the discussion items on which more information was requested.

## **8 Preparers**

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