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

Initial Review Draft

March 2011

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 once attained, and requiring membership in a mandatory salmon bycatch control cooperative in order to participate in the pollock fisheries. 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. The Council has tentatively signaled that it will advance both a PSC limit and mandatory bycatch cooperatives as a preliminary preferred alternative at initial review, in April 2011. 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. Both Alternatives 2 and 3 may be selected together.

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
Alternative 3: Require membership in a mandatory salmon bycatch control cooperative in order to fish in the directed pollock fishery

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

The Council specified a number of conditions for the mandatory bycatch cooperative. Alternative 3 would establish a program under which qualified license holders would be required to join a limited-purpose cooperative to participate in the Central and Western GOA pollock fisheries. Actions that may be undertaken by the cooperatives would be restricted to specific measures with the exclusive purpose of limiting Chinook salmon bycatch. Cooperative formation rules would allow two or three cooperatives to be created in each regulatory area, but would require an intercooperative agreement to ensure each cooperative could adopt Chinook salmon bycatch control measures without jeopardizing its members' opportunities in the fishery. Each cooperative would be required to annually report the effects of its Chinook salmon bycatch control measures to the Council. Contractual requirements aimed at limiting Chinook salmon bycatch must include full retention of salmon, and monitoring, reporting, and information sharing mechanisms among cooperative members to allow for salmon hotspot reporting and individual vessel bycatch performance, and may include other measures such as gear innovations, fishing practices, and vessel performance standards to promote salmon avoidance.

Probable impacts of the alternatives

[PLACEHOLDER: Note, the complete version of this executive summary will be available at the March/April 2011 Council meeting.]

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 0), which evaluates the impact of the action on small businesses. Sections 0 and 8 discuss the alternatives with respect to the requirements of the Magnuson-Stevens Act and other analytical considerations.

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List of Acronyms and Abbreviations

‘	feet
AAC	Alaska Administrative Code
ADF&G	Alaska Department of Fish and Game
AEQ	Adult equivalent
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
ANILCA	Alaska National Interest Land Conservation Act
BEG	Biological escapement goal
BiOp	Biological Opinion
BOF	Board of Fish
BSAI	Bering Sea and Aleutian Islands
CAS	Catch accounting system
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
COAR	Commercial Operators Annual Report
Council	North Pacific Fishery Management Council
CP	Catcher/processor
CV	Catcher vessel
CWT	Coded wire tag
DPS	distinct population segment
E	East
E.O.	Executive Order
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ESU	Endangered species unit
FMA	Fisheries Monitoring and Analysis
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRFA	Final Regulatory Flexibility Analysis
ft	foot or feet
GHL	guideline harvest level
GOA	Gulf of Alaska
IRFA	Initial Regulatory Flexibility Analysis
lb(s)	Pound(s)
LEI	long-term effect index
LLP	license limitation program
LOA	Length overall
m	meter or meters
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
mt	metric ton
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
NMFS	National Marine Fishery Service
NOAA	National Oceanographic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
NPPSD	North Pacific Pelagic Seabird Database
Observer Program	North Pacific Groundfish Observer Program
OEG	Optimal escapement goal
PBR	potential biological removal
PSC	prohibited species catch
PSEIS	Programmatic Supplemental Environmental Impact Statement
PWS	Prince William Sound
RFA	Regulatory Flexibility Act
RFFA	reasonably foreseeable future action
RIR	Regulatory Impact Review
RPA	Reasonable and prudent alternative
RSW	refrigerated seawater
SAFE	Stock Assessment and Fishery Evaluation
SAR	stock assessment report
SBA	Small Business Act
Secretary	Secretary of Commerce
SEG	Sustainable escapement goal
SET	Sustainable escapement threshold
SPLASH	Structure of Populations, Levels of Abundance, and Status of Humpbacks
SRKW	Southern Resident killer whales
SSFP	Sustainable Salmon Fisheries Policy
STAL	short-tailed albatross
SW	southwest
TAC	total allowable catch
U.S.	United States
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system
W	West

1 Introduction

This document analyzes proposed 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 once attained, and requiring membership in a mandatory salmon bycatch control cooperative in order to participate in the pollock fisheries.

This document is an Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA). An EA/RIR/IRFA provides assessments of the environmental impacts of an action and its reasonable alternatives (the EA), the economic benefits and costs of the action alternatives, as well as their distribution (the RIR), and the impacts of the action on directly regulated small entities (the IRFA). This EA/RIR/IRFA addresses the statutory requirements of the Magnuson Stevens Fishery Conservation and Management Act (MSA), the National Environmental Policy Act (NEPA), Presidential Executive Order 12866, and Regulatory Flexibility Act (RFA). An EA/RIR/IRFA is a standard document produced by the North Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) Alaska Region to provide the analytical background for decision-making.

1.1 Purpose and need

The purpose of this action is to address Chinook salmon bycatch in the GOA. Chinook salmon are a prohibited species in the GOA groundfish fisheries, and as such must be returned immediately to the sea with a minimum of injury if caught incidentally in the groundfish fisheries[1]. The Council has determined that Chinook salmon bycatch levels in 2010 were unacceptably high, and has developed this amendment package as a high priority consideration, in order to reduce the risk of high bycatch levels in the future. The directed pollock fishery in the Western and Central GOA is responsible for the majority of Chinook salmon caught as bycatch in the GOA groundfish fisheries. As such, the Council has focused this amendment package specifically on management measures for the GOA pollock fisheries in these areas. The Council has purposely identified alternatives that can be implemented within a short timeframe. The alternatives would establish measures that both encourage participants in the pollock fishery to develop mechanisms to reduce bycatch, and protect against the risk of high bycatch in future years. A subsequent amendment package will evaluate a broader range of alternatives that may offer other solutions to reduce Chinook salmon bycatch.

1.2 Council problem statement

The Council adopted the following problem statement, specifically for this action, at the February 2011 Council meeting.

> *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.*

[1] Except when their retention is authorized by other applicable law, such as the Prohibited Species Donation Program.

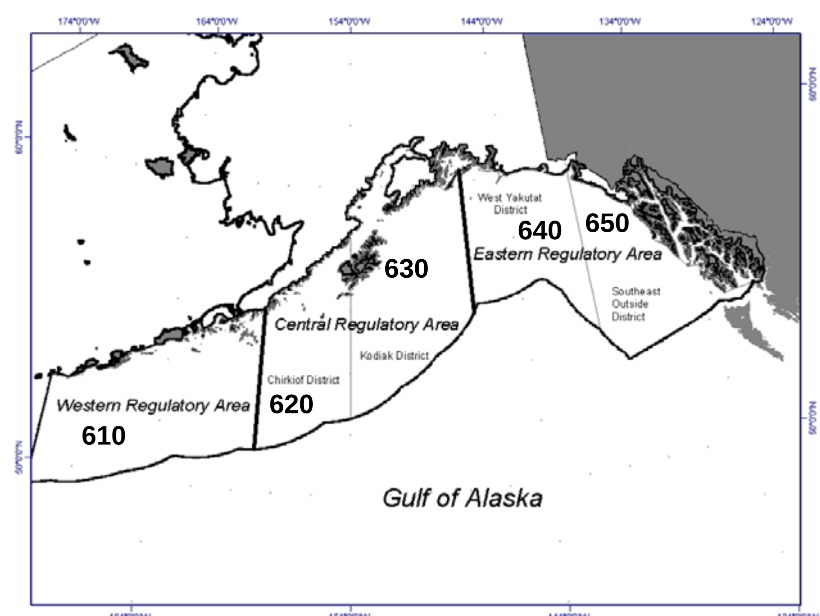
The Council is considering several management tools for the GOA pollock fishery, including a hard cap and cooperative approaches with improved monitoring and sampling opportunities to achieve Chinook salmon PSC reductions. Management measures are necessary to provide immediate incentive for the GOA pollock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

1.3 History of this action

Since the implementation of the groundfish fishery management plans for Alaska, the Council has adopted measures intended to control the bycatch of species taken incidentally in groundfish fisheries. Certain species, including all Pacific salmon species, are designated as 'prohibited' in the groundfish fishery management plans, as they are the target of other domestic fisheries. To further reduce the bycatch of these prohibited species, various bycatch control measures have been instituted in the Alaska groundfish fisheries (a history is provided in NMFS 2004, Appendix F.5). In the Gulf of Alaska (GOA) groundfish fisheries, PSC limits (which close the groundfish target fisheries after the limits are reached) have been set for halibut, and seasonal and permanent area closures have been established to protect red king crab and Tanner crab. To date, no bycatch control measures have been implemented specifically for salmon species taken incidentally in GOA groundfish fisheries.

The Council has at various times in the past several years requested staff prepare and update discussion papers examining the scope of Pacific salmon bycatch in the GOA groundfish fisheries, and has proposed management options that might be considered to regulate such bycatch. Although all species of Pacific salmon are taken incidentally in the groundfish fisheries within the GOA, the Council focused the scope of the discussion specifically on Chinook salmon as the species with the highest bycatch in recent years. The Council also limited the discussion to the Central GOA (reporting areas 620 and 630) and Western GOA (reporting area 610; Figure 1); in the eastern regulatory area, a large proportion of which is closed to trawling, salmon bycatch accounted for less than 2% of total GOA Chinook salmon bycatch. In December 2010, the Council initiated two amendment packages to address Chinook salmon bycatch; the first is evaluated in this analysis, and the second is described in the section below.

Figure 1 Regulatory and reporting areas in the GOA



1.4 Relationship to other Council bycatch reduction actions

In December 2010, at the same time that the current expedited amendment package was initiated, the Council also initiated a longer-term amendment package that will comprehensively address salmon bycatch management in the GOA trawl fisheries. The following alternatives were adopted for the comprehensive package:

Alternative 1: Status quo
Alternative 2: Establish a Chinook salmon PSC limit for the non-pollock trawl fisheries (hard cap, may be apportioned by area and/or directed fishery)
Alternative 3: Require membership in a mandatory salmon bycatch control cooperative in order to fish in any Western/Central GOA trawl fishery
Alternative 4: Require full retention of all salmon in all Western/Central GOA trawl fisheries (includes an option to require electronic monitoring or observers to monitor for discards)

Additionally, for the regular track analysis, the Council requested staff discuss several other issues, which might then be brought into the analysis. These issues include: bycatch rate data by fishery and season, correlations between bycatch rate and time of day, flexibility to adjust pollock season dates, pollock trip limits, salmon excluder deployment in the GOA, impacts on subsistence users, and a discussion of the benefits of developing cooperative management structure for the GOA pollock fisheries.

2 Description of Alternatives

The alternatives that are analyzed in this amendment package propose management measures that would apply exclusively to the directed pollock fishery in the Western and Central GOA. At the time that the 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. The Council has tentatively signaled that it will advance both a PSC limit and mandatory bycatch cooperatives as a preliminary preferred alternative at initial review, in April 2011. The Council plans to take final action on this issue in June 2011, which could allow implementation of the proposed action in mid-2012.

The Council adopted the following alternatives for analysis. Both Alternatives 2 and 3 may be selected together.

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
Alternative 3: Require membership in a mandatory salmon bycatch control cooperative in order to fish in the directed pollock fishery

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

The Council specified a number of conditions for the mandatory bycatch cooperative. Alternative 3 would establish a program under which qualified license holders would be required to join a limited-purpose cooperative to participate in the Central and Western GOA pollock fisheries. Actions that may be undertaken by the cooperatives would be restricted to specific measures with the exclusive purpose of limiting Chinook salmon bycatch. Cooperative formation rules would allow two or three cooperatives to be created in each regulatory area, but would require an intercooperative agreement to ensure each cooperative could adopt Chinook salmon bycatch control measures without jeopardizing its members' opportunities in the fishery. Each cooperative would be required to annually report the effects of its Chinook salmon bycatch control measures to the Council. Contractual requirements aimed at limiting Chinook salmon bycatch must include full retention of salmon, and monitoring, reporting, and information sharing mechanisms among cooperative members to allow for salmon hotspot reporting and individual vessel bycatch performance, and may include other measures such as gear innovations, fishing practices, and vessel performance standards to promote salmon avoidance.

The Council's detailed motion for each alternative is described below.

2.1 Alternative 2 PSC limit and increased monitoring

Alternative 2 includes two components: to set Chinook salmon PSC limits for the Western and Central GOA, and to expand observer coverage on vessels less than 60 ft.

2.1.1 Component 1: PSC limit of 15,000, 22,500, or 30,000 Chinook salmon

Council motion:

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 Gulf-wide).

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

If a Chinook salmon PSC limit is implemented midyear in the year of implementation, an amount should be deducted from the annual PSC limit in that year. The deduction should be equal to the contribution that would have been made based on historical averages (selected above) in the seasons preceding implementation.

2.1.1.1 GOA-wide PSC limit

The overall PSC limits analyzed in this amendment package are identified for the Central and Western GOA combined, and will be either 15,000, 22,500, or 30,000 Chinook salmon. In this analysis, this is referred to as the GOA-wide limit, although Chinook salmon bycatch while directed pollock fishing in reporting area 640 will not accrue to the PSC limit. In February 2011, the Council explicitly directed that the GOA-wide PSC limit will be apportioned to the Central and Western regulatory areas, and that all provisions of the PSC limits will be managed on a regulatory area basis. Once the PSC limit in a regulatory area has been reached, the directed pollock fishery in that area will be closed.

2.1.1.2 PSC limits by regulatory area under the apportionment options

The formulas used to calculate each apportionment option and suboption, as listed in the Council motion, are described in detail in the RIR, Section 3.8.2. Table 1 identifies what the PSC limit would be in the Central and Western GOA, under each option. Under the apportionment options, the Central GOA's proportion of the total GOA PSC limit ranges from 61% to 77%, or 9,122 Chinook salmon to 23,224 Chinook salmon depending on the overall PSC limit. For the Western GOA, the range is from 23% to 39%, which results in a range of 3,388 to 11,757 Chinook salmon.

Table 1 Proposed Chinook salmon PSC limits in the Central and Western GOA, under each option

		Central Gulf (620 & 630)				Western Gulf (610)			
Alternatives	Years	%	15,000	22,500	30,000	%	15,000	22,500	30,000
Option a (based on pollock TAC)	2006-2010	63%	9,401	14,101	18,802	37%	5,599	8,399	11,198
	2001-2010	63%	9,477	14,215	18,953	37%	5,523	8,285	11,047
Option b (based on Chinook bycatch)	2006-2010	61%	9,122	13,682	18,243	39%	5,878	8,818	11,757
	2001-2010	67%	10,068	15,102	20,136	33%	4,932	7,398	9,864
Suboption: exclude 2007 and 2010 data)	2006 & 2008 & 2009	75%	11,246	16,870	22,493	25%	3,754	5,630	7,507
	2001-2006, 2008-2009	77%	11,612	17,418	23,224	23%	3,388	5,082	6,776
Option c(i) Using 25% from Option a and 75% from Option b	2006-2010	61%	9,191	13,787	18,383	39%	5,809	8,713	11,617
	2006 & 2008 & 2009	72%	10,785	16,177	21,570	28%	4,215	6,323	8,430
	2001-2010	66%	9,920	14,880	19,840	34%	5,080	7,620	10,160
	2001-2006, 2008-2009	74%	11,078	16,617	22,156	26%	3,922	5,883	7,844
Option c(ii) Using 50% from Option a and 50% from Option b	2006-2010	62%	9,261	13,892	18,522	38%	5,739	8,608	11,478
	2006 & 2008 & 2009	69%	10,324	15,485	20,647	31%	4,676	7,015	9,353
	2001-2010	65%	9,772	14,658	19,544	35%	5,228	7,842	10,456
	2001-2006, 2008-2009	70%	10,544	15,816	21,089	30%	4,456	6,684	8,911
Option c(iii) Using 75% from Option a and 25% from Option b	2006-2010	62%	9,331	13,997	18,662	38%	5,669	8,503	11,338
	2006 & 2008 & 2009	66%	9,862	14,793	19,724	34%	5,138	7,707	10,276
	2001-2010	64%	9,624	14,437	19,249	36%	5,376	8,063	10,751
	2001-2006, 2008-2009	67%	10,010	15,016	20,021	33%	4,990	7,484	9,979
Maximum Allocation		77%	11,612	17,418	23,224	39%	5,878	8,818	11,757
Minimum Allocation		61%	9,122	13,682	18,243	23%	3,388	5,082	6,776
Mean Allocation		67%	10,035	15,052	20,070	33%	4,965	7,448	9,930
Median Allocation		66%	9,891	14,837	19,782	34%	5,109	7,663	10,218

Source: NOAA Catch accounting data

2.1.1.3 25% overage provision

The Council included a provision stating that in one of three consecutive years, the PSC limit could be exceeded. While this could be interpreted in more than one way, the intent of this provision has been clarified with the maker of the Council motion to be that in any year in which the PSC limit has not been exceeded in the previous two years, NMFS will manage the PSC limit at 125% of its threshold. This means that the provision will effectively function as two PSC limits, at the 125% level until an overage occurs, and in the next two years at the 100% level[2]. Because there is regional apportionment of the PSC limit to the Central and Western GOA regulatory areas, it may be the case that one area is operating under a 125% threshold, and the other area is operating under the 100% threshold, depending on whether there have been overages in a particular regulatory area.

Also, the Council acknowledges that due to the fast pace of the pollock fisheries, the fact that large numbers of salmon may be caught unpredictably in a single reporting week, and the estimation process used to extrapolate fleet-wide Chinook salmon bycatch levels, the agency may have difficulty managing preventing overages to the PSC limit. These issues are discussed in more detail in the management and enforcement chapter, Section 5. The Council has provided direction that the expectation is that the Chinook salmon PSC limit will be managed similar to the way the halibut PSC limits are managed, where the agency attempts to predict when the limit will be reached. In some cases, overages will occur, and in others, the fishery may be closed before the limit is reached.

[2] Note, if the 100% PSC limit is exceeded during those two years, the 100% threshold will remain in effect until two consecutive years have gone by during which there is no overage.

Table 2 **Proposed Chinook salmon PSC limits utilizing the 25% overage provision, for the Western and Central GOA, under each option**

		Central Gulf (620 & 630)				Western Gulf (610)			
Alternatives	Years	%	18,750	28,125	37,500	%	18,750	28,125	37,500
Option a (based on	2006-2010	78%	11,751	17,627	23,502	47%	6,999	10,498	13,998
pollock TAC)	2001-2010	79%	11,846	17,769	23,691	46%	6,904	10,356	13,809
Option b (based on	2006-2010	76%	11,402	17,103	22,804	49%	7,348	11,022	14,696
Chinook bycatch)	2001-2010	84%	12,585	18,877	25,169	41%	6,165	9,248	12,331
Suboption: exclude	2006 & 2008 & 2009	94%	14,058	21,087	28,116	31%	4,692	7,038	9,384
2007 and 2010 data)	2001-2006, 2008-2009	97%	14,515	21,772	29,030	28%	4,235	6,353	8,470
Option c(i)	2006-2010	77%	11,489	17,234	22,979	48%	7,261	10,891	14,521
Using 25% from	2006 & 2008 & 2009	90%	13,481	20,222	26,962	35%	5,269	7,903	10,538
Option a and 75%	2001-2010	83%	12,400	18,600	24,800	42%	6,350	9,525	12,700
from Option b	2001-2006, 2008-2009	92%	13,848	20,771	27,695	33%	4,902	7,354	9,805
Option c(ii)	2006-2010	77%	11,577	17,365	23,153	48%	7,173	10,760	14,347
Using 50% from	2006 & 2008 & 2009	86%	12,905	19,357	25,809	39%	5,845	8,768	11,691
Option a and 50%	2001-2010	81%	12,215	18,323	24,430	44%	6,535	9,802	13,070
from Option b	2001-2006, 2008-2009	88%	13,180	19,770	26,361	37%	5,570	8,355	11,139
Option c(iii)	2006-2010	78%	11,664	17,496	23,328	47%	7,086	10,629	14,172
Using 75% from	2006 & 2008 & 2009	82%	12,328	18,492	24,656	43%	6,422	9,633	12,844
Option a and 25%	2001-2010	80%	12,030	18,046	24,061	45%	6,720	10,079	13,439
from Option b	2001-2006, 2008-2009	83%	12,513	18,770	25,026	42%	6,237	9,355	12,474

Source: NOAA Catch accounting data

2.1.1.4 Midyear implementation

The Council has included a provision in Alternative 2 to account for the possibility that the PSC limit may be implemented midyear. In the implementation year, the PSC limit for each area would be reduced, based on the average bycatch that has historically been caught in the preceding seasons. The tables identifying what the PSC limit would be under each GOA-wide cap and apportionment option, if implemented mid-year, are included in Appendix 2 to this analysis.

2.1.2 Component 2: expanded observer coverage

Council motion:

> *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.*

Under this component, all vessels under 60 ft would be required to comply with the existing 30% observer coverage requirements for 60 ft to 125 ft vessels while directed fishing for pollock in the Central or Western GOA. The existing requirements (at 50 CFR 679.50(c)(1)(v)) identify that all vessels that are 60 ft to 125 ft and participate in the directed pollock fishery must have at least one observed fishing trip in each calendar quarter, and if participating in the directed pollock fishery for more than three fishing days in a calendar quarter must carry an observer during at least 30% of its fishing days in that calendar quarter.

2.2 Alternative 3 mandatory salmon bycatch control cooperative

Council motion:

> *To be eligible to participate in the Central Gulf of Alaska or Western Gulf of Alaska pollock fishery, the holder of an appropriately endorsed License Limitation Program license would be required to join a Chinook salmon bycatch control cooperative.*
>
> *Each cooperative would be formed for participation in a single regulatory area (e.g., Central Gulf of Alaska or Western Gulf of Alaska).*

To form, a cooperative is required to have more than:

- *a) 25 percent; or*
- *b) 33 percent;*

of the licenses that participated in the applicable regulatory area in the preceding year.

Any cooperative is required to accept as a member any eligible person, subject to the same terms and conditions that apply to all other cooperative members. In addition, the cooperative agreement shall not disadvantage any eligible person entering the fishery for not having an established Chinook salmon bycatch history in the fishery.

Each cooperative agreement shall contain:

A requirement that all vessels retain all salmon bycatch until the plant observers have an opportunity to determine the number of salmon and collect scientific data and biological samples.

Vessel reporting requirements to be used to identify salmon hotspots and an appropriate set of measures to limit fishing in identified hotspots.

A system of information sharing intended to provide vessels with timely information concerning Chinook salmon bycatch rates.

A monitoring program to:

ensure compliance with the full retention requirement,
catalogue gear use and fishing practices and their effects on Chinook salmon bycatch rates,
ensure compliance with vessel reporting requirements and limits on fishing under the system of salmon hotspots,
determine compliance with any measures that require use of fishing gear or practices to avoid Chinook salmon PSC, and
verify vessel performance and implement any system of rewards and penalties related to vessel performance.

A set of contractual penalties for failure to comply with any cooperative requirements.

Cooperative agreements may also contain the following measures:

Measures to promote gear innovations and the use of gear and fishing practices that contribute to Chinook salmon avoidance.

A system of vessel performance standards that creates individual incentives for Chinook salmon avoidance, which could include rewards or penalties based on Chinook salmon bycatch.

Cooperatives may have no measures except those specifically authorized by this action (and shall not include any measures that directly allocate access to any portion of the total allowable catch or any PSC limit).

Each cooperative shall annually provide a report to the Council that includes the cooperative agreement and describes the cooperative's compliance with the specific requirements for cooperatives and the cooperative's performance with respect to those requirements (including salmon retention, gear innovations and fishing practices, vessel reporting requirements and hotspot identification and fishing limitations, vessel performance standards, information sharing, and monitoring). Cooperative reports shall also document any rewards or penalties related to vessel performance and any penalties for failure to comply with the cooperative agreement. The cooperative report should also describe the Chinook salmon bycatch seasonally, identifying any notable Chinook salmon bycatch occurrences or circumstances in the fishery. As a part of its report, a cooperative shall describe each measure adopted by the cooperative, the rationale for the measure (specifically *describing how a measure is intended to serve the objective of addressing Chinook salmon PSC, while ensuring a fair opportunity to all participants in the fishery), and the effects of the measure.*

In the event more than one cooperative is created within a regulatory area, those cooperatives will be required to enter an intercooperative agreement prior to beginning fishing. The intercooperative agreement will establish rules to ensure that no cooperative (or its members) are disadvantaged in the fishery by its efforts to avoid Chinook salmon.

The parties to any intercooperative agreement shall annually provide a report to the Council including the intercooperative agreement and describing each measure in the agreement, the rationale for the measure (specifically describing how a measure is intended to serve the objective of addressing Chinook salmon PSC, while ensuring a fair opportunity to all participants in the fishery), and the effect of the measure.

The requirement for salmon PSC to be discarded at sea would not apply to directed GOA pollock fishing.

2.2.1 Mandatory cooperative participation by regulatory area

Under this alternative, no vessel may participate in the directed pollock fisheries in the Western or Central GOA unless they are a member of a limited purpose Chinook salmon bycatch control cooperative for that regulatory area. In order to provide all eligible license holders a reasonable opportunity to participate in the fishery, multiple cooperatives would be allowed to form (either two or three cooperatives in each regulatory area). Cooperative formation would require a minimum percentage of the licenses that participated in the fishery in the preceding year. Cooperatives would be required to accept any person eligible for the cooperative as a member on the subject to the same terms and conditions that apply to other cooperative members, without any disadvantage for not having a history in the fishery. In the event more than one cooperative forms in a management area, the cooperatives would be required to enter an intercooperative agreement to ensure that no cooperative is disadvantaged in the fishery as a result of its efforts to avoid Chinook salmon. The cooperatives, and the intercooperative if one exists, would be required to provide an annual report to the Council.

2.2.2 Contract provisions

Alternative 3 limits the measures that may be included in a cooperative agreement to specific types of measures, each of which is intended to address Chinook salmon bycatch. There are three categories of management actions identified for the cooperative agreements: those that shall be contained in the agreement, those that may be contained in the agreement, and those that cannot be contained in the agreement.

Shall contain	May contain	Shall not contain
• Requirement for full retention of salmon bycatch to determine the number of salmon and for biological sampling • Vessel reporting requirements to identify bycatch hotspots and measures to limit fishing in those areas • Information sharing system for informing other vessels of bycatch rates • Monitoring program to ensure compliance with the cooperative agreement • Penalties for failure to comply with the agreement	• Measures to promote gear innovations • Measures to promote the use of gear and fishing practices that contribute to salmon avoidance (may include rewards or penalties based on Chinook salmon bycatch)	• No measures except those specifically authorized in the alternative • No measures that directly allocate access to any portion of the pollock TAC or Chinook salmon PSC limit

2.2.3 Salmon retention provisions

A provision of this alternative would require a regulatory change to existing requirements prohibiting salmon retention in the GOA groundfish fisheries. Current regulations require vessel operators to discard salmon when an observer is not aboard. When an observer is aboard, they are required to allow for sampling by an observer before discarding prohibited species. In the pollock fishery, however, it is very common for vessel operators to retain all salmon regardless of whether an observer is onboard, because of the operational characteristics of the fishery. Large volumes of pollock are brought aboard and rapidly stowed in below-deck tanks. 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.

Under this alternative, cooperative members are required to retain all salmon bycatch until an opportunity has been given for a plant observer to sample the salmon. It is important to note, however, that regulations for full retention will not modify the observer duties. NMFS will have no way of verifying that full retention of salmon has occurred aboard unobserved vessels. Therefore, at this time, NMFS will not be modifying the observer sampling protocols as described in Section 5.1.1, and the requisite elements are not in place in the GOA to implement the same census and sampling system that is going into effect in 2011 in the Bering Sea under Amendment 91.

Adopting this alternative will require a regulatory change to exempt participants in the GOA pollock fisheries from the regulatory requirement prohibiting salmon retention. The salmon retained under this program would still need to be returned to the sea as soon as is practicable, following notification that any collection of scientific data or biological samples has been completed. An exception to this provision is provided if the Chinook salmon are delivered to an authorized prohibited species donation program. SeaShare, an organization participating in the food bank donation program, does not currently receive deliveries of GOA Chinook salmon. Since the recent increase in bycatch, however, there has been interest in expanding the program to the GOA. If shoreside processors participated in the SeaShare program, they would be exempted from the requirement to return salmon to Federal water as soon as is practicable.

The full retention provision in the cooperative contract is for the specific and sole purpose of improving information on Chinook salmon bycatch composition. NMFS will continue to calculate Chinook salmon bycatch numbers, and manage a PSC cap for Chinook salmon if one is implemented, using the existing system of extrapolating bycatch rates from observed vessels to the unobserved portion of the pollock fleet.

2.2.4 Concerns about administrating mandatory cooperatives

NMFS has raised concerns with the administration of the mandatory cooperative alternative. Specifically, the administration of cooperatives (including approval of annual cooperative contracts and any penalties for violation of the cooperative agreement) must be implemented in a manner that maintains NMFS' management authority over the fishery. Whether cooperatives would be able to serve their intended purpose, while maintaining a level of oversight that maintains that authority, is uncertain.[3] For example, the imposition of certain cooperative penalties would require notice, and an opportunity for a hearing, consistent with applicable Magnuson-Stevens Act and Administrative Procedures Act requirements. These administrative reviews typically take several weeks (or even months). A reasonable cooperative penalty might be to require a vessel to temporarily suspend fishing due for failure to abide by a hotspot limitation or some other agreed constraint on fishing effort. Measures of this type are likely subject to notice and hearing requirements. Pending completion of such a hearing, penalties are typically suspended. Such a hearing requirement could make any standdown ineffective. **An additional concern arises from a mandatory reporting of catch data within cooperatives. Any such reporting requirement would need to comport with data confidentiality constraints.** Whether confidentiality requirements could be satisfied requires additional consideration. These concerns are discussed more completely at the conclusion of the analysis of Alternative 3, in Section 3.11.3. In addition, some possible alternatives to this mandatory cooperative structure are discussed.

2.3 Preliminary preferred alternative

The Council anticipates selecting a preliminary preferred alternative at initial review, and has indicated that it intends to advance both a PSC limit and mandatory bycatch cooperatives (i.e., some combination of both Alternatives 2 and 3).

2.4 Alternatives considered but not advanced

As described in Section 1.3, the Council has proposed a variety of alternatives for comprehensive Chinook salmon bycatch reduction in the GOA groundfish fisheries, of which this amendment package addresses a subset. The other alternatives, addressing PSC limits and mandatory cooperatives for the non-pollock trawl fisheries, full retention of salmon, and discussing rationalization for the GOA pollock fishery, are slated for analysis in an amendment package that will be prepared once this action has been concluded.

Additionally, the Council's original motion initiating this analysis included other elements, which were discussed by the Council at the February 2011 meeting. One option in the original motion would have allowed the Chinook salmon PSC limit for the GOA pollock fishery to be applied to the Central and Western GOA as a whole, rather than requiring it to be apportioned between the two areas. Based on public testimony and preliminary data, the Council removed this option from the analysis. The pollock fishery in the two regulatory areas has different participants, fishing practices, and timing, and also the pattern of Chinook salmon encounters differs between the areas. A GOA-wide cap would change dynamics across these fisheries, and potentially allow participants in one area to adversely affect the fishery in the other area. Consequently, the Council chose to remove this option from the analysis in February 2011.

[3] In a voluntary cooperative structure (where a vessel has a reasonable fishing opportunity outside of a cooperative) management authority would be maintained, as membership is not a prerequisite to participating in the fishery.

An alternative to a mandatory cooperative structure as analyzed in Alternative 3 is a cooperative structure that allows participants who choose not to join a cooperative, an opportunity to fish outside of cooperative was considered but not advanced for analysis. Such a structure might be preferred to a mandatory cooperative structure, as it would avoid any complications arising from a requirement that a participant join an association to access the fishery. The complication for a structure with a limited access opportunity is the development of rules for that limited access fishing that both ensure its participants a reasonable fishing opportunity and creates incentives to reduce Chinook salmon PSC without disproportionately reducing the incentive for cooperatives to pursue Chinook salmon PSC avoidance measures. Any limited access structure would be intended to allow limited access participants to fish, but not gain a competitive advantage over the cooperative participants. Cooperatives, however, are likely to attempt to use time constraints on effort (e.g., delaying fishing while members monitor Chinook salmon PSC rates) to reduce Chinook salmon bycatch. Developing a management system for a limited access fishery that allows flexibility to delay starts or suspend fishing is likely unworkable for the agency. A further complication would likely arise from any management measures intended to reduce Chinook salmon PSC in the limited access fishery. These measures would need to be static, modified only through Council actions. The need to resort to Council action for their modification would delay any implementation of those measures, which could provide either limited access participants with an advantage in the fishery over cooperative participants or an incentive for cooperatives not to implement effective measures that could jeopardize their success in the fishery. For these reasons, a cooperative program with a limited access option was not advanced for analysis.

The Council considered a variety of cooperative formation rules. Since the LLP Gulf of Alaska trawl endorsements qualify vessels for all trawl fisheries, and many qualified licenses are not used in the pollock fisheries, any formation threshold based only on eligibility for the fishery was believed to give undue influence to licenses that may have no dependence or interest in the fishery. Thresholds that considered catch quantities (such as a threshold requiring licenses that accounted for in excess of 25 percent of the total catch in the fishery from the preceding year), were not advanced, as such a threshold would be over complex to administer and could require annually releasing of confidential catch data.

In developing this action, the Council considered whether to divide the PSC limit among participants in the fishery (both directly and through cooperatives). The Council elected not to advance such an action, as it would effectively require the Council to further develop limits on entry and fishing privileges in the GOA pollock fisheries. The development of any such program typically takes several meetings and involves many broader considerations, as the division would effectively redefine eligibility for the fishery and the specific fishing privileges of participants. The Council's purpose here is to take relatively quick action to address Chinook salmon bycatch in the Gulf of Alaska pollock fisheries. Any action to divide a cap among fishery participants (or cooperatives) could confound this near term purpose.

Finally, in earlier discussion papers on this issue (most recently reviewed in December 2010), various alternatives were considered that proposed area closures for some or all groundfish fisheries, either on a seasonal basis or to be triggered by a PSC limit. An additional alternative also proposed which looked at a voluntary bycatch cooperative. Based on the available data, however, there does not appear to be a consistent pattern in the location of areas of high salmon bycatch. The Council chose not to go forward with area closures because they do not seem to be the most effective tool for ensuring that the fishery does not catch large numbers of Chinook salmon. Based on public testimony at the December Council meeting, the Council altered the voluntary bycatch cooperative concept to become a mandatory bycatch cooperative, in order to require all fishery participants to abide by the salmon bycatch reduction tools that would be developed through the cooperative.

3 Regulatory impact review and probable economic and socioeconomic impacts

This Regulatory Impact Review (RIR) examines the costs and benefits of a proposed regulatory amendment to change Chinook salmon bycatch reduction measures in the Central (regulatory areas 620 and 630) and Western Gulf (regulatory area 610) of Alaska pollock trawl fishery. The preparation of an RIR is required under Presidential Executive Order (E.O.) 12866 (58 FR 51735: October 4, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following Statement from the E.O.:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and Benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

Under the Magnuson-Stevens Act, the United States has exclusive fishery management authority over all marine fishery resources found within the exclusive economic zone (EEZ). The management of these marine resources is vested in the Secretary of Commerce and in the Regional Fishery Management Councils. The pollock fishery in the Gulf of Alaska EEZ is managed under the Gulf of Alaska (GOA) Fisheries Management Plan (FMP).

This RIR examines the costs and benefits of proposed alternatives which include imposing a hard cap on the number of Chinook salmon that may be taken in the Central and Western Gulf of Alaska pollock trawl fisheries, increasing observer coverage on vessels that are less than 60' LOA, and requiring mandatory membership in a salmon bycatch control cooperative to participate in the GOA trawl pollock fishery. The complete alternative set is summarized in Section 3.4.

3.1 What is a Regulatory Impact Review?

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

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and Benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nonetheless essential to consider. Further, in choosing among alternative regulatory approaches agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.*

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

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, local or tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in this Executive Order.

3.2 Statutory Authority

Under the Magnuson-Stevens Act (16 USC 1801, et seq.), the United States has exclusive fishery management authority over all marine fishery resources found within the EEZ. The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the regional fishery management councils. In the Alaska Region, the Council has the responsibility for preparing FMPs and FMP amendments for the marine fisheries that require conservation and management, and for submitting its recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the federal mandates of the Department of Commerce with regard to marine and anadromous fish.

The Central and Western Gulf of Alaska pollock fishery in the EEZ off Alaska is managed under the FMP for Groundfish of the Gulf of Alaska. The salmon bycatch management measures under consideration would amend this FMP and federal regulations at 50 CFR 679. Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of federal law and regulations.

3.3 Purpose and Need for Action

The purpose of Chinook salmon bycatch management in the Central and Western Gulf of Alaska pollock fishery is to minimize Chinook salmon bycatch to the extent practicable while achieving optimum yield. Minimizing Chinook salmon bycatch while achieving optimum yield is necessary to maintain a healthy marine ecosystem, ensure long-term conservation and abundance of Chinook salmon provide maximum benefit to fishermen and communities that depend on Chinook salmon and pollock resources, as well as U.S. consumers, and comply with the Magnuson-Stevens Act and other applicable federal law. National Standard 9 of the Magnuson-Stevens Act requires that conservation and management measures shall, to the extent practicable, minimize bycatch. National Standard 1 of the Magnuson-Stevens Act requires that conservation and management measures prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

To address these issues the Council has developed the following 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 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 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.

3.4 Alternatives

Given the concerns identified in the Council's problem statement, its membership developed two sets of alternatives for analysis. The first set of alternatives, developed for expedited review and considered in this analysis, are intended to ensure that Chinook salmon bycatch limits are implemented and not exceeded in the near term. The alternatives for expedited analysis include the status quo, a range of Chinook salmon PSC limits with expanded observer coverage, and mandatory salmon bycatch control cooperatives.

Alternatives for expedited review and rule making apply to the directed pollock trawl fisheries in the Central and Western GOA. Chinook salmon bycatch that occurs in the Prince William Sound GHL pollock fishery would not be counted against the proposed cap, because it is under the authority of the State of Alaska. Therefore, the Federal regulations proposed in this amendment would not apply to that fishery. Pollock trawl fisheries that occur in the Central Gulf and Western Gulf of Alaska that are jointly managed by the State of Alaska and the Federal Government (often referred to as parallel fisheries) would be included under this action[4].

The suite of alternatives under consideration is provided below.

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.

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

[4] Issues that may arise if all participants do not have a Federal Fisheries Permit are discussed in Section X of the RIR.

If a Chinook salmon PSC limit is implemented midyear in the year of implementation, an amount should be deducted from the annual PSC limit in that year. The deduction should be equal to the contribution that would have been made based on historical averages (selected above) in the seasons preceding implementation.

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.

To be eligible to participate in the Central Gulf of Alaska or Western Gulf of Alaska pollock fishery, the holder of an appropriately endorsed License Limitation Program license would be required to join a Chinook salmon bycatch control cooperative. Each cooperative would be formed for participation in a single regulatory area (e.g., Central Gulf of Alaska or Western Gulf of Alaska).

To form, a cooperative is required to have more than:

a) 25 percent; or
b) 33 percent;

of the licenses that participated in the applicable regulatory area in the preceding year. Any cooperative is required to accept as a member any eligible person, subject to the same terms and conditions that apply to all other cooperative members. In addition, the cooperative agreement shall not disadvantage any eligible person entering the fishery for not having an established Chinook salmon bycatch history in the fishery. Each cooperative agreement shall contain:

- A requirement that all vessels retain all salmon bycatch until the plant observers have an opportunity to determine the number of salmon and collect scientific data and biological samples.
- Vessel reporting requirements to be used to identify salmon hotspots and an appropriate set of measures to limit fishing in identified hotspots.
- A system of information sharing intended to provide vessels with timely information concerning Chinook salmon bycatch rates.
- A monitoring program to**:**
- ensure compliance with the full retention requirement, catalogue gear use and fishing practices and their effects on Chinook salmon bycatch rates, ensure compliance with vessel reporting requirements and limits on fishing under the system of salmon hotspots, determine compliance with any measures that require use of fishing gear or practices to avoid Chinook salmon PSC, and verify vessel performance and implement any system of rewards and penalties related to vessel performance.
- A set of contractual penalties for failure to comply with any cooperative requirements.

Cooperative agreements may also contain the following measures:

- Measures to promote gear innovations and the use of gear and fishing practices that contribute to Chinook salmon avoidance.
- A system of vessel performance standards that creates individual incentives for Chinook salmon avoidance, which could include rewards or penalties based on Chinook salmon bycatch.

Cooperatives may have no measures except those specifically authorized by this action (and shall not include any measures that directly allocate access to any portion of the total allowable catch or any PSC limit).

Each cooperative shall annually provide a report to the Council that includes the cooperative agreement and describes the cooperative's compliance with the specific requirements for cooperatives and the cooperative's performance with respect to those requirements (including salmon retention, gear innovations and fishing practices, vessel reporting requirements and hotspot identification and fishing limitations, vessel performance standards, information sharing, and monitoring). Cooperative reports shall also document any rewards or penalties related to vessel performance and any penalties for failure to comply with the cooperative agreement. The cooperative report should also describe the Chinook salmon bycatch seasonally, identifying any notable Chinook salmon bycatch occurrences or circumstances in the fishery. As a part of its report, a cooperative shall describe each measure adopted by the cooperative, the rationale for the measure (specifically describing how a measure is intended to serve the objective of addressing Chinook salmon PSC, while ensuring a fair opportunity to all participants in the fishery), and the effects of the measure.

In the event more than one cooperative is created within a regulatory area, those cooperatives will be required to enter an intercooperative agreement prior to beginning fishing. The intercooperative agreement will establish rules to ensure that no cooperative (or its members) are disadvantaged in the fishery by its efforts to avoid Chinook salmon.

The parties to any intercooperative agreement shall annually provide a report to the Council including the intercooperative agreement and describing each measure in the agreement, the rationale for the measure (specifically describing how a measure is intended to serve the objective of addressing Chinook salmon PSC, while ensuring a fair opportunity to all participants in the fishery), and the effect of the measure.

The requirement for salmon PSC to be discarded at sea would not apply to directed GOA pollock fishing.

3.5 Market Failure Rationale

The Office of Management and Budget guidelines for analysis under E.O. 12866 state that…

> *in order to establish the need for the proposed action, the analysis should discuss whether the problem constitutes a significant market failure. If the problem does not constitute a market failure, the analysis should provide an alternative demonstration of compelling public need, such as improving governmental processes or addressing distributional concerns. If the proposed action is a result of a statutory or judicial directive (sic) that should be so stated.*[5]

Pollock taken in the GOA trawl fishery, and salmon caught incidentally to this fishery are both common property resources. However, both are subject to systems of stock and limited access management. The limited access management system includes a license limitation requirement in which participants must assign a groundfish license, with appropriate vessel size, gear, area and length designations to the vessel used to harvest pollock. Trawl vessel operations in the GOA do not, by virtue of their groundfish license, have ownership or access privileges to salmon. Similarly, salmon harvesters operating in the waters of and off Alaska do not have, by virtue of their salmon access privileges, ownership or access privileges to groundfish.

Bycatch of salmon in the GOA pollock fishery reduces the common property pool of the salmon resource. Bycatch removals may reduce the targeted subsistence, commercial, personal use, and sport catch of

[5] Memorandum from Jacob Lew, Office of Management and Budget director, March 22, 2000. "Guidelines to Standardize Measures of Costs and Benefits and the Format of Accounting Statements" Section 1.

Chinook salmon and thereby the welfare (e.g., revenue, utility) of salmon harvesters who have recognized salmon access privileges (e.g., Alaska Limited Entry permits) and established priority harvesting rights and historical dependence (e.g. subsistence). Chinook salmon removals may, over time, reduce the value of Chinook salmon access privileges as well as reducing the economic, social, and cultural benefits for subsistence and other non-commercial users of this resource. Under the prevailing fishery management structure, the market has no efficient mechanism by which groundfish harvesters may compensate salmon harvesters for the salmon lost to bycatch. Further, the market cannot readily measure many aspects of the value of Chinook salmon such as the cultural significance of Chinook salmon to the subsistence user. Thus, Chinook salmon bycatch reduction measures are imposed through regulation to reduce, to the extent practicable, this market failure. The goal of the action considered in this RIR is to improve Chinook salmon avoidance in the Central and Western GOA pollock fisheries and, thereby, further mitigate the market failure.

3.6 Description of the Western and Central Gulf of Alaska Commercial Pollock Fishery

Walleye pollock (*Theragra chalcogramma*) is a semi-pelagic schooling fish widely distributed in the North Pacific Ocean. Pollock in the GOA are managed as a single stock independently of pollock in the Bering Sea and Aleutian Islands. Peak spawning at the two major spawning areas in the GOA occurs at different times. In the Shumagin Island area, peak spawning apparently occurs between February 15-March 1, while in Shelikof Strait peak spawning occurs later, typically between March 15 and April 1. It is unclear whether the difference in timing is genetic, or a response to differing environmental conditions in the two areas.

The commercial fishery for walleye pollock in the GOA started as a foreign fishery in the early 1970s (Megrey 1989). Catches increased rapidly during the late 1970s and early 1980s. A large spawning aggregation was discovered in Shelikof Strait in 1981, and a fishery developed for which pollock roe was an important product. The domestic fishery for pollock developed rapidly in the GOA with only a short period of joint venture operations in the mid-1980s. The fishery was fully domestic by 1988.

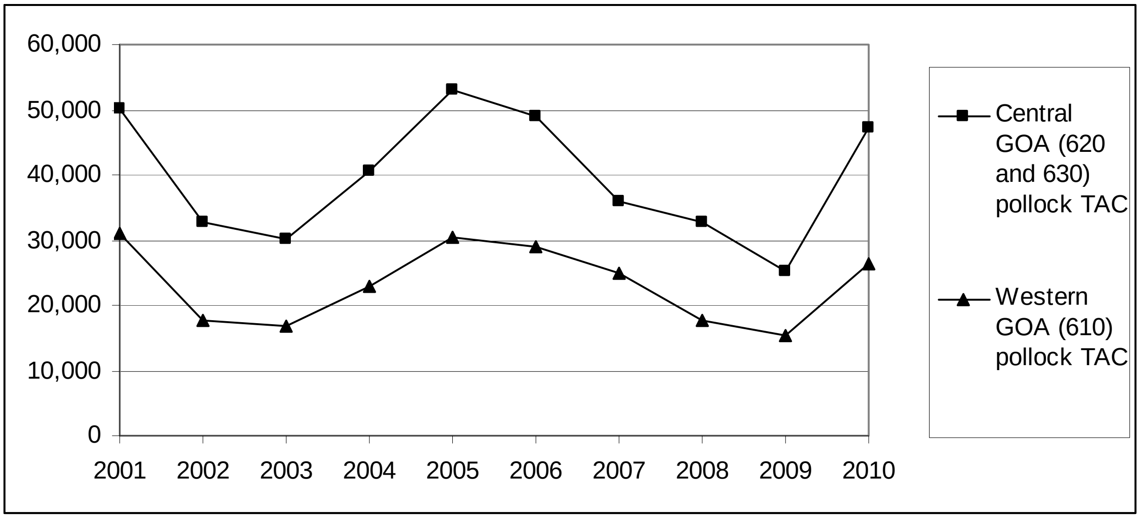
The fishery for pollock in the GOA is entirely shore-based with approximately 90% of the catch taken with pelagic trawls. During winter months fishing effort targets pre-spawning aggregations in Shelikof Strait and near the Shumagin Islands. Fishing in summer is less predictable, but typically occurs on the east side of Kodiak Island and in nearshore waters along the Alaska Peninsula.

Since 1992, the GOA pollock TAC has been apportioned spatially and temporally to reduce potential impacts on Steller sea lions. The details of the apportionment scheme have evolved over time, but the general objective is to allocate the TAC to management areas based on the distribution of surveyed biomass, and to establish three or four seasons between mid-January and autumn during which some fraction of the TAC can be taken. The Steller Sea Lion Protection Measures implemented in 2001 established four seasons in the Central and Western GOA beginning January 20 (“A” season), March 10 (“B” season), August 25 (“C” season), and October 1 (“D” season), with 25% of the total TAC allocated to each season. Allocations to management areas 610, 620 and 630 are based on the seasonal biomass distribution as estimated by groundfish surveys. In addition, a new harvest control rule was implemented that requires suspension of directed pollock fishing when spawning biomass declines below 20% of the reference unfished level (Dorn et al. 2010).

3.6.1 Total Allowable Catch

The total allowable catches of pollock in the Central and Western areas of the GOA from 2001 through 2010 are shown in Figure 2. Information in that figure indicates that the Central Gulf pollock TAC ranged from a high of 53,122 mt in 2005 to a low of 15,249 mt in 2009. Over this 10-year time period TAC averaged 39,679 mt. During the most recent 5-year period the TAC averaged slightly less than the 10-year average (37,992 mt). The 2010 GOA SAFE report (Dorn et al. 2010) indicates that the trend of increasing TACs is expected to continue through 2012.

Figure 2 Central and Western GOA TACs (in mt), 2001 2010



The Western Gulf TACs followed the same general trend as the Central Gulf and ranged from a high of 30,380 mt in 2005 and low of 15,249 mt in 2009. The 2001-2010 Western Gulf TACs were always between 35% and 41% of the two areas combined TACs. As in the Central Gulf, the Western Gulf TACs are projected to increase through 2012 (Dorn et al. 2010).

TACs for the GOA in 2011 were reduced by a total of 1,650 mt to account for the estimated removals from the Prince William Sound (PWS) GHL pollock fishery. This fishery is under the authority of the State of Alaska and the harvests from that fishery are not deducted from the Federal TAC. It is the only GHL pollock fishery in the Central and Western GOA.

GOA parallel fisheries for pollock take place in State waters around Kodiak Island, in the Chignik Area and along the South Alaska Peninsula. Pollock harvests in parallel fisheries (under both State of Alaska and Federal management) are deducted from the Federal TAC and are included under this amendment. Because parallel fishery harvests are deducted from the Federal TAC, the TACs are not reduced prior to the fishing season to account for removals. Instead, the harvest by vessel operators participating in either the State or Federal portion of the parallel fisheries are deducted from the TAC at the time the harvest is reported through the catch accounting system.

3.6.2 Groundfish Catch in Pollock Target Fisheries

Pollock catch in the Central GOA pollock target fishery ranged from 46,802 mt in 2005 to 22,700 mt in 2009 (Table 3). Catch in 2010 (44,033 mt) was relatively close to 2005 levels. Western Gulf catches ranged from 30,756 mt in 2005 to 14,010 mt in 2009. Catch in 2010 was 25,766 mt.

Harvesters in the Central GOA have generally harvested over 90% of the pollock TAC. Since 2003, the only years participants did not harvest over 90% of the TAC were 2005 (86%) and 2006 (88%). During 2005, the pollock fishery was reopened in Area 630 for 48 hours on October 17th to more fully harvest the TAC. The fishery was also opened for 24 hours on October 27th. However, the lowest percentage of the TAC was harvested in that year.

In the Western GOA over 90% of the pollock TAC was harvested except the years 2006 2008. The lowest percentage of the TAC (69%) was harvested in 2007. That year the "C" season and "D" season pollock fisheries were closed by regulation limiting the directed fishing season, and not as a result of the TAC being harvested. About 84% of the TAC was harvested in the other two years. Appendix 1 shows all the Central and Western GOA pollock fishery openings and closures for the years 2006-2010.

Incidental catch in the GOA directed pollock fishery is low (Table 3). For catch classified in the pollock targets in the Central GOA between 2003 and 2010, on average about 93% of the catch by weight of FMP species consisted of pollock. In the Western GOA about 96% of the catch was pollock. Pollock target landings are defined by the dominance of pollock in the catch, and may include tows where other species were targeted, but where pollock were caught instead. The most common target species in the incidental catch are arrowtooth flounder, Pacific cod, flathead sole, Pacific ocean perch, miscellaneous flatfish, and the shortraker/rougheye rockfish complex. The most common non-target species are squid, eulachon, various shark species (e.g., Pacific sleeper sharks, spiny dogfish, salmon shark), jellyfish, and grenadiers.

Table 3 Pollock and all other groundfish catch in Central Gulf and Western Gulf pollock target fisheries, 2003-2010

		Metric Tons		Percentage		
Area	Year	Pollock	Groundfish Incidental Catch	Pollock	Groundfish Incidental Catch	Pollock Catch as a % of Pollock TAC
Central Gulf	2003	31,290	1,126	97%	3%	104%
	2004	38,311	2,053	95%	5%	95%
	2005	46,802	3,287	93%	7%	88%
	2006	42,299	6,036	88%	12%	86%
	2007	32,205	2,768	92%	8%	90%
	2008	30,769	2,566	92%	8%	94%
	2009	22,700	1,371	94%	6%	90%
	2010	44,033	1,749	96%	4%	93%
2003-2010 CG Average		36,051	2,619	93%	7%	
Western Gulf	2003	15,970	330	98%	2%	95%
	2004	23,124	296	99%	1%	101%
	2005	30,756	526	98%	2%	101%
	2006	24,427	574	98%	2%	84%
	2007	17,303	766	96%	4%	69%
	2008	14,828	669	96%	4%	84%
	2009	14,010	664	95%	5%	92%
	2010	25,766	2,828	90%	10%	98%
2003-2010 WG Average		20,773	832	96%	4%	

Source: NOAA Catch Accounting data

3.6.3 Chinook Salmon Bycatch in Pollock Target Fisheries

The number of Chinook salmon caught in the Central and Western GOA pollock fishery and the rate at which they are caught varies by year. In the Central Gulf the fewest Chinook salmon were caught in 2009. Only 2,123 Chinook salmon were estimated to be caught that year. The most Chinook salmon were caught in 2007, when an estimated 31,647 fish were taken. On average just over 12,600 Chinook salmon were caught annually during the 2003-2010 time period.

Central Gulf of Alaska

Rates of Chinook salmon bycatch are shown in Table 4 for the years 2003 2010. In the Central GOA as few as 0.09 Chinook salmon were estimated to be caught per metric ton of pollock harvested in the pollock target fishery (2009). Chinook salmon bycatch per metric ton of pollock harvest in the pollock target fishery was greatest in 2007. That year 0.98 Chinook salmon were estimated to be caught per metric ton of pollock. On average, about 0.35 Chinook salmon were caught per metric ton of pollock from 2003-2010. The inverse of the calculation showing the number of Chinook salmon caught per metric ton of pollock is the metric tons of pollock that can be harvested with one Chinook salmon. In 2009, 10.69 mt of pollock were harvested for each salmon that was estimated to be caught. Just over one metric ton of pollock was caught for each salmon in 2007. On average, 2.86 mt of pollock was harvested for each salmon estimated to be caught during 2003-2010.

The percentage of the combined Central and Western GOA Chinook salmon bycatch was greater in the Central Gulf than the percentage of pollock harvested, every year (2003-2010), except 2010. This is primarily due to the increase in Chinook salmon bycatch in the Western Gulf, as opposed to unusually small bycatch numbers of Chinook salmon in the Central Gulf that year. Typically, the percent of Chinook salmon taken as bycatch in the Central Gulf accounts for 70% 90% of the Central and Western Gulf total. In 2010, the Central Gulf accounted for only 28% of the total.

Table 4 Chinook salmon prohibited species catch (PSC) and pollock catch in the Central and Western Gulf of Alaska pollock fishery, 2003-2010.

Area	Year	Chinook PSC	Pollock	Chinook/mt of Pollock	Mt of pollock /Chinook	% of CG & WG Chinook harvested	% of CG & WG pollock harvested
Central Gulf	2003	3,557	31,290	0.11	8.80	83%	66%
	2004	10,655	38,311	0.28	3.60	82%	62%
	2005	21,429	46,802	0.46	2.18	78%	60%
	2006	11,138	42,299	0.26	3.80	71%	63%
	2007	31,647	32,205	0.98	1.02	90%	65%
	2008	7,971	30,769	0.26	3.86	79%	67%
	2009	2,123	22,700	0.09	10.69	83%	62%
	2010	12,334	44,033	0.28	3.57	28%	63%
2003 - 2010 CG Average		12,607	36,051	0.35	2.86	66%	63%
Western Gulf	2003	738	15,970	0.05	21.64	17%	34%
	2004	2,327	23,124	0.10	9.94	18%	38%
	2005	5,951	30,756	0.19	5.17	22%	40%
	2006	4,529	24,427	0.19	5.39	29%	37%
	2007	3,359	17,303	0.19	5.15	10%	35%
	2008	2,116	14,828	0.14	7.01	21%	33%
	2009	441	14,010	0.03	31.77	17%	38%
	2010	31,581	25,766	1.23	0.82	72%	37%
2003 - 2010 WG Average		6,380	20,773	0.31	3.26	34%	37%

Source: NOAA Catch Accounting System.

Western Gulf of Alaska

Chinook salmon bycatch in the Western GOA, from 2003-2010, was estimated to range from 441 fish in 2009 to 31,581 fish in 2010. On average, 6,380 fish were caught each year. However, if 2010 were excluded from the average, the estimate decreases to 2,780 Chinook salmon per year. This information indicates that 2010 was an unusual year for Chinook salmon bycatch in the Western Gulf.

The rates at which Chinook salmon were caught in the Western Gulf pollock fishery were 0.19 fish per metric ton of pollock or less every year except 2010. During 2010, 1.23 Chinook salmon were caught for every metric ton of pollock. That is over ten-times the average Chinook salmon catch rate from 2003-2009. The majority of Chinook bycatch occurred during the “D” season.

In terms of metric tons of pollock that could be harvested for the catch of one Chinook salmon the amount of pollock ranged from 31.77 mt in 2009 to 0.82 mt in 2010. Most years between 5 and 10 metric tons of pollock were caught for each Chinook salmon that was estimated to be taken. Years with the more extreme rates indicate the annual variability of Chinook salmon bycatch that exists in the pollock fishery.

3.6.4 Harvesting Vessels

Vessels that harvest pollock in the directed GOA pollock fishery deliver their catch to shorebased[6] processors or tenders that transport their catch to shorebased processors. Table 5 reports the number of catcher vessels that participated in the pollock fisheries during 2003-2010. The table also reports the number of vessels that were less than 60’ and the number of vessels ≥ 60’ LOA. This breakdown was included because the proposed amendment may change current observer coverage requirements for vessels < 60’ LOA and because the < 60’ vessels Chinook salmon bycatch rates were estimated using observed catch from other vessels. A further breakdown of vessels that were greater than or equal to 125’ LOA was not included because only one vessel met that criteria. That vessel only reported Gulf pollock catch in one week (during 2008) from 2003-2010. Their information could not have been presented alone because it would not meet the confidentiality requirements imposed on the use of these data.

[6] The term “shorebased processors” used in this section refers to processing plants that are located in coastal communities or floating processors that operate within State waters in a single geographic location.

Table 5 Catcher vessel participation in the Central and Western GOA pollock target fishery, 2003-2010

		Vessels <60' LOA			Vessels ≥60' LOA			All Vessels		
Area	Year	Estimated Chinook Catch (fish)	Pollock (mt)	Vessels	Estimated Chinook Catch (fish)	Pollock (mt)	Vessels	Estimated Chinook Catch (fish)	Pollock (mt)	Vessels
CG	2003	94	220	4	3,463	31,070	45	3,557	31,290	49
	2004	30	463	5	10,625	37,848	48	10,655	38,311	53
	2005	823	1,590	4	20,607	45,212	43	21,429	46,802	47
	2006	103	638	3	11,035	41,661	42	11,138	42,299	45
	2007	*	*	1	31,647*	32,205*	37	31,647	32,205	38
	2008	*	*	2	7,971*	30,769*	42	7,971	30,769	44
	2009	*	*	1	2,123*	22,700*	39	2,123	22,700	40
	2010	936	1,839	4	11,397	42,194	37	12,334	44,033	41
CG Avg. 2003-2010		397	950	3	*	*	42	12,607	36,051	45
WG	2003	467	10,082	20	271	5,887	11	738	15,970	31
	2004	1,547	14,892	17	779	8,232	8	2,327	23,124	25
	2005	4,563	19,854	18	1,388	10,901	10	5,951	30,756	28
	2006	2,141	13,034	18	2,388	11,394	10	4,529	24,427	28
	2007	2,121	12,465	16	1,238	4,838	9	3,359	17,303	25
	2008	2,092	14,218	16	24	610	3	2,116	14,828	19
	2009	400	12,310	17	41	1,700	5	441	14,010	22
	2010	26,127	19,739	20	5,453	6,027	6	31,581	25,766	26
WG Avg. 2003-2010		4,932	14,574	18	1,448	6,199	8	6,380	20,773	26
CG+WG	2003	561	10,302	22	3,734	36,958	51	4,295	47,260	73
	2004	1,577	15,355	18	11,404	46,080	50	12,982	61,435	68
	2005	5,386	21,445	19	21,995	56,113	47	27,381	77,558	66
	2006	2,245	13,671	18	13,423	53,055	47	15,667	66,726	65
	2007	*	*	16	32,885	37,043	43	35,006	49,508	59
	2008	*	*	17	7,995	31,379	44	10,087	45,598	61
	2009	*	*	18	2,164	24,400	44	2,564	36,710	62
	2010	27,064	21,578	22	16,851	48,220	41	43,914	69,799	63
CG+WG Avg. 2003-2010		*	*	19	13,806	41,656	46	18,987	56,824	65

Source: NMFS Catch Accounting data
Note: * indicates the data was either hidden or set equal to the total to avoid disclosing confidential data.

Table 5 indicates that in the Central GOA the vessels participating in the pollock target fishery are generally ≥ 60' LOA. A range of 37 and 48 vessels (≥ 60' LOA) targeted Central Gulf pollock, annually, from 2003-2010. On average, 42 vessels ≥ 60' LOA annually targeted pollock.

Over the 2003-2010 time period no more than five vessels < 60' LOA targeted pollock in the Central Gulf. Fewer than three vessels fished during the years 2007-2009. Because fewer than three vessels fished those years, their pollock catch and the number of Chinook salmon associated with their pollock catch cannot be reported. For the years that can be reported, the < 60' vessels always caught less than 2,000 mt of pollock and averaged less than 1,000 mt. The number of Chinook salmon attributed to these vessels was always less than 1,000 fish and was less than 100 fish some years.

The Western Gulf fleet had fewer vessels participating and a greater percentage of the vessels were < 60' LOA, especially in the three most recent years of data. Since the beginning of the 2007 fishing year, less than seven vessels have fished in the Western Gulf pollock fishery that were ≥ 60' LOA. Over that same time-period more than 15 < 60' vessels fished each year. The greatest number of < 60' vessels fished in 2010 (20). The < 60' vessel class also accounted for the greatest percentage of pollock catch in the Western Gulf. For example, during the years 2008-2010 they accounted for 95%, 88%, and 77% of the areas pollock catch, respectively. These smaller vessels are typically owned by individuals that are local to the Western Gulf.

The total number of vessels that targeted pollock in the Central and Western Gulf ranged from 59 (2007) to 73 (2003). Since 2007, there have never been more than 63 vessels in these fisheries. However, there has been a small (one or two vessels per year) increase in the number of participants during that period.

Table 6 shows the number of vessels and their groundfish catch in the pollock fishery, based on whether the vessels were members of a cooperative. The three different cooperatives considered are the American Fisheries Act cooperatives, the Rockfish Program cooperatives, and the Bering Sea Crab cooperatives. If a vessel was a member of any of these cooperatives they are considered to be in a cooperative. The table is broken out by participation in the Central Gulf pollock fishery, Western Gulf pollock fishery, and the Central and Western Gulf pollock fisheries combined. This table is important for two reasons. First, owners of vessels that are currently active in cooperatives may have an advantage over non-cooperative members, if cooperatives are required under this action. Vessel owners already in a cooperative will understand how they function and may have be able to use connections in their current cooperative to influence development of the Gulf cooperatives. Second, membership in a cooperative triggers the affiliation standards in Regulatory Flexibility Act. Therefore, cooperative members would not be considered a small entity under RFA standards.

Table 6 Number of vessels, groundfish catch, and percentage of groundfish catch by vessels that are in a cooperative and those not in a cooperative, by area (2003-2010).

	Vessels not in a Cooperative			Vessels in a Cooperative			Total		
Year	Vessels	Groundfish (mt)	Percent of Groundfish	Vessels	Groundfish (mt)	Percent of Groundfish	Vessels	Groundfish (mt)	Percent of Groundfish
	Central Gulf								
2003	10	4,146	12.8	39	28,270	87.2	49	32,416	100
2004	11	5,313	13.2	42	35,051	86.8	53	40,363	100
2005	8	8,035	16.0	39	42,054	84.0	47	50,089	100
2006	9	5,330	11.0	36	43,006	89.0	45	48,335	100
2007	5	2,440	7.0	33	32,533	93.0	38	34,973	100
2008	8	2,472	7.4	36	30,864	92.6	44	33,336	100
2009	5	2,466	10.2	35	21,604	89.8	40	24,070	100
2010	9	6,820	14.9	32	38,963	85.1	41	45,782	100
	Western Gulf								
2003	23	10,073	61.8	8	6,226	38.2	31	16,299	100
2004	17	15,109	64.5	8	8,311	35.5	25	23,420	100
2005	19	19,610	62.7	9	11,672	37.3	28	31,282	100
2006	19	13,910	55.6	9	11,092	44.4	28	25,001	100
2007	16	11,312	62.6	9	6,757	37.4	25	18,069	100
2008	15	13,259	85.6	4	2,239	14.4	19	15,497	100
2009	16	11,770	80.2	6	2,904	19.8	22	14,674	100
2010	20	21,595	75.5	6	6,998	24.5	26	28,593	100
	Central and Western Gulf Total								
2003	30	14,219	29.2	43	34,496	70.8	73	48,715	100
2004	24	20,422	32.0	44	43,362	68.0	68	63,784	100
2005	24	27,645	34.0	42	53,726	66.0	66	81,371	100
2006	23	19,239	26.2	42	54,097	73.8	65	73,337	100
2007	20	13,752	25.9	39	39,289	74.1	59	53,041	100
2008	22	15,730	32.2	39	33,103	67.8	61	48,833	100
2009	21	14,236	36.7	41	24,507	63.3	62	38,744	100
2010	26	28,415	38.2	37	45,960	61.8	63	74,376	100

Sources: NOAA Catch Accounting Data: Ram Permit Data

Catcher vessels that are qualified to participate in the Bering Sea pollock fishery under the AFA are also allowed to harvest a limited amount of pollock from the GOA. These limits are often referred to as "groundfish sideboards". Table 6 shows that 19 to 22 AFA vessels were reported as having targeted Central Gulf pollock from 2003-2010. Western Gulf pollock participants that are AFA qualified ranged from 3 to 6 depending on the year. In total, 22 to 25 vessels fished in one or both of the areas from 2003-2010. These vessels harvested approximately 12,000 mt to 26,000 mt of pollock, 450 mt to 2,400 mt of other groundfish species, and 1,100 and 9,900 Chinook salmon per year. There was no direct relationship between the percentage of pollock harvested and the percentage of Chinook salmon caught. Some years the percentage of pollock was greater and some years the percentage of salmon was greater. When the percentage of pollock was greater, it meant that the AFA fleet had a lower rate of Chinook salmon bycatch per metric ton of pollock harvest than the Non-AFA fleet. When their pollock percentage was lower than the percentage of Chinook salmon caught, their Chinook salmon bycatch rate was higher than the Non-AFA fleet. Because there was no consistent pattern, one fleet did not indicate they were better at Chinook salmon avoidance than the other.

From 28 to 36 vessels harvested pollock in the Central Gulf and also participated in the Rockfish Pilot program. The vessels harvested between 21,089 mt and 40,455 mt of groundfish from the pollock target fishery. In the Western Gulf from one to six vessels that targeted pollock also participated in the Rockfish Pilot Program. These vessels harvested up to 7,211 mt of groundfish from the pollock fishery. Between one and three vessels fished for pollock and participated in crab cooperatives. Their catch data are not provided because of confidentiality restrictions.

Table 7 Number of vessels and groundfish catch by cooperative membership in the Central and Western Gulf pollock fisheries, 2003-2010.

Management subarea	Year	Fishery totals		AFA participants			Rockfish program participants			Crab program vessels
					Catch			Catch		
		Vessels	Catch	Vessels	in metric tons	as percentage of total	Vessels	in metric tons	as percentage of total	
Central Gulf	2003	49	32,416	22	15,201	46.9	33	25,858	79.8	2
	2004	53	40,363	22	17,305	42.9	36	32,094	79.5	3
	2005	47	50,089	21	19,585	39.1	35	39,871	79.6	3
	2006	45	48,335	20	21,489	44.5	33	40,455	83.7	1
	2007	38	34,973	19	18,960	54.2	29	30,401	86.9	2
	2008	44	33,336	20	18,675	56.0	32	29,010	87.0	1
	2009	40	24,070	20	9,790	40.7	31	21,089	87.6	2
	2010	41	45,782	19	22,134	48.3	28	36,884	80.6	1
Western Gulf	2003	31	16,299	6	4,011	24.6	3	3,493	21.4	1
	2004	25	23,420	5	5,701	24.3	5	5,192	22.2	2
	2005	28	31,282	6	6,507	20.8	5	7,211	23.1	2
	2006	28	25,001	6	5,679	22.7	5	7,115	28.5	2
	2007	25	18,069	5	1,998	11.1	6	5,095	28.2	2
	2008	19	15,497	3	644	4.2	1	*	*	2
	2009	22	14,674	4	982	6.7	3	2,099	14.3	1
	2010	26	28,593	4	4,439	15.5	2	*	*	2

Sources: NMFS Catch Accounting; RAM permit data.
Note: crab vessel catches are withheld for confidentiality.

Processors

Shorebased processors that are located in communities adjacent to the waters of the GOA and BSAI take deliveries of groundfish harvested in the Central and Western GOA pollock trawl fishery. These processors are located in Akutan, Dutch Harbor, King Cove, Kodiak, Sand Point, and Seward. There was also one floating processor, operated by Icicle Seafoods, taking pollock deliveries some years. Most of the pollock processors were located in the port of Kodiak. These are the primary processors of fish harvested from the Central GOA pollock trawl fishery. Kodiak processors did not report taking deliveries of Western Gulf pollock since 2003. The processors located in the other ports tend to rely less on the Central Gulf pollock and more on pollock from the Western GOA and the Bering Sea/Aleutian Islands areas. Table 8 reports all of the processors listed in the 2003-2009 data.

Table 8 shows the number of processors that took deliveries of Central and Western Gulf pollock from 2003-2009. Data from 2010 was not included because the processor information was not included in the data provided. The table separates processors by their location. Kodiak and Seward comprise one class. Only one plant reported any landings in Seward and only in 2004. Processors in all other locations, which took deliveries of Central or Western Gulf pollock harvested in the pollock target fishery, comprise the other class (Table 9).

Table 8 Processors taking deliveries from the Central and Western GOA pollock target fishery, 2003-2010.

	Other Ports		Kodiak/Seward		Total			
Year	# of Plants	Pollock (mt)	# of Plants	Pollock (mt)	# of Plants	Pollock (mt)	% of pollock landed in Kodiak/Seward	% of pollock landed in Other Ports
2003	5	16,070	6	31,190	11	47,260	66%	34%
2004	5	24,283	8	37,153	13	61,435	60%	40%
2005	5	31,865	7	45,693	12	77,558	59%	41%
2006	4	25,807	7	40,920	11	66,726	61%	39%
2007	4	17,475	6	32,033	10	49,508	65%	35%
2008	5	15,636	8	29,962	13	45,598	66%	34%
2009	5	14,283	7	22,426	12	36,710	61%	39%

Source: NMFS Catch Accounting data

The information in Table 8 indicates that either 4 or 5 processors in the “other ports” group took deliveries of Central/Western GOA pollock from 2003 2010, depending on the year. Processors that were active showed very little entry and exit in the fishery. These processors took deliveries of between 14,000 mt and 32,000 mt of pollock annually during that period of time. They took deliveries of 34% to 41% of the pollock harvested from the Central and Western Gulf.

About 98% of all pollock harvested from the Central Gulf target fishery from 2003-2010 was delivered to Kodiak. The remaining pollock was delivered to Sand Point, King Cove or Seward. Pollock harvested from the Western Gulf was delivered to Akutan, Dutch Harbor, King Cove, Sand Point, or a floating mothership. Percentages of the total pollock deliveries cannot be reported by port because of confidentiality restrictions. However, from 10 to 13 processors took deliveries of Central and/or Western GOA pollock annually from 2003 2010. A total of 14 processors were active at some point during that time period. Processors in “Kodiak/Seward” took deliveries of 59% to 66% of the annual harvest of pollock from the Western and Central Gulf.

Table 9 Processors that took deliveries of Central and Western Gulf pollock, 2003-2009.

Kodiak & Seward	Other Ports
Alaska Fresh Seafoods Inc	Akutan (Trident)
Alaska Pacific Seafood Division	Dutch Harbor (Alyeska)
Alaska Seafood Systems	Floating Domestic Mothership (Icicle)
Global Seafoods North America	King Cove (Peter Pan)
International Seafoods Of Alaska Inc	Sand Point (Trident)
Isa-Twfa	
Island Seafoods	
North Pacific Processors Inc	
North Pacific Seafoods Inc	
Ocean Beauty Seafoods Inc (Kodiak & Seward)	
Trident Seafoods Corporation	
True World Foods - Alaska	
Western Alaska Fisheries Inc	
Westward Seafoods Inc	

Source: NOAA Catch Accounting data

3.6.5 Community Listed on Vessel's LLP Permit

The address listed on the vessel's License Limitation Program permit was assumed to be the vessel's home port. This information is used as a proxy for information on where pollock vessels are kept and the vessel's owner resides. Because the communities where the vessel owner resides and where the vessels have their home port could be impacted by potential decreases in pollock catch, this information provided.

Table 10 provides vessel counts and pollock catch for vessels that are aggregated by location based on the address listed on the vessel's LLP. Table 11 provides a list of the communities that are represented in each region. Most vessels had an LLP permit address in Washington prior to 2010. However, in 2010 the same number of vessels had LLP addresses in Alaska and Washington. Oregon typically was the LLP address for about half as many vessels as Washington.

Table 10 Number of vessels and pollock catch by address listed on LLP, 2003-2010.

	2003	2004	2005	2006	2007	2008	2009	2010
Address	Number of Vessels (Based on LLP Address)							
Kodiak	15	16*	13	13	12	13	15*	13
King Cove/Sand Point	7	7	7	7	7	5	6	8
Other Alaska (East of Kodiak)	4	*	4	4	3	3	*	4
Alaska Total	26	23	24	24	22	21	21	25
Washington	33	30	28	27	23	26	29	25
Oregon	14	15	14	14	14	14	13	13
Total	73	68	66	65	59	61	63	63
	Catch of Pollock (mt)							
Kodiak	10,391	13,155*	17,024	17,198	11,674	10,893	9,704*	15,036
King Cove/Sand Point	4,051	7,346	7,374	5,387	3,966	4,944	3,795	7,017
Other Alaska (East of Kodiak)	1,563	*	3,728	3,291	451	1,082	*	5,110
Alaska Total	16,006	20,501	28,126	25,877	16,092	16,919	13,499	27,163
Washington	18,364	25,764	32,689	25,973	19,941	16,135	14,153	24,533
Oregon	13,832	15,386	18,624	16,443	13,558	13,696	10,207	19,648
Total	48,202	61,650	79,440	68,293	49,591	46,750	37,859	71,344
	Percentage of Pollock Catch							
Kodiak	22%	21%	21%	25%	24%	23%	26%	21%
King Cove/Sand Point	8%	12%	9%	8%	8%	11%	10%	10%
Other Alaska (East of Kodiak)	3%	*	5%	5%	1%	2%	*	7%
Alaska Total	33%	33%	35%	38%	32%	36%	36%	38%
Washington	38%	42%	41%	38%	40%	35%	37%	34%
Oregon	29%	25%	23%	24%	27%	29%	27%	28%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Source: NOAA Catch Accounting data. NOAA LLP data sets for vessel address information

Table 10 also shows that vessels with LLP addresses in Alaska and Washington typically caught 32% to 42% of the pollock. Vessels with Oregon addresses caught 23% to 29% of the pollock, but only accounted for 19% to 24% of the vessels. Therefore, on average, the vessels with Oregon addresses harvested more pollock per vessel.

Table 11 Communities that are included in the regions reported

Washington	Oregon	Other Alaska
Bellingham	Brookings	Homer
East Wenatchee	Charleston	Girdwood
Edmonds	Clackamas	Petersburg
Everett	Florence	
Fox Island	Newport	
Gig Harbor	Port Orford	
Issaquah	Siletz	
Lynden	Sisters	
Mercer Island	South Beach	
Seattle		
South Bend		

Source: NOAA Catch Accounting data and RAM LLP data

Alaska addresses were further divided by three geographic regions. The furthest West region included the communities of King Cove and Sand Point, two Alaska Natives Claims Settlement Act communities. Five to eight vessels had LLP addresses in those communities, depending on the year. Kodiak was home to the most vessels, with 12 to 15 vessels making pollock landings in a year. The last region included the communities East of Kodiak. A maximum of four vessels reported pollock landings that had these communities listed on their LLP permit. These vessels had the most landings in 2010 when the reported harvesting over 5,000 mt of pollock in the Central and Western Gulf pollock target fishery.

3.6.6 Taxes Generated by the Gulf Pollock Fishery

There are three fisheries taxes that are levied on pollock catch/landings by the State of Alaska. The descriptions of these taxes were taken from the State of Alaska web site and are provided below:

- "A **Fisheries Business Tax** is levied on persons who process or export fisheries resources from Alaska. The tax is based on the price paid to commercial fishers or fair market value when there is not an arms-length transaction. Fisheries business tax is collected primarily from licensed processors and persons who export fish from Alaska."

The tax rate assessed under the Fisheries Business Tax for pollock fisheries in the Central and Western GOA is 3% of the price paid to commercial fishers for landings at shorebased processors and 5% for landings at floating processors. Because landings from these pollock fisheries typically are to shorebased processors a 3% tax rate is typically applied.

- "A **Fishery Resource Landing Tax** is levied on fishery resources processed outside the 3-mile limit and first landed in Alaska or any processed fishery resource subject to sec. 210(f) of the American Fisheries Act. The tax is based on the unprocessed value of the resource, which is determined by multiplying a statewide average price (determined by the Alaska Department of Fish and Game data) by the unprocessed weight. The Fishery Resource Landing Tax is collected primarily from factory trawlers and floating processors which process fishery resources outside of the state's 3-mile limit and bring their products into Alaska for transshipment."

As stated earlier, landings of Gulf pollock typically are delivered to shorebased processors and this tax would not apply. However, if motherships or catcher/processors take deliveries of Gulf harvested pollock in the future, those landings would be subject to the Fishery Resource Landing Tax.

- "A **Seafood Marketing Assessment** is levied at a rate of 0.5% of the value of seafood products processed first landed in, or exported from Alaska."

The Seafood Marketing Assessment would be levied on all Gulf pollock landings and any changes in the total value of the Central Gulf and Western Gulf pollock fishery will impact the tax revenue that is generated by the State of Alaska.

Because the two taxes that are levied on Gulf pollock landings are the Fisheries Business Tax and the Seafood Marketing Assessment a tax rate of 3.5% of the actual or fair market value of the tax is paid to the State in most cases. If the fish are landed at a floating processor the tax is increased to 5.5% of the value. Since the data indicates that only one floating process has taken deliveries since 2003, it is assumed the tax rate is about 3.5% of the value of the landings in the Gulf pollock fishery.

The Bering Sea Chinook salmon RIR (NPFMC, 2009) provides information on the tax revenue generated by the pollock fishery in the BSAI. However, because the Bering Sea pollock fishery is so large, using that information would over emphasize the importance of the Gulf pollock fishery on taxes generated by landings in those Alaskan ports.

Information reported in the Economic SAFE report (Hiatt et al. 2010) indicates that exvessel value of GOA pollock ranged from $21.6 million in 2005 to $15.3 million in 2009. If a tax rate of 3.5% was applied to the exvessel values reported over that time period, the tax levied would range from $0.5 million to $0.8 million. Those estimates are for the entire Gulf pollock catch using trawl gear. Because that tax amount is an estimate for all pollock it is not intended to represent changes in tax revenue that would occur if this amendment were implemented and the pollock fisheries were closed to directed fishing during the year because of Chinook salmon bycatch.

3.6.7 Gulf of Alaska Pollock Products

Table 28 of the Economic SAFE report (Hiatt et al, 2010) shows the amount of various products generated from pollock. Products processed from Bering Sea/Aleutian Islands pollock are reported separately from GOA pollock. The information from Table 28 of the 2010 Economic SAFE is presented in Table 12. Surimi, head and gut, fillets, and roe comprised the majority of products produced.

Table 12 Pollock products (1,000 mt product weight) from Gulf of Alaska fisheries, 2005-2009

Product	*2005*	*2006*	*2007*	*2008*	*2009*
Whole Fish	.2	.51	.66	.72	.66
Head & Gut	4.27	7.56	7.32	5.7	5.97
Roe	1.71	1.82	1.95	1.13	.59
Fillets	5.85	5.41	2.53	2.33	2.61
Surimi	9.44	6.90	5.06	4.37	2.54
Minced Fish	.09				
Fish Meal	1.86	2.01	.21		
Other Products	3.28	1.56	.33	.41	.35

Source: Table 28 of NPFMC Economic SAFE, 2010

The product mix could change as a result of the proposed amendment. For example, if the Western and/or Central Gulf pollock fisheries were to close after the "B" season, the amount of roe would not be reduced but the amount of the remaining products would be reduced. Buyers of fillets, surimi, and head and gut product would realize the greatest impact. If the fishery were to close during the "A" or "B" seasons all product forms produced would be reduced. It is also important to note that some of the pollock products could have been produced with pollock that was harvested as incidental catch in other target fisheries.

3.7 Potentially Affected Chinook Salmon Fisheries

North Pacific Chinook salmon are the subject of commercial, subsistence, personal use, and sport/recreational (used interchangeably) fisheries. Chinook salmon are the least abundant of the five salmon species found on both sides of the Pacific Ocean and the least numerous in the Alaska commercial harvest. The majority of the Alaska commercial catch is made in Southeast Alaska, Bristol Bay, and the Arctic-Yukon-Kuskokwim area. The majority of catch is made with troll gear and gillnets. Approximately 90% of the subsistence harvest is taken in the Yukon and Kuskokwim rivers. The Chinook salmon is one of the most highly prized sport fish in Alaska and is extensively fished by anglers in the Southeast and Cook Inlet areas. The sport fishing harvest of Chinook salmon is over 76,000 fish annually with Cook Inlet and adjacent watersheds contributing over half the catch. Unlike other Pacific salmon species, Chinook salmon rear in inshore marine waters and are, therefore, available to commercial and sport fishers all year round (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main).

The Alaska State Constitution establishes, as state policy, the development and use of replenishable resources, in accordance with the principle of sustained yield, for the maximum benefit of the people of the state. In order to implement this policy for the fisheries resources of the state, the Alaska Legislature created the Alaska Board of Fisheries (BOF) and the Alaska Department of Fish & Game (ADF&G). The BOF was given the responsibility to establish regulations guiding the conservation and development of the state's fisheries resources, including the distribution of benefits among subsistence, commercial, recreational, and personal uses. ADF&G was given the responsibility to implement the BOF's regulations and management plans through the scientific management of the state's fisheries resources. Scientific and technical advice is provided by ADF&G to the BOF during its rule-making process. The first priority for management is to meet spawning escapement goals in order to sustain salmon resources for future generations. The highest priority use is for subsistence under both state and federal law. Salmon surplus above escapement needs and subsistence uses are made available for other uses (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management).

ADF&G's fishery management activities fall into two categories: inseason management and applied science. For inseason management, the division employs fishery managers near the fisheries. Local fisheries managers are given authority to open and close fisheries to achieve two goals: the overriding goal is conservation to ensure an adequate escapement of spawning stocks, and the secondary goal is an allocation of fish to various user groups based upon management plans developed by the BOF. The BOF develops management plans in open, public meetings after considering public testimony and advice from various scientists, advisors, fishermen, and user interest groups (Woodby et al. 2005). Decisions to open and close fisheries are based on the professional judgment of area managers, the most current biological data from field projects, and fishery performance. Research biologists and other specialists conduct applied research in close cooperation with the fishery managers. The purpose of the division's research staff is to ensure that the management of Alaska's fisheries resources is conducted in accordance with the sustained yield principle and that managers have the technical support they need to ensure that fisheries are managed according to sound scientific principles and utilizing the best available biological data. The division works closely with the Division of Sport Fisheries in the conduct of both management and research activities (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management).

By far, most salmon in Alaska are caught in commercial troll, gillnet, and purse seine fisheries in which participation is restricted by a limited entry system. Troll gear works by dragging baited hooks through the water. Gillnet gear works by entangling the fish as they attempt to swim through the net. Gillnets are deployed in two ways: from a vessel that is drifting and from an anchored system out from the beach. Purse seines work by encircling schools of fish with nets that are drawn up to create giant "purses" that hold the school until the fish can be brought aboard. Other kinds of gear used in Alaska's smaller fisheries include fishwheels, which scoop fish up as the wheel is turned by river currents (Woodby et al. 2005).

Information on the status of Chinook salmon stocks in Alaska is included in Section 4.3. Almost all stock-specific information on spatial and temporal distribution of Chinook salmon within the U.S. 200-mile zone in the northern and Western GOA comes from recoveries of coded-wire tagged Chinook salmon by the U.S. North Pacific Groundfish Observer Program (http://www.refm.noaa.gov/observers/). Recoveries of coded-wire tagged Chinook salmon show that North American stocks originating south of the Alaska Peninsula (from Central Alaska to the Sacramento River, California) range northward into the eastern Bering Sea. Coded-wire tag recoveries also provided the first information on winter distribution of Yukon Territory Chinook salmon in the Bering Sea, showing their distribution along the shelf break (200-meter contour) from Unimak pass and northwestward into the Central Bering Sea. A recovery off the south Central Oregon coast of a coded-wire tagged immature Chinook salmon from the Kenai River, Alaska marks the southernmost recovery of an Alaska origin Chinook salmon on the U.S. Pacific Coast.[7] More information on the origin of GOA Chinook salmon is included in Section 4.3.3.

3.7.1 State commercial salmon fishery management

Commercial fishing is defined by the State of Alaska as the taking of fish with the intent of disposing of them for profit, or by sale, barter, trade, or in commercial channels (AS 16.05.940 (5)). Commercial fisheries in Alaska fall under a mix of state and federal management jurisdictions. In general, the state has management authority for all salmon, herring, and shellfish fisheries, and for groundfish fisheries within three nautical miles of shore. Under the Magnuson-Stevens Act, the federal government has management authority for the majority of groundfish fisheries three to two hundred nautical miles offshore.

The state manages a large number of commercial salmon fisheries in waters from Southeast Alaska to the Bering Strait. Management of the commercial salmon fisheries is the responsibility of the ADF&G Division of Commercial Fisheries, under the direction of the BOF. The fisheries are managed under a limited entry system; participants need to hold a limited entry permit for a fishery in order to fish and the number of permits for each fishery is limited. The state originally issued permits to persons with histories of participation in the various salmon fisheries. Permits can be bought and sold; thus, new persons have entered into the commercial fishery since the original limitation program was implemented by buying permits on the open market.

Alaska's commercial salmon fisheries are administered through the use of management areas throughout the state. For information on commercial regulations refer to:
www.adfg.alaska.gov/index.cfm?adfg=CommercialByFisherySalmon.main

The value of the commercial salmon harvest varies both with the size of the runs and with foreign currency exchange rates. Information on the annual commercial Chinook salmon harvest in Alaska is reported at http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/catchval/blusheet/09exvesl.php. Those reports extend back to 1994 and provide information by region as well as the State total. During 2010, preliminary data indicates that 365,000 Chinook salmon (5.2 million lbs) were harvested and generated an exvessel value of $17.9 million. Data reported for 2009 indicates that 359,000 Chinook salmon (5.1 million lbs) were harvested and generated an exvessel value of $14.1 million. Southeast Alaska was reported to account for 85% of the 2009 commercial exvessel value. The pounds of Chinook salmon harvested in the commercial fishery and the number of fish harvested has been lower since 2008 than any other years back to 1994. The exvessel value was greater than $20 million each year from 2004-2008. However, the 2009 and 2010 estimates were $14.1 million and $17.9 million, respectively. Table 13 provides data on the Chinook salmon exvessel value, pounds harvested, and the number of Chinook salmon harvested in the commercial fishery from 1994-2010.

[7] http://www.fish.washington.edu/research/highseas/known_range.html

Table 13 Alaska commercial Chinook salmon harvest and exvessel value, 1994-2010

Year	Exvessel Value (million $)	Pounds (million)	Fish (x1,000)
1994	16.1	11.6	640
1995	18.9	12.7	670
1996	13.4	9.4	500
1997	18.3	11.9	660
1998	11.9	10.2	580
1999	16.7	7.3	430
2000	10.0	6.0	360
2001	12.1	6.4	370
2002	12.9	9.6	584
2003	13.5	10.3	634
2004	24.9	12.9	816
2005	24.4	10.7	699
2006	30.7	10.1	645
2007	26.7	8.7	571
2008	25.6	5.6	376
2009	14.1	5.1	359
2010	17.9	5.2	365

Source: ADF&G Commercial Fisheries Division,
http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/catchval/blusheet/09exvesl.php

3.7.2 State management of personal use and sport salmon fisheries

The State of Alaska defines personal use fishing as the taking, fishing for, or possession of finfish, shellfish, or other fishery resources, by Alaska residents for personal use and not for sale or barter, with gill or dip net, seine, fish wheel, longline, or other means defined by the BOF (AS 16.05.940(25)). Personal use fisheries are different from subsistence fisheries because they either do not meet the criteria established by the Joint Board of Fisheries and Game (Joint Board) for identifying customary and traditional fisheries (5 AAC 99.010) or because they occur within nonsubsistence areas.

The Joint Board is required to identify 'nonsubsistence areas', where 'dependence upon subsistence is not a principal characteristic of the economy, culture, and way of life of the area or community' (AS 16.05.258(c)). The BOF may not authorize subsistence fisheries in nonsubsistence areas. Personal use fisheries provide opportunities for harvesting fish with gear other than rod and reel in nonsubsistence areas. The Joint Board has identified Ketchikan, Juneau, Anchorage-Matsu-Kenai, Fairbanks, and Valdez as nonsubsistence areas (5 AAC 99.015). Persons may participate in personal use or recreational harvests for subsistence purposes within nonsubsistence use areas, but subsistence use does not have a preference in those areas.

Generally, fish may be taken for personal use purposes only under authority of a permit issued by ADF&G. Personal use fishing is primarily managed by ADF&G, Division of Sport Fish, but some regional or area fisheries for various species of fish are managed by the Division of Commercial Fisheries. For more information on state management of personal use fisheries, refer to the ADF&G website: www.adfg.alaska.gov/index.cfm?adfg=fishingPersonalUse.main.

The ADF&G Division of Sport Fish also manages the state's recreational fisheries. Alaska statute defines sport fishing as the taking of or attempting to take for personal use, and not for sale or barter, any fresh water, marine, or anadromous fish by hook and line held in the hand, or by hook and line with the line attached to a pole or rod which is held in the hand or closely attended, or by other means defined by the BOF (AS 16.05.940(30)). By law, the division's mission is to protect and improve the state's recreational fisheries resources. For more information on state management of recreational fisheries, refer to the ADF&G website: www.adfg.alaska.gov/index.cfm?adfg=fishingSport.main.

Per Alaska statute (5 AAC 75.075(c)), the ADF&G, Division of Sport Fish is also responsible for overseeing the annual licensing of sport fish businesses and guides. A 'sport fishing guide' means a person who is licensed to provide sport fishing guide services to persons who are engaged in sport fishing

(AS 16.40.299). 'Sport fishing guide services' means assistance, for compensation or with the intent to receive compensation, to a sport fisherman to take or to attempt to take fish by accompanying or physically directing the sport fisherman in sport fishing activities during any part of a sport fishing trip. Salmon is one of the primary species targeted in the states' recreational fisheries. For further information, refer to the ADF&G website: www.adfg.alaska.gov/index.cfm?adfg=prolicenses.sportfishguides. This site contains information important to the State of Alaska, Department of Fish and Game requirements for sport fish charter businesses, sport fish guides, and saltwater charter vessels.

Chinook salmon are a prized sport fish in Alaska's recreational fisheries, and most anglers sport fishing for anadromous (sea-run) Chinook salmon (king) salmon must have purchased (and have in their possession) a current year's king salmon stamp. For further information, refer to the ADF&G website: http://www.sf.adfg.state.ak.us/Guides/index.cfm/FA/guides.home. This site contains information important to the State of Alaska, Department of Fish and Game requirements for sport fish charter businesses, sport fish guides, and saltwater charter vessels. Chinook salmon are often harvested by trolling with rigged herring in salt water or using lures or salmon eggs in freshwater. The annual Alaska sport fishing harvest of Chinook salmon from 1989 to 2006 averaged 170,000 fish. During that period, 60% of the sport fish harvest of Chinook salmon was taken in SouthCentral Alaska, 26% in Southeast Alaska, and 14% in other areas (ADF&G, 2010).

3.7.3 State subsistence management

ADF&G, under the direction of the Alaska BOF, manages subsistence, personal use, and commercial chum salmon harvests in waters within the State of Alaska out to the three mile limit. The State has 82 local fish and game advisory committees that review, make recommendations, submit proposals, and testify to the Alaska BOF concerning subsistence and other uses in their areas.

The state defines subsistence uses of wild resources as noncommercial, customary, and traditional uses for a variety of purposes. These include:

> Direct personal or family consumption as food, shelter, fuel, clothing, tools, or transportation, for the making and selling of handicraft articles out of nonedible byproducts of fish and wildlife resources taken for personal or family consumption, and for the customary trade, barter, or sharing for personal or family consumption (AS 16.05.940[33]).

Under Alaska's subsistence statute, the BOF must identify fish stocks that support subsistence fisheries and, if there is a harvestable surplus of these stocks, determine the amount of the harvestable surplus that is reasonably necessary for subsistence uses, and adopt regulations that provide reasonable opportunities for these subsistence uses to take place. The Alaska BOF is required by the state subsistence statute to provide reasonable opportunities for subsistence uses; "reasonable opportunity" is defined in statute to mean an opportunity that allows a subsistence user to participate in a subsistence fishery that provides a normally diligent participant with a reasonable expectation of success of taking of fish (AS 16.05.258(f)). The BOF evaluates whether reasonable opportunities are provided by existing or proposed regulations by reviewing harvest estimates relative to the "amount reasonably necessary for subsistence use" findings as well as subsistence fishing schedules, gear restrictions, and other management actions. Whenever it is necessary to restrict harvest, subsistence fisheries have a preference over other uses of the stock (AS 16.05.258). ADF&G, Division of Commercial Fisheries, manages subsistence fisheries in the area of potential effect. Subsistence and other uses may be restricted or closed to provide for sustainability based upon relevant adopted fishery management plans.

Alaska subsistence fishery regulations do not, in general, permit the sale of resources taken in a subsistence fishery. State law recognizes 'customary trade' as a legal subsistence use. Alaska statute defines customary trade as "…the limited noncommercial exchange, for minimal amounts of cash, as restricted by the appropriate board, of fish or game resources…" (AS 15.05.940(8)). This is applicable in certain regions of Alaska, including the customary trade in finfish (including salmon) within the Norton Sound-Port Clarence Area (5 AAC 01.188). Presently, the BOF has not received regulatory change proposals to allow customary trade in salmon resources under state subsistence regulations in other areas under consideration in this document.

ADF&G, Division of Commercial Fisheries, prepares annual fishery management reports for most fishery management areas in the state (Figure 1-1). Although fishery management reports focus primarily on commercial fisheries, most also routinely summarize basic data for programs that collect harvest information for subsistence fisheries. Detailed annual reports about subsistence fisheries harvest assessment programs are prepared for the Norton Sound/Kotzebue, Yukon River, and Kuskokwim areas; however, it is important to recognize the limitations associated with the effort to present a comprehensive annual report on Alaska's subsistence fisheries. Because of such limitations, harvest data may be a conservative estimate of the number of salmon being taken for subsistence uses in Alaska. These limitations include:

- Annual harvest assessment programs do not take place for all subsistence fisheries although programs are in place for most salmon fisheries such as the Yukon and Kuskokwim river drainages through post-season household surveys and for Bristol Bay Area through subsistence salmon permits. There is no longer an annual subsistence harvest monitoring program for the Kotzebue Fisheries Management Area. Similarly, since 2004 annual harvest monitoring in the Norton Sound-Port Clarence Area has been limited to post-season household surveys in Shaktoolik and Unalakleet and through catch and gear information obtained from subsistence fishing permits in other parts of Norton Sound-Port Clarence Area.
- Annual subsistence harvest data are largely dominated by fish harvested under efficient gear types authorized by regulation, which, especially for salmon, generally means fish taken with gillnets, beach seines, or fish wheels. However, in portions of the Kotzebue Fisheries Management Area (5 AAC 01.120(b) &(f)), Norton Sound-Port Clarence Area (5 AAC 01.170(b) & (h)), and Yukon-Northern Area (5 AAC 01.220(a) & (k)), as well as the entire Kuskokwim Fisheries Management Area (5 AAC 01.270(a)), hook and line attached to a rod or pole (i.e. rod and reel) are recognized as legal subsistence gear under state subsistence fishing regulations. In these areas significant numbers of households take salmon for subsistence uses with rod and reel or retain salmon from commercial harvests for home use. Where the BOF has recognized rod and reel gear as legal subsistence gear, annual harvest assessment programs or subsistence fishing permits also document salmon harvested with rod and reel. Federal subsistence management represents different subsistence gear regulations in some cases. For example, in Kotzebue Sound federally qualified users are authorized under federal subsistence regulations to harvest salmon by gillnet, beach seine, or rod and reel, but these harvests are not documented through either a state or federal harvest monitoring program and the numbers of salmon (largely chum salmon) harvested by gillnet or beach seine compared to rod and reel is unknown.
- Annual harvest assessment programs are generally limited to post-season household surveys in communities located within the fisheries management area or through subsistence permits such that harvests by other Alaskans in the Kotzebue Area, Kuskokwim river drainage or areas where permits are not required along the Yukon River drainage, for example, are not reflected in the annual harvest assessment programs.
- Between management areas, and sometimes between districts within management areas, there is inconsistency in how subsistence harvest data are collected, analyzed, and reported.

- In some areas there are no routine mechanisms for evaluating the quality of subsistence harvest data. For example, in some areas it is not known if all subsistence fishermen are obtaining permits and providing accurate harvest reports. This can result in an underestimation of harvests.
- There are few programs for contextualizing annual subsistence harvest data so as to interpret changes in harvests. However, in some cases, FMRs do contain discussions of data limitations and harvest trends.

For more information on state management of salmon subsistence fisheries, refer to the ADF&G website at www.adfg.alaska.gov/index.cfm?adfg=fishingSubsistence.main and the Alaska Subsistence Salmon Fisheries 2007 Annual Report at www.subsistence.adfg.state.ak.us/techpap/TP346.pdf.

The amount of Chinook salmon harvested for subsistence use and the portion of subsistence Chinook salmon harvested relative to other species of salmon varies greatly by region. Information on State management of the salmon subsistence fisheries, is provided in the Alaska Subsistence Salmon Fisheries 2007 Annual Report, available on the State of Alaska website[8]. This is the most recent report available to the public, published in September 2009 (ADF&G 2009). This report indicates that 157,813 Chinook salmon were estimated to be taken in the subsistence fishery in 2007. The breakdown of catch by general harvest area indicates that the largest estimated subsistence harvests of Chinook salmon occurred in the Kuskokwim area (72,097 salmon; 45 percent), followed by the Yukon (55,292 salmon; 35 percent), Bristol Bay (15,444 salmon; 10 percent), Northwest (3,829 salmon; 2 percent), the Glennallen Subdistrict of the Prince William Sound Area (4,125 salmon; 3 percent), and the Chitina Subdistrict of the Prince William Sound Area (2,811 salmon; 2 percent). See Figure 1-1 of the Alaska Subsistence Salmon Fisheries 2006 Annual Report (p. 5) for a map of the Alaska subsistence areas.

The estimated total subsistence harvest of all salmon in Alaska in 2007, based on annual harvest assessment programs, was 1,066,608 fish.[9] The largest estimated subsistence harvests of all salmon species in 2007 occurred in the Yukon area (271,618 salmon; 28 percent), followed by Kuskokwim (187,502 salmon; 19 percent), the Chitina Subdistrict of the Prince William Sound Area (135,133 salmon; 13 percent), Bristol Bay (124,679 salmon; 12 percent), the Glennallen Subdistrict of the Prince William Sound Area (91,110 salmon; 9 percent), and the Northwest (74,312 salmon; 7 percent).

The estimated statewide subsistence harvest by species was as follows in 2007: 459,372 sockeye (46 percent), 273,951 chum (27 percent), 157,813 Chinook salmon (16 percent), 80,685 coho (8 percent), and 34,787 pink salmon (4 percent). Table 2-2 (pp. 10 15) of the Alaska Subsistence Salmon Fisheries 2007 Annual Report shows subsistence harvests in 2007 by species and place of residence of participants, including total harvests from all subsistence fisheries combined. Chinook salmon are the first salmon to arrive in the spring, which is fundamental to their importance for subsistence.

3.7.4 Federal subsistence management

The Alaska National Interest Lands Conservation Act (ANILCA), passed by Congress in 1980, mandates that rural residents of Alaska be given a priority opportunity for customary and traditional subsistence use, among consumptive uses of fish and wildlife, on federal lands. In 1986, Alaska amended its subsistence law mandating a rural subsistence priority to bring it into compliance with ANILCA. However, in 1989, in the McDowell decision, the Alaska Supreme Court ruled that the priority in the

[8] http://www.subsistence.adfg.state.ak.us/TechPap/TP344.pdf
[9] Note that personal use salmon harvests from Southeast Alaska, the Yukon Area, and the Chitina Subdistrict of the Upper Copper River are included in this statistic. Personal use fisheries that take place in nonsubsistence area of the Cook Inlet Management Area are not included. For background, see Chapter 1 of the Alaska Subsistence Salmon Fisheries 2006 Annual Report.

state's subsistence law could not be exclusively based on location of residence under provisions of the Alaska Constitution. Other federal court cases regarding the state's administration of Title VIII of ANILCA ruled that the state would not be given deference in interpreting federal statute. Proposed amendments to ANILCA and the constitution were not adopted to rectify these conflicts, so the Secretaries of Interior and Agriculture implemented a duplicate regulatory program to assure the rural subsistence priority is applied under ANILCA on federal lands. As a result, beginning in 1990, the state and federal governments both provide subsistence uses on federal public lands and waters in Alaska, which is about 230 million acres or 60% of the land within the state. In 1992, the secretaries of the Interior and Agriculture established the Federal Subsistence Board and ten Regional Advisory Councils to administer the responsibility. The Board's composition includes a chair appointed by the Secretary of the Interior with concurrence of the Secretary of Agriculture; the Alaska Regional Director, U.S. Fish and Wildlife Service; the Alaska Regional Director, National Park Service; the Alaska State Director, Bureau of Land Management; the Alaska Regional Director, Bureau of Indian Affairs; and the Alaska Regional Forester, USDA Forest Service. See the figure below for the subsistence fisheries areas in Alaska.

Through the Federal Subsistence Board, these agencies participate in development of regulations which establish the program structure, determine which Alaska residents are eligible to take specific species for subsistence uses, and establish seasons, harvest limits, and methods and means for subsistence take of species in specific federal areas. The Regional Advisory Councils provide recommendations and information to the Federal Subsistence Board; review proposed regulations, policies, and management plans; and provide a public forum for subsistence issues. Each Regional Advisory Council consists of residents representing subsistence, sport, and commercial fishing and hunting interests.

3.7.5 Pacific Salmon Treaty

Overview information on the Pacific Salmon Treaty can be found at:
http://www.psc.org/about_treaty.htm.

Interception of Pacific salmon bound for rivers of one country in fisheries of the other has been the subject of discussion between the Governments of Canada and the United States for over a century. Intercepting fisheries were identified through research conducted by the two countries on species and stocks originating from Alaska, British Columbia, Washington, and Oregon. Management of stocks subject to interception became a matter of common concern to both Canada and the United States. A mechanism to enable the countries to reap the benefits of their respective management and enhancement efforts was required and that mechanism is currently provided through the Pacific Salmon Treaty, ratified by the U.S. and Canada in 1985.

The Pacific Salmon Treaty is built upon two basic principles:

- Prevent overfishing and provide for optimum production both countries agree to respond to conservation concerns related to the interception of stocks of mutual concern.
- Equity each country should receive benefits equivalent to the production of salmon originating in its waters.

The twin principles of conservation and equity are to be implemented, taking into account:

- The desirability in most cases of reducing interceptions;
- The desirability in most cases of avoiding undue disruption of existing fisheries; and
- Annual variations in abundance.

The arrangements and institutions established in 1985 were effective in the early years of the Treaty but became outmoded after 1992 when the original fishing arrangements expired. From 1992 to 1998, Canada and the United States were not able to reach agreement on comprehensive, coast-wide fisheries arrangements. In 1999, government-to-government negotiations culminated in the successful renewal of long-term fishing arrangements under the Pacific Salmon Treaty.

Some of the key elements introduced with the 1999 Agreement include the creation of the Transboundary Panel and the Committee on Scientific Cooperation; the inclusion of habitat provisions in the Treaty; a move from fisheries based on negotiated catch ceilings to abundance-based management fisheries; and the establishment of the Northern and Southern Restoration and Enhancement funds (“Northern Fund” and “Southern Fund”).

In May 2008, the Pacific Salmon Commission recommended a new bilateral agreement for the conservation and harvest sharing of Pacific salmon to the Governments of Canada and the United States. The product of nearly 18 months of negotiations, the agreement represents a major step forward in science-based conservation and sustainable harvest sharing of the salmon resource between Canada and the United States of America. Approved in December 2008 by the respective governments, the new fishing regimes are in force from the beginning of 2009 through the end of 2018.
The new fishing regimes are contained in the following Chapters of Annex IV of the Treaty:

- Chapter 1. Transboundary Rivers
- Chapter 2. Northern British Columbia and Southeast Alaska Boundary Area
- Chapter 3. Chinook salmon
- Chapter 5. Coho Salmon
- Chapter 6. Southern British Columbia and Washington State Chum Salmon

The agreement replaces previous versions of the Chapters. Refer to Appendix 5to read the updated fishing regime for Chinook salmon as it appears in Chapter 3 (Annex IV) of the Treaty.

3.7.6 Summary of 2010 Alaska Chinook salmon stock status

Following the below average 2007–2009 Chinook salmon runs in Western Alaska, management of the 2010 fisheries was conservative. All of the Chinook salmon runs to Western Alaska started late and most were four to six days late in run timing. The late run combined with inclement weather in early June resulted in a delayed start to most fisheries. No directed Chinook salmon commercial fisheries occurred in the Yukon River, Kuskokwim River, or in Norton Sound in 2010, and only small commercial fisheries occurred in the Nushagak and Kuskokwim Bay (Table 14). Sport fisheries were restricted or closed in the Nushagak River, Yukon (Chena River), Kuskokwim (Kwethluk and Tuluksak rivers), and Unalakleet and Shaktoolik rivers of Norton Sound Area. More significantly, subsistence fisheries in the Nushagak River, two tributaries of the Kuskokwim River (Kwethluk and Tuluksak rivers; USFWS federal closure), and Norton Sound (Unalakleet and Shaktoolik rivers) were restricted or closed. In spite of conservative management strategies, which in some cases were at great cost to the people who rely on these resources for food and income, few escapement goals were achieved in Western Alaska.

Kodiak Island Chinook salmon escapement was well below the previous 10-year average. Returns to the Karluk River did not meet the lower escapement goal despite closures to the subsistence, sport, and commercial fisheries. Escapement through the Ayakulik weir was within the established escapement goal range. The 2010 escapement to the Chignik River was above the escapement goal range and the 5-year average, but below the 10-year average. The Deshka River is the only system in northern Cook Inlet where Chinook salmon escapement is monitored inseason with a weir. 2010 escapement on the Deshka River was within the escapement goal range. Both the early and late run Kenai River escapement goals were achieved.

Table 14 Overview of Alaskan Chinook salmon stock performance, 2010.

Chinook salmon stock	Total run size?	Escapement goals met?[a]	Subsistence fishery?	Commercial fishery?	Sport fishery?	Stock of concern?
Bristol Bay	Poor	0 of 1[b] (4 not surveyed)	Restricted on Nushagak	Limited in Nushagak District	Restricted and closed on Nushagak	No
Kuskokwim	Poor	3 of 7 (7 not surveyed)	Yes, 2 Tributaries closed	None on Kuskokwim River, Limited in Bay	2 Tributaries closed	No
Yukon	Poor	3 of 7	Yes	No directed, some incidental take with chum	1 Tributary closed	Yield
Norton Sound	Poor	1 of 3 (2 not surveyed)	Yes, with restrictions	No	No	Yield
Alaska Peninsula	Below average	1 of 1	Yes	Yes	Yes	No
Kodiak	Below average	1 of 2	Karluk closed	Restricted in Karluk and Ayakulik areas	Karluk closed	Management (Karluk)
Chignik	Average	1 of 1	Yes	Yes	Yes	No
Upper Cook Inlet	Below average	4 of 19 [c]	Yes	Restricted in Northern District	Various restrictions	6 stocks of conern
Lower Cook Inlet	Below average	2 of 3	Yes	Yes, incidental to other fisheries	Yes	No
Prince William Sound	Below average	0 of 1	Yes	Yes	Yes	No
Southeast	Average	9 of 11	Yes	Yes	Yes	No

[a] Some aerial survey-based escapement goals were not assessed due to inclement weather or poor survey conditions, therefore we do not know if the escapement goals were met for these systems.
[b] The Chinook salmon escapement goal was not met on the Nushagak River in 2010.
[c] 2 of the 21 escapement goals were not assessed in 2010.

3.8 Description of the Alternatives

The analysis of the alternatives defined by the Council is provided in this section. Three subsections are included. The first provides an analysis of the status quo alternative. This alternative would maintain the current management structure that includes no Chinook salmon bycatch caps in the GOA. It would also maintain the current observer requirements that include no coverage for vessels less than 60' LOA and 30% coverage for vessels 60' LOA to 125' LOA, until the observer restructuring amendment is implemented if approved by the U.S. Secretary of Commerce[10]. Alternative 2 would implement Chinook salmon bycatch caps in the Central and Western GOA pollock trawl fisheries. As proposed, a cap would be set for each area and would close the pollock trawl fishery in that area when the cap is reached. A suboption would allow the cap to be exceeded by up to 25% every third year. There are three overall PSC limits and 18 options to divide the PSC limit between the Central and Western Gulf being considered by the Council. Alternative 2 would also amend the observer coverage requirements for vessels less than 60' in the Central and Western GOA trawl pollock fishery. Those vessels would be required to carry an observer on 30% of their Central and Western GOA pollock trips, as defined by the current 30% coverage requirements for the 60-125' LOA vessels in those areas. Finally, Alternative 3 addresses the proposed mandatory cooperative structure.

3.8.1 Alternative 1: Status quo

Alternative 1 is the no-action alternative (status quo). This alternative is the baseline alternative against which the costs and benefits of each action alternative are compared. This alternative would leave the

[10] This amendment could be in place within a year of these proposed amendments. However, the exact data will depend on when the package is approved by the SOC and the time to write and implement the regulatory package.

existing Central and Western GOA pollock trawl fishery regulations in place. These include the quarterly apportionment of the pollock TAC that are only limited by TAC and seasonal closures. Participation in the Gulf pollock fisheries is constrained to those vessels that are assigned a valid Groundfish License Limitation Program permit to fish with trawl gear in that area.

3.8.2 Alternative 2: Chinook salmon PSC limit and increased monitoring

Component 1:

Component 1 under Alterative 2 defines the proposed Chinook salmon PSC limits that are being considered, the proposed 25% PSC limit buffer that could be used once every three years, and direction on how to treat midyear implementation of the program if it is necessary.

<u>Proposed Chinook Salmon PSC Limits</u>

If implemented, Alternative 2 would establish a Chinook salmon bycatch limit for the Central and Western GOA trawl fisheries. The Chinook salmon bycatch limit that are being considered are 15,000 Chinook, 22,500 Chinook, or 30,000 Chinook. The selected limit would be divided among the Central and Western Gulf pollock trawl fisheries based on one of three methodologies defined by the Council. Option a defines the first methodology. It would divide the overall Chinook salmon bycatch limit based on the average of historic annual pollock TACs that were established for the two areas.

The formula to calculate the Option a Chinook salmon PSC limit for an area is provided below:

$$A_i\ Cap = \frac{\sum A_i\ TAC}{\sum A_i\ TAC + \sum A_j\ TAC} * Total\ Chinook\ Cap$$

In the formula, A_i represents one of the areas (Central or Western Gulf). A_iCap is the Chinook salmon bycatch limit for Area i. Total Chinook salmon Cap is the combined Central and Western GOA Chinook salmon limit the Council is considering for those trawl pollock fisheries. Finally, A_iTAC is the pollock TAC that was set for Area i and A_jTAC is the pollock TAC for area j. The years that would be summed are either 2006-2010 or 2001-2010, depending on the alternative selected.

Option b is calculated using the estimated historic annual Chinook salmon bycatch, in numbers of fish, instead of the historic TACs. Under this option the area with the greatest number of salmon caught during the years considered, would be given more of the Chinook salmon PSC limit.

$$A_i\ Cap = \frac{\sum A_i\ Chinook\ bycatch}{\sum A_i\ Chinook\ bycatch + \sum A_j\ Chinook\ bycatch} * Total\ Chinook\ Cap$$

Option c combines the outcomes of Option a and Option b by using percentages of those outcomes before they are multiplied by the Total Chinook salmon Cap. Those percentages defined by Option a and Option b are then multiplied by the Option c suboption percentages defined by the Council. Three suboptions were considered. The first suboption would use 25% of the Option a result and 75% of the Option b result; the second suboption would use 50% of the results from both Option a and Option b; the third suboption would use 75% of the Option a result and 25% of the Option b result. Option c would use the same years of data for both the Option a and Option b results. The formula used to calculate Option c is shown below:

$$A_i\ Cap = \left(\frac{\sum A_i\ TAC}{\sum A_i\ TAC + \sum A_j\ TAC} * 50\%a + \frac{\sum A_i\ chinook\ bycatch}{\sum A_i\ chinook\ bycatch + \sum A_j\ chinook\ bycatch} * 50\%b\right) * Total\ Chinook\ Cap$$

Where SO%a is the percent of the suboption a outcome that was defined by the Council and SO%b is the percent of the suboption b outcome set by the Council.

Table 15 reports the calculated percentage of the total Chinook salmon cap and the number of Chinook salmon that would be allocated to the Central Gulf and Western Gulf pollock fishery, by alternative considered by the Council. Using Option c(i) as an example to show how Option c is calculated, based on the 2006-2010 time period. The formula for the Central Gulf calculation when the total Chinook salmon PSC limit is 15,000 fish is shown below:

Option c: Suboption c(i) = {(0.63 * 0.25)+(0.61*.0.75)} * 15,000

The result of the calculation is 9,191 Chinook salmon being allocated to the Central Gulf pollock fishery. Applying the same formula to the Western Gulf yields a result of 5,809 Chinook salmon being allocated to that pollock fishery. Summing the two results yields a total of 15,000 Chinook, or the total number of Chinook salmon that was set as the overall Chinook salmon PSC limit.

The last four lines of Table 15 shows the maximum, minimum, mean, and median allocations to each area that are being considered. In the Central Gulf, the maximum allocation of Chinook salmon is 77% of the total Chinook salmon PSC limit. Option b over the 2001-2010 time-period, with 2007 and 2010 data deleted, gives the Central Gulf its maximum allocation. This option also results in the minimum Chinook salmon allotment to the Western Gulf (33%). The minimum allocation to the Central Gulf is 61% of the total Chinook salmon PSC limit. Option b using data from the years 2006-2010 yields the minimum allocation to the Central Gulf. The allotment of Chinook salmon to the Western Gulf is 39% under this option. Therefore, up to 14% of the total Chinook salmon allotment can be moved from one area to the other, depending on the option the Council selects. The mean and median allocation amounts are provided to show the reader how the maximum and minimum allocations compare to the average and mid-range calculations.

Table 15 Proposed Chinook salmon caps by alternative

		Central Gulf (620 & 630)				Western Gulf (610)			
Alternatives	Years	%	15,000	22,500	30,000	%	15,000	22,500	30,000
Option a (based on	2006-2010	63%	9,401	14,101	18,802	37%	5,599	8,399	11,198
pollock TAC)	2001-2010	63%	9,477	14,215	18,953	37%	5,523	8,285	11,047
Option b (based on	2006-2010	61%	9,122	13,682	18,243	39%	5,878	8,818	11,757
Chinook bycatch)	2001-2010	67%	10,068	15,102	20,136	33%	4,932	7,398	9,864
Suboption: exclude	2006 & 2008 & 2009	75%	11,246	16,870	22,493	25%	3,754	5,630	7,507
2007 and 2010 data)	2001-2006, 2008-2009	77%	11,612	17,418	23,224	23%	3,388	5,082	6,776
Option c(i)	2006-2010	61%	9,191	13,787	18,383	39%	5,809	8,713	11,617
Using 25% from	2006 & 2008 & 2009	72%	10,785	16,177	21,570	28%	4,215	6,323	8,430
Option a and 75%	2001-2010	66%	9,920	14,880	19,840	34%	5,080	7,620	10,160
from Option b	2001-2006, 2008-2009	74%	11,078	16,617	22,156	26%	3,922	5,883	7,844
Option c(ii)	2006-2010	62%	9,261	13,892	18,522	38%	5,739	8,608	11,478
Using 50% from	2006 & 2008 & 2009	69%	10,324	15,485	20,647	31%	4,676	7,015	9,353
Option a and 50%	2001-2010	65%	9,772	14,658	19,544	35%	5,228	7,842	10,456
from Option b	2001-2006, 2008-2009	70%	10,544	15,816	21,089	30%	4,456	6,684	8,911
Option c(iii)	2006-2010	62%	9,331	13,997	18,662	38%	5,669	8,503	11,338
Using 75% from	2006 & 2008 & 2009	66%	9,862	14,793	19,724	34%	5,138	7,707	10,276
Option a and 25%	2001-2010	64%	9,624	14,437	19,249	36%	5,376	8,063	10,751
from Option b	2001-2006, 2008-2009	67%	10,010	15,016	20,021	33%	4,990	7,484	9,979
Maximum Allocation		77%	11,612	17,418	23,224	39%	5,878	8,818	11,757
Minimum Allocation		61%	9,122	13,682	18,243	23%	3,388	5,082	6,776
Mean Allocation		67%	10,035	15,052	20,070	33%	4,965	7,448	9,930
Median Allocation		66%	9,891	14,837	19,782	34%	5,109	7,663	10,218

Source: NOAA Catch Accounting Data

Reordering the options by rank (in terms of the Chinook salmon PSC limit) shows which options generate the largest and smallest PSC limits for each area. Because the overall Chinook salmon limit is set for the combined areas, the option that generates the smallest PSC limit in the Central Gulf generates the largest PSC limit in the Western Gulf, and vice-versa. Table 16 indicates that Option b (2006-2010) yields the smallest PSC limit for the Central Gulf and the largest PSC limit for the Western Gulf. The five smallest PSC allotments for the Central Gulf are based on 2006-2010 data, and they include all of the calculation methods defined by the Council (Option a, Option b, Option c(i), Option c(ii), and Option c(iii)). Option b excluding the data from 2007 and 2010 generate the largest PSC allotments for the Central Gulf. In general, excluding 2007 and 2010 data or using the longer time series of data benefits the Central Gulf over the Western Gulf. The Western Gulf pollock fishery receives a larger PSC limit using the shorter time period and including all the years.

Table 16 Options considered by the Council ranked by their resulting Chinook salmon PSC limit.

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

Source: NOAA Catch Accounting Data

25% Overage Provision

The Council included an option that would allow a Chinook salmon PSC limit to be exceeded by up to 25% in one of three consecutive years. This provision is applied by area. For example, if vessels in the Central exceed their limit in 2014 they would not be allowed to exceed their PSC limit again until 2017. Vessels operating in the Western Gulf would still be allowed to exceed their PSC during 2015 or 2016 if they did not exceed their PSC limit during 2014. 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 salmon 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. Table 17 shows the maximum number of Chinook salmon that could be caught under each alternative, by area in the Gulf pollock fisheries, if vessels may take advantage of the proposed 25% overage provision during a year.

Table 17 Maximum Chinook salmon bycatch that would be allowed utilizing the 25% overage provision

		Central Gulf (620 & 630)				Western Gulf (610)			
Alternatives	Years	%	18,750	28,125	37,500	%	18,750	28,125	37,500
Option a (based on	2006-2010	78%	11,751	17,627	23,502	47%	6,999	10,498	13,998
pollock TAC)	2001-2010	79%	11,846	17,769	23,691	46%	6,904	10,356	13,809
Option b (based on	2006-2010	76%	11,402	17,103	22,804	49%	7,348	11,022	14,696
Chinook bycatch)	2001-2010	84%	12,585	18,877	25,169	41%	6,165	9,248	12,331
Suboption: exclude	2006 & 2008 & 2009	94%	14,058	21,087	28,116	31%	4,692	7,038	9,384
2007 and 2010 data)	2001-2006, 2008-2009	97%	14,515	21,772	29,030	28%	4,235	6,353	8,470
Option c(i)	2006-2010	77%	11,489	17,234	22,979	48%	7,261	10,891	14,521
Using 25% from	2006 & 2008 & 2009	90%	13,481	20,222	26,962	35%	5,269	7,903	10,538
Option a and 75%	2001-2010	83%	12,400	18,600	24,800	42%	6,350	9,525	12,700
from Option b	2001-2006, 2008-2009	92%	13,848	20,771	27,695	33%	4,902	7,354	9,805
Option c(ii)	2006-2010	77%	11,577	17,365	23,153	48%	7,173	10,760	14,347
Using 50% from	2006 & 2008 & 2009	86%	12,905	19,357	25,809	39%	5,845	8,768	11,691
Option a and 50%	2001-2010	81%	12,215	18,323	24,430	44%	6,535	9,802	13,070
from Option b	2001-2006, 2008-2009	88%	13,180	19,770	26,361	37%	5,570	8,355	11,139
Option c(iii)	2006-2010	78%	11,664	17,496	23,328	47%	7,086	10,629	14,172
Using 75% from	2006 & 2008 & 2009	82%	12,328	18,492	24,656	43%	6,422	9,633	12,844
Option a and 25%	2001-2010	80%	12,030	18,046	24,061	45%	6,720	10,079	13,439
from Option b	2001-2006, 2008-2009	83%	12,513	18,770	25,026	42%	6,237	9,355	12,474
Maximum Allocation		97%	14,515	21,772	29,030	49%	7,348	11,022	14,696
Minimum Allocation		76%	11,402	17,103	22,804	28%	4,235	6,353	8,470
Mean Allocation		84%	12,544	18,816	25,087	41%	6,206	9,309	12,413
Median Allocation		82%	12,364	18,546	24,728	43%	6,386	9,579	12,772

Source: NOAA Catch Accounting data

Mid-year Implementation

The Council has requested that if the proposed PSC limits 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. It is assumed that the program would be implemented between one of the four pollock seasons that have been established for the Gulf. Therefore this analysis will consider the number of salmon that were added to the Chinook salmon 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 salmon for the “C” and “D” seasons would be available to the harvesting fleet during that year.

Table 18 shows the percentage of the total allocation that was generated by each season. To calculated the seasons, it was assumed that all catches with a week ending date before March 10^{th} is “A” season catch; all remaining catch with a week ending date before August 25^{th} is “B” season catch; all remaining catch with a week ending data before October 1^{st} is “C” season catch; and all other catch with a week ending date on October 1^{st} or later in the year is “D” season catch. The information in this section is provided as percentages to minimize the number of tables needed. However, the tables are provided in Appendix 2 that shows the actual numbers of Chinook salmon that would be allocated to participants by season the program was implemented for every overall PSC limit and option considered by the Council.

Table 18 Percentage of Chinook salmon 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 on	2006-2010	24%	40%	14%	22%	17%	24%	26%	32%
pollock TAC)	2001-2010	24%	41%	17%	19%	21%	17%	29%	34%
Option b (based on	2006-2010	14%	56%	13%	17%	10%	6%	7%	77%
Chinook bycatch)	2001-2010	26%	40%	11%	22%	11%	7%	8%	74%
Suboption: exclude	2006 & 2008 & 2009	23%	37%	21%	19%	31%	19%	11%	39%
2007 and 2010 data)	2001-2006, 2008-2009	37%	24%	13%	26%	20%	13%	11%	56%
Option c(i)	2006-2010	17%	52%	13%	19%	12%	11%	11%	66%
Using 25% from	2006 & 2008 & 2009	23%	37%	19%	20%	28%	20%	15%	37%
Option a and 75%	2001-2010	26%	40%	13%	21%	13%	9%	13%	64%
from Option b	2001-2006, 2008-2009	33%	29%	14%	24%	20%	14%	15%	51%
Option c(ii)	2006-2010	19%	48%	14%	20%	14%	15%	16%	55%
Using 50% from	2006 & 2008 & 2009	23%	38%	18%	21%	24%	21%	19%	36%
Option a and 50%	2001-2010	25%	41%	14%	21%	16%	12%	18%	54%
from Option b	2001-2006, 2008-2009	30%	33%	15%	22%	20%	15%	20%	45%
Option c(iii)	2006-2010	21%	44%	14%	21%	16%	20%	21%	43%
Using 75% from	2006 & 2008 & 2009	23%	39%	16%	22%	21%	23%	22%	34%
Option a and 25%	2001-2010	24%	41%	15%	20%	18%	14%	23%	44%
from Option b	2001-2006, 2008-2009	27%	37%	16%	21%	20%	16%	24%	39%
Maximum Allocation		37%	56%	21%	26%	31%	24%	29%	77%
Minimum Allocation		14%	24%	11%	17%	10%	6%	7%	32%
Mean Allocation		24%	40%	15%	21%	19%	15%	17%	49%
Median Allocation		24%	40%	14%	21%	19%	15%	17%	44%

Source: NOAA Catch Accounting Data

Component 2

Component 2 under Alternative 2 defines the modifications to the observer program that are bring considered to better monitor the Chinook salmon bycatch in the Central and Western Gulf pollock fisheries. The Council proposes modifying observer program regulations to mandate 30% coverage on vessels < 60’. The 30% coverage requirement would be structured like the current 30% coverage requirement on trawl vessels from 60’ 125’ LOA in the Gulf fisheries.

3.8.3 Alternative 3: Mandatory Chinook salmon bycatch cooperatives

Alternative 3 would create a requirement that any vessel participating in the Central GOA (areas 620 and 630) or Western GOA (area 610) pollock fisheries join a limited purpose Chinook salmon bycatch control cooperative. The measures that a cooperative could include in its cooperative agreement would be limited to specific measures intended to address Chinook salmon bycatch, including required salmon retention to allow for biological sampling, bycatch reporting to identify Chinook salmon hotspots, information sharing and limits on fishing in Chinook salmon hotspots, promotion of gear innovations, vessel performance standards to create individual incentives for bycatch control, and monitoring to ensure compliance with the cooperative agreement. Cooperatives would not be permitted to adopt measures other than those specifically authorized and would not be permitted to develop allocations of either pollock or the Chinook salmon PSC cap. Cooperatives would also be required provide an annual report to the Council that would include the cooperative agreement, as well as a description of the various measures adopted by the cooperative and their performance and Chinook salmon bycatch seasonally in the fishery.

Cooperative formation would require a minimum percentage of the licenses that participated in the fishery in the preceding year either more than 25 percent or more that 33 percent of those licenses depending on the option selected. This provision would allow for the formation of up to two or three cooperatives in each management area. Cooperatives would be required to accept any person eligible for the cooperative as a member subject to the same terms and conditions that apply to other cooperative members, without any disadvantage for not having a history in the fishery. In the event more than one cooperative forms in a management area, the cooperatives would be required to enter an intercooperative agreement to ensure that no cooperative is disadvantaged in the fishery as a result of its efforts to avoid Chinook salmon. The intercooperative would also be required to a report to the Council describing the measures included in the agreement and their effects.

NMFS has raised concerns with the administration of the mandatory cooperative alternative. Specifically, the administration of cooperatives (including approval of annual cooperative contracts and any penalties for violation of the cooperative agreement) must be implemented in a manner that maintains NMFS' management authority over the fishery. Whether cooperatives would be able to serve their intended purpose, while maintaining a level of oversight that maintains that authority, is uncertain.[11] For example, the imposition of certain cooperative penalties would require notice, and an opportunity for a hearing, consistent with applicable Magnuson-Stevens Act and Administrative Procedures Act requirements. These administrative reviews typically take several weeks (or even months). A reasonable cooperative penalty might be to require a vessel to temporarily suspend fishing due for failure to abide by a hotspot limitation or some other agreed constraint on fishing effort. Measures of this type are likely subject to notice and hearing requirements. Pending completion of such a hearing, penalties are typically suspended. Such a hearing requirement could make any standdown ineffective. **An additional concern arises from a mandatory reporting of catch data within cooperatives. Any such reporting requirement would need to comport with data confidentiality constraints.** Whether confidentiality requirements could be satisfied requires additional consideration. These concerns are discussed more completely at the conclusion of the analysis of Alternative 3, in Section 3.11.3. In addition, some possible alternatives to this mandatory cooperative structure are discussed.

3.9 Analysis of Impacts: Alternative 1, Status Quo

Selecting the status quo alternative would maintain the current regulations for the Central Gulf and Western GOA pollock trawl fisheries. The number of Chinook salmon taken as bycatch in the pollock trawl fisheries would not close those fisheries. Pollock fishing would only be closed because the TAC has been harvested (or NMFS projecting it will be harvested) or the fishery being closed by season date regulations.

During the 2006-2008 fishing years (see Appendix 1), the Central Gulf and Western Gulf pollock "D" season fisheries typically were closed by regulation. After 2008, the "D" season fisheries have been closed as a result of the TAC being taken. Therefore, in recent years the Gulf pollock fisheries were assumed to have harvested the available pollock at the time the fisheries were closed for the year to directed fishing.

Chinook salmon bycatch is estimated using observer data that is available from the 30% coverage fleet (vessels between 60' and 125' LOA) and the 100% coverage fleet (≥ 125' LOA), if they participate in the fishery. From 2003-2010 only one vessel in the 100% coverage category has participated in these fisheries and they only participated one week during 2008 (Section 3.6.4). Because of the limited participation, very little observer data on Chinook salmon bycatch was derived from this 100% coverage vessel. Therefore, the Chinook salmon bycatch data comes primarily from the 30% coverage fleet. The operators of these vessels often do not know the extent of their Chinook salmon bycatch until the catch is offloaded. When catch is sorted at the processing plant the Chinook salmon are recorded. Therefore, skippers may not know their Chinook salmon bycatch totals until they are fishing their next trip.

While some information on the number of Chinook landed is recorded on fish tickets, that information has not been reported in this document. Chinook salmon bycatch may be entered on the fish ticket as either a total count or total weight (in pounds) of fish, or both. Since NMFS' management, and the proposed PSC limit, is based on a count of Chinook salmon, converting entries that list bycatch in pounds

[11] In a voluntary cooperative structure (where a vessel has a reasonable fishing opportunity outside of a cooperative) management authority would be maintained, as membership is not a prerequisite to participating in the fishery.

to a comparable number of salmon would involve relying on the averaged observer sample measures of weight. As described further in Section 4.3.2.1, there appears to be some variation in average weight, by season and year, however the number of observer samples is not high. Additionally, since mid-year 2006 (implementation of the e-Landings program), a disposition code was added to the entries related to Chinook salmon bycatch. There are three disposition codes used for the bycatch of Chinook salmon: discards at sea, discards onshore, and donated fish. The fish ticket data shows that, while uncommon, there have been discards at sea of Chinook salmon reported in both the Western and Central GOA since 2006.

Typically (although not exclusively), entries associated with the discards at sea disposition code are reported as a count, while discards onshore and donated fish entries may use both pounds and count. These disposition codes were not used prior to mid-year 2006. Fish tickets without a disposition code may report Chinook bycatch as number of fish or weight, but the data is not reported on all fish tickets. The fish tickets associated with the 2003-2009 pollock target fishery record pounds of Chinook on 80.2% records and number of Chinook on 61.7% of records. The reason the percentages do not total 100% is because some processors indicate both the pounds of Chinook landed as well as the number of Chinook landed.

The fish ticket entries related to Chinook salmon bycatch are not used for management. Estimates of Chinook salmon bycatch are made by the agency using observer data, or by extrapolating bycatch rates on observed vessels to unobserved vessels. Consequently, there has been little oversight to ensure that the Chinook salmon fish ticket entries are filled in consistently.

Table 19 provides estimates of the percentage of groundfish that was observed in the pollock trawl fisheries. Seasons were determined based on the start dates reported in the data. Landing reports include the reported discards, but the estimated total discards are not included because bycatch rates were not applied to landed groundfish. It should also be noted that two observer records were discarded because they did not contain fishing start dates.

Table 19 shows that the percentage of groundfish observed in the Central Gulf pollock trawl fishery varied by year and season, but on average was about 30% of the catch. In the Western Gulf the percentage of groundfish catch that was observed was lower than the Central Gulf. Observed groundfish accounted for 11% to 17% of the groundfish catch in the Western Gulf pollock trawl fishery. The percentage of groundfish observed in the pollock fishery decreased to about half of previous levels after 2006. This is primarily due to increased effort by local fishermen using vessels that are less than 60’ (see Table 5). Recall that the <60’ vessels were not required to carry an observer. Until the observer program restructuring amendment is implemented or the current observer coverage requirements for the < 60’ fleet are amended, it is anticipated that the low observer coverage rates in the Western Gulf will continue. Low coverage rates will require limited observer data on Chinook salmon bycatch rates to be applied to substantial amounts of unobserved catch. If the bycatch rates applied to the unobserved catch are greater than the actual rates, the estimated Chinook salmon bycatch will be overestimated. If the applied bycatch rates are lower than the actual bycatch, Chinook salmon bycatch will be underestimated. Information will not be available to know if Chinook salmon bycatch is actually greater or less than the estimated numbers.

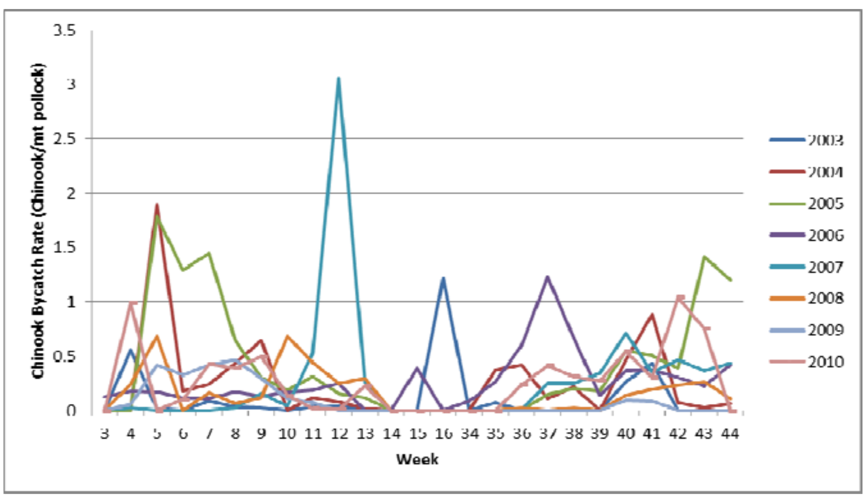
Table 19 Percent of groundfish observed in the pollock trawl fisheries, by season and year

	Central Gulf					Western Gulf				
Year	A	B	C	D	Total	A	B	C	D	Total
2003	36%	29%	37%	34%	33%	25%	4%	18%	13%	17%
2004	24%	38%	29%	32%	33%	19%	0%	9%	13%	11%
2005	25%	34%	11%	24%	27%	12%	0%	12%	20%	14%
2006	23%	33%	27%	30%	28%	12%	10%	21%	17%	15%
2007	37%	24%	25%	29%	27%	6%	4%	8%	13%	8%
2008	45%	29%	33%	29%	34%	2%	3%	3%	2%	2%
2009	33%	33%	63%	57%	43%	0%	10%	17%	7%	8%
2010	29%	25%	36%	29%	29%	13%	2%	4%	11%	7%
All Years	30%	31%	33%	31%	31%	13%	5%	11%	13%	11%

Source: NOAA Catch Accounting Data

Estimated Chinook salmon bycatch in the Gulf pollock fisheries has varied greatly between 2003 and 2010. When Ianelli (2009) looked at Bering Sea salmon bycatch rates he concluded that they were highly variable and that recent higher bycatch levels are likely due to increased salmon abundance rather than shifting patterns of effort by the pollock fleet. This may also be true in the Gulf. Salmon bycatch estimates and salmon bycatch rates have been highly variable in the Gulf. Weekly bycatch rates for the Central GOA are presented in Figure 3 for the years 2003-2010. The purpose of the figure is to show the variability of salmon bycatch rates that have been estimated. Peaks in the figure show weeks when high bycatch rates were realized. The 2007 rate during the 12th week was the highest bycatch rate reported over the eight years. That week almost 25,000 Chinook salmon were estimated to have been caught. The next highest Chinook salmon bycatch rate shown was the 5th week during 2004. While the rate was high that week, a relatively small amount of pollock was harvested so few Chinook salmon were estimated to have been caught. It is not possible to report the actual number because of confidentiality restrictions placed upon the use of the data.

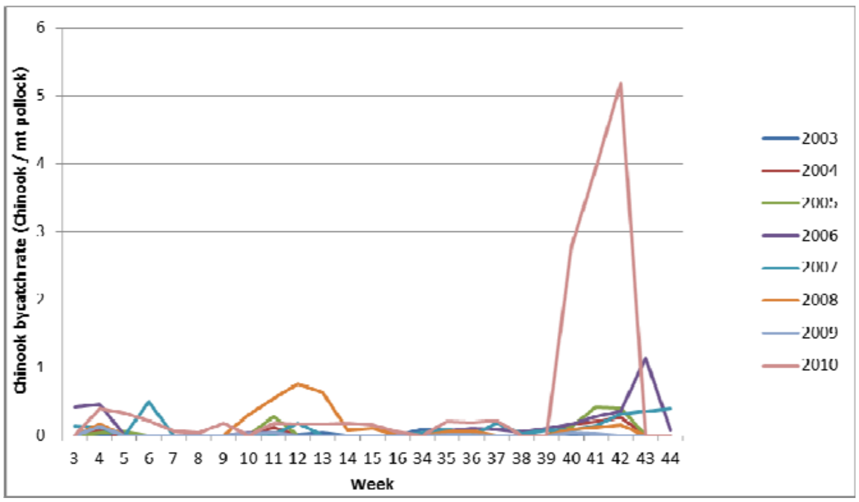
Figure 3 Chinook salmon bycatch rates in the Central Gulf of Alaska pollock trawl fishery by week, 2003-2010



During most weeks, the bycatch rate was less than 0.5, which means that less than one Chinook salmon was estimated to have been caught for every two metric tons of pollock. The weeks when bycatch was more than 0.5 are spread throughout the year and the weeks where spikes of high bycatch were estimated do not indicate a trend.

Figure 4 shows the Chinook salmon bycatch rate for the Western GOA. Rates in the Western Gulf fishery were always less than one, except during the "D" season. Especially during the 2010 "D" season the bycatch rates were estimated to be very high. During the 42nd week of 2010, over five Chinook salmon were estimated to have been caught for each metric ton of pollock. Over 21,000 Chinook salmon were estimated to have been caught that week. That is almost four times as many Chinook salmon as were estimated to have been caught in any other year considered in the Western Gulf. During 2010, 11% of the "D" season pollock catch and 6% of the "D" season pollock trips were observed. Low observer rates increase the likelihood that the estimated Chinook salmon bycatch rates differ from the actual rates. So, the actual number of Chinook salmon caught may have been lower or higher that the reported estimates.

Figure 4 Chinook salmon bycatch rate in the Western Gulf of Alaska pollock trawl fishery by week, 2003-2010



If the observer procurement and restructuring amendment is approved by the U.S. Secretary of Commerce (NPFMC, 2010) some of the economic incentive to fish vessels < 60' in the Gulf pollock fisheries will be removed. Under the proposed observer restructuring amendment, catcher vessels would pay a 1.25% vessel fee on their landings. That fee would be paid directly to NMFS and would fund the observer coverage that NMFS determines is necessary for those vessels. Because NMFS determines the coverage levels and the observer fee is the same percentage of exvessel landings, regardless of the catcher vessel's length, the incentive to fish a vessel less than 60' to avoid observer coverage costs is removed. Until the restructured observer program is implemented, the data on Chinook salmon bycatch in the Gulf is expected to continue to be weak under the status quo. It should be noted that observer coverage costs is just one component in determining the length of the vessel used in the pollock fisheries. The < 60' vessels may also be used in other fisheries (e.g. Salmon) that place restrictions on length or that may be size restriction on the owner's Groundfish license. So, amending observer regulations will remove some, but not all, economic incentives to use vessels < 60'.

Because the status quo would not change the current regulations, selection of 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 Gulf and Western GOA. Individuals, businesses, communities, and specific fish stocks that rely on Chinook salmon that may be taken as bycatch in the Central Gulf and Western Gulf pollock fisheries will continue to rely on the pollock fleet to voluntarily minimize their Chinook salmon bycatch. However, vessels working independently in relatively short fisheries without a Chinook salmon bycatch limit do not have the correct economic incentives to stop fishing in an area to reduce their salmon bycatch. 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 bycatch under the status quo, the desire to maximize profits could lessen the bycatch reductions that could be achieved.

3.10 Impacts of Alternative 2: Chinook salmon PSC Limit and increased monitoring

This section of the analysis will consider the impacts of the Chinook salmon PSC limits the Council has considered and the impacts of revising the observer coverage requirements on vessels < 60’ that participate in the Central Gulf and Western Gulf directed pollock fisheries. The impacts of the proposed PSC limits are discussed first and then the impacts of changing the monitoring program are provided.

The impacts of implementing a Chinook salmon bycatch cap on members of the Central Gulf and Western GOA pollock trawl fishery will depend on whether the PSC limits reduce their groundfish catch. If the PSC limit reduces groundfish catch, the fleet’s revenue and likely profits will decrease. The decrease in revenue will also reduce skipper and crew wages. On the post exvessel side of the equation, decreases in production will reduce processing revenue and reduce the amount of pollock products that are available to consumers. It may also reduce the total number of hours that processing plant workers are able to log, thereby reducing their income.

If Chinook salmon bycatch is reduced as a result of this action it would have beneficial impacts on the harvesters and consumers Chinook salmon. Our ability to quantify these positive impacts is constrained by the lack of data on the origins of the Chinook salmon harvested as bycatch in the Gulf pollock fishery. Because we do not know the regions the Chinook salmon originated, it is not possible to determine the areas and peoples that are affected by the bycatch.

3.10.1 Chinook Salmon PSC Limits

Three Chinook salmon PSC limits were considered by the Council. The PSC amounts for the combined Central Gulf and Western Gulf are 15,000, 22,500, and 30,000 Chinook salmon. A total of 18 different options were considered to divide the three PSC limits between the Central Gulf and the Western Gulf pollock fisheries. The Council did not include an alternative to set a single PSC limit that would be shared by pollock harvesters in both areas, in part because the two fisheries are prosecuted by different vessels. Keeping the PSC limit as an aggregate cap shared by the two areas would allow the PSC catch of the vessels in one area to impact the fishery in the other area. An aggregate cap would also impact the formation and effectiveness of cooperatives that are described under Alternative 3.

The first step in studying the impacts of the proposed Chinook salmon PSC limits is determining whether they may constrain future Gulf pollock fisheries. To assess the likelihood that a Chinook salmon cap will be a constraint, the 2003-2010 Central Gulf and Western Gulf pollock fisheries were compared to the proposed caps under each of the options considered. As shown in Section 3.6.3, Chinook salmon bycatch in the Central Gulf, since 2003, has ranged from over 2,100 fish in 2009 to under 31,700 fish in 2007. These are estimated numbers of fish. Chinook salmon bycatch in the Western Gulf since 2003 also varies widely within and between years. Estimated Chinook salmon bycatch was smallest in 2009 when less than 500 fish were reported. Bycatch was estimated to be over 31,500 fish during 2010, with most of that bycatch being estimated to have been caught during the “D” season.

3.10.1.1 Chinook Salmon PSC Limits (15,000 Chinook)

As described in Section 3.4 the overall PSC limit is divided among areas based on historic pollock TACs, estimated historic Chinook salmon bycatch numbers, or a blending of the two methods using various year combinations from 2001 through 2010. The resulting PSC limits are provided in Section 3.8.2. Historic Chinook salmon bycatch estimates by week are provided in Appendix 3. The tables in that appendix also show when the smallest proposed PSC limit for the area (shaded data) and the largest PSC limit would become binding (dark vertical line).

Because the total Chinook salmon PSC limit is set at 15,000 fish, in this scenario, any increase to one area results in an equal decrease to the other area. Each of the options considered under the 15,000 Chinook salmon PSC limit allocate different amounts of the total Chinook salmon PSC limit to each area. So, an option that gives the Central Gulf the largest Chinook salmon allotment gives the Western Gulf their smallest allotment.

Each of the options being considered by the Council are discussed in this section in terms of the 15,000 Chinook salmon PSC limit. A discussion of how the 25% buffer could impact the management of the fishery is also included. Information is provided based on the impact the PSC limit would have had on the fishery, during the years 2003-2010, if the PSC limit had been in place. These years were selected because it is the farthest back in time we can reach and have a consistent data base to draw upon, and the random nature of Chinook bycatch makes future projections of Chinook bycatch, by area and week, unreliable. Information provided here will include the date when the fishery was projected to close under each option considered by the Council, the amount of pollock that would have been forgone, and the value of that pollock to the harvesters and processors. Information on the reduction in the number of Chinook salmon is also provided. However, because of the limited amount of data available on the origin of the Chinook salmon taken as bycatch in the Gulf pollock fishery, the age of those fish, and the natural mortality until maturity, the conclusions that can be drawn on the impacts to various groups as a result of those savings are limited.

No attempt is made to estimate the number of Chinook salmon that would be harvested by participants in the Central Gulf and Western Gulf pollock fisheries in the future. Chinook salmon bycatch is highly variable and estimating future catches in a year with the information available could produce inaccurate estimates. Therefore, the catches that occurred from 2003-2010 are used as a proxy to indicate the types of outcomes that may result if the proposed PSC limits were implemented.

3.10.1.1.1 Closure Dates

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 PSC limit was taken during five of the eight years from 2003-2010 (Table 20). The earliest the fishery would have closed was February 26th (during 2005). A closure that early would shut the fishery down during the roe-season when pollock have their greatest value[12]. A March closure in 2007 could also impact the roe-season. However the 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.

[12] The exvessel roe bonus that harvesters receive is usually $0.03/lb to $0.05/lb. Actual roe bonuses depend on the roe percentage that is delivered and the value of the roe in the market that year. Personal communication with Julie Bonny, based on her discussions with Kurt Cochran and Kent Helligso.

Table 20 Historic dates when the Central Gulf pollock fishery is projected to have closed by reaching the Chinook salmon PSC limit (15,000 Chinook salmon divided between the Central Gulf and Western Gulf)

Alternatives	Years	Chinook Cap	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	9,401		9-Oct	26-Feb	7-Oct	24-Mar			2-Oct
pollock TAC)	2001-2010	9,477		9-Oct	26-Feb	7-Oct	24-Mar			2-Oct
Option b (based on	2006-2010	9,122		9-Oct	26-Feb	23-Sep	24-Mar			2-Oct
Chinook bycatch)	2001-2010	10,068		9-Oct	26-Feb	14-Oct	24-Mar			9-Oct
Suboption: exclude	2006 & 2008 & 2009	11,246			12-Mar		24-Mar			9-Oct
2007 and 2010 data)	2001-2006, 2008-2009	11,612			12-Mar		24-Mar			16-Oct
Option c(i)	2006-2010	9,191		9-Oct	26-Feb	30-Sep	24-Mar			2-Oct
Using 25% from	2006 & 2008 & 2009	10,785			5-Mar	21-Oct	24-Mar			9-Oct
Option a and 75%	2001-2010	9,920		9-Oct	26-Feb	14-Oct	24-Mar			2-Oct
from Option b	2001-2006, 2008-2009	11,078			12-Mar	4-Nov	24-Mar			9-Oct
Option c(ii)	2006-2010	9,261		9-Oct	26-Feb	7-Oct	24-Mar			2-Oct
Using 50% from	2006 & 2008 & 2009	10,324		9-Oct	5-Mar	21-Oct	24-Mar			9-Oct
Option a and 50%	2001-2010	9,772		9-Oct	26-Feb	14-Oct	24-Mar			2-Oct
from Option b	2001-2006, 2008-2009	10,544		9-Oct	5-Mar	21-Oct	24-Mar			9-Oct
Option c(iii)	2006-2010	9,331		9-Oct	26-Feb	7-Oct	24-Mar			2-Oct
Using 75% from	2006 & 2008 & 2009	9,862		9-Oct	26-Feb	14-Oct	24-Mar			2-Oct
Option a and 25%	2001-2010	9,624		9-Oct	26-Feb	14-Oct	24-Mar			2-Oct
from Option b	2001-2006, 2008-2009	10,010		9-Oct	26-Feb	14-Oct	24-Mar			2-Oct

Source: NOAA Catch Accounting Data

Closures that are projected to have occurred under the other options considered by the Council were within two weeks of those discussed under Option a. None of the options would have resulted in a pollock fishery closure earlier than February 26th. However, during 2006 the fishery would have been closed during the "C" season, under Option b (2006-2010), instead of the first week of the "D" season.

Table 21 shows the dates the Western Gulf pollock fishery was projected to close because the PSC limit is reached. The Western Gulf pollock fishers were estimated to reach their proposed PSC limits under every option during 2005 and 2010. The 2005 fishery would reach the PSC limit 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.

Table 21 Historic dates when the Western Gulf pollock fishery is projected to close by reaching the Chinook salmon PSC limit (15,000 Chinook salmon divided between the Central Gulf and Western Gulf)

Alternatives	Years	Chinook Cap	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	5,599			15-Oct					2-Oct
pollock TAC)	2001-2010	5,523			15-Oct					2-Oct
Option b (based on	2006-2010	5,878			15-Oct					2-Oct
Chinook bycatch)	2001-2010	4,932			15-Oct					2-Oct
Suboption: exclude	2006 & 2008 & 2009	3,754			8-Oct	28-Oct				2-Oct
2007 and 2010 data)	2001-2006, 2008-2009	3,388			8-Oct	14-Oct				11-Sep
Option c(i)	2006-2010	5,809			15-Oct					2-Oct
Using 25% from	2006 & 2008 & 2009	4,215			15-Oct	28-Oct				2-Oct
Option a and 75%	2001-2010	5,080			15-Oct					2-Oct
from Option b	2001-2006, 2008-2009	3,922			15-Oct	28-Oct				2-Oct
Option c(ii)	2006-2010	5,739			15-Oct					2-Oct
Using 50% from	2006 & 2008 & 2009	4,676			15-Oct					2-Oct
Option a and 50%	2001-2010	5,228			15-Oct					2-Oct
from Option b	2001-2006, 2008-2009	4,456			15-Oct	28-Oct				2-Oct
Option c(iii)	2006-2010	5,669			15-Oct					2-Oct
Using 75% from	2006 & 2008 & 2009	5,138			15-Oct					2-Oct
Option a and 25%	2001-2010	5,376			15-Oct					2-Oct
from Option b	2001-2006, 2008-2009	4,990			15-Oct					2-Oct

Source: NOAA Catch Accounting Data

3.10.1.1.2 Salmon Savings

Table 22 reports the number of Chinook salmon that are available at the end of the year under the various options considered. Because the PSC limit was not exceeded during 2003, 2008, or 2009 all of the options show positive numbers, indicating the number of Chinook that remained at the end of the year before the PSC limit is reached. PSC limits would be exceeded (and is indicated by the grey shading of the negative numbers) under all of the options during 2005, 2007 and 2010. Only the largest Chinook allotment would not be exceeded during 2004 and 2006. In the Central Gulf, the largest PSC allotments are generated under Option b when the years 2007 and 2010 are removed from the calculations and when 75% of Option b results are used to calculate Option c.

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 occurred 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. However, NMFS would need to take a very conservative approach to manage the pollock fisheries to ensure the PSC limit is never exceeded. Issues associated with how the PSC limits would be managed are provided later in this section under the heading the PSC Limit Buffer of 25%.

Table 22 Number of salmon available at the end of the year under the PSC limit in the Central Gulf (15,000 Chinook salmon limit)

Alternatives	Years	PSC Limit	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	9,401	5,843	(1,254)	(12,029)	(1,737)	(22,246)	1,430	7,278	(2,933)
pollock TAC)	2001-2010	9,477	5,919	(1,179)	(11,953)	(1,661)	(22,170)	1,505	7,354	(2,857)
Option b (based on	2006-2010	9,122	5,564	(1,534)	(12,308)	(2,016)	(22,525)	1,150	6,999	(3,212)
Chinook bycatch)	2001-2010	10,068	6,510	(588)	(11,362)	(1,070)	(21,579)	2,097	7,945	(2,266)
Suboption: exclude	2006 & 2008 & 2009	11,246	7,689	591	(10,183)	108	(20,401)	3,275	9,124	(1,087)
2007 and 2010 data)	2001-2006, 2008-2009	11,612	8,055	957	(9,817)	474	(20,035)	3,641	9,489	(722)
Option c(i)	2006-2010	9,191	5,634	(1,464)	(12,238)	(1,947)	(22,456)	1,220	7,069	(3,142)
Using 25% from	2006 & 2008 & 2009	10,785	7,228	130	(10,644)	(353)	(20,862)	2,814	8,662	(1,549)
Option a and 75%	2001-2010	9,920	6,363	(735)	(11,509)	(1,218)	(21,727)	1,949	7,797	(2,414)
from Option b	2001-2006, 2008-2009	11,078	7,521	423	(10,351)	(60)	(20,569)	3,107	8,955	(1,256)
Option c(ii)	2006-2010	9,261	5,704	(1,394)	(12,168)	(1,877)	(22,386)	1,290	7,138	(3,072)
Using 50% from	2006 & 2008 & 2009	10,324	6,766	(332)	(11,106)	(814)	(21,323)	2,352	8,201	(2,010)
Option a and 50%	2001-2010	9,772	6,215	(883)	(11,657)	(1,366)	(21,875)	1,801	7,649	(2,562)
from Option b	2001-2006, 2008-2009	10,544	6,987	(111)	(10,885)	(594)	(21,103)	2,573	8,421	(1,789)
Option c(iii)	2006-2010	9,331	5,774	(1,324)	(12,098)	(1,807)	(22,316)	1,360	7,208	(3,003)
Using 75% from	2006 & 2008 & 2009	9,862	6,305	(793)	(11,567)	(1,276)	(21,785)	1,891	7,739	(2,471)
Option a and 25%	2001-2010	9,624	6,067	(1,031)	(11,805)	(1,514)	(22,023)	1,653	7,502	(2,709)
from Option b	2001-2006, 2008-2009	10,010	6,453	(645)	(11,419)	(1,128)	(21,637)	2,039	7,888	(2,323)

Source: NOAA Catch Accounting Data

Table 23 shows the number of Chinook salmon the Western Gulf pollock fishery participants are estimated to be under their limit when the fishery closed. The proposed PSC limits were exceeded under every option during 2005 and 2010. Overages in 2005 ranged from less than 100 Chinook salmon to over 2,500 Chinook, depending on the option selected. During 2010, the Chinook salmon limit was exceeded by about 26,000 to 28,000 fish. Overages in 2010 were much greater than any other year. The 2006 fishery would have exceeded the PSC limit only under Option b when 2007 and 2010 were dropped from the data. Option c(i) would also result in the PSC limit being exceeded when 2007 and 2010 data were excluded. Option C(ii) only slightly exceeds the limit (by 74 Chinook) when the 2003-2010 time period, excluding 2007 and 2010, was used.

Table 23 Number of salmon under the PSC limit in the Western Gulf (15,000 Chinook salmon limit)

Alternatives	Years	PSC Limit	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	5,599	4,861	3,273	(352)	1,070	2,241	3,483	5,158	(25,981)
pollock TAC)	2001-2010	5,523	4,785	3,197	(428)	994	2,165	3,407	5,082	(26,057)
Option b (based on	2006-2010	5,878	5,140	3,552	(73)	1,349	2,520	3,762	5,437	(25,702)
Chinook bycatch)	2001-2010	4,932	4,194	2,606	(1,019)	403	1,574	2,816	4,491	(26,648)
Suboption: exclude	2006 & 2008 & 2009	3,754	3,016	1,427	(2,198)	(776)	395	1,638	3,313	(27,827)
2007 and 2010 data)	2001-2006, 2008-2009	3,388	2,650	1,061	(2,563)	(1,141)	29	1,272	2,947	(28,193)
Option c(i)	2006-2010	5,809	5,071	3,482	(143)	1,279	2,450	3,693	5,368	(25,772)
Using 25% from	2006 & 2008 & 2009	4,215	3,477	1,888	(1,736)	(314)	856	2,099	3,774	(27,366)
Option a and 75%	2001-2010	5,080	4,342	2,753	(871)	551	1,721	2,964	4,639	(26,501)
from Option b	2001-2006, 2008-2009	3,922	3,184	1,595	(2,029)	(607)	563	1,806	3,481	(27,659)
Option c(ii)	2006-2010	5,739	5,001	3,412	(212)	1,209	2,380	3,623	5,298	(25,842)
Using 50% from	2006 & 2008 & 2009	4,676	3,938	2,350	(1,275)	147	1,318	2,560	4,235	(26,904)
Option a and 50%	2001-2010	5,228	4,490	2,901	(723)	698	1,869	3,112	4,787	(26,353)
from Option b	2001-2006, 2008-2009	4,456	3,718	2,129	(1,495)	(74)	1,097	2,340	4,015	(27,125)
Option c(iii)	2006-2010	5,669	4,931	3,342	(282)	1,140	2,310	3,553	5,228	(25,912)
Using 75% from	2006 & 2008 & 2009	5,138	4,400	2,811	(813)	608	1,779	3,022	4,697	(26,443)
Option a and 25%	2001-2010	5,376	4,638	3,049	(576)	846	2,017	3,260	4,935	(26,205)
from Option b	2001-2006, 2008-2009	4,990	4,252	2,663	(962)	460	1,631	2,874	4,549	(26,591)

Source: NOAA Catch Accounting Data

<u>Rolling Over Unused TAC</u>

Comparing the information in Table 22 and Table 23 shows the years of high Chinook salmon bycatch catch in the Central Gulf were 2005 and 2007. In the Western Gulf, 2010 Chinook salmon bycatch was substantially greater than other years, but Chinook salmon bycatch in 2005 exceeded the proposed PSC limits under every option. This indicates that high bycatch levels in one area do not result in high bycatch in both areas. This is important because one area could be closed to pollock fishing while the other remains open. If this occurs early in the year, NMFS has the authority to transfer unused pollock between areas. 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 of Chinook salmon bycatch before the start of the “B”, “C”, or “D” season. Any of those scenarios allows NMFS to transfer an amount of pollock up to 20% of the TAC of the area that receives the allocation. The authority for these transfers is found at §679.20 (a)(5)(iv)(B). The actual language is provided in Section 3.10.1.1.7. For example, the Central Gulf pollock fishery was projected to close during the “B” season in 2007. Chinook salmon PSC limits were not taken that year in the Western Gulf. Therefore, 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.

3.10.1.1.3 Metric Tons of Pollock Foregone

Had the pollock fisheries closed on the week ending dates listed above, the amount of pollock that was harvested after that date can be calculated. The calculated amount represents the pollock foregone. This estimate assumes that NMFS would close the pollock fisheries at the end of the week the PSC limit was reached. It also assumes that the 25% buffer is not used. If the 25% buffer were in place it would alter the metric tons of pollock foregone during select years.

Table 24 shows the metric tons of pollock that would be foregone in the Central Gulf. No pollock would have been foregone in 2003, 2008, and 2009. The largest amounts of pollock would have been foregone during 2005 and 2007, respectively.

The 25% buffer would have altered the amount of foregone pollock catch during the years 2004, 2007, and 2010 under most of the options. The buffer would have only impacted the catch foregone in 2005 and 2010 under the options. It is estimated that 1,467mt of pollock would not have been harvested in 2004 if one the four smallest PSC allocations was selected. The most pollock would have been foregone in 2005 under the three largest Chinook allotments to the Central Gulf. That year approximately 22,000mt to

33,000mt of pollock would have been foregone. As shown in Table 20, the fishery was projected to have closed at the end of February or early March, depending on the option selected. During 2007 the fishery is projected to have closed with just over 14,000mt of pollock unharvested, regardless of the option selected. Because all the options closed the fishery on the same week, it indicates a substantial number of Chinook salmon were estimated to be caught that week.

Table 24 Metric tons of pollock forgone if the Central Gulf pollock fishery was closed on the week ending date of the week the Chinook salmon PSC limit was reached (15,000 Chinook salmon PSC limit).

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	1,467	32,598	4,811	14,141	-	-	5,206
pollock TAC)	2001-2010	-	1,467	32,598	4,811	14,141	-	-	5,206
Option b (based on	2006-2010	-	1,467	32,598	6,481	14,141	-	-	5,206
Chinook bycatch)	2001-2010	-	1,467	32,598	3,302	14,141	-	-	1,054
Suboption: exclude	2006 & 2008 & 2009	-	-	22,317	-	14,141	-	-	1,054
2007 and 2010 data)	2001-2006, 2008-2009	-	-	22,317	-	14,141	-	-	260
Option c(i)	2006-2010	-	1,467	32,598	5,908	14,141	-	-	5,206
Using 25% from	2006 & 2008 & 2009	-	-	29,032	1,241	14,141	-	-	1,054
Option a and 75%	2001-2010	-	1,467	32,598	3,302	14,141	-	-	5,206
from Option b	2001-2006, 2008-2009	-	-	22,317	-	14,141	-	-	1,054
Option c(ii)	2006-2010	-	1,467	32,598	4,811	14,141	-	-	5,206
Using 50% from	2006 & 2008 & 2009	-	1,467	29,032	1,241	14,141	-	-	1,054
Option a and 50%	2001-2010	-	1,467	32,598	3,302	14,141	-	-	5,206
from Option b	2001-2006, 2008-2009	-	1,467	29,032	1,241	14,141	-	-	1,054
Option c(iii)	2006-2010	-	1,467	32,598	4,811	14,141	-	-	5,206
Using 75% from	2006 & 2008 & 2009	-	1,467	32,598	3,302	14,141	-	-	5,206
Option a and 25%	2001-2010	-	1,467	32,598	3,302	14,141	-	-	5,206
from Option b	2001-2006, 2008-2009	-	1,467	32,598	3,302	14,141	-	-	5,206

Source: NOAA Catch Accounting Data

Pollock foregone in the Western Gulf predominately occurred in 2010 (Table 25). Large numbers of estimated Chinook salmon bycatch during the “D” season which resulted in the proposed PSC limits being taken with 7,210mt of pollock yet to be harvested. The smallest PSC limit would have resulted in the 2005 pollock fishery being closed with 5,251mt 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 limits.

Table 25 Metric tons of pollock forgone if the Western Gulf pollock fishery was closed on the week ending date of the week the Chinook salmon PSC limit was reached (15,000 Chinook salmon PSC limit).

		Western Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	-	-	-	-	-	7,210
pollock TAC)	2001-2010	-	-	-	-	-	-	-	7,210
Option b (based on	2006-2010	-	-	-	-	-	-	-	7,210
Chinook bycatch)	2001-2010	-	-	-	-	-	-	-	7,210
Suboption: exclude	2006 & 2008 & 2009	-	-	5,251	308	-	-	-	7,210
2007 and 2010 data)	2001-2006, 2008-2009	-	-	5,251	1,401	-	-	-	7,210
Option c(i)	2006-2010	-	-	-	-	-	-	-	7,210
Using 25% from	2006 & 2008 & 2009	-	-	-	308	-	-	-	7,210
Option a and 75%	2001-2010	-	-	-	-	-	-	-	7,210
from Option b	2001-2006, 2008-2009	-	-	-	308	-	-	-	7,210
Option c(ii)	2006-2010	-	-	-	-	-	-	-	7,210
Using 50% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	7,210
Option a and 50%	2001-2010	-	-	-	-	-	-	-	7,210
from Option b	2001-2006, 2008-2009	-	-	-	308	-	-	-	7,210
Option c(iii)	2006-2010	-	-	-	-	-	-	-	7,210
Using 75% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	7,210
Option a and 25%	2001-2010	-	-	-	-	-	-	-	7,210
from Option b	2001-2006, 2008-2009	-	-	-	-	-	-	-	7,210

Source: NOAA Catch Accounting Data

3.10.1.1.4 Exvessel Revenue Foregone

This section provides estimates of the pollock exvessel value that would have been foregone. To estimate an exvessel value, the annual exvessel GOA pollock prices from Table 18 in the 2008 and 2010 Economic SAFE reports[13] were used. The prices reported in those tables were multiplied by 2,204.6 to convert the price from dollars per pound into dollars per metric ton of pollock. Resulting prices are shown in Table 26. It is important to note that 2010 pollock prices are not included in the table. Exvessel prices for that year will not be available until the Commercial Operators Annual Report (COAR) data from the State of Alaska are submitted and published for 2011. That will occur during September/December 2011 in the Economic SAFE report. COAR data could be available during the late spring or early summer, but those dates are also too late to be used in this analysis.

Table 26 Gulf of Alaska nominal exvessel pollock prices (in $/mt), 2003-2009

Year	Exvessel Value/mt
2003	$209.44
2004	$224.87
2005	$273.37
2006	$297.62
2007	$317.46
2008	$399.03
2009	$381.40

Source: Economic SAFE report (2008 and 2010).

The purpose of the COAR is to collect statewide buying and production information. Each year the COAR must be completed by operations that are the first buyers of fish harvested from Alaskan state waters and Federal waters off the Alaskan coast. The report must be completed and submitted to the Alaska Department of Fish and Game by April 1 of the year after the fishing occurred.

Fish buyers are required to report in the COAR the total amount paid to fishermen by species, area purchased, gear types, delivery codes, weights, and pricing that are listed on fish tickets filled out using that company's processor code. All post-season adjustments and/or bonuses, including credit received by fishermen for gas expenses, ice, delivery premiums, and other miscellaneous expenses must be included in the total price. If additional adjustments may be made after the COAR is filed, the price is submitted as "not final" and an additional form (Form M) must be submitted when those adjustments are paid.

The assumptions used to develop the estimated change in exvessel revenue under the alternatives include:

- Exvessel prices are the annual prices reported in the Economic SAFE reports.
- Exvessel prices do not account for price differences that occur during the roe and non-roe season.
- Pollock fishery closures after the roe season may overstate the actual revenue changes. (Additional information was provided in Section 3.10.1.1.1).
- Exvessel prices are held constant under all the alternatives. It is assumed that the small changes in the quantity of pollock harvested under any alternative will not affect the world whitefish markets enough to alter the prices paid to harvesters.
- Historic harvest data was used for the 2003 through 2010 fishing years. It is assumed that the same amount of pollock and Chinook salmon would have been caught those years if the program had been implemented. No Chinook salmon savings would have occurred because of cooperative fishing behavior, etc.
- The amount of pollock foregone is multiplied by the exvessel prices to estimate the exvessel revenue foregone.

[13] All of the SAFE report documents can be found at http://www.fakr.noaa.gov/npfmc/SAFE/SAFE.htm

Table 27 reports the estimated exvessel value of pollock that would have been foregone in the Central Gulf if the fishery were closed on the week ending date that the PSC limit was reached or exceeded. Note that 2010 estimates are not provided in the table because the exvessel prices are not yet available in the COAR or the Economic SAFE report. The revenue foregone by harvesters of Central Gulf pollock was estimated to have been greatest in 2005. That year between $6 million and $9 million of pollock, at the exvessel level, would not have been harvested. Exvessel revenue would have been reduced by about $4.5 under every alternative in 2007. The outcomes that rely heavily on Option b suboptions, with 2007 and 2010 data excluded from the Chinook salmon PSC limit calculations, would not be affected by the Chinook salmon PSC limits in 2004. During 2006, the option that sets the smallest PSC limit (Option b 2006-2010) is projected to have resulted in a loss of just under $2 million. Option a outcomes indicate that the fleet would have foregone about $1.5 million in exvessel revenue. All of the other years considered by the Council would not have been impacted by the proposed PSC limits.

Table 27 Estimated exvessel pollock revenue ($ million) foregone in the Central Gulf if the proposed Chinook salmon PSC limits were in place from 2003-2009.

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	0.33	8.91	1.43	4.49	-	-	n/a
pollock TAC)	2001-2010	-	0.33	8.91	1.43	4.49	-	-	n/a
Option b (based on	2006-2010	-	0.33	8.91	1.93	4.49	-	-	n/a
Chinook bycatch)	2001-2010	-	0.33	8.91	0.98	4.49	-	-	n/a
Suboption: exclude	2006 & 2008 & 2009	-	-	6.10	-	4.49	-	-	n/a
2007 and 2010 data)	2001-2006, 2008-2009	-	-	6.10	-	4.49	-	-	n/a
Option c(i)	2006-2010	-	0.33	8.91	1.76	4.49	-	-	n/a
Using 25% from	2006 & 2008 & 2009	-	-	7.94	0.37	4.49	-	-	n/a
Option a and 75%	2001-2010	-	0.33	8.91	0.98	4.49	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	6.10	-	4.49	-	-	n/a
Option c(ii)	2006-2010	-	0.33	8.91	1.43	4.49	-	-	n/a
Using 50% from	2006 & 2008 & 2009	-	0.33	7.94	0.37	4.49	-	-	n/a
Option a and 50%	2001-2010	-	0.33	8.91	0.98	4.49	-	-	n/a
from Option b	2001-2006, 2008-2009	-	0.33	7.94	0.37	4.49	-	-	n/a
Option c(iii)	2006-2010	-	0.33	8.91	1.43	4.49	-	-	n/a
Using 75% from	2006 & 2008 & 2009	-	0.33	8.91	0.98	4.49	-	-	n/a
Option a and 25%	2001-2010	-	0.33	8.91	0.98	4.49	-	-	n/a
from Option b	2001-2006, 2008-2009	-	0.33	8.91	0.98	4.49	-	-	n/a

Source: NOAA Catch Accounting Data and Economic SAFE Reports (2008 & 2010)
Note: n/a means the exvessel price for 2010 was not available

Table 28 shows the exvessel revenue that would have been foregone in the Western Gulf under the Council's options. From 2003 through 2009 the proposed options would have had little impact on exvessel revenue. The five options that generate the smallest Western Gulf Chinook salmon PSC limits would have reduced 2006 exvessel revenue. 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 exvessel revenue. It is unfortunate that the greatest impact would have been seen in 2010, the only year that exvessel prices were not available. Had that data been available it would have likely shown that the largest exvessel revenue losses would have occurred that year. 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 exvessel price from 2003-2009. The range of exvessel prices result in a $1.5 million to $2.9 million reduction in 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.

Table 28 Estimated exvessel pollock revenue ($ million) foregone in the Western Gulf if the proposed Chinook salmon PSC limits were in place from 2003-2009.

		Western Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	-	-	-	-	-	n/a
pollock TAC)	2001-2010	-	-	-	-	-	-	-	n/a
Option b (based on	2006-2010	-	-	-	-	-	-	-	n/a
Chinook bycatch)	2001-2010	-	-	-	-	-	-	-	n/a
Suboption: exclude	2006 & 2008 & 2009	-	-	1.44	0.09	-	-	-	n/a
2007 and 2010 data)	2001-2006, 2008-2009	-	-	1.44	0.42	-	-	-	n/a
Option c(i)	2006-2010	-	-	-	-	-	-	-	n/a
Using 25% from	2006 & 2008 & 2009	-	-	-	0.09	-	-	-	n/a
Option a and 75%	2001-2010	-	-	-	-	-	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	-	0.09	-	-	-	n/a
Option c(ii)	2006-2010	-	-	-	-	-	-	-	n/a
Using 50% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	n/a
Option a and 50%	2001-2010	-	-	-	-	-	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	-	0.09	-	-	-	n/a
Option c(iii)	2006-2010	-	-	-	-	-	-	-	n/a
Using 75% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	n/a
Option a and 25%	2001-2010	-	-	-	-	-	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	-	-	-	-	-	n/a

Source: NOAA Catch Accounting Data and Economic SAFE Reports (2008 & 2010)
Note: n/a means the exvessel price for 2010 was not available

3.10.1.1.5 First Wholesale Revenue Foregone

The Economic SAFE reports also provide data on the first wholesale revenue derived from pollock harvested in the Gulf. For shoreside plants, first wholesale revenue is the revenue generated by the first processor/seller of fish that were purchased from the harvesting vessels. Table 26 of the 2010 Economic SAFE reports the price per pound of pollock products that were processed by shoreside plants over the years 2005-2009; the 2008 Economic SAFE reports the same data for the years 2003-2007. Combining the two SAFE reports yields the first wholesale price information presented in Table 29. Information reported in the table shows that pollock roe was the most valuable product in terms of price per pound. Deep-skin fillets commanded the second greatest price per pound until 2006, when the other fillets price was greater. This is due to increased demand for individually quick frozen (IQF) fillets over the block frozen deep-skin fillets traditionally utilized by fast service food providers (Economic SAFE report, 2010 Alaska Pollock Fillet Market Profiles). Surimi prices surpassed both fillet prices in 2008, but were again less in 2009. The increase in surimi prices was thought to be due to decreases in pollock TACs and shifting more of the available fish to fillet production (Economic SAFE report, 2010 Alaska Pollock Surimi Market Profiles).

Table 29 First wholesale prices of pollock products, 2003-2009 ($/lb nominal prices)

Product Form	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Whole fish	$0.26	$0.38	$0.27	$0.42	$0.33	$0.35	$0.28
H&G		$0.44	$0.42	$0.55	$0.62	$0.80	$0.79
Roe	$4.31	$4.91	$5.42	$3.61	$3.07	$4.35	$3.15
Deep-skin	$1.11	$1.04	$1.25	$1.22	$1.25	$1.51	$1.55
Other fillets	$0.94	$0.94	$1.17	$1.23	$1.27	$1.66	$1.81
Surimi	$0.70	$0.66	$0.90	$0.84	$0.88	$1.79	$1.23
Minced fish			$0.64	$0.79	$0.70	$0.88	$0.98
Fish meal	$0.34	$0.33	$0.32	$0.44	$0.43	$0.43	$0.52
Other products	$0.22	$0.29	$0.31	$0.33	$0.34	$0.46	$0.31
All products	$0.86	$0.87	$1.00	$0.97	$1.00	$1.46	$1.24

Source: Economic SAFE report (2008 and 2010)

Table 27 of the Economic SAFE report provides estimates of the first wholesale product value per metric ton of retained pollock from the GOA by shoreside plants. Data for the 2003-2009 fishing years are reported in Table 30. The information in that table indicates that the prices were typically between $750/mt and $850/mt for retained pollock. However, the price spiked to almost $1,000/mt in 2008 before dropping back to $870/mt in 2009.

Table 30 First wholesale value per metric ton of retained pollock harvested from the Gulf of Alaska.

Year	First Wholesale Value ($/mt)
2003	$794
2004	$752
2005	$848
2006	$773
2007	$775
2008	$988
2009	$870

Source: Economic SAFE report (2008 and 2010)

The assumptions used to generate the estimates of foregone first wholesale revenue include:

- First wholesale prices are the annual $/mt of retained Gulf pollock reported in the Economic SAFE report documents.
- First wholesale value was reduced by 2% to account for an assumed 2% pollock discard rate.
- No value was assigned to the other groundfish species harvested as incidental catch in the pollock fishery. This will underestimate the value of the total harvest. About 10% of the total catch is incidental catch. Some of the incidental catch is discarded and has no wholesale value.
- First wholesale prices do not account for price differences that occur during the roe and non-roe season.
- Pollock fishery closures after the roe season may overstate the actual wholesale revenue changes.
- First wholesale prices are held constant under all the options considered. It is assumed that the small changes in the quantity of pollock harvested under any alternative will not affect the world whitefish markets enough to alter the prices paid to the first processors.
- Historic harvest data was used for the 2003 through 2010 fishing years. It is assumed that the same amount of pollock and Chinook salmon would have been caught those years if the program had been implemented.

Table 31 reports the estimated first wholesale revenue that would be foregone by processors if the Chinook salmon PSC limit had been in place that year. First wholesale prices per metric ton of pollock in Table 30 were multiplied by 98% of the metric tons of pollock that was estimated to go unharvested as a result of the PSC limit. Only 98% of the catch was used because the first wholesale price was based on retained catch. Because of the Full Retention amendment almost all of the pollock is retained in the Gulf. However, the discards of pollock in the pollock fishery are reported to be about 2% annually. 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 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.

Table 31 Estimated first wholesale revenue ($ million) foregone by processors of Central Gulf pollock (15,000 Chinook salmon PSC Limit)

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	1.10	27.64	3.72	10.96	-	-	n/a
pollock TAC)	2001-2010	-	1.10	27.64	3.72	10.96	-	-	n/a
Option b (based on	2006-2010	-	1.10	27.64	5.01	10.96	-	-	n/a
Chinook bycatch)	2001-2010	-	1.10	27.64	2.55	10.96	-	-	n/a
Suboption: exclude	2006 & 2008 & 2009	-	-	18.93	-	10.96	-	-	n/a
2007 and 2010 data)	2001-2006, 2008-2009	-	-	18.93	-	10.96	-	-	n/a
Option c(i)	2006-2010	-	1.10	27.64	4.57	10.96	-	-	n/a
Using 25% from	2006 & 2008 & 2009	-	-	24.62	0.96	10.96	-	-	n/a
Option a and 75%	2001-2010	-	1.10	27.64	2.55	10.96	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	18.93	-	10.96	-	-	n/a
Option c(ii)	2006-2010	-	1.10	27.64	3.72	10.96	-	-	n/a
Using 50% from	2006 & 2008 & 2009	-	1.10	24.62	0.96	10.96	-	-	n/a
Option a and 50%	2001-2010	-	1.10	27.64	2.55	10.96	-	-	n/a
from Option b	2001-2006, 2008-2009	-	1.10	24.62	0.96	10.96	-	-	n/a
Option c(iii)	2006-2010	-	1.10	27.64	3.72	10.96	-	-	n/a
Using 75% from	2006 & 2008 & 2009	-	1.10	27.64	2.55	10.96	-	-	n/a
Option a and 25%	2001-2010	-	1.10	27.64	2.55	10.96	-	-	n/a
from Option b	2001-2006, 2008-2009	-	1.10	27.64	2.55	10.96	-	-	n/a

Source: NOAA Catch Accounting Data

First wholesale pollock revenue foregone in the Western Gulf is limited from 2003 through 2009 (Table 32). 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 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 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 first wholesale revenue of $5.4 million to $7.1 million.

Table 32 Estimated first wholesale revenue ($ million) foregone by processors of Western Gulf pollock (15,000 Chinook salmon PSC Limit)

		Western Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based	2006-2010	-	-	-	-	-	-	-	n/a
on pollock TAC)	2001-2010	-	-	-	-	-	-	-	n/a
Option b (based	2006-2010	-	-	-	-	-	-	-	n/a
on Chinook	2001-2010	-	-	-	-	-	-	-	n/a
Suboption:	2006 & 2008 & 2009	-	-	4.45	0.24	-	-	-	n/a
exclude 2007 and	2001-2006, 2008-2009	-	-	4.45	1.08	-	-	-	n/a
Option c(i)	2006-2010	-	-	-	-	-	-	-	n/a
Using 25% from	2006 & 2008 & 2009	-	-	-	0.24	-	-	-	n/a
Option a and 75%	2001-2010	-	-	-	-	-	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	-	0.24	-	-	-	n/a
Option c(ii)	2006-2010	-	-	-	-	-	-	-	n/a
Using 50% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	n/a
Option a and 50%	2001-2010	-	-	-	-	-	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	-	0.24	-	-	-	n/a
Option c(iii)	2006-2010	-	-	-	-	-	-	-	n/a
Using 75% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	n/a
Option a and 25%	2001-2010	-	-	-	-	-	-	-	n/a
from Option b	2001-2006, 2008-2009	-	-	-	-	-	-	-	n/a

Source: NOAA Catch Accounting Data

3.10.1.1.6 PSC Limit Buffer of 25 Percent

An alternative considered by the Council would apply a 25% buffer to any of the options that are under consideration. The proposed buffer allows the pollock industry to exceed the PSC limit in an area by 25% once every three years (See Section 3.8.2).

The proposed 25% buffer could be managed one of two ways. It could be managed so that NMFS will attempt to close the pollock fisheries that are projected to reach or exceed the Chinook salmon PSC limit prior to the Council defined limit being reached. The 25% buffer would be utilized when the Chinook salmon catch in a week exceeded the amount NMFS projected and because of the magnitude of the catch, the PSC limit was exceeded. Over the next two years the PSC limit must be managed more closely to ensure the limit is not exceeded. For example, if the “C” season closed when 10 Chinook salmon remained under the limit, the “D” season would not be opened because there is too great of a probability that the Chinook salmon limit would be exceeded. The 25% buffer would be only utilized when there is sufficient uncertainty that the pollock limit would be exceeded to open the “D” season. If the Chinook salmon limit were exceeded, the 25% buffer would be utilized and an even more cautious approach would be implemented for the next two years.

A second interpretation is that NMFS will manage the Chinook salmon PSC limit 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 salmon catch within the 100% of the set limit. See Table 17 for the maximum Chinook salmon bycatch allowed under each option with the 25% buffer. Under this interpretation, if the “C” season closed with 10 Chinook salmon remaining under the limit, the “D” season would be opened using the 25% buffer that is available. Assuming that more than 10 Chinook salmon 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. This philosophy is assumed to be used for management of the 25% buffer.

Based on management of the buffer using the second approach, it is possible to discuss the 25% buffer’s impact using the 15,000 Chinook salmon limit, historic catch from 2003 through 2010, and the options proposed by the Council. The Central Gulf fleet would have exceeded the PSC limit 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 limit in 2004. Because they were also over the PSC limit in 2005 and 2006, they would have been managed not to exceed the limit those years. Because the fleet was only over their limit by 588 Chinook salmon to 1,534 Chinook salmon they would not have utilized their entire 25% buffer that would have allowed them to harvest 2,300 Chinook salmon to 2,800 Chinook salmon over the limit. 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 limit in 2008 or 2009, they would have been eligible to use the 25% buffer again in 2010. Managing to 125% of the PSC limit may have allowed the fishery to remain open for all of 2010 under half of the options considered.

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 limit in 2004. In 2005 they were over the limit 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 1,000mt 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 salmon limits under all but two options. Option b (with suboptions) would have exceeded the Chinook salmon PSC limit 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 308mt 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 salmon cap 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 salmon 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 salmon bycatch rates and could close the fishery earlier in the week, when it was determined the PSC limit would be exceeded.

3.10.1.1.7 Other Impacts on Pollock Harvesters

The previous sections described the estimated revenue reductions that may have occurred if the various options under consideration had been in place those years. However, if these harvesters were required to stop fishing earlier in the year for pollock, 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 limits 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. Harvesters would need to deliver to their historic processor or develop a market with a processor in the open area. If the processors in that area did not have any openings for vessels in their delivery rotation and their historic processor was too far from the fishing grounds, those fisheries would not be options. In summary, vessels that are displaced because of a Chinook salmon PSC limit closing their fishery are not expected to be able to recoup that revenue in other fisheries.

Close monitoring of the Chinook salmon PSC limits 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 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:

> *Each apportionment established under paragraph (a)(5)(iv)(A) of this section will be divided into four seasonal apportionments corresponding to the four fishing seasons specified in §679.23(d)(2) as follows: A Season, 25 percent; B Season, 25 percent; C Season, 25 percent; and D Season, 25 percent. Within any fishing year, underharvest or overharvest of a seasonal apportionment may be added to or subtracted from remaining seasonal apportionments in a manner to be determined by the Regional Administrator, provided that any revised seasonal apportionment does not exceed 20 percent of the seasonal TAC apportionment for the statistical area. The reapportionment of underharvest will be applied to the subsequent season within the*

> *same statistical area up to the 20 percent limit specified in this paragraph. Any underharvest remaining beyond the 20 percent limit may be further apportioned to the subsequent season in the other statistical areas, in proportion to estimated biomass and in an amount no more than 20 percent of the seasonal TAC apportionment for the statistical area.*

Given the above regulations, 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 TAC. 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.

3.10.1.1.8 Other Impacts on Pollock Processors

In addition to the reductions in first wholesale revenue described above, two other issues are discussed in this section. 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. There are at least two options. The 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. While the cost of sending the employees home early is not estimated, contracting too much labor for the actual amount of fish processed is expected to reduce their overall profitability of the plant. The uncertainty associated with determining the amount of labor needed for the pollock fishery increases when the potential for closures associated with Chinook salmon PSC limits are introduced.

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 bycatch, processors may not able to fulfill their contracts to deliver product. If processors are unable to fulfill their contracts, the uncertainty created could result in the loss of market share or lower prices.

3.10.1.1.9 Impacts on 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 taken as bycatch 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[14]. Additional information on the size of Chinook salmon taken as bycatch is

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

reported in Section 4.3.2.1. 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 limits 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 (NMFS 2009b). 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 bycatch in the Gulf pollock fishery before similar projections can be generated (see Section 4.3.3 for additional information).

3.10.1.1.10Impacts on Chinook Salmon Stocks

Information on Chinook salmon stocks was provided in Section 3.7.6, and is described in more detail in Section 4.3.5. The impact of reducing Chinook salmon bycatch in the Gulf pollock fisheries on Chinook salmon stocks will depend on the stocks of origin of the bycatch. Reducing bycatch of stocks listed and threatened or endangered will have a greater impact than reducing the bycatch of hatchery released fish. However, until additional information is available conclusions cannot be made for specific stocks.

3.10.1.1.11Summary

The 15,000 Chinook salmon PSC limit generates the smallest allotment of Chinook salmon for the Central Gulf and Western Gulf pollock fisheries. In the Central Gulf, the number of Chinook salmon that would be available as bycatch in the pollock fishery ranges from 9,122 fish (Option b 2006 through 2010) to 11,612 fish (Option b 2001 through 2006 and 2008 through 2009). Based on the historic catch estimates from 2003 through 2010, these Chinook salmon allotments would result in the pollock fishery being closed early in five of the 10 years. The pollock fishery would have closed during the “A” or “B” seasons in 2005 and 2007 and have closed during the “D” season the other years. The amount of exvessel revenue that would have been foregone by the fleet, if the Chinook salmon limits were in place those years, ranged from $6 million to $9 million in 2005, depending on the option selected. Exvessel revenue foregone in 2007 would have been about $4.5 million under every option. Exvessel revenue foregone never exceeded $2 under any other year/option combination. The first wholesale revenue was estimated to decline between $18 million and $28 million in 2005, and $11 million in 2007. The estimates for the other year/option combinations were $0 to about $5 million. Because almost all of the deliveries from the Central Gulf are to Kodiak the processors based there would absorb these reductions in their revenue.

The 15,000 Chinook salmon PSC limit results in 3,388 Chinook salmon (Option b 2001 through 2006 and 2008 through 2009) to 5,878 Chinook salmon (Option b 2006 through 2010) being allocated to the Western Gulf pollock fishery. Those limits would have caused the 2005 fishery to close either on October 8th or October 15th, depending on the option selected. Chinook salmon bycatch reduction ranged from 73 fish to 2,563 fish. Pollock harvest would have been reduced by 5,251 mt under the two smallest Chinook salmon allotments. Exvessel revenue was projected to decline by up $1.44 million and first wholesale revenue was projected to decline by $4.45 million under the two smallest Chinook salmon allotments. The 2006 fishery would have closed October 14th or October 28th. The smallest Chinook salmon allotment would have reduced exvessel revenue by $420,000 and the next four smallest allotments by less than $10,000. In terms of first wholesale revenue, the reductions would have been $1.08 million for the smallest Chinook salmon allotment and $0.24 for the next four smallest. The 2010 fishery would have closed in late September or early October with 7,201 mt of pollock projected to go unharvested. An estimated 25,000 Chinook salmon to 28,000 Chinook salmon would not have been caught. The exvessel and first wholesale prices are not available for 2010. However if the range of prices from 2003-2009 were used as estimates the foregone exvessel value would have been between $1.5 million and $2.9 million and the first wholesale revenue foregone would have ranged from $5.4 million to $7.1 million.

3.10.1.2 Chinook Salmon PSC Limits (22,500 Chinook)

This section provides the same types of information and tables as was provided for the 15,000 Chinook salmon PSC limit. The only difference is the affect increasing the Chinook salmon allotment to 22,500 fish has on the options considered. Two tables are excluded in this section. Western GOA tables that report estimates of exvessel revenue foregone and first wholesale revenue foregone are excluded, because the PSC limit would not constrain pollock catch from 2003 through 2009. In 2010 the PSC limit would have constrained the pollock harvest, however, the exvessel and first wholesale price data are not yet available to estimate the revenue foregone that year. Since 2003 through 2009 were not constrained by the PSC limit and 2010 price data are not available, the two Western Gulf tables would have been blank and provide no additional information.

3.10.1.2.1 Closure Dates

This section shows the dates the pollock fishery is estimated to have closed if the proposed 22,500 Chinook salmon PSC limit and the various options to divide the limit between the Central Gulf and Western Gulf were in place from 2003-2010. Table 33 shows that the PSC limit was taken during two of the eight years, from 2003-2010. The 2005 fishery is projected to have closed 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. 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 salmon PSC limits.

Table 33 Historic dates when the Central Gulf pollock fishery is projected to have closed by reaching the Chinook salmon PSC limit (22,500 Chinook salmon divided between the Central Gulf and Western Gulf)

Alternatives	Years	Chinook Cap	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	14,101			19-Mar		24-Mar			
pollock TAC)	2001-2010	14,215			19-Mar		24-Mar			
Option b (based on	2006-2010	13,682			19-Mar		24-Mar			
Chinook bycatch)	2001-2010	15,102			17-Sep		24-Mar			
Suboption: exclude	2006 & 2008 & 2009	16,870			8-Oct		24-Mar			
2007 and 2010 data)	2001-2006, 2008-2009	17,418			8-Oct		24-Mar			
Option c(i)	2006-2010	13,787			19-Mar		24-Mar			
Using 25% from	2006 & 2008 & 2009	16,177			1-Oct		24-Mar			
Option a and 75%	2001-2010	14,880			17-Sep		24-Mar			
from Option b	2001-2006, 2008-2009	16,617			8-Oct		24-Mar			
Option c(ii)	2006-2010	13,892			19-Mar		24-Mar			
Using 50% from	2006 & 2008 & 2009	15,485			1-Oct		24-Mar			
Option a and 50%	2001-2010	14,658			26-Mar		24-Mar			
from Option b	2001-2006, 2008-2009	15,816			1-Oct		24-Mar			
Option c(iii)	2006-2010	13,997			19-Mar		24-Mar			
Using 75% from	2006 & 2008 & 2009	14,793			10-Sep		24-Mar			
Option a and 25%	2001-2010	14,437			19-Mar		24-Mar			
from Option b	2001-2006, 2008-2009	15,016			17-Sep		24-Mar			

Source: NOAA Catch Accounting Data

Table 34 shows the dates the Western Gulf pollock fishery is projected to close because the PSC limit is reached. The Western Gulf pollock harvesters were estimated to reach their proposed PSC limits under some options in 2005 and all options in 2010. 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 allotments. 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).

Table 34 Historic dates when the Western Gulf pollock fishery is projected to have closed by reaching the Chinook salmon PSC limit (22,500 Chinook salmon divided between the Central Gulf and Western Gulf)

Alternatives	Years	Chinook Cap	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	8,399								9-Oct
pollock TAC)	2001-2010	8,285								9-Oct
Option b (based on	2006-2010	8,818								9-Oct
Chinook bycatch)	2001-2010	7,398								9-Oct
Suboption: exclude	2006 & 2008 & 2009	5,630			15-Oct					2-Oct
2007 and 2010 data)	2001-2006, 2008-2009	5,082			15-Oct					2-Oct
Option c(i)	2006-2010	8,713								9-Oct
Using 25% from	2006 & 2008 & 2009	6,323								2-Oct
Option a and 75%	2001-2010	7,620								9-Oct
from Option b	2001-2006, 2008-2009	5,883			15-Oct					2-Oct
Option c(ii)	2006-2010	8,608								9-Oct
Using 50% from	2006 & 2008 & 2009	7,015								9-Oct
Option a and 50%	2001-2010	7,842								9-Oct
from Option b	2001-2006, 2008-2009	6,684								9-Oct
Option c(iii)	2006-2010	8,503								9-Oct
Using 75% from	2006 & 2008 & 2009	7,707								9-Oct
Option a and 25%	2001-2010	8,063								9-Oct
from Option b	2001-2006, 2008-2009	7,484								9-Oct

Source: NOAA Catch Accounting Data

3.10.1.2.2 Salmon Savings

Table 35 shows the number of Chinook salmon available in the Central Gulf at the end of the year under each option considered by the Council. A negative number indicates the Council's proposed PSC limit would have been exceeded. Cells with a negative number are shaded in this table. Proposed PSC limits are exceeded under every option in 2005 and 2007. Chinook salmon PSC limits are not exceeded under any option during the other years. If the proposed PSC limits had been in place beginning in 2003, between 4,011 Chinook salmon (Option b with suboption using 2001-2006 and 2008-2009 data) and 7,747 Chinook salmon (Option b using 2006-2010 data) would have been harvested in excess of the PSC limit. More Chinook salmon were caught during 2007, so the PSC limit was exceeded by 14,229 Chinook salmon (Option b with suboption using 2001-2006 and 2008-2009 data) to 19,965 Chinook salmon (Option b using 2006-2010 data).

Table 35 Number of Chinook salmon available at the end of the year under the PSC limit in the Central Gulf (22,500 Chinook salmon limit)

Alternatives	Years	PSC Limit	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	14,101	10,544	3,446	(7,328)	2,963	(17,546)	6,130	11,978	1,768
pollock TAC)	2001-2010	14,215	10,657	3,559	(7,215)	3,077	(17,432)	6,244	12,092	1,881
Option b (based on	2006-2010	13,682	10,125	3,027	(7,747)	2,544	(17,965)	5,711	11,560	1,349
Chinook bycatch)	2001-2010	15,102	11,544	4,446	(6,328)	3,964	(16,545)	7,130	12,979	2,768
Suboption: exclude	2006 & 2008 & 2009	16,870	13,312	6,214	(4,560)	5,732	(14,777)	8,898	14,747	4,536
2007 and 2010 data)	2001-2006, 2008-2009	17,418	13,861	6,763	(4,011)	6,280	(14,229)	9,447	15,295	5,084
Option c(i)	2006-2010	13,787	10,230	3,132	(7,642)	2,649	(17,860)	5,816	11,664	1,453
Using 25% from	2006 & 2008 & 2009	16,177	12,620	5,522	(5,252)	5,039	(15,470)	8,206	14,055	3,844
Option a and 75%	2001-2010	14,880	11,323	4,225	(6,550)	3,742	(16,767)	6,909	12,757	2,546
from Option b	2001-2006, 2008-2009	16,617	13,060	5,962	(4,812)	5,479	(15,030)	8,646	14,494	4,283
Option c(ii)	2006-2010	13,892	10,334	3,237	(7,538)	2,754	(17,755)	5,921	11,769	1,558
Using 50% from	2006 & 2008 & 2009	15,485	11,928	4,830	(5,944)	4,347	(16,162)	7,514	13,363	3,152
Option a and 50%	2001-2010	14,658	11,101	4,003	(6,771)	3,520	(16,989)	6,687	12,535	2,325
from Option b	2001-2006, 2008-2009	15,816	12,259	5,161	(5,613)	4,678	(15,831)	7,845	13,694	3,483
Option c(iii)	2006-2010	13,997	10,439	3,341	(7,433)	2,859	(17,650)	6,025	11,874	1,663
Using 75% from	2006 & 2008 & 2009	14,793	11,236	4,138	(6,636)	3,655	(16,854)	6,822	12,671	2,460
Option a and 25%	2001-2010	14,437	10,879	3,781	(6,993)	3,299	(17,210)	6,465	12,314	2,103
from Option b	2001-2006, 2008-2009	15,016	11,458	4,360	(6,414)	3,878	(16,631)	7,044	12,893	2,682

Source: NOAA Catch Accounting Data

Table 36 reports the estimated number of Chinook salmon each option would be under the PSC limit in the Western Gulf when the 22,500 total Chinook salmon limit is selected. Option b, when the 2007 and 2010 data are excluded from the two PSC limit 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 2005 Chinook salmon bycatch. Under those three options, the PSC limit was exceeded by 68 Chinook salmon to 869 Chinook. So, the PSC bycatch limit almost covered Chinook salmon bycatch under all of the options considered. Given the lag in time bycatch is reported, those options may not have resulted in any Chinook salmon savings unless the fishery was managed very conservatively. Estimated Chinook salmon bycatch exceeded all of the PSC limit options in 2010. That year the PSC limit was exceeded by 22,763 Chinook salmon to 26,499 Chinook salmon depending on the option selected. 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 could be expected to be between 4,000 Chinook salmon and the number listed in the 2010 column. The actual savings would depend on NMFS' ability to close the pollock fishery when the PSC limit is reached.

Table 36 Number of Chinook salmon available at the end of the year under the PSC limit in the Western Gulf (22,500 Chinook salmon limit)

Alternatives	Years	PSC Limit	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	8,399	7,661	6,072	2,448	3,869	5,040	6,283	7,958	(23,182)
pollock TAC)	2001-2010	8,285	7,547	5,959	2,334	3,756	4,927	6,169	7,844	(23,295)
Option b (based on	2006-2010	8,818	8,080	6,491	2,866	4,288	5,459	6,702	8,376	(22,763)
Chinook bycatch)	2001-2010	7,398	6,660	5,072	1,447	2,869	4,040	5,282	6,957	(24,182)
Suboption: exclude	2006 & 2008 & 2009	5,630	4,892	3,304	(321)	1,101	2,272	3,514	5,189	(25,950)
2007 and 2010 data)	2001-2006, 2008-2009	5,082	4,344	2,755	(869)	553	1,723	2,966	4,641	(26,499)
Option c(i)	2006-2010	8,713	7,975	6,386	2,762	4,183	5,354	6,597	8,272	(22,868)
Using 25% from	2006 & 2008 & 2009	6,323	5,584	3,996	371	1,793	2,964	4,206	5,881	(25,258)
Option a and 75%	2001-2010	7,620	6,882	5,293	1,669	3,091	4,261	5,504	7,179	(23,961)
from Option b	2001-2006, 2008-2009	5,883	5,145	3,556	(68)	1,353	2,524	3,767	5,442	(25,698)
Option c(ii)	2006-2010	8,608	7,870	6,282	2,657	4,079	5,250	6,492	8,167	(22,972)
Using 50% from	2006 & 2008 & 2009	7,015	6,277	4,688	1,063	2,485	3,656	4,899	6,574	(24,566)
Option a and 50%	2001-2010	7,842	7,104	5,515	1,891	3,312	4,483	5,726	7,401	(23,739)
from Option b	2001-2006, 2008-2009	6,684	5,946	4,357	732	2,154	3,325	4,568	6,243	(24,897)
Option c(iii)	2006-2010	8,503	7,765	6,177	2,552	3,974	5,145	6,387	8,062	(23,077)
Using 75% from	2006 & 2008 & 2009	7,707	6,969	5,380	1,755	3,177	4,348	5,591	7,266	(23,874)
Option a and 25%	2001-2010	8,063	7,325	5,737	2,112	3,534	4,705	5,947	7,622	(23,517)
from Option b	2001-2006, 2008-2009	7,484	6,746	5,158	1,533	2,955	4,126	5,368	7,043	(24,096)

Source: NOAA Catch Accounting Data

3.10.1.2.3 Metric Tons of Pollock Foregone

The difference between the actual pollock harvest and the estimated pollock harvest as a result of this action is the amount of pollock foregone. Because the Chinook salmon PSC allotment in this section is larger than the 15,000 fish limit previously considered, the amount of pollock foregone under most options will decrease. However, if large numbers of Chinook salmon were taken in week and the PSC limit was exceeded by a substantial amount, the increased PSC limit may not provide a sufficient buffer to keep the fishery open. In that case, the amount of pollock foregone would be the same under both Chinook salmon caps.

Table 37 reports that 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. 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.

Table 37 Metric tons of pollock forgone if the Central Gulf pollock fishery was closed on the week ending date of the week the Chinook salmon PSC limit was reached (22,500 Chinook salmon PSC limit)

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on pollock TAC)	2006-2010	-	-	12,092	-	14,141	-	-	-
	2001-2010	-	-	12,092	-	14,141	-	-	-
Option b (based on Chinook bycatch)	2006-2010	-	-	12,092	-	14,141	-	-	-
	2001-2010	-	-	8,901	-	14,141	-	-	-
Suboption: exclude 2007 and 2010 data)	2006 & 2008 & 2009	-	-	2,470	-	14,141	-	-	-
	2001-2006, 2008-2009	-	-	2,470	-	14,141	-	-	-
Option c(i) Using 25% from Option a and 75% from Option b	2006-2010	-	-	12,092	-	14,141	-	-	-
	2006 & 2008 & 2009	-	-	5,998	-	14,141	-	-	-
	2001-2010	-	-	8,901	-	14,141	-	-	-
	2001-2006, 2008-2009	-	-	2,470	-	14,141	-	-	-
Option c(ii) Using 50% from Option a and 50% from Option b	2006-2010	-	-	12,092	-	14,141	-	-	-
	2006 & 2008 & 2009	-	-	5,998	-	14,141	-	-	-
	2001-2010	-	-	11,445	-	14,141	-	-	-
	2001-2006, 2008-2009	-	-	5,998	-	14,141	-	-	-
Option c(iii) Using 75% from Option a and 25% from Option b	2006-2010	-	-	12,092	-	14,141	-	-	-
	2006 & 2008 & 2009	-	-	10,598	-	14,141	-	-	-
	2001-2010	-	-	12,092	-	14,141	-	-	-
	2001-2006, 2008-2009	-	-	8,901	-	14,141	-	-	-

Source: NOAA Catch Accounting Data

Table 38 shows that options considered by the Council would have a minor impact on the amount of pollock that would have been harvested between 2003 and 2010 in the Western Gulf. All of the PSC limits 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 limit is taken. During 2010 the fishery would have closed with between 6,119 mt and 7,210 mt of pollock not harvested. Therefore, over the 2003 through 2010 time period, the options considered by the Council were estimated to change the amount of pollock harvested by about 1,000 mt.

Table 38 Metric tons of pollock forgone if the Western Gulf pollock fishery was closed on the week ending date of the week the Chinook salmon PSC limit was reached (22,500 Chinook salmon PSC limit)

		Western Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on pollock TAC)	2006-2010	-	-	-	-	-	-	-	6,119
	2001-2010	-	-	-	-	-	-	-	6,119
Option b (based on Chinook bycatch)	2006-2010	-	-	-	-	-	-	-	6,119
	2001-2010	-	-	-	-	-	-	-	6,119
Suboption: exclude 2007 and 2010 data)	2006 & 2008 & 2009	-	-	-	-	-	-	-	7,210
	2001-2006, 2008-2009	-	-	-	-	-	-	-	7,210
Option c(i) Using 25% from Option a and 75% from Option b	2006-2010	-	-	-	-	-	-	-	6,119
	2006 & 2008 & 2009	-	-	-	-	-	-	-	7,210
	2001-2010	-	-	-	-	-	-	-	6,119
	2001-2006, 2008-2009	-	-	-	-	-	-	-	7,210
Option c(ii) Using 50% from Option a and 50% from Option b	2006-2010	-	-	-	-	-	-	-	6,119
	2006 & 2008 & 2009	-	-	-	-	-	-	-	6,119
	2001-2010	-	-	-	-	-	-	-	6,119
	2001-2006, 2008-2009	-	-	-	-	-	-	-	6,119
Option c(iii) Using 75% from Option a and 25% from Option b	2006-2010	-	-	-	-	-	-	-	6,119
	2006 & 2008 & 2009	-	-	-	-	-	-	-	6,119
	2001-2010	-	-	-	-	-	-	-	6,119
	2001-2006, 2008-2009	-	-	-	-	-	-	-	6,119

Source: NOAA Catch Accounting Data

3.10.1.2.4 Exvessel Revenue Foregone

Calculations of the amount of exvessel revenue that would be foregone use the same methodology in this section as was used when the 15,000 Chinook salmon PSC limit was considered. Table 39 shows that the exvessel revenue foregone in 2005 ranged from $0.68 million to $3.31 million. Exvessel revenue foregone in 2007 was $4.49 million under all options, and 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 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 salmon PSC limits had been in place during that time period.

Table 39 Estimated exvessel revenue ($ million) foregone by processors of Central Gulf pollock (22,500 Chinook salmon PSC Limit)

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	3.31	-	4.49	-	-	-
pollock TAC)	2001-2010	-	-	3.31	-	4.49	-	-	-
Option b (based on	2006-2010	-	-	3.31	-	4.49	-	-	-
Chinook bycatch)	2001-2010	-	-	2.43	-	4.49	-	-	-
Suboption: exclude	2006 & 2008 & 2009	-	-	0.68	-	4.49	-	-	-
2007 and 2010 data)	2001-2006, 2008-2009	-	-	0.68	-	4.49	-	-	-
Option c(i)	2006-2010	-	-	3.31	-	4.49	-	-	-
Using 25% from	2006 & 2008 & 2009	-	-	1.64	-	4.49	-	-	-
Option a and 75%	2001-2010	-	-	2.43	-	4.49	-	-	-
from Option b	2001-2006, 2008-2009	-	-	0.68	-	4.49	-	-	-
Option c(ii)	2006-2010	-	-	3.31	-	4.49	-	-	-
Using 50% from	2006 & 2008 & 2009	-	-	1.64	-	4.49	-	-	-
Option a and 50%	2001-2010	-	-	3.13	-	4.49	-	-	-
from Option b	2001-2006, 2008-2009	-	-	1.64	-	4.49	-	-	-
Option c(iii)	2006-2010	-	-	3.31	-	4.49	-	-	-
Using 75% from	2006 & 2008 & 2009	-	-	2.90	-	4.49	-	-	-
Option a and 25%	2001-2010	-	-	3.31	-	4.49	-	-	-
from Option b	2001-2006, 2008-2009	-	-	2.43	-	4.49	-	-	-

Source: NOAA Catch Accounting Data and Economic SAFE report Exvessel Price Data

As discussed in the introduction to this section, a table is not provided for the Western Gulf. The proposed Chinook salmon PSC limits are estimated to have been a constraint only during 2010. Price data are not available for that year so no information would be provided by including the table. 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. 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. So, the amount of exvessel revenue lost as a result of the PSC limits considered for the Western Gulf may be between $1.3 million and $2.9 million.

3.10.1.2.5 First Wholesale Revenue Foregone

The amount of first wholesale revenue foregone is calculated using the same method discussed under the 15,000 Chinook salmon PSC limit. Table 40 shows that processors are estimated to lose between $2.09 million and $10.25 million in first wholesale revenue during 2005, if one of the PSC limits under Council consideration were in place that year. 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 exceed any other year, so the first wholesale revenue is not reduced.

Table 40 Estimated first wholesale revenue ($ million) foregone by processors of Central Gulf pollock (22,500 Chinook salmon PSC Limit)

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	10.25	-	10.96	-	-	-
pollock TAC)	2001-2010	-	-	10.25	-	10.96	-	-	-
Option b (based on	2006-2010	-	-	10.25	-	10.96	-	-	-
Chinook bycatch)	2001-2010	-	-	7.55	-	10.96	-	-	-
Suboption: exclude	2006 & 2008 & 2009	-	-	2.09	-	10.96	-	-	-
2007 and 2010 data)	2001-2006, 2008-2009	-	-	2.09	-	10.96	-	-	-
Option c(i)	2006-2010	-	-	10.25	-	10.96	-	-	-
Using 25% from	2006 & 2008 & 2009	-	-	5.09	-	10.96	-	-	-
Option a and 75%	2001-2010	-	-	7.55	-	10.96	-	-	-
from Option b	2001-2006, 2008-2009	-	-	2.09	-	10.96	-	-	-
Option c(ii)	2006-2010	-	-	10.25	-	10.96	-	-	-
Using 50% from	2006 & 2008 & 2009	-	-	5.09	-	10.96	-	-	-
Option a and 50%	2001-2010	-	-	9.71	-	10.96	-	-	-
from Option b	2001-2006, 2008-2009	-	-	5.09	-	10.96	-	-	-
Option c(iii)	2006-2010	-	-	10.25	-	10.96	-	-	-
Using 75% from	2006 & 2008 & 2009	-	-	8.99	-	10.96	-	-	-
Option a and 25%	2001-2010	-	-	10.25	-	10.96	-	-	-
from Option b	2001-2006, 2008-2009	-	-	7.55	-	10.96	-	-	-

Source: NOAA Catch Accounting Data and Economic SAFE report First Wholesale Price Data

A table showing the estimated first wholesale revenue reduction for the Western Gulf was not generated. Proposed PSC limit 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 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 first wholesale revenue. The actual result is likely between those two estimates.

3.10.1.2.6 Summary

The 22,500 Chinook salmon PSC limit is the median allotment of Chinook salmon for the Central Gulf and Western Gulf pollock fisheries being considered by the Council. In the Central Gulf, the number of Chinook salmon that would be available as bycatch in the pollock fishery ranges from 13,682 fish (Option b 2006 through 2010) to 17,418 fish (Option b 2001 through 2006 and 2008 through 2009). Based on the historic catch estimates from 2003 through 2010, these Chinook salmon allotments would result in the pollock fishery being closed early in two of the eight years. The pollock fishery would have closed during the “B” season under some options and during the “D” season under others in 2005. In 2007 the fishery would have always closed during the “D” season. The amount of exvessel revenue that would have been foregone by the fleet, if the Chinook salmon limits were in place those years, ranged from $0.7 million to $3.3 million in 2005, depending on the option selected. Exvessel revenue foregone in 2007 would have been about $4.5 million under every option. The first wholesale revenue was estimated to decline between $2.1 million and $10.3 million in 2005, and $11 million in 2007. Because almost all of the deliveries from the Central Gulf are to Kodiak the processors based there would absorb these reductions in their revenue.

The 22,500 Chinook salmon PSC limit results in 5,082 Chinook salmon (Option b 2001 through 2006 and 2008 through 2009) to 8,818 Chinook salmon (Option b 2006 through 2010) being allocated to the Western Gulf pollock fishery. Those limits would have caused the 2005 fishery to close on October 8th under the three smallest allotments. Chinook salmon bycatch reduction ranged from 68 fish to 869 fish in 2005 and from 23,000 to 26,500 Chinook salmon in 2010. Pollock harvest would have been reduced by 6,119 mt. in 2010. Exvessel and first wholesale revenue projections were not made because price data for 2010 are currently not available. Reductions in 2010 first wholesale revenue would have been shared by plants in King Cove, Sand Point, Dutch Harbor, and Akutan.

The other impacts on pollock harvesters and processors were discussed in Section 3.10.1.1.7 and Section 3.10.1.1.8, respectively. Information on Chinook salmon users and Chinook salmon stocks was discussed in Section 3.10.1.1.9 and Section 3.10.1.1.10, respectively.

3.10.1.3 Chinook Salmon PSC Limits (30,000 Chinook)

This section of the analysis describes the impacts of imposing a 30,000 Chinook salmon PSC limit that would be divided between the Central Gulf and Western Gulf. The information in this section is calculated as it was for the 15,000 Chinook salmon and 22,500 Chinook salmon PSC limits discussed earlier. Also, because 2010 price data are not available, the exvessel revenue foregone and first wholesale revenue foregone tables for the Western Gulf are not included.

3.10.1.3.1 Closure Dates

Pollock fishery closure dates are estimated in this section under the proposed 30,000 Chinook salmon PSC limit and the various options to divide the limit between the Central Gulf and Western Gulf. Table 41 shows that the PSC limit was taken during two of the eight years, from 2003-2010. The 2005 fishery is projected to have closed on October 22nd under all be the five largest Chinook allotments. The four largest allotments would provide sufficient Chinook to prevent the limit from being exceeded. The fifth largest allotment 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 limit and the 15,000 Chinook limit. A single closure date for all PSC limits and options indicates that more Chinook was estimated to have been taken that week than the range between the smallest Chinook PSC limit proposed using the 15,000 Chinook PSC limit and the largest option using the 30,000 Chinook limit.

Table 41 Historic dates when the Central Gulf pollock fishery is projected to have closed by reaching the Chinook salmon PSC limit (30,000 Chinook divided between the Central Gulf and Western Gulf)

Alternatives	Years	Chinook Cap	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	18,802			22-Oct		24-Mar			
pollock TAC)	2001-2010	18,953			22-Oct		24-Mar			
Option b (based on	2006-2010	18,243			22-Oct		24-Mar			
Chinook bycatch)	2001-2010	20,136			22-Oct		24-Mar			
Suboption: exclude	2006 & 2008 & 2009	22,493					24-Mar			
2007 and 2010 data)	2001-2006, 2008-2009	23,224					24-Mar			
Option c(i)	2006-2010	18,383			22-Oct		24-Mar			
Using 25% from	2006 & 2008 & 2009	21,570					24-Mar			
Option a and 75%	2001-2010	19,840			22-Oct		24-Mar			
from Option b	2001-2006, 2008-2009	22,156					24-Mar			
Option c(ii)	2006-2010	18,522			22-Oct		24-Mar			
Using 50% from	2006 & 2008 & 2009	20,647			22-Oct		24-Mar			
Option a and 50%	2001-2010	19,544			22-Oct		24-Mar			
from Option b	2001-2006, 2008-2009	21,089			29-Oct		24-Mar			
Option c(iii)	2006-2010	18,662			22-Oct		24-Mar			
Using 75% from	2006 & 2008 & 2009	19,724			22-Oct		24-Mar			
Option a and 25%	2001-2010	19,249			22-Oct		24-Mar			
from Option b	2001-2006, 2008-2009	20,021			22-Oct		24-Mar			

Source: NOAA Catch Accounting Data

Table 42 shows the dates the Western Gulf pollock fishery is projected to close because the PSC limit is reached. The Western Gulf pollock harvesters were estimated to reach their proposed PSC limits under all options during 2010. The fishery is always projected to close on October 9th, after the "D" season had been opened. Chinook PSC limits proposed would be been sufficient to cover Chinook bycatch during all of the other years.

Table 42 Historic dates when the Western Gulf pollock fishery is projected to have closed by reaching the Chinook salmon PSC limit (30,000 Chinook divided between the Central Gulf and Western Gulf)

Alternatives	Years	Chinook Cap	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	11,198								9-Oct
pollock TAC)	2001-2010	11,047								9-Oct
Option b (based on	2006-2010	11,757								9-Oct
Chinook bycatch)	2001-2010	9,864								9-Oct
Suboption: exclude	2006 & 2008 & 2009	7,507								9-Oct
2007 and 2010 data)	2001-2006, 2008-2009	6,776								9-Oct
Option c(i)	2006-2010	11,617								9-Oct
Using 25% from	2006 & 2008 & 2009	8,430								9-Oct
Option a and 75%	2001-2010	10,160								9-Oct
from Option b	2001-2006, 2008-2009	7,844								9-Oct
Option c(ii)	2006-2010	11,478								9-Oct
Using 50% from	2006 & 2008 & 2009	9,353								9-Oct
Option a and 50%	2001-2010	10,456								9-Oct
from Option b	2001-2006, 2008-2009	8,911								9-Oct
Option c(iii)	2006-2010	11,338								9-Oct
Using 75% from	2006 & 2008 & 2009	10,276								9-Oct
Option a and 25%	2001-2010	10,751								9-Oct
from Option b	2001-2006, 2008-2009	9,979								9-Oct

Source: NOAA Catch Accounting Data

3.10.1.3.2 Salmon Savings

Table 43 reports the number of Chinook salmon that would remain if the proposed PSC limits considered for the Central Gulf pollock fishery were in place in those years. This section of the document assumes the total number of Chinook salmon available to participants in the Central Gulf and Western Gulf is 30,000 fish. Those fish are divided between the Central Gulf and Western Gulf pollock fisheries based on the 18 options that the Council selected for analysis. The PSC limits ranged from 18,243 Chinook salmon to 23,224 Chinook, depending on the option selected. Those PSC limits would have been exceeded under all options except the four largest allotments in 2005. The four largest allotments would only have been exceeded during 2007. All of the remaining options resulted in the PSC limit being exceeded by an estimated 341 Chinook salmon to 3,186 Chinook. All of the PSC limits were estimated to be exceeded during 2007. That year the PSC limits were exceeded by an estimated 8,423 Chinook salmon to 13,404 Chinook, depending on the option selected. The PSC limits were only exceeded those two years in the Central Gulf.

Table 43 Number of Chinook salmon available at the end of the year under the PSC limit in the Central Gulf (30,000 Chinook salmon limit)

Alternatives	Years	PSC Limit	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	18,802	15,244	8,146	(2,628)	7,664	(12,845)	10,831	16,679	6,468
pollock TAC)	2001-2010	18,953	15,396	8,298	(2,476)	7,815	(12,694)	10,982	16,830	6,619
Option b (based on	2006-2010	18,243	14,686	7,588	(3,186)	7,105	(13,404)	10,272	16,120	5,910
Chinook bycatch)	2001-2010	20,136	16,578	9,480	(1,294)	8,998	(11,511)	12,164	18,013	7,802
Suboption: exclude	2006 & 2008 & 2009	22,493	18,935	11,837	1,063	11,355	(9,154)	14,522	20,370	10,159
2007 and 2010 data)	2001-2006, 2008-2009	23,224	19,667	12,569	1,794	12,086	(8,423)	15,253	21,101	10,890
Option c(i)	2006-2010	18,383	14,826	7,728	(3,047)	7,245	(13,264)	10,412	16,260	6,049
Using 25% from	2006 & 2008 & 2009	21,570	18,013	10,915	141	10,432	(10,077)	13,599	19,447	9,236
Option a and 75%	2001-2010	19,840	16,283	9,185	(1,590)	8,702	(11,807)	11,869	17,717	7,506
from Option b	2001-2006, 2008-2009	22,156	18,599	11,501	727	11,018	(9,491)	14,185	20,033	9,823
Option c(ii)	2006-2010	18,522	14,965	7,867	(2,907)	7,384	(13,125)	10,551	16,400	6,189
Using 50% from	2006 & 2008 & 2009	20,647	17,090	9,992	(782)	9,509	(11,000)	12,676	18,524	8,314
Option a and 50%	2001-2010	19,544	15,987	8,889	(1,885)	8,406	(12,103)	11,573	17,421	7,211
from Option b	2001-2006, 2008-2009	21,089	17,531	10,433	(341)	9,951	(10,558)	13,117	18,966	8,755
Option c(iii)	2006-2010	18,662	15,105	8,007	(2,767)	7,524	(12,985)	10,691	16,539	6,328
Using 75% from	2006 & 2008 & 2009	19,724	16,167	9,069	(1,705)	8,586	(11,923)	11,753	17,602	7,391
Option a and 25%	2001-2010	19,249	15,691	8,593	(2,181)	8,111	(12,398)	11,278	17,126	6,915
from Option b	2001-2006, 2008-2009	20,021	16,463	9,365	(1,409)	8,883	(11,626)	12,050	17,898	7,687

Source: NOAA Catch Accounting Data

Table 44 reports the number of Chinook salmon that the Western Gulf pollock fleet was estimated to be under the PSC limit at the end of the fishing year. 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, depending on the option selected.

Table 44 Number of Chinook salmon available at the end of the year under the PSC limit in the Western Gulf (30,000 Chinook salmon limit)

Alternatives	Years	PSC Limit	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	11,198	10,460	8,872	5,247	6,669	7,840	9,082	10,757	(20,382)
pollock TAC)	2001-2010	11,047	10,309	8,720	5,096	6,518	7,688	8,931	10,606	(20,534)
Option b (based on	2006-2010	11,757	11,019	9,430	5,806	7,227	8,398	9,641	11,316	(19,824)
Chinook bycatch)	2001-2010	9,864	9,126	7,538	3,913	5,335	6,506	7,748	9,423	(21,716)
Suboption: exclude	2006 & 2008 & 2009	7,507	6,769	5,181	1,556	2,978	4,149	5,391	7,066	(24,073)
2007 and 2010 data)	2001-2006, 2008-2009	6,776	6,038	4,449	825	2,247	3,417	4,660	6,335	(24,805)
Option c(i)	2006-2010	11,617	10,879	9,290	5,666	7,088	8,258	9,501	11,176	(19,964)
Using 25% from	2006 & 2008 & 2009	8,430	7,692	6,103	2,479	3,901	5,071	6,314	7,989	(23,151)
Option a and 75%	2001-2010	10,160	9,422	7,833	4,209	5,631	6,801	8,044	9,719	(21,421)
from Option b	2001-2006, 2008-2009	7,844	7,106	5,517	1,893	3,314	4,485	5,728	7,403	(23,737)
Option c(ii)	2006-2010	11,478	10,739	9,151	5,526	6,948	8,119	9,361	11,036	(20,103)
Using 50% from	2006 & 2008 & 2009	9,353	8,615	7,026	3,402	4,823	5,994	7,237	8,912	(22,228)
Option a and 50%	2001-2010	10,456	9,718	8,129	4,505	5,926	7,097	8,340	10,015	(21,125)
from Option b	2001-2006, 2008-2009	8,911	8,173	6,585	2,960	4,382	5,553	6,795	8,470	(22,669)
Option c(iii)	2006-2010	11,338	10,600	9,011	5,387	6,809	7,979	9,222	10,897	(20,243)
Using 75% from	2006 & 2008 & 2009	10,276	9,538	7,949	4,324	5,746	6,917	8,160	9,834	(21,305)
Option a and 25%	2001-2010	10,751	10,013	8,425	4,800	6,222	7,393	8,635	10,310	(20,829)
from Option b	2001-2006, 2008-2009	9,979	9,241	7,653	4,028	5,450	6,621	7,863	9,538	(21,601)

Source: NOAA Catch Accounting Data

3.10.1.3.3 Metric Tons of Pollock Foregone

The metric tons of pollock foregone in the two pollock fisheries, as a result of the PSC limit (based on 30,000 Chinook), are presented in this section. In the Central Gulf (Table 45), the PSC limit reduced the amount of pollock harvested during 2005 and 2007. PSC limits were not constraining for any option in any other year considered. During 2005 the reduction was estimated to be 641 mt of under the 13 options that generate the smallest PSC limit. Pollock harvests were estimated to be reduced by 14,141 mt under all the options considered. 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 allotment and the 30,000 Chinook salmon allotment 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.

Table 45 Metric tons of pollock forgone if the Central Gulf pollock fishery was closed on the week ending date of the week the Chinook salmon PSC limit was reached (30,000 Chinook salmon PSC limit)

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	641	-	14,141	-	-	-
pollock TAC)	2001-2010	-	-	641	-	14,141	-	-	-
Option b (based on	2006-2010	-	-	641	-	14,141	-	-	-
Chinook bycatch)	2001-2010	-	-	641	-	14,141	-	-	-
Suboption: exclude	2006 & 2008 & 2009	-	-	-	-	14,141	-	-	-
2007 and 2010 data)	2001-2006, 2008-2009	-	-	-	-	14,141	-	-	-
Option c(i)	2006-2010	-	-	641	-	14,141	-	-	-
Using 25% from	2006 & 2008 & 2009	-	-	-	-	14,141	-	-	-
Option a and 75%	2001-2010	-	-	641	-	14,141	-	-	-
from Option b	2001-2006, 2008-2009	-	-	-	-	14,141	-	-	-
Option c(ii)	2006-2010	-	-	641	-	14,141	-	-	-
Using 50% from	2006 & 2008 & 2009	-	-	641	-	14,141	-	-	-
Option a and 50%	2001-2010	-	-	641	-	14,141	-	-	-
from Option b	2001-2006, 2008-2009	-	-	-	-	14,141	-	-	-
Option c(iii)	2006-2010	-	-	641	-	14,141	-	-	-
Using 75% from	2006 & 2008 & 2009	-	-	641	-	14,141	-	-	-
Option a and 25%	2001-2010	-	-	641	-	14,141	-	-	-
from Option b	2001-2006, 2008-2009	-	-	641	-	14,141	-	-	-

Source: NOAA Catch Accounting Data

Table 46 shows the reduction in pollock catch from the Western Gulf pollock fishery. The results are the same under the 14 largest allocations as they were when the overall Chinook salmon PSC limit was based on 22,500 Chinook. Under those options the estimated pollock catch was reduced by 6,119 mt. The options that yielded the four smallest PSC limits also reduced the estimated pollock catch by 6,119 mt under the 30,000 Chinook salmon cap options. When the overall cap was 22,500 Chinook, the options that yielded the four largest PSC limits reduced pollock catch by 7,210 mt. So, the difference between the 22,500 Chinook salmon cap and the 30,000 Chinook salmon cap over the years considered in the Western Gulf is about 100 mt of pollock from 2003 through 2010.

Table 46 Metric tons of pollock forgone if the Western Gulf pollock fishery was closed on the week ending date of the week the Chinook salmon PSC limit was reached (30,000 Chinook salmon PSC limit)

		Western Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	-	-	-	-	-	6,119
pollock TAC)	2001-2010	-	-	-	-	-	-	-	6,119
Option b (based on	2006-2010	-	-	-	-	-	-	-	6,119
Chinook bycatch)	2001-2010	-	-	-	-	-	-	-	6,119
Suboption: exclude	2006 & 2008 & 2009	-	-	-	-	-	-	-	6,119
2007 and 2010 data)	2001-2006, 2008-2009	-	-	-	-	-	-	-	6,119
Option c(i)	2006-2010	-	-	-	-	-	-	-	6,119
Using 25% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	6,119
Option a and 75%	2001-2010	-	-	-	-	-	-	-	6,119
from Option b	2001-2006, 2008-2009	-	-	-	-	-	-	-	6,119
Option c(ii)	2006-2010	-	-	-	-	-	-	-	6,119
Using 50% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	6,119
Option a and 50%	2001-2010	-	-	-	-	-	-	-	6,119
from Option b	2001-2006, 2008-2009	-	-	-	-	-	-	-	6,119
Option c(iii)	2006-2010	-	-	-	-	-	-	-	6,119
Using 75% from	2006 & 2008 & 2009	-	-	-	-	-	-	-	6,119
Option a and 25%	2001-2010	-	-	-	-	-	-	-	6,119
from Option b	2001-2006, 2008-2009	-	-	-	-	-	-	-	6,119

Source: NOAA Catch Accounting Data

3.10.1.3.4 Exvessel Revenue Foregone

The exvessel revenue that is estimated to be foregone under the 30,000 Chinook salmon cap is calculated using the same methodology described for the 15,000 and 22,500 Chinook salmon cap. In the 2005 Central Gulf pollock fishery the reduction in exvessel revenue is estimated to be about $180,000 under the 13 options that generate the smallest PSC limits (Table 47). The remaining five options would not reduce the exvessel revenue. When the 22,500 Chinook salmon cap was considered, the reduction in exvessel revenue ranged from $680,000 to $3.31 million, depending on the alternative selected. The exvessel revenue reduction in 2007 is estimated to be $4.49 million for every option under Council consideration. This is the same exvessel revenue reduction that was estimated under the 22,500 Chinook salmon cap. Exvessel revenue is not reduced under any of the other options in any of the years considered.

Table 47 **Estimated exvessel revenue ($ million) foregone by processors of Central Gulf pollock (30,000 Chinook salmon PSC Limit)**

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	0.18	-	4.49	-	-	-
pollock TAC)	2001-2010	-	-	0.18	-	4.49	-	-	-
Option b (based on	2006-2010	-	-	0.18	-	4.49	-	-	-
Chinook bycatch)	2001-2010	-	-	0.18	-	4.49	-	-	-
Suboption: exclude	2006 & 2008 & 2009	-	-	-	-	4.49	-	-	-
2007 and 2010 data)	2001-2006, 2008-2009	-	-	-	-	4.49	-	-	-
Option c(i)	2006-2010	-	-	0.18	-	4.49	-	-	-
Using 25% from	2006 & 2008 & 2009	-	-	-	-	4.49	-	-	-
Option a and 75%	2001-2010	-	-	0.18	-	4.49	-	-	-
from Option b	2001-2006, 2008-2009	-	-	-	-	4.49	-	-	-
Option c(ii)	2006-2010	-	-	0.18	-	4.49	-	-	-
Using 50% from	2006 & 2008 & 2009	-	-	0.18	-	4.49	-	-	-
Option a and 50%	2001-2010	-	-	0.18	-	4.49	-	-	-
from Option b	2001-2006, 2008-2009	-	-	-	-	4.49	-	-	-
Option c(iii)	2006-2010	-	-	0.18	-	4.49	-	-	-
Using 75% from	2006 & 2008 & 2009	-	-	0.18	-	4.49	-	-	-
Option a and 25%	2001-2010	-	-	0.18	-	4.49	-	-	-
from Option b	2001-2006, 2008-2009	-	-	0.18	-	4.49	-	-	-

Source: NOAA Catch Accounting Data and Economic SAFE report Exvessel Price Data

A table reporting the reductions in exvessel revenue that are estimated to have occurred in the Western Gulf is 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 exvessel revenue foregone, the estimates would be $1.3 million and $2.4 million. The actual reduction in exvessel revenue may fall within that range.

3.10.1.3.5 First Wholesale Revenue Foregone

First wholesale revenue foregone in the Central Gulf under the 30,000 Chinook salmon cap is presented in Table 48. The estimates for 2005 were either $0 or $540,000, depending on the option. 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 first wholesale revenue in the Central Gulf.

Virtually all of the first wholesale revenue foregone by processors in the Central Gulf would take place at Kodiak plants. As reported in Section 3.6.5, Central Gulf pollock was processed in Kodiak except for a limited amount in Seward, King Cove, and Sand Point. Therefore, it is assumed that the reductions in first wholesale revenue are primarily attributed to Kodak.

Table 48 Estimated first wholesale revenue ($ million) foregone by processors of Central Gulf pollock (30,000 Chinook salmon PSC Limit)

		Central Gulf							
Alternatives	Years	2003	2004	2005	2006	2007	2008	2009	2010
Option a (based on	2006-2010	-	-	0.54	-	10.96	-	-	-
pollock TAC)	2001-2010	-	-	0.54	-	10.96	-	-	-
Option b (based on	2006-2010	-	-	0.54	-	10.96	-	-	-
Chinook bycatch)	2001-2010	-	-	0.54	-	10.96	-	-	-
Suboption: exclude	2006 & 2008 & 2009	-	-	-	-	10.96	-	-	-
2007 and 2010 data)	2001-2006, 2008-2009	-	-	-	-	10.96	-	-	-
Option c(i)	2006-2010	-	-	0.54	-	10.96	-	-	-
Using 25% from	2006 & 2008 & 2009	-	-	-	-	10.96	-	-	-
Option a and 75%	2001-2010	-	-	0.54	-	10.96	-	-	-
from Option b	2001-2006, 2008-2009	-	-	-	-	10.96	-	-	-
Option c(ii)	2006-2010	-	-	0.54	-	10.96	-	-	-
Using 50% from	2006 & 2008 & 2009	-	-	0.54	-	10.96	-	-	-
Option a and 50%	2001-2010	-	-	0.54	-	10.96	-	-	-
from Option b	2001-2006, 2008-2009	-	-	-	-	10.96	-	-	-
Option c(iii)	2006-2010	-	-	0.54	-	10.96	-	-	-
Using 75% from	2006 & 2008 & 2009	-	-	0.54	-	10.96	-	-	-
Option a and 25%	2001-2010	-	-	0.54	-	10.96	-	-	-
from Option b	2001-2006, 2008-2009	-	-	0.54	-	10.96	-	-	-

Source: NOAA Catch Accounting Data and Economic SAFE report First Wholesale Price Data

A table presenting estimates of first wholesale revenue reductions for the Western Gulf options is not provided. Revenue reductions 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 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.

3.10.1.3.6 Summary

The 30,000 Chinook salmon PSC limit is the largest allotment of Chinook salmon considered for the Central Gulf and Western Gulf pollock fisheries. In the Central Gulf, the number of Chinook salmon that would be available as bycatch in the pollock fishery ranges from 18,243 fish (Option b 2006 through 2010) to 23,224 fish (Option b 2001 through 2006 and 2008 through 2009). Based on the historic catch estimates from 2003 through 2010, these Chinook salmon allotments would result in the pollock fishery being closed early in 2005 and 2007 under 13 options considered and just 2007 under the five largest allotments. The pollock fishery would have closed during the “B” season in 2007 and the “D” season in 2005. The exvessel revenue foregone by the fleet in 2005 was estimated to be about $0.2 million under the options that would have closed the fishery early. Exvessel revenue foregone in 2007 was estimated to be about $4.5 million under every option. The first wholesale revenue was estimated to decline by $0.5 million in 2005 and $11.0 million in 2007.

The 30,000 Chinook salmon PSC limit results in 6,776 Chinook salmon (Option b 2001 through 2006 and 2008 through 2009) to 11,757 Chinook salmon (Option b 2006 through 2010) being allocated to the Western Gulf pollock fishery. Those limits would have caused the 2010 fishery to close on October 9th. Chinook salmon bycatch reduction ranged from 23,000 Chinook salmon to 26,500 Chinook salmon in 2010. Chinook salmon bycatch would not have been reduced in any other year considered. Pollock harvest would have been reduced by 6,119mt in 2010. This is the same reduction that was projected under the 22,500 Chinook salmon cap. Exvessel and first wholesale revenue projections were not made because price data for 2010 are currently not available. However, if it is assumed that the 2010 prices fall with the range of prices used for 2003 through 2009, the exvessel value would fall within the range of $1.3 million to $2.4 million and the first wholesale revenue would be between $5.4 million and $6.0 million.

The other impacts on pollock harvesters and processors were discussed in Section 3.10.1.1.7 and Section 3.10.1.1.8, respectively. Information on Chinook salmon users and Chinook salmon stocks was discussed in Section 3.10.1.1.9 and Section 3.10.1.1.10, respectively.

3.10.2 Mid-year Implementation

The Council indicated that if the proposed amendment were implemented mid-year, the percentage of the PSC limit that was generated during the seasons that have yet to take place should be allocated as the limit for that year. This option would only impact the first year, and only if the program were implemented mid-year.

Table 49 reports the percentage of the cap that was generated by each pollock season. In the Central Gulf the high Chinook salmon bycatch estimates occurred earlier in the year than they did in the Western Gulf. Option b shows that the "B" season accounts for the largest percentage of Chinook salmon bycatch. The estimated 24,673 Chinook salmon taken as bycatch during the 12th week of the year tends to drive that result (see Appendix III). In the Western Gulf, the Chinook salmon bycatch estimates reported during the 2010 "D" season results in the majority of the PSC limit still being available at the start of the "D" season, for all options that are based on Chinook salmon bycatch. Options that are based on the TAC would only allocate about 1/3 of the total PSC limit to the "D" season.

Table 49 Percentage of the Chinook salmon PSC cap generated during each season by 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 on	2006-2010	24%	40%	14%	22%	17%	24%	26%	32%
pollock TAC)	2001-2010	24%	41%	17%	19%	21%	17%	29%	34%
Option b (based on	2006-2010	14%	56%	13%	17%	10%	6%	7%	77%
Chinook bycatch)	2001-2010	26%	40%	11%	22%	11%	7%	8%	74%
Suboption: exclude	2006 & 2008 & 2009	23%	37%	21%	19%	31%	19%	11%	39%
2007 and 2010 data)	2001-2006, 2008-2009	37%	24%	13%	26%	20%	13%	11%	56%
Option c(i)	2006-2010	17%	52%	13%	19%	12%	11%	11%	66%
Using 25% from	2006 & 2008 & 2009	23%	37%	19%	20%	28%	20%	15%	37%
Option a and 75%	2001-2010	26%	40%	13%	21%	13%	9%	13%	64%
from Option b	2001-2006, 2008-2009	33%	29%	14%	24%	20%	14%	15%	51%
Option c(ii)	2006-2010	19%	48%	14%	20%	14%	15%	16%	55%
Using 50% from	2006 & 2008 & 2009	23%	38%	18%	21%	24%	21%	19%	36%
Option a and 50%	2001-2010	25%	41%	14%	21%	16%	12%	18%	54%
from Option b	2001-2006, 2008-2009	30%	33%	15%	22%	20%	15%	20%	45%
Option c(iii)	2006-2010	21%	44%	14%	21%	16%	20%	21%	43%
Using 75% from	2006 & 2008 & 2009	23%	39%	16%	22%	21%	23%	22%	34%
Option a and 25%	2001-2010	24%	41%	15%	20%	18%	14%	23%	44%
from Option b	2001-2006, 2008-2009	27%	37%	16%	21%	20%	16%	24%	39%
Maximum Allocation		37%	56%	21%	26%	31%	24%	29%	77%
Minimum Allocation		14%	24%	11%	17%	10%	6%	7%	32%
Mean Allocation		24%	40%	15%	21%	19%	15%	17%	49%
Median Allocation		24%	40%	14%	21%	19%	15%	17%	44%

Source: NOAA Catch Accounting Data

Table 50 presents the information from Table 49 in a different way. This table shows the percentage of the PSC limit under each option that would be allocated prior to the start of the fishing each season. So if the program were implemented after the "B" season, under Option a (2006-2010), the Central Gulf fleet would be assigned 37% of their annual Chinook salmon PSC limit[15]. The Western Gulf fleet would be assigned 58% of their annual allocation.

It is not anticipated that the proposed amendment would be implemented while one of the four seasons is open to directed pollock fishing. These fisheries are often very short. So, it is relatively easy to ensure that the program is not implemented during a season. Implementing the program while fishing is underway would make it difficult to determine the PSC limit that should be issued and it would be difficult to determine what Chinook salmon should be counted against the limit. For example, should the Chinook salmon that has been caught at the time the program is implemented or the Chinook salmon that have

[15] The difference between the 37% reported and the 36% from adding the "C" season total of 14% and the "D" season total of 22% is a result of rounding errors.

been counted from trips that have been offloaded count towards the limit? Implementing the proposed program between seasons would eliminate many of these issues.

Table 50 Percentage of the PSC limit that would be allocated to the pollock fleets prior to the start of each season if the program is implemented mid-year.

		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 on	2006-2010	100%	76%	37%	22%	100%	82%	58%	32%
pollock TAC)	2001-2010	100%	76%	35%	19%	100%	79%	62%	34%
Option b (based on	2006-2010	100%	86%	30%	17%	100%	90%	83%	77%
Chinook bycatch)	2001-2010	100%	74%	34%	22%	100%	89%	82%	74%
Suboption: exclude	2006 & 2008 & 2009	100%	77%	40%	19%	100%	69%	50%	39%
2007 and 2010 data)	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 Allocation		100%	86%	40%	26%	100%	90%	83%	77%
Minimum Allocation		100%	63%	30%	17%	100%	69%	50%	32%
Mean Allocation		100%	76%	36%	21%	100%	81%	66%	49%
Median Allocation		100%	76%	36%	21%	100%	81%	66%	44%

Source: NOAA Catch Accounting Data

Appendix 2 reports the number of Chinook salmon that would be allocated to the fleet prior to the start of each season. A table is presented for each Chinook salmon cap (15,000 fish, 22,500 fish, or 30,000 fish) and each option the Council considered. That information is not provided in the main body of the document because of the number of tables that are required.

Because Option a is based on pollock TAC and Option b is based on historic Chinook salmon bycatch, comparing the results Option a and Option b (using the same years) provides information on the percentage of Chinook salmon caught relative to the percent TAC available. For example, using 2006-2010 data the average percentage of the TAC available prior to the start of the "D" season in the Western Gulf was 32%. The percentage based on the average number of Chinook salmon caught was 77%. Mid-year implementation under Option a would allocate the harvesters 32% of their annual Chinook salmon PSC limit to use during the "D" season. Option b would allocate harvesters 77% of their annual Chinook salmon PSC limit for use during the "D" season. The large difference in the two percentages is driven by the large number of Chinook salmon that were estimated to be taken by the fleet during the "D" season of 2010. Implementing the program mid-year and basing the allocation on the historic TAC will disadvantage participants in the Western Gulf because a large percentage of their historic PSC bycatch is taken in the "D" season. The difference in the Central Gulf is not as pronounced, so implementing the program mid-year and using the TAC in the allocation formula would not have as great of an impact.

3.10.3 Increased Monitoring

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.

The economic impacts associated with this alternative on the agency and the less than 60’ harvesting fleet is described in this section. To estimate the impacts, the number of observer days required and how much would they cost the fleet and NMFS is presented. These costs would be necessary to collect better Chinook salmon bycatch data from the fleet. Improved bycatch data should provide more accurate data to determine whether the proposed PSC limits are exceeded. To the extent the current information on Chinook salmon bycatch in the Gulf pollock fisheries overestimates actual removals, the increased observer costs may result in the pollock fisheries being open longer. However, if the current estimates underestimate Chinook salmon bycatch the fisheries could close sooner. In either situation, the inseason management staff at the Alaska Region should have better information to determine if a closure is necessary.

Methods

Data were obtained from the GOA Chinook salmon Bycatch FT query originated by AKFIN. These data were constrained to the Central and Western Gulf areas during 2007-2009, with targets pertaining to pollock. Data supplied in this query had been aggregated by week ending date to enumerate the number of fishing trips and fishing days. Fishing days were calculated in this query from the difference of the minimum fishing start date and the maximum landing date. Of interest was the total number of days expected to be burdened to the fleet under a 30% observer coverage for vessels in this fishery (as defined by species and area above) less than 60’ in length.

There are three assumptions with the source data pertaining to trips to disclose. FMA analysts were not clear whether fish tickets or landing ID were used to enumerate trips, and assume that landing ID was used since multiple tickets can be generated under one landing ID. Second, as noted by AKFIN, trips were enumerated in each week that they occur. Thus any trip spanning two reporting weeks was double-counted. The magnitude of this overlap is unknown. Finally, by necessity, fishing trip duration was calculated as the duration between fishing start date and landing date in the AKFIN database. Thus time to steam from port to the fishing grounds is unaccounted for in this analysis.

Since observers are paid a daily rate, any calculation of observer costs and effort must attempt to enumerate the total effort by the fishery in terms of both fishing and non-fishing days. From the above discussion, it may be assumed that the any over-estimate of fishery effort due to over-counting of trips would be offset by any under-estimate of trip duration. Data were aggregated within each year (2007-2009) and the average days per trip, trips per vessel, and days per vessel were computed from summed values. In addition, these averages were used to derive summary statistics (minimum, average, maximum) across years.

Results

The AKFIN query returned data from 489 trips and 22 vessels. Three vessel classes below 60’ were identified: 58, 36, and 30. Excepting two jig trips made by vessels <57’, all remaining data pertained to 58’ trawl vessels. From this, it was concluded that jig data was introduced into the query data through the pollock targeting method and was not intended for analyses by the Council. Data from these jig vessels were not considered in observer-day analyses.

Table 51 provides an estimate of the average number of observer days that would be realized if the existing 30% observer coverage requirement for vessels 60’-125’ were extended to trawl vessels less than 60’ directed fishing for pollock in the Central or Western GOA, based on data from 2007 -2009.

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, indicating relatively high retention rates between years. 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 (Table 51). 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.

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. Assumptions and methods related to this calculation can be found in Appendix 4. 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 55,500). The average cost of observer coverage per vessel would be $2,954 (range = $2,460 $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.

Table 51 Average number of observer days that would be realized 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.

	2007			2008			2009			2007-2009 Average					
	Vessels	Trips	Days	Vessels	Trips	Days	Vessels	Trips	Days	Vessels	Trips	Days	Summary		
TRAWL < 60ft	16	192	396	17	169	363	18	126	316	17	162.3	358.3	Min	Mean	Max
30% Coverage			118.8			108.9			94.8			107.5	94.8	107.5	118.8
Means:															
Days per trip			2.1			2.1			2.5			2.2	2.1	2.2	2.5
Trips per vessel		12.0			9.9			7.0			9.5		7.0	9.5	12.0
Days per vessel			24.8			21.4			17.6			21.1	17.6	21.1	24.8
30% Coverage Days per vessel			7.4			6.4			5.3			6.3	5.3	6.3	7.4

3.11 Impacts of Alternative 3: Mandatory Chinook salmon bycatch (pre-catch share) cooperatives

Under Alternative 3, LLP license holders would need to join a Chinook salmon bycatch control cooperative to participate in the Central GOA (area 620 or 630) or Western GOA (area 610) pollock fisheries. Separate cooperatives would be created for each regulatory area, with members of Central GOA cooperatives eligible to participate in areas 620 and 630. The cooperative structure is intended to institutionalize measures to reduce Chinook salmon bycatch in the Gulf pollock fisheries. Under the status quo, participants in the fishery have little individual incentive to control Chinook salmon bycatch, as no consequences flow from any changes in Chinook salmon bycatch. Under this alternative, cooperatives are required to establish, monitor, and enforce certain measures intended to control Chinook salmon bycatch.

Cooperative formation would require a threshold percentage of the licenses that participated in the fishery in the applicable regulatory area in the preceding year. Options under consideration are for either more than 25 percent or 33 percent of those licenses. The thresholds are intended to allow for the formation of multiple cooperatives, while ensuring that a minimum percentage of fishery participants in each cooperative to achieve information sharing benefits. Given the current lack of information concerning location and timing of Chinook salmon bycatch in the fisheries, information sharing is likely to be critical to Chinook salmon avoidance.

Eligibility for the Central Gulf and Western Gulf pollock fisheries are based on the current LLP endorsements, under which any holder of a trawl designated license endorsed for the appropriate regulatory area is eligible. Currently, 118 and 98 License Limitation Program (LLP) licenses are endorsed for participation in the Central Gulf and Western Gulf trawl fisheries, respectively. Yet, since 2003 no more than 53 and 31 vessels have participated in these fisheries in any year, respectively (see Table 52). To ensure that participants attempting to meet the cooperative formation threshold do not simply solicit membership from persons who have no interest in the fishery, the cooperative formation threshold could be based on membership of licenses that participated in the fishery the year preceding the cooperative application. These persons would have recent participation in the fishery and are most likely to have a continuing interest in the fishery and provide the effective knowledge of fishing practices and Chinook salmon avoidance needed for a cooperative to develop successful Chinook salmon avoidance measures.

While basing the threshold on activity in the preceding season will prevent persons with no interest in the fishery from biasing the formation process, using licenses as the identifier may allow persons to stack licenses on a vessel to bias that count. A cleaner approach could be to require a threshold of previously participating vessels. To use a vessel basis for the action, the Council could revise its motion to provide:

> To form, a cooperative is required to have more than:
>
> a) 25 percent; or
> b) 33 percent;
>
> of the ~~licenses~~ **vessels** that participated in the applicable regulatory area in the preceding year.

Although the threshold would be applied to determine when a cooperative has met the requirements for formation, any person with a license endorsed for participation in the GOA trawl fisheries would remain eligible to join a cooperative (and thereby the pollock fisheries), but may not be counted toward achieving the threshold for cooperative formation. The threshold could be administered by posting a list of eligible vessels at the end of each season comprised of vessels used for a targeted landing of pollock in the area in the preceding year. This list would provide notice to participants of those persons whose membership in a cooperative would count toward attaining the threshold.

Table 52 Targeted pollock and accompanying Chinook salmon PSC catch in the Central and Western Gulf (2003-2010).

Area	Year	Number of vessels	Total catch		Lowest catch of vessels able to meet the 25 percent threshold				Lowest catch of vessels able to meet the 33 percent threshold			
					Pollock		Chinook Salmon		Pollock		Chinook Salmon	
			Pollock	Chinook salmon PSC	Tons	As a percent of total	Chinook salmon PSC	As a percent of total	Tons	As a percent of total	Chinook salmon PSC	As a percent of total
Central Gulf of Alaska	2003	49	32,416	3,557	771	2.4	79	2.2	1,548	4.8	321	9.0
	2004	53	40,363	10,655	1,455	3.6	323	3.0	2,737	6.8	764	7.2
	2005	47	50,089	21,429	3,195	6.4	979	4.6	5,804	11.6	1,829	8.5
	2006	45	48,335	11,138	2,560	5.3	419	3.8	4,621	9.6	799	7.2
	2007	38	34,973	31,647	2,139	6.1	695	2.2	3,964	11.3	1,591	5.0
	2008	44	33,336	7,971	1,653	5.0	551	6.9	2,519	7.6	783	9.8
	2009	40	24,070	2,123	1,754	7.3	304	14.3	2,782	11.6	375	17.6
	2010	41	45,782	12,334	3,597	7.9	771	6.3	5,428	11.9	1,558	12.6
Western Gulf of Alaska	2003	31	16,299	738	685	4.2	22	3.0	1,388	8.5	54	7.4
	2004	25	23,420	2,327	3,095	13.2	311	13.4	4,761	20.3	565	24.3
	2005	28	31,282	5,951	4,157	13.3	1,732	29.1	5,945	19.0	2,292	38.5
	2006	28	25,001	4,529	2,450	9.8	565	12.5	3,652	14.6	755	16.7
	2007	25	18,069	3,359	292	1.6	67	2.0	727	4.0	159	4.7
	2008	19	15,497	2,116	316	2.0	51	2.4	854	5.5	71	3.4
	2009	22	14,674	441	1,490	10.2	35	7.9	2,320	15.8	73	16.5
	2010	26	28,593	31,581	2,318	8.1	3,666	11.6	3,829	13.4	6,110	19.3

Source: NOAA Fisheries Catch Accounting Data.

For example, if 30 vessels participated in the fishery, 10 of those vessels would be required to join a cooperative to meet the 33 percent threshold in the following year. To meet the 25 percent threshold, 8 of those vessels would be required. Although these options present the possibility that more than one cooperative would form, allowing a substantial minority to form a cooperative might be important to the acceptability of the system among participants and avoiding the potential of persons to use the cooperative structure to limit others opportunity in the fishery. Considering these two thresholds, historical data from 2003-2010 in the table suggest that, at the extreme, at the 25 percent threshold, a cooperative could have been formed by vessels that account for less than 3 percent or 2 percent of the preceding year's total catch from the Central Gulf and Western Gulf fisheries, respectively. On average, approximately 5 percent and 8 percent of the total catch would be the minimum amount harvested by vessels that would meet the threshold based on historical participation. The 33 percent threshold could be met by vessels with as little as 4 percent and 5 percent of the total catch from the preceding year in the Central Gulf and Western Gulf, respectively. On average during those years, vessels catching more than 9 percent and 12 percent of the total catch from the fishery in the preceding year would be required to form a cooperative. Although it is possible that vessels with a small share of the preceding year's catch could form a cooperative under either of the threshold options, whether such a segment of the fleet would have reason to develop a cooperative is questionable, as the administrative and reporting costs would seem excessively burdensome to a segment of the fleet with only a marginal interest in the fishery. In addition, a cooperative made up of the more active vessels in the fleet would also likely form.

While the proposed threshold rule would make cooperative formation more predictable and manageable, the alternative also contains a requirement that cooperatives accept any eligible person as a member, subject to the same terms and conditions that apply to other cooperative members ensure all eligible license holders are able to access the fishery. Requiring cooperatives to accept eligible persons as members not only serves new entrants, but also ensures that a portion of past participants (able to meet the cooperative threshold) are unable to close other past participants out of the fishery. In addition, the cooperative may not establish rules that disadvantage new entrants (or participants with little history) based on the absence of a substantial recent bycatch history. For example, a cooperative that has delayed starts for persons who have not met a minimal bycatch avoidance standard in the preceding season could operate simply as a standdown for all new entrants, who have no recent history in the fishery. To avoid such a result, the rule would require that entrants be subject to rules not more restrictive than those generally applicable to the cooperative members. For example, impositions of standdowns (or early starts) based on past performances on new entrants may disadvantage these entrants in an unfair manner, or even effectively prevent an entrant from having a reasonable fishing opportunity. The cooperative system must be structured to allow reasonable entry opportunities.

In considering the cooperative structure advanced in this alternative, experience of participants with cooperative fishing and capability of the fleet to develop the desired cooperative structure should also be considered. First, in the Central Gulf and, to a very limited extent, in the Western Gulf, participants have shown a willingness to enter agreements concerning effort in the fisheries to gain additional benefits. In some instances, participants have agreed to delay fishing in the pollock fishery to allow roe to mature, fish to aggregate for spawning, or a segment of the fleet to fish in other fisheries (such as Pacific cod or *C. bairdi* fisheries). In other cases, fleets have agreed to limit the number of trips any vessel would take or the amount of catch of any vessel to assure NMFS that the fleet would not exceed the total allowable catch, if the fishery were opened. These experiences of fleet agreement and coordination show a propensity of participants to work together when needed, as would be the case under the system of cooperatives proposed by this alternative.

In addition, a portion of the fleet in each regulatory area also participates in other cooperative programs, including the Central GOA rockfish program, the Bering Sea pollock cooperative program (or AFA), and the Bering Sea and Aleutian Islands crab program (see Table 53). In the Central GOA, almost 80 percent of the fleet in each year from 2003 through 2010 has participated in another cooperative program. These vessels accounted for 84 percent or more have the catch in each year of that time period. In this area, Central GOA rockfish program participants make up approximately two-thirds of the active fleet and have accounted for approximately 80 percent of the catch in recent years. In addition, Bering Sea pollock participants have accounted for between 40 percent and 50 percent of the fleet, catching between 40 percent and 55 percent of the total catch. These vessels are likely to draw on their experiences in these other cooperative fisheries and lead in the development of cooperatives in the Central Gulf pollock fisheries.

Cooperative program participants are less prevalent in the Western Gulf pollock fishery. Annually from 2003 through 2007, more than 25 percent of the Western Gulf participants also participate in other cooperative programs. These vessels caught in excess of 35 percent of the catch from the Western Gulf pollock fishery in those years. In 2008 and 2009, these cooperative program participants accounted for less than 20 percent of the catch in each year. In 2010, catch of cooperative vessels rose to almost 25 percent of the total from the fishery. From 2003 through 2006, Bering Sea pollock cooperative vessels caught approximately 20 percent of the catch, as did vessels qualified for the Central Gulf rockfish pilot program from 2003 through 2007. In the more recent years, participation of these vessels qualified for other cooperative programs has declined, as have catches (to the extent that those numbers can be revealed). Since fewer vessels of the Western Gulf pollock fishery participants have experience with cooperative programs, it is likely that participants in that area will have more difficulty adjusting to a new cooperative structure. In addition, to the extent that participants in other cooperative programs could reach the required threshold for cooperative formation (independent of vessels that do not participate in those other programs), it is possible that vessels with no cooperative experience (and relatively high dependence on the Western Gulf fishery) could feel disenfranchised by the cooperative requirement. These vessels could be left to either accept rules developed by other persons or develop their own cooperative, an endeavor with which they have no experience. The degree to which a cooperative agreement could operate to the detriment of these participants is limited by the rules that specify the types of measures that cooperatives may adopt (and the NMFS review of cooperative agreements) and the prohibition on discriminatory rules. Yet, to persons who have little familiarity with harvest cooperatives, cooperative fishing arrangements (which could include delays in fishing and area closures) may seem overly constraining, particularly if developed by others without their direct participation. On the other hand, it is possible that any negotiation will include both persons with no cooperative experience and those who participate in other cooperative programs. This type of negotiation is likely to result in a cooperative that is much more acceptable to both those with cooperative experience and those who have none.

Table 53 Central and Western Gulf of Alaska pollock fishery participants that participate in cooperative programs (2003-2010).

Management subarea	Year	Fishery totals		Cooperative program participants**			AFA participants			Rockfish program participants			Crab program vessels
					Catch			Catch			Catch		
		Vessels	Catch	Vessels	in metric tons	as percentage of total	Vessels	in metric tons	as percentage of total	Vessels	in metric tons	as percentage of total	
Central Gulf	2003	49	32,416	39	28,270	87.2	22	15,201	46.9	33	25,858	79.8	2
	2004	53	40,363	42	35,051	86.8	22	17,305	42.9	36	32,094	79.5	3
	2005	47	50,089	39	42,054	84.0	21	19,585	39.1	35	39,871	79.6	3
	2006	45	48,335	36	43,006	89.0	20	21,489	44.5	33	40,455	83.7	1
	2007	38	34,973	33	32,533	93.0	19	18,960	54.2	29	30,401	86.9	2
	2008	44	33,336	36	30,864	92.6	20	18,675	56.0	32	29,010	87.0	1
	2009	40	24,070	35	21,604	89.8	20	9,790	40.7	31	21,089	87.6	2
	2010	41	45,782	32	38,963	85.1	19	22,134	48.3	28	36,884	80.6	1
Western Gulf	2003	31	16,299	8	6,226	38.2	6	4,011	24.6	3	3,493	21.4	1
	2004	25	23,420	8	8,311	35.5	5	5,701	24.3	5	5,192	22.2	2
	2005	28	31,282	9	11,672	37.3	6	6,507	20.8	5	7,211	23.1	2
	2006	28	25,001	9	11,092	44.4	6	5,679	22.7	5	7,115	28.5	2
	2007	25	18,069	9	6,757	37.4	5	1,998	11.1	6	5,095	28.2	2
	2008	19	15,497	4	2,239	14.4	3	*	*	1	*	*	2
	2009	22	14,674	6	2,904	19.8	4	*	*	3	*	*	1
	2010	26	28,593	6	6,998	24.5	4	*	*	2	*	*	2

Sources: NMFS Catch Accounting; RAM permit data.
Note: crab vessel catches are withheld for confidentiality.
* withheld for confidentiality.
** includes members of any of the three cooperative programs

Under the cooperative program, 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.

Lastly, cooperatives would be prohibited from adopting any measures beyond those specifically authorized and are specifically prohibited from adopting any allocations (including allocations of portions of the total allowable catch or Chinook salmon PSC limit). Cooperatives also cannot disadvantage any member for not having an established Chinook salmon PSC history in the fishery. The following discussion reviews each of the required and permitted cooperative measures.

One of the primary concerns in addressing Chinook salmon bycatch in the Gulf is the absence of information concerning the timing and location of Chinook salmon bycatch. To address this shortcoming a cooperative would be required to administer a **system to gather Chinook salmon bycatch information and share it among members**. This information sharing is likely to be critical to improved Chinook salmon avoidance, as participants in the fishery have little information concerning the timing and location of Chinook salmon bycatch currently. In the absence of this communication and coordination of fishing effort, each vessel might rely on its own fishing to assess salmon bycatch at different times and locations (i.e., trial and error by each vessel). Since one of the primary benefits to be derived from cooperatives is communication and coordination of the fleet, allowing only a few cooperatives to form may be critical to achieving that goal. If formation rules are too liberal, allowing the many cooperatives to form, it is possible that effort will be too disbursed among cooperatives for the information benefits to be achieved. Each cooperative would have information from only a few participating vessels with no broader understanding of the distribution of Chinook salmon bycatch in the fishery. The cooperative formation rule (requiring a substantial percentage of the preceding year's participants) seems to strike a reasonable balance between the need for a substantial number of vessels for information sharing and allowing for some choice of cooperatives.

Once formed, cooperatives will be challenged to develop means for producing reliable and timely estimates of Chinook salmon bycatch. One of the difficulties facing this fleet, which includes relatively small catcher vessels, is the absence of deck space and time to sort catch adequately to determine the extent of salmon bycatch in a tow. If a vessel's bycatch is not recorded until after a delivery is made, it may not be possible for the cooperative to direct vessels away from areas of relatively high Chinook salmon bycatch. The process of developing reliable estimates of Chinook salmon bycatch will likely prove challenging and may require cooperatives to use scouting trips, sending a few vessels out to for minimal tows to determine the extent of bycatch in different areas. Over time, cooperatives may develop methods of sampling catches to supplement information gained in census of catches at offload. Use of a cooperative structure for developing these estimates is particularly appealing, as a cooperative can quickly respond to new information, including changing methods of estimation inseason, if a method appears to be particularly accurate or inaccurate. The cooperative can experiment with new methods of estimating Chinook salmon bycatch and could provide incentives for the development of more accurate estimates. Although cooperatives are likely to be challenged by the need to determine the distribution of Chinook salmon bycatch, their flexibility makes them uniquely suited to that task.

Cooperatives are also well positioned to distribute bycatch information among members. In both Bering Sea and Gulf of Alaska cooperatives have developed systems for communicating with their fleets to oversee harvests and gather and distribute current information concerning fishing conditions and the status of fisheries to ensure that members' fishing effort is deployed in the appropriate scales and locations. The voluntary rolling hotspot program in the Bering Sea pollock pollock fishery establishes a system of information collection and distribution similar to that proposed by this action. The voluntary rolling hotspot program provides real-time salmon bycatch information so that the fleet can avoid areas of high chum or Chinook salmon bycatch. A similar system of communication can be replicated in the GOA pollock fisheries to respond to Chinook salmon bycatch.

Current regulations prohibit a vessel from retaining any salmon (see 50 CFR 679.21). While this prohibition is intended to remove any incentive to harvest salmon, the regulation has the unintended effect of limiting information concerning salmon bycatch. If full retention of salmon is anticipated and/or required by the cooperative, the agency recognizes a need to amend this prohibition, as was done to facilitate the data collection of Amendment 91. Several industry members have commented that the practical difficult of promptly discarding all salmon should be recognized in the regulations and potentially encouraged to enable observer census and sampling. To allow for more complete information concerning Chinook salmon bycatch, an element of this alternative is the **removal of the prohibition on the retention of salmon** by trawl vessels. This, in tandem with **a cooperative requirement that all salmon be retained**, would substantially increase information concerning amounts and locations of Chinook salmon bycatch in the fisheries.

Having the retention requirement administered by cooperatives allows greater flexibility in implementation and oversight than a requirement administered by NMFS. Under its current rules, NMFS would require 100 percent observer coverage for the administration of a full retention requirement. Development of any alternative monitoring scheme that would be used for management of the fisheries would require additional research and testing of that monitoring. Since cooperatives monitoring is administered for gaining additional information concerning salmon bycatch (rather than fishery management), alternative methods of monitoring (which might include video monitoring or comparisons of Chinook salmon rates across observed and unobserved vessels) could be administered with less comprehensive study.[16]

The cooperative Chinook salmon retention requirement would serve a variety of purposes including: 1) aiding cooperatives in developing improved information concerning the distribution of Chinook salmon on the grounds and Chinook salmon avoidance, 2) allowing for biological sampling to improve information concerning the effects of bycatch on salmon stocks, 3) allowing census counts of Chinook salmon bycatch on observed vessels to improve estimates of and accounting for Chinook salmon bycatch in the fisheries, and 4) encouraging development of a food bank donation program for bycaught salmon in the GOA. Currently, the food bank donation program administered by SeaState is not active in GOA fisheries.

As discussed in Section 4.3.3 of this analysis, we have reliable documentation of the presence of some Chinook salmon stocks in the bycatch, through coded wire tag recoveries, however we do not have sufficient information to establish the relative abundance of stocks in the bycatch, nor to estimate the number harvested from any one stock as bycatch. Since 1995, coded wire tags of Chinook salmon recovered in the GOA groundfish fisheries have originated from British Columbia, Alaska, Oregon, Washington, and Idaho. Removing the salmon discard requirement and having cooperatives require full retention could provide the basis for improved sampling and study of the effects of bycatch in Gulf pollock fisheries on Chinook salmon stocks.

Cooperatives would also be required to develop **a system of identifying Chinook salmon hotspots and limiting fishing in those areas**. Such a system could be patterned to some degree after the intercooperative rolling hotspot program in the Bering Sea pollock fishery. Under that system, cooperatives are assigned to certain bycatch tiers, based on their members' bycatch rates. Tier assignments are updated weekly. Tier differentiated closures are implemented based on collected bycatch information, with cooperatives with poorer tier rankings prohibited from fishing in larger and more areas. Monitoring and enforcement are carried out through the cooperative. Regulations require the agreement to

[16] It should be noted that Chinook salmon bycatch from unobserved vessels would not be used for fishery management, as those the retention would not meet minimum regulatory oversight requirements. Only if a future monitoring system that supports a rention requirement without 100 percent observer coverage would Chinook salmon bycatch on unobserved vessels be used for fishery management. Information from unobserved vessels, however, would be useful for understanding the distribution of Chinook salmon in the Gulf of Alaska and the effects of Chinook salmon bycatch on various Chinook salmon stocks.

describe measures taken to monitor salmon bycatch and redirect fishing effort away from areas in which salmon bycatch rates are relatively high. The cooperative agreement must also include enforcement measures. The intercooperative data manager monitors salmon bycatch in the pollock fisheries and announces area closures based on relative salmon bycatch rates.

In the Gulf fisheries, bycatch control cooperatives could institute a similar system of closures. The ability of the cooperative to effectively administer such a system will depend on the ability of cooperative managers to collect timely and accurate Chinook salmon bycatch information. Given the difficulty of estimating bycatch by sampling catch during a trip, at the outset of the program, it is possible that the cooperatives will need to use a limited number of observed trips to gauge bycatch in the fishery. Once high bycatch areas are identified, all vessels may be restricted from fishing in those areas. If cooperatives develop the capacity to accurately estimate bycatch during a trip, it is possible the cooperative could develop a system in which vessels report bycatch during trips and vessels are redirected away from hotspots on an ongoing basis.

At the outset, it is unlikely that a system of tiering of vessels, under which those with high bycatch are subject to more and broader area restrictions will be implemented. The fairness of such a system would likely be somewhat arbitrary and unacceptable to the fleet until data can be gathered that demonstrate an ability in vessels to influence differential bycatch rates. If individual vessels demonstrate an ability (or inability) to avoid bycatch, it is possible that such a system could be developed. Gear modifications and excluders could prove to create such ability in the future. In the meantime, a hotspot closure program is likely to consist of recording of bycatch rates by area, with closures of or limits on fishing in areas of high bycatch, which apply to all vessels equally.

In addition to required measures to control Chinook salmon bycatch, cooperatives would also be permitted to adopt measures to promote **gear innovations and fishing practices** that contribute to Chinook salmon avoidance. These measures could include programs to develop and improve salmon excluders or limitations on fishing during certain times of day or at certain depths. These measures are likely to be developed through the experimentation, reporting, and analysis of performance of various fishing practices. As knowledge of the effects of these practices improves, cooperatives would be expected to incorporate effective measures into their agreements through incentives and requirements.

Cooperatives may also choose to adopt **vessel performance standards** that create individual incentives for Chinook salmon avoidance. These systems could include rewards or penalties based on a vessel's bycatch performance. These programs are likely not mandated, as participants currently have little information concerning individually implemented measures to effectively avoid Chinook salmon. As participants gain better information concerning means of avoiding Chinook, it may be expected that performance standards (including incentives and penalties) could be incorporated into cooperative agreements. These measures could take a variety of forms. A tiering system could be implemented that allows participants with lower bycatch performance to fish in broader areas during certain times. Simple reporting requirements could be implemented that discloses bycatch performance within the fleet could also create a social incentive for improved bycatch control.[17]

Cooperative agreements must also define **contractual penalties** to motivate members to comply with the cooperative agreement. A range of penalties could be considered by a cooperative include required standdowns, financial penalties, or even simple reprimands. In each case, the penalty should be commensurate with the violation. Minor violations, such as untimely reports, might be subject to a minor sanction. More significant violations, such as intentionally disregarding limits on fishing in a closure area,

[17] Cooperatives will need to take care in fashioning these individual incentives to avoid disadvantaging entrants with little or no bycatch history in the fishery.

may be subject to more substantial sanctions, such as standdowns. Penalties should be structured to achieve compliance, but must also be meted out in proportion to the seriousness of the violation[18].

Cooperatives would also be required to have a **monitoring program** to ensure compliance with cooperative agreements. While this discussion suggests a variety of methods of overseeing cooperative members, it is likely that, over time, cooperatives will adapt their monitoring based on their experiences, costs, and the circumstances of the fleet. Verification with the full retention requirement could be accomplished through several measures that may be implemented contemporaneously across the fleet depending on the differing arrangements on each vessel. These could include observers, video monitoring, crew verification, and comparison of bycatch rates across observed and unobserved vessels. The cooperative will also be required to monitor gear use and fishing practices, both to verify compliance with any cooperative requirements and to assess the effects of those factors on Chinook salmon bycatch. These requirements could be monitored through observer reports, catch reports, vessel operator reporting requirements, vessel monitoring systems, video monitoring, and vessel and gear inspections. Vessel performance standards would likely use similar monitoring systems. Any monitoring program should be tailored to its specific use. General monitoring to oversee cooperative Chinook salmon bycatch performance would need to be structured to gain insights into bycatch rates relative to changes in time, location, and fishing practices. This oversight will need to be structured to capture these general trends. If the monitoring is designed to evaluate individual vessel performance (which might be subject to a reward or penalty) a more rigorous monitoring program (capable of providing information sufficient to justify rewards or penalties) may be necessary[19].

At the end of each season, each cooperative would be required to submit an **annual report** to the Council. This annual reporting requirement should allow the Council to assess the effectiveness of the cooperative program and ensure that cooperatives are developing the bycatch control capacity, as intended. The report would be required to document all cooperative requirements, as well as any of the optional cooperative measures. The system for ensuring salmon retention would need to be described, along with the use of that system to estimate bycatch. Gear innovations and fishing practices adopted through the cooperative agreement would need to be described, along with the performance of the measures. Any rewards or penalties related to vessel performance and penalties for violation of the cooperative agreement are also required to be included in the report. The report should also describe the means by which the various measures serve a Chinook salmon bycatch control purpose while preserving a fair fishing opportunity to all participants.

Cooperatives are also subject to a **prohibition on making allocations** of either portions of the total allowable catch or portions of any Chinook salmon PSC cap. This limitation is important to maintaining the agency's management control over the fishery, as development of a cooperative membership requirement with limited opportunity to form a cooperative, while allowing cooperatives to make allocations might be construed as effectively delegating control of the fishery to cooperatives.

Since the cooperative formation rules would permit multiple cooperatives to form in each regulatory area, this alternative provides for an **intercooperative agreement** to ensure that each cooperative is able to pursue Chinook salmon bycatch control measures without sacrificing its opportunity in the fishery. Cooperatives are likely to use temporal fishing constraints to avoid Chinook salmon. For example, a large majority of a cooperative's fleet may standdown, while a few vessels scout certain areas of the grounds to determine whether Chinook salmon bycatch rates are acceptably low. Alternatively, using information

[18] Penalties included in a cooperative contract would likely be subject to notice and hearing requirements applicable to NMFS under the Magnuson-Stevens Act and the Administrative Procedures Act. A more complete discussion of this issue and its consequences is contained in the next section.
[19] Any reporting requirement would need to be structured to adequately protect the confidentiality of information. A more complete discussion of this issue is contained Section 3.11.3.

gathered from its fleet, a cooperative may choose not to fish at certain times, either delaying or suspending fishing on certain days (or at certain times of day). For these temporal measures to be effective, a cooperative must be able to suspend fishing for a period of time, without its members sacrificing a substantial portion of their catch from the fishery. Examining data from recent years, however, show that season have been relatively short (see Table 54) and further suggests that fishing occurs over brief periods within some seasons (see Table 55) after a fleet has elected to standdown. In the recent years, some seasons have been as short as a single day. Although other seasons have been substantially longer, season lengths alone may not reflect the effort level in the fisheries.

Table 54 Gulf of Alaska pollock seasons (2010).

Area	Season	Opening	Closing	Reason
610 (WG)	A	January 20	February 27	TAC
	B	March 20	April 12	
	C	August 20	September 10	
	D	October 1	October 9	
		October 14	October 17	
620 (CG)	A	January 20	February 25	
	B	March 10	March 16	
	C	August 25	September 7	
	D	October 1	October 6	
630 (CG)	A	January 20	February 5	
		February 28	March 2	
	B	March 10	March 10	
		March 22	March 25	
	C	August 25	August 27	
		September 18	September 19	
	D	October 1	October 2	
		October 15	October 18	

Source: NMFS Inseason management reports

Catch data in the fisheries show that fishing takes place over more than 10 weeks each year in each management area (i.e., 610, 620, and 630). Yet, the weekly catches frequently exceed one-half of the seasonal catch. Specifically, in areas 610 and 620, more than three times a year, on average, half of a season’s catch taken in a single reporting week. In area 630, slightly less than 3 times a year, on average, half of a season’s catch is taken in a single reporting week.

Table 55 Weeks of fishing, the number of weeks when vessels catches exceeded one-half or one-third of the average seasonal catch (2003-2010).

Area	Year	Weeks of fishing	Number of weeks one-half of the average seasonal catch	Number of weeks one-third of the average seasonal catch	Number of weeks with more than half of participating vessels
610	2003	7	3	3	3
	2004	8	4	5	6
	2005	8	4	5	7
	2006	15	2	5	6
	2007	17	3	4	2
	2008	13	3	4	6
	2009	7	5	5	5
	2010	18	2	3	8
620	2003	11	3	5	3
	2004	15	2	3	2
	2005	16	3	5	5
	2006	17	3	5	4
	2007	14	3	3	3
	2008	13	4	4	4
	2009	10	3	3	3
	2010	10	4	6	6
630	2003	11	3	4	3
	2004	14	3	4	4
	2005	13	3	5	4
	2006	18	2	5	6
	2007	14	1	5	3
	2008	7	4	5	4
	2009	4	2	2	2
	2010	11	4	4	4

Source: NMFS Catch Accounting.

The occurrence of these high weekly catches, despite the season being open substantially longer, likely reflects the fleet's willingness to make arrangements to limit fishing effort. These agreements may serve a few purposes. In some cases, standdowns may be used to ensure that roe conditions are acceptable in the fishery or to allow participants to fish in other fisheries prior to fishing for pollock. Management needs have also driven some agreements to limit effort. The catching power of the fleet (relative to the available total allowable catches) has complicated in-season management, as those total allowable catches could be quickly exceeded. Managers have carefully monitored catch inseason, at times, announcing brief openings of a day or two, to prevent total allowable catch overages. Managers often communicate with participants concerning the timing of their efforts.

The high catch rates in the fisheries raise concerns with any multiple cooperative system that attempts to derive Chinook salmon PSC reductions through actions affecting the timing of fishing effort. For example, if two cooperatives are permitted to form and one cooperative attempts to reduce Chinook salmon bycatch by delaying fishing (while the other does not) it might be possible for early starting cooperative's efforts to substantially reduce the portion of the total allowable catch available to the cooperative that delays fishing. To address this concern, if multiple cooperatives are formed in a regulatory area, an intercooperative agreement would be required. The intercooperative agreement would be intended to ensure that a cooperative's decision to pursue Chinook salmon avoidance through changing the timing of its fishing does not forsake a fair fishing opportunity for its members. An intercooperative agreement could be negotiated to time fishing in a manner that does not disadvantage either cooperative or provide for a compensatory mechanism, if one cooperative's choice of timing unfairly disadvantages the other.

Requiring all cooperatives to be part of an intercooperative agreement would be preferred to requiring all participants to be part of a single cooperative, as an intercooperative would be more limited in its terms. Rather than requiring all participants to join a single association (which could be interpreted as imposing associations on some participants), an intercooperative would allow most terms to be defined by the cooperative with the intercooperative only defining those terms that ensure that no cooperative has an unfair advantage in the fishery that could arise from differences in measures to address Chinook salmon bycatch. This separation would allow participants more choice of associations and specific fishing terms through the cooperatives, at the same time using the intercooperative to ensure that no cooperative's internal measures to reduce Chinook salmon PSC creates an unfair advantage or disadvantage.

In addition to annual cooperative reporting, in the event multiple cooperatives form, an **intercooperative report** would be required. Such a report could describe any terms of the intercooperative agreement, any measures implemented under those terms and their effects. As with cooperative reports, the intercooperative report could also be required to describe how each measure served the objective of addressing Chinook salmon PSC, while ensuring participants have a fair fishing opportunity.

3.11.1 Potential effects of fishing in parallel waters

Although the mandatory cooperative structure (including the required intercooperative agreement) proposed by this alternative may prevent any federally licensed vessel from disrupting cooperative efforts to control bycatch through measures that slow the rate of harvests, it may be possible for vessels that fish exclusively in parallel waters (inside 3 nm) to participate in the fishery without joining a cooperative. Historically, a substantial portion of the catches from the fisheries are from State waters (see Table 56). In most recent years, over 50 percent of the Western Gulf catches are from State waters, while over 25 percent of catches in the Central Gulf are from State waters. Although few vessels have fished without LLP licenses in recent years, in some years a substantial portion of the fleet has fished exclusively in State waters, accounting for a significant share of the total catch. If these vessels are able to circumvent the requirement to join a cooperative by fishing exclusive in State waters, it is possible that the incentive for cooperative's to institute Chinoook bycatch control measures that slow the rate of catch or delay fishing could be dramatically reduced. If a cooperative were to attempt to delay or slow fishing, vessels fishing in the parallel fishery that do not adopt measures that delay or slow catches could increase their share of the total catch. Therefore it could substantially undermine the ability of a mandatory cooperative to limit Chinook salmon bycatch in federal waters if the mandatory cooperative requirement does not apply to federally permitted vessels that fish for pollock in state waters.

Table 56 Catches from State waters by area (2003-2010).

Management subarea	Year	Fishery totals		Vessels fishing only in State waters (i.e., parallel fishery only)			State waters catch (i.e., catch from all vessels in the parallel fishery)		Vessels fishing without an LLP license
					Catch				
		Vessels	Catch	Vessels	in metric tons	as percentage of total	in metric tons	as percentage of total	
Central Gulf	2003	49	32,416	4	239	0.7	7,804	24.1	1
	2004	53	40,363	5	496	1.2	14,830	36.7	1
	2005	47	50,089	4	165	0.3	12,179	24.3	0
	2006	45	48,335	2	*	*	13,907	28.8	0
	2007	38	34,973	2	*	*	9,163	26.2	0
	2008	44	33,336	2	*	*	10,900	32.7	0
	2009	40	24,070	2	*	*	8,745	36.3	0
	2010	41	45,782	0	0	0.0	10,943	23.9	0
Western Gulf	2003	31	16,299	13	4,786	29.4	9,155	56.2	2
	2004	25	23,420	8	6,269	26.8	14,127	60.3	0
	2005	28	31,282	4	2,076	6.6	15,334	49.0	1
	2006	28	25,001	14	6,723	26.9	15,482	61.9	0
	2007	25	18,069	10	2,885	16.0	9,509	52.6	0
	2008	19	15,497	3	197	1.3	5,373	34.7	0
	2009	22	14,674	5	2,325	15.8	9,960	67.9	0
	2010	26	28,593	2	*	*	16,493	57.7	0

Sources: NMFS Catch Accounting; RAM permit data.
* withheld for confidentiality.

Existing regulations, together with the structuring of this action could be used to deter this opportunistic fishing. By attaching the cooperative requirement to federal permits, the requirement can be applied to all vessels that wish to maintain their authority to fish in federal waters under those permits. For example, **all holders of federal fishing permits (FFPs) that fish in the Central GOA pollock fishery or Western GOA pollock fishery in parallel waters could be required to 1) have the appropriate LLP endorsement for the applicable area and gear type to authorize participation in that pollock fishery, 2) endorse their federal fisheries permit for the fishery, and 3) be a member of a salmon bycatch control cooperative.** Under such a requirement only persons without a federal fisheries permit could avoid the cooperative requirement. In addition, the potential for a person active in federal fisheries to fish without a federal fisheries permit is limited by previous Council actions. Specifically, as a part of its action creating the GOA Pacific cod sector split, the Council limited the ability of persons to surrender and reactivate their federal fisheries permits, to limit the potential of persons to circumvent federal permit requirements in that fishery. Specifically, the Council included a provision that a person who has a federal fisheries permit endorsed for trawl fishing in the GOA would be permitted to surrender or reactivate the permit once every three years. This limitation would prevent a person from surrendering the federal fisheries permit to avoid the imposition of federal measures while fishing in parallel waters. Since the limitation applies generally to vessels permitted to fish in federal GOA trawl fisheries, the limitation applies to vessels that wish to participate in the Central Gulf pollock fishery or the Western Gulf pollock fishery.

The requirement suggested here would not prevent a vessel that fishes exclusively in the parallel fisheries from entering a Gulf pollock fishery without joining a cooperative. The action, however, would severely constrain any vessel that fishes in federal waters (for which a federal fisheries permit is required) from surrendering its federal permits to avoid the cooperative membership requirement of this alternative.

3.11.2 Effects of the alternative on fleets and participants

Although the effects of the alternative are likely to vary across the two management areas (Central Gulf and Western Gulf), particularly in the first few years of the program, some generalizations apply. The first effect will be the need for fleet members to develop the required cooperative associations and agreements. These contracts are likely unfamiliar to a portion of the fleet in each area (particularly in the Western Gulf, where a majority of the fleet appears to have no cooperative fishing experience). The negotiation of agreements could be difficult, particularly for those fleet members that have no experience with these types of fishing arrangements. The ability to reach agreement should be aided by past fishing arrangements that have been made in both areas. In both the Central Gulf and Western Gulf participants have recently to reach agreements to limit efforts to change the timing or rate of fishing effort. The ability of these fleets to make these arrangements suggests that cooperative requirements may be surmountable, but the arrangements could be contentious in some cases, particularly in the first year or two after implementation.

Most notably, increased fleet coordination of harvests and harvest practices will occur, as the cooperatives require new increased communication concerning Chinook salmon bycatch and coordinate effort to limit that bycatch. This coordination will have some similarities to that achieved through the Central Gulf rockfish cooperatives, which include many pollock participants. Rockfish cooperatives have a particular focus on halibut PSC, as each receives an allocation and unused PSC is available to the trawl fleet generally after the rockfish season. Although there are similarities to the rockfish cooperatives, the cooperatives created by this alternative have a slightly different focus. The salmon bycatch control cooperatives receive no allocations. With no allocation of target species, cooperatives (and their members) will continue to participate in a race for pollock, constrained only by the measures intended to address Chinook salmon bycatch. The absence of cooperative allocations of bycatch also limit the focus of cooperative bycatch control measures. Measures will generally be limited to modifying members' effort to limit Chinook salmon PSC usage, as opposed to putting direct limits on members' Chinook salmon PSC usage.[20]

At least at the outset of the program, cooperatives are likely to use the reporting requirements to identify times and locations of relatively high (and low) Chinook salmon bycatch. Depending on the cooperative agreements, the pace of fishing could be slowed by these reporting requirements and responses to reported information. At the beginning of a season, it is possible that only a few vessels will fish, taking relatively small tows to determine the extent of Chinook salmon bycatch that may be expected in different areas. If adopted, this practice might delay the start of fishing for some vessels. Inseason, it is possible that fishing could be slowed, if cooperative members are required to sample catches or estimate salmon bycatch. Although most members of the fleet believe that limited opportunity for sampling onboard will exist due to deck space limitations, it is possible that some routine means of counting or estimating salmon bycatch, either while at sea or at the time of landing, could be adopted that results in some slowing of effort in the fishery.

In response to information received through either early season test tows or inseason bycatch reports, effort may be deployed in different locations (i.e., away from identified hotspots), becoming more

[20] Although some performance standards might be applied within the cooperatives to create individual incentives to limit bycatch, those measures are unlikely to be adopted initially, as knowledge of the causes of Chinook salmon bycatch and the means of avoiding that bycatch is limited.

concentrated in areas that experienced lower Chinook salmon bycatch and decreased (or perhaps eliminated altogether) in areas of higher bycatch. This redistribution of effort in the fishery is another expected effect of this alternative. The extent of any redistribution is difficult to predict and will depend not only on the distribution of Chinook salmon bycatch on the fishing grounds, but also the participants' estimates of Chinook salmon bycatch rates. These estimates may (or may not) be accurate and accuracy could change over time, as participants gain experience with various methods of estimating bycatch. In addition, methods of estimating bycatch and the timing of reporting estimates may change. For example, if no on-deck estimate of bycatch is sufficiently accurate when the alternative is implemented, it is possible that reports from salmon counts on delivery will be used to estimate the distribution of Chinook salmon bycatch in the fishery. Use of these estimates to redirect effort would be delayed from the time of the tow until the time that the information is reported and processed. Given the rate of harvest of the total allowable catch in the current fisheries, it is possible that these later estimates may not be timely for redirecting effort in the fishery. In this case, it is possible that test tows may be the only effective means of determining Chinook salmon bycatch hotspots in the fisheries.

Some cooperatives may promote gear modifications and other changes in fishing practices to control Chinook salmon bycatch. Early in the program members of these cooperatives may be provided with additional fishing opportunities for their willingness to experiment with additional Chinook salmon bycatch control measures. Over time, it is possible that these cooperatives may require use of modified gear or impose limits on fishing (such as time of day limits to address Chinook salmon bycatch). These changes will be driven by the specific cooperative agreements negotiated by the parties. As with other aspects of the cooperative agreements, provisions concerning gear modifications and fishing practices are likely to change over time, as experience is gained with different fishing technologies and methods.

The alternative will also require cooperatives to include a provision in their agreements for full retention of salmon by all member vessels. This requirement, in and of itself, will have little effect on participants. Few (if any) participants currently comply with the current discard requirement because of the safety and logistical challenges associated with sorting catch on deck and discarding salmon. Recognizing these challenges, NMFS has de-prioritized enforcement of the discard requirement. For those that do attempt to discard salmon, the removal of that requirement will simplify their operations and reduce regulatory confusion. Consequently, establishing a full retention requirement for cooperative members should have little effect on the fleet.

Overall, the effect of this alternative on fishing operations will be to bring added attention to Chinook salmon bycatch. Under the status quo, participants in the pollock fishery only social pressures create an incentive for avoidance of Chinook salmon PSC. Although cooperatives may require time to develop capacity to avoid Chinook salmon bycatch, the cooperative requirement should ensure that increasing attention is given to Chinook salmon avoidance by participants in the fishery. Most importantly, this alternative should ensure that Chinook salmon bycatch is a consideration at all times for all participants, as compared to the status quo or the alternative creating a single annual cap for each management area. Since the pollock fishery is prosecuted over four seasons, it is possible that some participants in the early seasons (when the catches are of the greatest value because of roe and the annual cap is least likely to bind) may give little attention to Chinook salmon bycatch. Participants who do not intend to participate in the later seasons may, in fact, completely disregard Chinook salmon bycatch, if they do not perceive a potential for the cap to be reached in the early seasons. Requiring these participants to join cooperatives should ensure some level of attention to Chinook salmon bycatch and may be fairer to the participants that depend on the fishery during the later seasons, who could suffer, if the fishery closes later in the year, in part, due to bycatch in the early seasons.

Cooperatives will also be required to develop monitoring programs to ensure that members comply with their agreements. These monitoring and oversight programs will require vessel operators to monitor the retention requirement, use of gear modifications and fishing practices intended to control bycatch (if advanced by a cooperative), bycatch reporting, and hotspot compliance. These requirements are also likely to evolve, as cooperatives gain experience with bycatch measures and monitoring compliance with those measures. It is possible that the initial monitoring programs will use observer reports, vessel reporting, vessel monitoring systems, and comparisons of catch and bycatch rates across observed and unobserved vessels to assess compliance with most cooperative measures. These lower costs monitoring requirements may give way to more direct monitoring using video monitoring, as those technologies are developed for the fishery in the future.

Cooperatives are likely to need to contract a manager for various cooperative functions. The cooperative manager would oversee implementation and administration of the cooperative contract, most importantly collecting information from the fleet, processing that information, and distributing the information to the fleet. The manager may also serve administrative functions, including developing cooperative reports, coordinating the cooperative's board of directors for the consideration of decisions (such as penalties or rewards) in accordance with the agreement. These administrative functions are likely to require a cooperative manager, who is able to process information during fishing seasons.

Added costs of this alternative fall into a few specific categories. Contracting costs (including the services of an attorney) and cooperative management costs will also be incurred in the development of cooperative agreements each year. These costs are likely to be highest in the first year or two of the program, when the majority of the terms of cooperative agreements are being defined. Within a year or two these terms are likely to become fairly well settled, with substantial modifications occurring only when dictated by experiences in the fishery or the development of new technologies. For example, if cooperatives find certain gear modifications to be effective for Chinook salmon avoidance, they could require such modifications in the cooperative contract. More generally, a year of relatively high Chinook salmon bycatch could lead a cooperative to modify its rules (and cooperative contract) in an attempt to make its bycatch efforts more effective. Cooperative management costs will also be incurred, likely through a cooperative manager hired to oversee administration of the cooperative agreement and to complete cooperative reports.

Operational costs could increase through efforts to avoid Chinook salmon. These costs will be incurred through any system for test tows to locate grounds with acceptably low bycatch rates, gear modifications and other changes in fishing practices that decrease catch per unit effort or limit gear deployments (such as limits on fishing during certain times of day). To the extent that vessels delay starting fishing, time costs could be incurred (to the extent that vessels are unable to shift effort to other fisheries). In addition, costs could be increased, if vessels need to travel further from port to reach fishing grounds with lower Chinook salmon bycatch rates. The effects of these factors are uncertain, as the distribution of Chinook salmon on the grounds during the fishery is not well understood. In addition a cooperative will also need to incur costs associated with monitoring. These costs will vary with choices of monitoring. Cooperatives are likely to attempt to keep monitoring costs down, while maintaining monitoring at a level needed to ensure fairness.

The effect of this alternative on processors will likely be minimal, but may significant at times. To the extent that cooperatives organize harvest activity and deliveries in a predictable manner, processors are likely to benefit from the cooperative structure. Any precise scheduling of fishing activities and deliveries may help processors achieve production efficiencies through scaling operations appropriately and better planning of crew assignments. On the other hand, to the extent that cooperatives redirect fishing activity and deliveries or suspend fishing on short or little notice, processor operations could be disrupted. These disruptions may be most significant for processors with less diverse operations (or fewer other activities to redirect their crews toward during down times). In most cases, processors attempt to keep crews active and employed. All of the processors in these fisheries are multispecies plants, so they all may have some opportunities to shift crew among activities. The ability to move crews to other activities will vary seasonally. For example, in the A season plants are often active with deliveries from Pacific cod and pollock fisheries, and may be able to shift crew to Pacific cod deliveries, if a cooperative slows or suspends its pollock fishing. In the D season, with less variety of deliveries a processor may have very few alternative activities for crew, if pollock fishing is suspended or slowed by a cooperative. The effects also may vary across processors and communities. Processors in King Cove and Sand Point who receive most of the deliveries from the Western Gulf tend to have larger numbers of non-resident employees. These plants may have a greater cost from maintaining employees at their plants for an extended period, if the pollock fishery is delayed. Although Kodiak plants will attempt to keep their workforce employed and active, those plants have fewer expenses associated with housing and feeding employees. Processors that use tenders for deliveries, in particular, could see additional costs arise from any suspension of fishing that would also suspend tender operations (or slows fishing to an extent that fewer tenders may be needed in the fishery than anticipated).

Processors could also be affected, in a very minor way, through the implementation of a system to count or sample salmon. Although these systems are implemented in several fisheries, they could have a minor effect on processing rates, as processors must accommodate these efforts. This effect is expected to be very small.

Information on Chinook salmon stocks is described in more detail in Section 4.3.5. The impact of reducing Chinook salmon bycatch in the Gulf pollock fisheries on Chinook salmon stocks will depend on the stocks of origin of the bycatch. Reducing bycatch of stocks listed and threatened or endangered will have a greater impact than reducing the bycatch of hatchery released fish. However, until additional information is available conclusions cannot be made for specific stocks.

3.11.3 Concerns about administering the mandatory cooperatives

NMFS has raised concerns that the cooperative alternative (including approval of annual cooperative contracts and any penalties for violation of the cooperative agreement) must be administered in a manner that maintains NMFS’ management authority over the fishery. Whether cooperatives would be able to serve their intended purpose, while maintaining a level of oversight that maintains that authority is uncertain. This concern is specific to this action because of the mandatory nature of the cooperatives proposed (i.e., the alternative requires cooperative membership to participate in the fishery). 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 alternative (as currently defined), no opportunity to fish outside of a cooperative would be permitted. As such, the cooperative structure would need to be defined and implemented such that NMFS defines the cooperative rules and the implements of those rules under its management authority over the fisheries.

Two aspects of the cooperative, in particular, raise this concern. First, annual contract approval would require that NMFS review the contract making an independent assessment of whether 1) those measures proposed are permitted measures (as defined by the cooperative alternative) and, 2) those measures serve the intended bycatch control purpose, to the extent that the cooperative is provided latitude to define specific rules to serve that purpose. For example, if a cooperative establishes criteria for identifying a Chinook salmon hotspot, those criteria would need to be approved by NMFS. 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. While some cooperatives might choose to work with the agency in developing their contract, to prevent a possible delay in contract approval, delays could occur despite those efforts. These determinations could also be delayed, if some persons wishing to participate in the fishery contest certain provisions in the cooperative contract to the agency. Timely cooperative formation would be imperative in a fishery that requires cooperative membership for participation.

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 most likely apply to most standdown and financial penalties. The benefits that arise from a cooperative system for addressing Chinook salmon bycatch are dependent on the flexibility to respond quickly to information. For example, suspensions of fishing in a hotspot would need to happen as soon as the hotspot is identified. To achieve this flexibility cooperatives rely on the threat of penalties that may be efficiently and predictably administered. Imposition of penalties that require compliance with NMFS administrative processes are likely to be delayed. These delays may make time sensitive penalties (such as standdowns) wholly ineffective.[21] Monitoring by the cooperative might also need to comply with NMFS' standards for penalties to be enforceable. In addition, cooperative penalties may not be consistent with NMFS' penalties, adding substantial uncertainty concerning the consequences of failing to comply with a cooperative measure. Whether the benefits of a cooperative program could be achieved, given these requirements and uncertainties concerning the administration of the cooperative contract is questionable.

An additional concern arises from a mandatory reporting of catch data within cooperatives. Any such reporting requirement would need to comport with data confidentiality constraints. Whether confidentiality requirements could be satisfied requires additional consideration. Determining the prevalence of Chinook salmon bycatch will require vessel level catch data (including both pollock catches and Chinook salmon catches). 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.

A few alternative management approaches might be suggested to the cooperative structure proposed in this alternative. The simplest approach would be to allow participants in the fishery complete discretion concerning private arrangements to be undertaken to control Chinook salmon bycatch. The Council would take no regulatory action to facilitate these arrangements, but such arrangements may arise, if fishery participants perceive a need to address Chinook salmon bycatch due to either social pressures or the potential constraint of a PSC limit, in the event the Council elects to adopt such a limit under Alternative 2. Since these arrangements would be wholly voluntary, they would not be subject to regulatory approval. The primary downside of these arrangements is that persons who choose not to enter the arrangement may derive an advantage in the fishery, which could create a disincentive for the formation of or participation in the arrangements.

Alternatively, the Council could develop a simplified structure for a system of mandatory cooperatives. Such a structure could explicitly establish cooperative measures, thereby limiting the potential that approval of a cooperative contract would be delayed beyond a fishery opening. The difficulty in such an cooperative structure would be defining the provisions for inclusion in the cooperative contract. At a minimum, the cooperatives might collect data concerning the distribution of Chinook salmon bycatch in the fishery. Other measures, such as processing those data to define hotspots (which could be used to inform participants concerning the distribution of Chinook salmon bycatch in the fishery) could be considered. While such an alternative might be considered, data confidentiality protections would need to be maintained, for such an alternative to be implemented. The means of maintaining those protections will need additional consideration, if such an alternative is advanced.

[21] Tiering of vessels might also be subject to notice and hearing requirements, as differential treatment of permit holders could be construed as a penalty.

Additionally, the Council could reconsider cooperative structures that provide a limited access opportunity to persons who elect not to join a cooperative. The challenge in creating such a structure would be to allow cooperatives to advance measures to control Chinook bycatch while still providing a reasonable fishing opportunity in the limited access fishery. To provide cooperatives an opportunity to assess Chinook salmon bycatch, a variety of structures could be considered, but given the lack of good information concerning Chinook salmon bycatch in the Gulf fisheries, it would be difficult to assess the merits of any structure. [22]

3.12 Interactions of Alternative 2 and Alternative 3

In the event that the Council elects to adopt both the cap alternative and the cooperative alternative, the effects will be largely those described under those two individual alternatives. A few factors should be considered in assessing combined effects of the two alternatives and their interaction.

The two alternatives motivate Chinook salmon avoidance in different ways. The cap alternative would constrain fishing, in the event the cap would be exceeded. In general, fishing behavior will be affected by the cap, when participants believe the cap could limit their fishing. If the participants perceive that the cap will not be reached, the cap will not affect fishing behavior (or Chinook salmon avoidance).[23] This lack of incentive may be manifested in a few different ways. Across the fleet in general, participants who perceive no threat of a closure from the cap may choose to reduce their Chinook salmon avoidance efforts. Although participants may vary, the fleet, as a whole, may generally reduce its Chinook salmon avoidance efforts when participants believe that the cap will not be reached in a year.

Complementing the cap alternative with the cooperative alternative should ensure that participants in the fleet, as a whole, exert Chinook salmon avoidance efforts at all times (regardless of the potential for the cap to constrain the fishery). While the ability of participants in the pollock fishery to avoid Chinook salmon has not been firmly established, the cooperative alternative will ensure that certain efforts will always be exerted by the fleet to increase their understanding of Chinook salmon bycatch (through the collection of Chinook salmon bycatch information from the fleet) and to avoid Chinook salmon (through limiting effort in Chinook salmon hotspots). Additional efforts could also be undertaken (such as gear modifications and other changes in fishing practices), depending on cooperative agreements and the experiences of the cooperatives.

The cooperative alternative also provides a foundation for coordination of fleet activity that could address certain circumstances when the cap has potential to bind, but portions or all of the fleet may choose not to react. For example, as Chinook salmon bycatch approaches the cap, some participants may view reaching the cap as a forgone conclusion. In response, this segment of the fleet could choose to disregard Chinook salmon bycatch to achieve a higher pollock catch rate (taking advantage of the Chinook salmon avoidance efforts of others). Requiring these vessels to join a cooperative that uniformly applies Chinook salmon

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[22] For example, a possible structure could allow cooperatives to undertake limited fishing (i.e., catching a small portion of the total allowable catch) in the first week of the fishery, with no fishing in the limited access. After that week, fishing could open for both cooperatives and the limited access with participants in the limited access fishery subject to a relatively restrictive trip limit. The trip limit would be intended to remove disincentives that might arise for cooperative measures that attempt to control bycatch by slowing catch rates. While such an approach is a possible means of allowing for cooperative/limited access fishery management structure, such a structure would requires more input from participants and development through the Council process.

[23] It should be noted that this does not necessarily mean that participants will not work to reduce Chinook salmon bycatch, only that the cap will not motivate of Chinook salmon avoidance efforts. For a variety of social and political reasons, it is possible that vessels may exert efforts to avoid Chinook, even when the cap is not likely to be constraining.

avoidance measures could prevent these vessels from disregarding Chinook salmon bycatch in an attempt to secure a greater share of the catch from the fishery.

A similar issue could arise under the cap alternative, if vessels that only fish early in the year choose not to put effort to avoiding Chinook salmon since a fishery closure in a later season will not affect them. For example, a vessel owner who intends to only fish in the A season may be confident that the fishery will not close in A season regardless the vessel's Chinook salmon bycatch. This owner's fishing may be unaffected by the cap, as the risk posed to its fishing by the cap is negligible. Historically, few vessels participated only during the early seasons (see Table 57). Yet, adopting only a cap could increase the potential for vessels to opportunistically disregard Chinook salmon bycatch measures to increase their shares of the early season catches, at the expense of others who intend to fish all seasons in the fishery.

Table 57 Participation and catches by season (2003-2010).

Management subarea	Year	Vessels in the fishery	Vessels fishing only the A season	Vessels fishing only the A or B season			Vessels fishing only the A, B or C season			Vessels that participated in the D season		
				Vessels	Catch in metric tons	Catch as percentage of total	Vessels	Catch in metric tons	Catch as percentage of total	Vessels	Catch in metric tons	Catch as percentage of total
Central Gulf	2003	49	6	14	2,704	8.3	20	5,988	18.5	29	26,427	81.5
	2004	53	1	8	2,456	6.1	23	9,737	24.1	30	30,626	75.9
	2005	47	3	14	6,385	12.7	25	17,100	34.1	22	32,989	65.9
	2006	45	1	14	6,413	13.3	19	10,223	21.2	26	38,112	78.8
	2007	38	3	15	6,549	18.7	24	14,138	40.4	14	20,835	59.6
	2008	44	1	14	7,053	21.2	21	8,504	25.5	23	24,832	74.5
	2009	40	0	8	3,306	13.7	9	3,817	15.9	31	20,253	84.1
	2010	41	0	7	3,288	7.2	9	5,176	11.3	32	40,606	88.7
Western Gulf	2003	31	8	10	2,182	13.4	13	2,944	18.1	18	13,355	81.9
	2004	25	3	5	2,264	9.7	6	3,283	14.0	19	20,137	86.0
	2005	28	1	1	*	*	3	3,698	11.8	25	27,584	88.2
	2006	28	3	5	1,695	6.8	8	2,650	10.6	20	22,352	89.4
	2007	25	6	8	1,041	5.8	13	4,093	22.6	12	13,976	77.4
	2008	19	3	5	872	5.6	5	872	5.6	14	14,626	94.4
	2009	22	0	3	706	4.8	4	884	6.0	18	13,790	94.0
	2010	26	2	5	3,276	11.5	6	3,392	11.9	20	25,201	88.1

Sources: NMFS Catch Accounting
Note: Catch amounts are annual totals of identified vessels.
* withheld for confidentiality.

Adoption of the cooperative alternative, together with the cap, would limit the potential for persons who fish only in the early seasons from disregarding Chinook salmon bycatch. All members of a cooperative would be required to comply with cooperative measures, thereby keeping participants on equal footing in the fishery, regardless of whether they intend to participate in the later season when risk of a closure because of the PSC limit is greatest.

In addition, the adoption of the cooperative alternative could help the fleet avoid reaching the Chinook salmon PSC limit in a few ways. If the cap does not constrain the fleet in most years, in the absence of the cooperative requirements, it is possible that the fleet could become complacent with respect to Chinook salmon bycatch avoidance. The cooperative program could be instrumental in the development of Chinook salmon avoidance measures enabling the fleet to avoid reaching the limit in periods of relatively high Chinook salmon interactions. Without the cooperative requirement, it is possible that successive years of low Chinook salmon bycatch could leave the fleet unprepared (and unknowledgeable of measures that might be effective) to respond to Chinook salmon bycatch.

Similarly, the cooperative structure is likely to provide the foundation for the communication and coordination of Chinook salmon bycatch avoidance, in the event the fishery may approach the cap. In the absence of the cooperative, it is possible that the fleet will lack the communication and coordination needed to adopt Chinook salmon bycatch avoidance measures should it appear that the cap may be constraining. A critical part of achieving the needed coordination is a system of monitoring adequate to ensure that participants comply with Chinook salmon avoidance measures. A monitoring program that achieves that level of acceptance could be difficult to develop midyear, when the fleet is under the pressure of a potentially constraining PSC limit. Cooperatives are likely to have developed acceptable monitoring programs prior to any such crisis. By putting into place an institutional structure for implementing bycatch control measures, cooperatives should prepare participants in the fishery to increase Chinook salmon avoidance efforts during periods of relatively high Chinook salmon interaction.

Although the cooperative alternative could help the fleet achieve lower levels of Chinook salmon bycatch control at times when the Chinook salmon PSC limit is not constraining, it alone may not ensure that Chinook salmon bycatch is maintained at an acceptable level. Should Chinook salmon bycatch increase to a level above the proposed caps, the cooperatives would not be required to stop fishing and would have no direct obligation to take actions beyond those required by their cooperative agreements. The cooperative alternative would commit participants to gather and disseminate information concerning Chinook salmon bycatch and implement certain bycatch measures. Yet, the cooperative alternative, in and of itself, does not ensure that the pollock fisheries will achieve any specific level of Chinook salmon bycatch control. So, in the absence of the cap, the cooperative alternative may allow the fleet to reach a level of Chinook salmon bycatch that is perceived as unacceptable.

In considering the effects of adopting both alternatives, the potential for the adoption of the PSC limit to complicate cooperative negotiations should be considered. In a single cooperative fishery, that cooperative's members will be positioned to develop a set of rules that all of participants accept as a condition of their participation in the fishery. In a multiple cooperative fishery, the different cooperatives will be compelled to negotiate their own internal agreements, as well as an intercooperative agreement to ensure that no cooperative gains an unfair advantage over other cooperatives, as a result of the differences in the Chinook salmon bycatch avoidance measures across cooperatives. The potential for different cooperative's to have different preferences for different Chinook salmon bycatch avoidance measures will complicate any negotiation of the terms of an intercooperative agreement, as the parties are likely to attempt to ensure that their positions in the fishery are not sacrificed by the differences. The existence of a binding hard cap could further complicate these negotiations, particularly as cooperatives perceive the potential for their pollock catch to be constrained by not only the pollock total allowable catch, but also by the Chinook salmon PSC limit. A cooperative would need to balance its own measures against those of any competing cooperative to ensure that it has a fair opportunity in the fishery relative to the other cooperative, given the potential to reach either the pollock total allowable catch or the Chinook salmon PSC cap.

While these factors may complicate negotiations of cooperative and intercooperative agreements under a system that includes both a cooperative structure and a Chinook salmon PSC cap, the cap would serve as an upper limit on Chinook salmon PSC. In addition, the cooperative structure and the incentive for Chinook salmon PSC reductions might complement the cap by creating an incentive for Chinook salmon PSC reductions in periods when the cap is not (or is not likely to be) binding. In assessing the interactions of a Chinook salmon PSC limit with a cooperative alternative, the relatively brief seasons in the fishery should also be considered. The rate at which the fishery is prosecuted has presented a challenge to NMFS efforts to maintain catches below the total allowable catch for the last several years. The need to also manage the fishery to a Chinook salmon PSC cap (particularly one based on extrapolated rates within a partially observed fleet) could present even greater challenges. To the extent that cooperatives slow the rate of prosecution of the fishery, they may also facilitate more precise management of the fishery. Similarly, cooperative management provides an avenue for improved communication between the fleet and managers. This additional communication concerning the timing of effort in the fishery, pollock catch rates, and Chinook salmon PSC rates could also benefit NMFS' efforts to manage the fleet to the pollock total allowable catch and any Chinook salmon PSC cap.

Overall, the effects of adopting both alternatives are very similar to the effects described for each alternative. Adoption of the two alternatives together may have a complementary effect. The cooperative alternative provisions are likely to drive Chinook salmon bycatch control measures in periods when the PSC limit is not perceived as binding, while the PSC limit will ensure that Chinook salmon bycatch does not exceed the absolutely unacceptable level defined by that limit.

4 Environmental Assessment

There are four required components for an environmental assessment. The need for the proposal is described in Section 1, and the alternatives in Section 2. This section addresses the probable environmental impacts of the proposed action and alternatives. A list of agencies and persons consulted is included in Chapter 9.

4.1 Methodology for impacts analysis

This document analyzes two alternatives that evaluate proposed Chinook salmon bycatch control measures for the Western and Central GOA directed pollock fishery. The alternatives propose Chinook salmon PSC limits for the Western and Central GOA regulatory areas, accompanied by a requirement to expand observer coverage on under 60 ft vessels, or mandatory bycatch cooperatives, or a combination of both.

The proposed action affects vessels fishing in the Federal pollock fishery in the Central and Western GOA. In this section, the impacts of the alternatives and option on the various environmental components are evaluated. The socio-economic impacts of this action are described in detail in the RIR and IRFA portions of this analysis (Sections 3 and 6).

The documents listed below contain information about the fishery management areas, fisheries, marine resources, ecosystem, social, and economic elements of the GOA groundfish fisheries, and are referenced in the analysis of impacts in this chapter.

<u>Alaska Groundfish Harvest Specifications Final Environmental Impact Statement (NMFS 2007a).</u>

This EIS provides decision makers and the public an evaluation of the environmental, social, and economic effects of alternative harvest strategies for the Federally-managed groundfish fisheries in the GOA and the Bering Sea and Aleutian Islands management areas. The EIS examines alternative harvest strategies that comply with Federal regulations, the GOA FMP, and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). These strategies are applied to the best available scientific information to derive the total allowable catch estimates for the groundfish fisheries. The EIS evaluates the effects of different alternatives on target species, non-specified species, forage species, prohibited species, marine mammals, seabirds, essential fish habitat, ecosystem relationships, and economic aspects of the GOA fisheries.

<u>Stock Assessment and Fishery Evaluation (SAFE) Report for the Groundfish Resources of the GOA (NPFMC 2010).</u>

Annual SAFE reports review recent research and provide estimates of the biomass of each species and other biological parameters. The SAFE report includes the acceptable biological catch (ABC) specifications used by NMFS in the annual harvest specifications. The SAFE report also summarizes available information on the GOA ecosystem and the economic condition of the groundfish fisheries off Alaska. This document is available from: http://www.afsc.noaa.gov/refm/stocks/assessments.htm.

Analysis of the potential cumulative effects of a proposed action and its alternatives is a requirement of NEPA. An environmental assessment or environmental impact statement must consider cumulative effects when determining whether an action significantly affects environmental quality. The Council on Environmental Quality (CEQ) regulations for implementing NEPA define cumulative effects as:

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

For the most part, the discussion of past and present cumulative effects is addressed with the analysis of direct and indirect impacts for each resource component below. The cumulative impact of reasonably foreseeable future actions is addressed in Section 4.9.

Section 5 addresses the management and enforcement considerations of the proposed alternatives and options.

The criteria listed in Table 58 are used to evaluate the significance of impacts. If significant impacts are likely to occur, preparation of an Environmental Impact Statement (EIS) is required. Although economic and socioeconomic impacts must be evaluated, such impacts by themselves are not sufficient to require the preparation of an EIS (see 40 CFR 1508.14).

Table 58 Criteria used to evaluate the alternatives

Component	Criteria
Fish species	An effect is considered to be significant if it can be reasonably expected to jeopardize the sustainability of the species or species group.
Habitat	An effect is considered to be significant if it exceeds a threshold of more than minimal and not temporary disturbance to habitat.
Seabirds and marine mammals	An effect is considered to be significant if it can be reasonably expected to alter the population trend outside the range of natural variation.
Ecosystem	An effect is considered to be significant if it produces population-level impacts for marine species, or changes community- or ecosystem-level attributes beyond the range of natural variability for the ecosystem.

4.2 Pollock

Walleye pollock (*Theragra chalcogramma*) is a semi-pelagic schooling fish widely distributed in the North Pacific Ocean. Pollock in the GOA are managed as a single stock independently of pollock in the Bering Sea and Aleutian Islands. Peak spawning at the two major spawning areas in the GOA occurs at different times. In the Shumagin Island area, peak spawning apparently occurs between February 15-March 1, while in Shelikof Strait peak spawning occurs later, typically between March 15 and April 1. It is unclear whether the difference in timing is genetic, or a response to differing environmental conditions in the two areas.

Figure 5 shows pollock catch in the GOA since 1964, in the foreign, joint venture, and domestic fisheries, as well as TAC for GOA pollock since 1976. The total allowable catches of pollock in the Central and Western areas of the GOA from 2001 through 2010 are shown in Figure 6. Information in that figure indicates that the Central GOA pollock TAC ranged from a high of 53,122 mt in 2005 to a low of 15,249 mt in 2009. Over this 10-year time period TAC averaged 39,679 mt. During the most recent 5-year period the TAC averaged slightly less than the 10-year average (37,992 mt). The 2010 GOA SAFE report indicates that the trend of increasing TACs is expected to continue through 2012 (Dorn et al 2010).

Figure 5 GOA pollock catch, 1964-2010 (in mt)

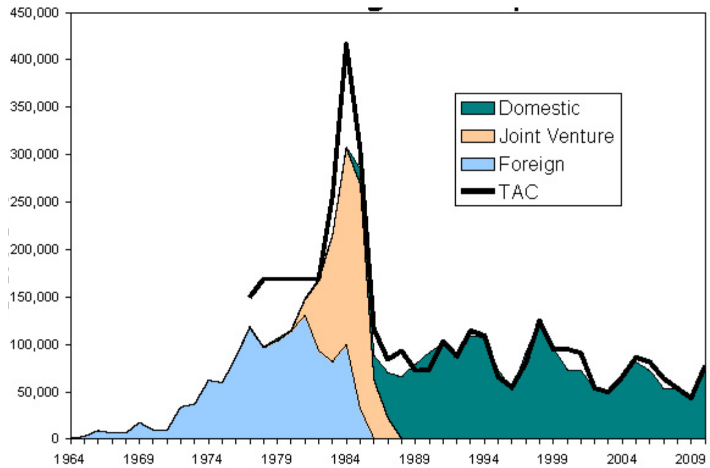
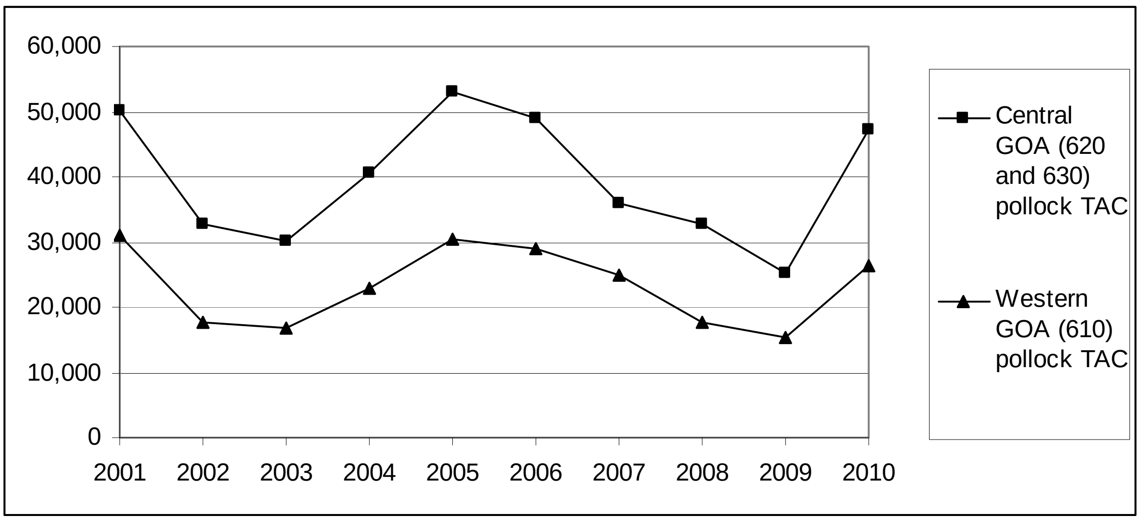


Figure 6 Central and Western GOA TACs (in mt), 2001 2010



The Western GOA TACs followed the same general trend as the Central GOA and ranged from a high of 30,380 mt in 2005 and low of 15,249 mt in 2009. The 2001-2010 Western GOA TACs were always between 35% and 41% of the two areas combined TACs. As in the Central GOA, the Western GOA TACs are projected to increase through 2012 (Dorn et al 2010).

Since 1992, the GOA pollock TAC has been apportioned spatially and temporally to reduce potential impacts on Steller sea lions. The details of the apportionment scheme have evolved over time, but the general objective is to allocate the TAC to management areas based on the distribution of surveyed biomass, and to establish three or four seasons between mid-January and autumn during which some fraction of the TAC can be taken. The Steller Sea Lion Protection Measures implemented in 2001 established four seasons in the Central and Western GOA beginning January 20, March 10, August 25, and October 1, with 25% of the total TAC allocated to each season. Allocations to management areas 610, 620 and 630 are based on the seasonal biomass distribution as estimated by groundfish surveys.

Walleye pollock in the GOA undergo an annual migration between summer foraging habitats and winter spawning grounds. Since surveying effort has been concentrated during the summer months and prior to spawning in late winter, the dynamics and timing of this migration are not well understood. Regional biomass estimates are highly variable, indicating either large sampling variability, large interannual changes in distribution, or, more likely, both. There is a comprehensive survey of the GOA in summer, but historically surveying during winter has focused on the Shelikof Strait spawning grounds. Recently there has been expanded EIT surveying effort outside of Shelikof Strait in winter, but no acoustic survey has been comprehensive, covering all areas where pollock could potentially occur.

4.2.1 Effects of the alternatives

The effects of the GOA pollock fishery on the pollock stock is assessed annually in the GOA SAFE report (Dorn et al 2010), and was also evaluated in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). The pollock stock is neither overfished nor being overfished, and in fact biomass levels are projected to increase into 2015. It is estimated that the GOA pollock fishery under the status quo is sustainable for pollock stocks.

Alternative 2 would establish a hard cap that limits bycatch of Chinook salmon in the GOA pollock fishery. 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. Table 20 and Table 21, Table 33 and Table 34, and Table 41 and Table 42 in Sections 3.10.1.1.1, 3.10.1.2.1, and 3.10.1.3.1 of the RIR show when the fishery would have been closed in the past eight years, applying the three overall PSC limit levels retrospectively to the pollock fishery in the Central and Western GOA. Table 24 and Table 25, Table 37 and Table 38, and Table 45 and Table 46, in Sections 3.10.1.1.3, 3.10.1.2.3, and 3.10.1.3.3 of the RIR, identify how much pollock would have been forgone had the closures gone into place on those dates. Alternative 3 would establish bycatch cooperatives, which would work to identify bycatch hotspots. If cooperatives are able to identify and avoid fishing in high bycatch areas, the pollock season could be as long as the status quo fishery or potentially longer. If pollock catch rates are lower in areas identified as outside of the bycatch hotspots, it may take more fishing effort to catch the pollock TAC.

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. If the implementation of a PSC limit curtails the fishery, it is likely the C and D seasons that will be most impacted, i.e., fishing in the early part of the year is most likely to remain unchanged, while fishing patterns may be altered further on in the year when the fishery is approaching the PSC limit. Changing fishery patterns or seasonal changes in the timing of the fishing pressure may result in the fishery focusing on different ages of pollock than would otherwise have been taken. These changes, however, would be monitored and updated in future stock assessment. Fishery age composition is already used in the assessment, which stratifies catch at age by area and between the first and second half of the year. In 2009, age 3 and age 4 fish were the dominant mode in catches in all areas and both seasons (Dorn et al 2010). The risk to the stock is considered minor since conservation goals for maintaining spawning biomass would remain Central to the assessment. However, the change in fishing pattern could result in lower overall ABC and TAC levels, depending on how the age composition of the catch changed.

The potential biological effects of the alternatives are expected to be correctly incorporated in the present pollock stock assessment and harvest specifications system, and there is no anticipated adverse impact to the pollock stocks that would result from a fishery with lower catch per unit effort. Consequently, Alternatives 2 and 3 are not likely to result in adverse impacts to pollock stocks, and are likely insignificant.

4.3 Chinook salmon

4.3.1 Overview of biology and ecological role

Overview information on Chinook salmon can be found at:
http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main.

The Chinook salmon (*Oncorhynchus tshawytscha*) is the largest of all Pacific salmon species, with weights of individual fish commonly exceeding 30 pounds. In North America, Chinook salmon range from the Monterey Bay area of California to the Chukchi Sea area of Alaska. On the Asian coast, Chinook salmon occur from the Anadyr River area of Siberia southward to Hokkaido, Japan. In Alaska, they are abundant from the southeastern panhandle to the Yukon River. In summer, Chinook salmon concentrate around the Aleutian Islands and in the Western GOA. Chinook salmon typically have relatively small spawning populations and the largest river systems tend to have the largest populations. Major populations of Chinook salmon return to the Yukon, Kuskokwim, Nushagak, Susitna, Kenai, Copper, Alsek, Taku, and Stikine rivers with important runs also occurring in many smaller streams.

Like all species of Pacific salmon, Chinook salmon are anadromous. They hatch in fresh water and rear in main-channel river areas for one year. The following spring, Chinook salmon turn into smolt and migrate to the salt water estuary. They spend anywhere from one to five years feeding in the ocean, then return to spawn in fresh water. All Chinook salmon die after spawning. Chinook salmon may become sexually mature from their second through seventh year, and as a result, fish in any spawning run may vary greatly in size. Females tend to be older than males at maturity. In many spawning runs, males outnumber females in all but the 6- and 7-year age groups. Small Chinooks that mature after spending only one winter in the ocean are commonly referred to as “jacks” and are usually males. Alaska streams normally receive a single run of Chinook salmon in the period from May through July.

Chinook salmon often make extensive freshwater spawning migrations to reach their home streams on some of the larger river systems. Yukon River spawners bound for the headwaters in Yukon Territory, Canada will travel more than 2,000 river miles during a 60-day period. Chinook salmon do not feed during the freshwater spawning migration, so their condition deteriorates gradually during the spawning run as they use stored body materials for energy and gonad development.

Each female deposits between 3,000 and 14,000 eggs in several gravel nests, or redds, which she excavates in relatively deep, fast moving water. In Alaska, the eggs usually hatch in the late winter or early spring, depending on time of spawning and water temperature. The newly hatched fish, called alevins, live in the gravel for several weeks until they gradually absorb the food in the attached yolk sac. These juveniles, called fry, wiggle up through the gravel by early spring. In Alaska, most juvenile Chinook salmon remain in fresh water until the following spring when they migrate to the ocean as smolt in their second year.

Juvenile Chinook salmon in freshwater feed on plankton and then later eat insects. In the ocean, they eat a variety of organisms including herring, pilchard, sand lance, squid, and crustaceans. Salmon grow rapidly in the ocean and often double their weight during a single summer season.

Food habits and ecological role

For Pacific salmon, oceanic foraging conditions and food relationships are important to growth. They are omnivorous and opportunistic feeders. Major categories of prey found in stomach contents of Pacific salmon species usually include either one or a combination of fish, squid, euphausiids, amphipods, copepods, pteropods, larval crustaceans, zooplankton, polychaetes, ostracods, mysids, and shrimps. By switching their diets to micronekton (fish and squid), salmon can sustain themselves through seasons or years of low zooplankton production. At the same time, Pacific salmon are selective feeders. Prey selectivity in salmon is related to inter- and intra-specific differences in functional morphology, physiology, and behavior. In general, Chinook salmon tend to feed on large prey (Kaeriyama et al, 2000).

The Bering Sea-Aleutian Salmon International Survey (BASIS) is an NPAFC-coordinated program of pelagic ecosystem research on salmon and forage fish in the Bering Sea. A major goal of this program is to understand how changes in the ocean conditions affect the survival, growth, distribution, and migration of salmon in the Bering Sea. At this time, no such coordinated research plan exists for the GOA. As a result, ecological information specifically related to Chinook salmon in the GOA is limited.

Ocean salmon feeding ecology is highlighted by the BASIS program given the evidence that salmon are food limited during their offshore migrations in the North Pacific and Bering Sea. Increases in salmon abundance in North America and Asia stocks have been correlated to decreases in body size of adult salmon, which may indicate a limit to the carrying capacity of salmon in the ocean. International high seas research results suggest that inter- and intra-specific competition for food and density-dependant growth effects occur primarily among older age groups of salmon particularly when stocks from different geographic regions in the Pacific Rim mix and feed in offshore waters (Ruggerone et al. 2003).

Results of a fall study to evaluate food habits data in 2002 indicated Chinook salmon consumed predominately small nekton and did not overlap their diets with sockeye and chum salmon. Shifts in prey composition of salmon species between season, habitats, and among salmon age groups were attributed to changes in prey availability (Davis et al. 2004).

Stomach sample analysis of ocean age .1 and .2 fish from basin and shelf area Chinook salmon indicated that their prey composition was more limited than chum salmon. This particular study did not collect many ocean age .3 or .4 Chinook salmon although those collected were located predominantly in the basin. Summer Chinook salmon samples contained high volumes of euphausiids, squid, and fish while fall stomach samples in the same area contained primarily squid and some fish. The composition of fish in salmon diets varied with area with prey species in the basin primarily northern lamp fish, rockfish, Atka mackerel, Pollock, sculpin, and flatfish while shelf samples contained more herring, capelin, Pollock, rockfish, and sablefish. Squid was an important prey species for ocean age .1, .2, and .3 Chinook salmon in summer and fall. The proportion of fish was higher in summer than fall as was the relative proportion of euphausiids. The proportion of squid in Chinook salmon stomach contents was larger during the summer in year (even numbered) when there was a scarcity of pink salmon in the basin (Davis et al. 2004).

Results from the Bering Sea shelf on diet overlap in 2002 indicated that the overlap between chum and Chinook salmon was moderate (30%), with fish constituting the largest prey category, results were similar in the basin. However, notably on the shelf, both chum and Chinook salmon consumed juvenile Pollock, with Chinook salmon consuming somewhat larger than those consumed by chum salmon. Other fish consumed by Chinook salmon included herring and capelin while chum salmon stomach contents also included sablefish and juvenile rockfish (Davis et al. 2004).

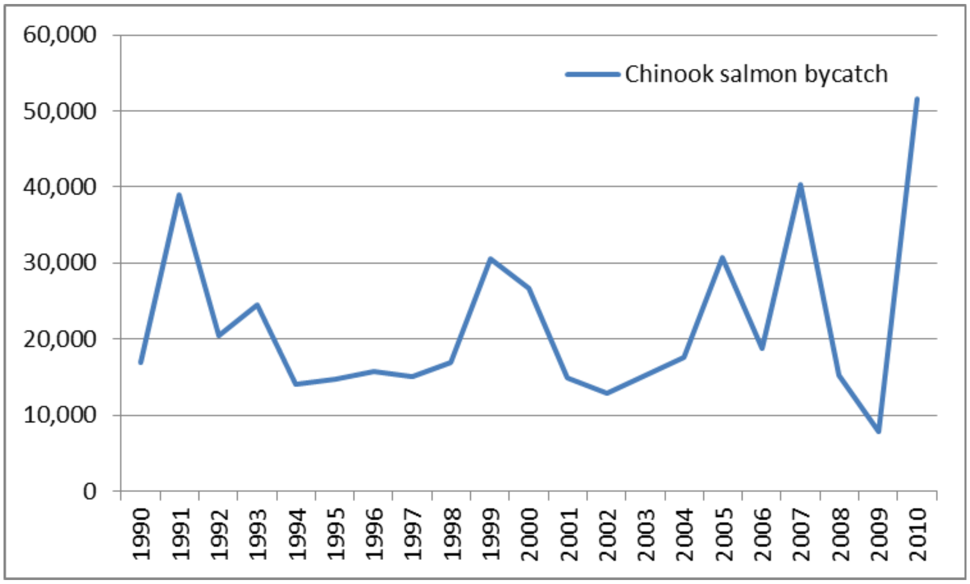
General results from the study found that immature chum salmon are primarily predators of macrozooplankton while Chinook salmon tend to prey on small nektonic prey such as fish and squid. Prey compositions shift between species and between seasons in different habitats and a seasonal reduction in diversity occurs in both chum salmon and Chinook salmon diets from summer to fall. Reduction in prey diversity was noted to be caused by changes in prey availability due to distribution shifts, abundance changes, or progression of life-history changes which could be the result of seasonal shift in environmental factors such as changes in water temperature and other factors (Davis et al. 2004).

Diet overlap estimates between Chinook salmon and sockeye salmon and Chinook salmon and chum salmon were lower than estimates obtained for sockeye and chum salmon, suggesting a relatively low level of inter-specific food competition between immature Chinook salmon and immature sockeye of chum salmon in the Bering Sea because Chinook salmon were more specialized consumers. In addition, the relatively low abundance of immature Chinook salmon compared to other species may serve to reduce intra-specific competition at sea. Consumption of nektonic organisms (fish and squid) may be efficient because they are relatively large bodied and contain a higher caloric density then zooplankton. However, the energetic investment required of Chinook salmon to capture actively swimming prey is large, and if fish and squid prey abundance is reduced, a smaller proportion of ingested energy will be available for salmon growth. It is hypothesized that inter- and intra-specific competition in the Bering Sea could negatively affect the growth of chum salmon and Chinook salmon particularly during spring and summer in odd-numbered years when the distribution of Asian and North American salmon stocks overlap. Decreased growth could lead to reduction in salmon survival by increasing predation, decreasing lipid storage to the point of insufficiency to sustain the salmon through the winter when consumption rates are low, and increasing susceptibility to parasites and disease due to poor salmon nutritional condition (Davis et al. 2004, 1998; Ruggerone et al. 2003).

4.3.2 Bycatch of Chinook salmon in the GOA pollock fisheries

Figure 7 shows the bycatch of Chinook salmon in the GOA groundfish trawl fisheries since 1990 (note this figure is for all trawl fisheries, and is not specific to the pollock trawl fishery). The 20-year average for Chinook salmon bycatch (1991-2010) is 20,185 Chinook salmon while the most recent 5-year average (2006-2010) is 26,732 Chinook salmon. Chinook salmon bycatch in the pollock target fishery accounts for approximately three-quarters of Chinook salmon bycatch in the GOA. As can be seen from Figure 7, bycatch levels are highly variable from year to year. 2010 is the year of highest bycatch, with the majority of bycatch occurring in the Western GOA. 2007 was also a year of high bycatch, primarily attributed to the Chignik area (reporting area 620). In the Kodiak area (reporting area 630), 2005 was the highest bycatch year. In 2009, Chinook salmon bycatch in all areas was considerably lower than in the previous five years. It is assumed that salmon caught as bycatch have a 100% mortality rate in the groundfish fisheries.

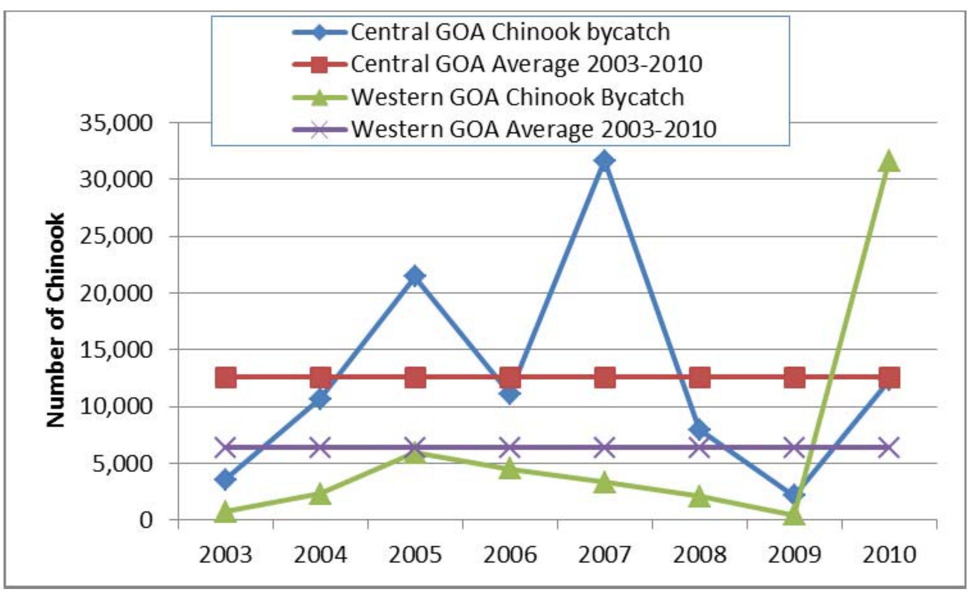
Figure 7 Bycatch of Pacific salmon in Gulf of Alaska groundfish trawl fisheries, by species, 1990-2010



Source: NMFS catch reports (http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm) for 1990-2002; NMFS PSC database for 2003-2010.

Chinook salmon bycatch is discussed in detail in the RIR, Section 3.2.1.3. Figure 8 illustrates bycatch for 2003-2010 in the Western and Central area pollock fisheries (see also Table 2 in the RIR). Prior to 2010, Chinook salmon bycatch in the Western regulatory area as a proportion of total GOA Chinook salmon bycatch in the pollock fisheries varied between 10% and 29%, by year, but averaged to approximately 19%. In 2010, however, an especially high amount of Chinook salmon were caught as bycatch in the Western GOA, amounting to 31,581 Chinook salmon.

Figure 8 Chinook salmon bycatch in the Western and Central GOA pollock fisheries, 2003-2010



The timing of salmon bycatch follows a predictable pattern in most years. Chinook salmon are caught in high quantities regularly during the pollock fishery, from the start of A season on January 20 through early April (when the B season fishery closes), and again during September/October in the C/D seasons. The regulatory pollock seasons are as follows: A season (January 20 to March 10), B season (March 10 to May 31), C season (August 25 to October 1), and D season (October 1 to November 1), although in most instances, the available TAC will be caught (and the fishery will be closed) well before the end of the season, often in only a few days.

The majority of Chinook salmon bycatch data presented in this analysis is from the NMFS catch accounting prohibited species catch database, which applies bycatch rates from observed fishing trips to unobserved groundfish catch within each target, gear type, and reporting area. In order to examine the spatial distribution of bycatch at a finer scale than that of the reporting area, we rely on bycatch data from observed trips only, as only these observed hauls are associated with geographical coordinates. As only a small proportion of total groundfish catch in the GOA is observed, however, it should be remembered that the mapped data may not represent the total activity of the fisheries. Additionally, observer program data for the pollock fishery has an additional limitation when used for spatial analysis. Chinook salmon bycatch in the pollock fishery is generally sampled at the plant, rather than onboard the vessel, because of safety issues in bringing onboard the large volumes of catch in the pollock fishery. As all hauls are mixed together in the vessel's hold, the entire delivery is monitored for PSC at the shoreside plant upon delivery. The delivery's bycatch rates are then proportioned back in the database to individual tows made during the trip. In effect, this averages the bycatch among several hauls at several locations, when in fact it could possibly be the case that all the bycatch was caught during one haul in one location, and other locations had little or no associated bycatch. The spatial distribution currently displayed in the document maps the bycatch data by individual tows, and the maps should therefore be interpreted with caution.

Two sets of maps are provided in Section 12 at the end of this document, mapping Chinook salmon bycatch. First, Figure 21 through Figure 26, provided by NMFS inseason management,offer an annual illustration of observed GOA Chinook salmon bycatch from 2006 to 2010. Figure 21 provides an overview of bycatch aggregated for all five years, and Figure 22 through Figure 26 present each year's distribution. It is apparent from the annual illustrations that there is considerable interannual variability in the locations of high Chinook salmon bycatch.

Additionally, another set of aggregated maps is included. Figure 27, in Section 12, maps the total number of Chinook salmon observed during the aggregated years 2001-2008, in the pollock pelagic trawl gear fishery, and Figure 28 illustrates the total bycatch rate, number of Chinook salmon per metric ton of total catch, for the period 2001 to 2008.

4.3.2.1 Size and weight of Chinook salmon caught as bycatch

Chinook salmon caught as bycatch in the GOA groundfish fisheries in the Central and Western GOA tend to be smaller fish, averaging just over seven and a half pounds based on observer samples taken during 2001 to 2010. Figure 9 differentiates the average weight of GOA Chinook salmon caught as bycatch during the time periods of the GOA pollock seasons, in the Central and Western GOA. Because there is more observer coverage in the Central GOA groundfish fisheries, the number of samples for the Central GOA (2,299) is considerably higher than is available for the Western GOA (312). In the Central GOA, the average weight of Chinook salmon caught as bycatch varied from 6 to 9 pounds, depending on the time of year. The data indicate that Chinook salmon taken as bycatch in the first half of the year are, on average, smaller than fish that are caught as bycatch in the second half of the year.

Figure 9 **Average weight of Chinook salmon bycatch in the groundfish fisheries in the Western and Central GOA, during the time period of the GOA pollock sesasons, based on observer data from 2001-2010.**

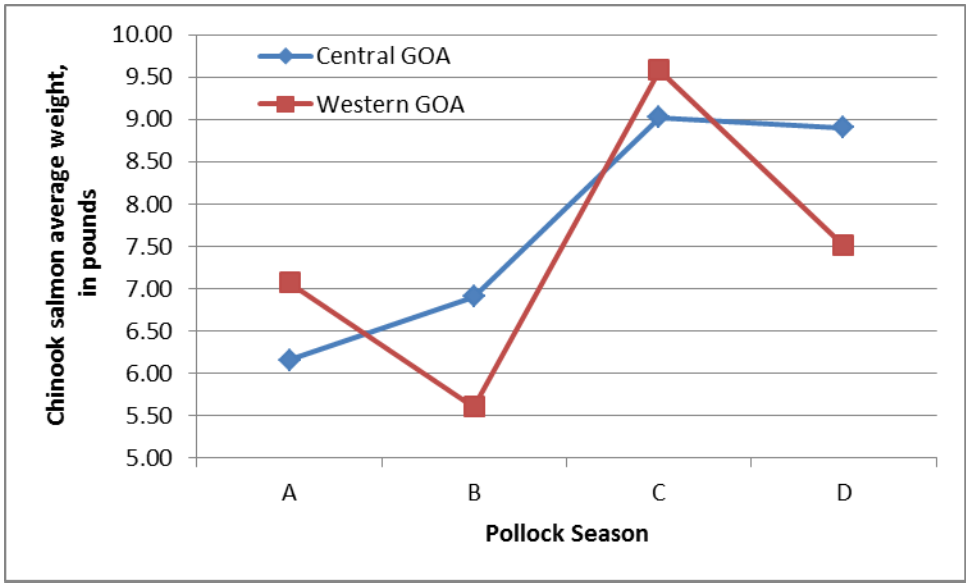
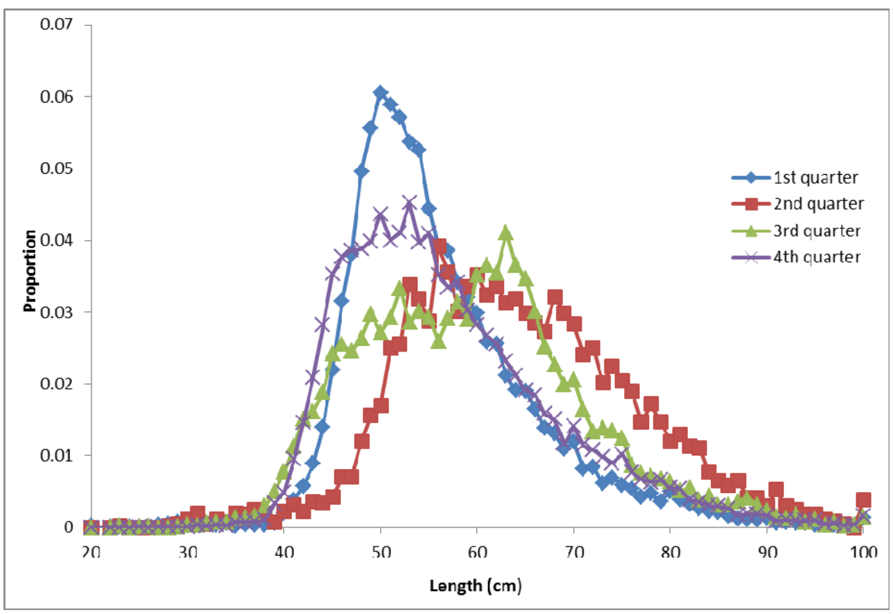


Figure 10 shows the length frequency of Chinook salmon in GOA groundfish bycatch, for a longer time series (1987-2010), and compares the length frequency by quarter year. As above, the data indicate that fisheries occurring during the first half of the year may be catching smaller Chinook salmon than the fisheries operating in the second part of the year.

Figure 10 **Length frequency of Chinook salmon in GOA groundfish bycatch, by quarter (January-March, April-June, July-September, October-December), based on available observer samples from 1987-2010**



4.3.3 River of origin information and bycatch composition sampling

4.3.3.1 Origins of coded-wire tagged Chinook salmon in the GOA

Coded-Wire Tags (CWTs) are an important source of information for the stock-specific ocean distribution of those Chinook salmon stocks that are tagged and caught as bycatch in the BSAI and GOA groundfish fisheries. The Regional Mark Processing Center operated by the Pacific States Marine Fisheries Commission provides the regional coordination of the organizations involved in marking anadromous salmonids throughout the Pacific Region. The coastwide CWT system is coordinated through the activities of two principal organizations: (1) Regional Mark Committee (2) Pacific Salmon Commission (established by the United States–Canada Pacific Salmon Treaty) (Nandor et al. 2010). The Regional Mark Processing Center is the United States site for exchanging United States CWT data with Canada for Pacific Salmon Treaty requirements. After 40 years, the CWT program in the greater Pacific region of North America continues to be an important tool for salmonid research and management and remains the only stock identification tool that is Pacific coastwide in scope and provides unparalleled information about ocean distribution patterns, fishery impacts, and survival rates for Pacific salmon along the Pacific coast (Nandor et al. 2010).

Although CWT recoveries provide reliable documentation of the presence of a stock in the bycatch, the recoveries to date can't be used to establish the relative abundance of stocks in the bycatch, nor to estimate the number harvested from any one stock as bycatch due to sampling issues. CWTs do not represent the true composition of all stocks of Chinook salmon in the bycatch in the GOA groundfish fisheries. For instance, there are no CWT tagging programs on Western Alaska Chinook salmon stocks, so these stocks are not represented in stock composition estimates based on CWT recoveries. Additionally, not all Chinook salmon stocks along the Pacific coast are marked at equal rates. Furthermore, although there are CWT tagging programs on wild stocks of Chinook salmon all along the Pacific coast, wild stocks are probably under-represented by CWTs as compared with hatchery stocks, which are much easier to tag in large numbers. Exploitation rates for naturally spawning populations of Chinook salmon are difficult to estimate. The capture and tagging of juveniles and enumeration of adult escapement from wild stocks is logistically challenging and costly. The impacts of fisheries on naturally spawning populations can be estimated based on CWT-based age- and fishery-specific exploitation rates of hatchery stock indicators. However, direct validation of the assumption that selected hatchery indicator stocks are representative of their associated natural stocks is also difficult and costly (PSC 2005).

Information on high seas salmonid CWT recoveries has been reported annually to the International North Pacific Fisheries Commission (1981–1992) and to the North Pacific Anadromous Fish Commission (NPAFC, 1993–present). Reports are available at http://www.npafc.org. In 2010, 61 CWTs salmonids were reported to the Pacific States Marine Fisheries Commission/Regional Mark Processing Center for the first time. Of these recoveries, 16 Chinook salmon were recovered from the 2008, 2009, and 2010 groundfish trawl fishery in the GOA (Celewycz et al. 2010).

From 1995 through 2010, the majority of CWT Chinook salmon recovered as bycatch in the GOA originated from British Columbia and Alaska. Recoveries of CWT Chinook salmon in the bycatch of the GOA groundfish fishery are summarized by state or province of origin (Table 59). Since 1995, 34% of the observed CWTs of Chinook salmon in the GOA fishery have originated from British Columbia, followed by Alaska (31%), Oregon (21%), Washington (13%), and Idaho (<1%). When accounting for mark expansions for each tag code (see section on Recovery Estimation Techniques), British Columbia provided 52% of Chinook salmon bycatch, followed by Alaska (33%), Oregon (8%), Washington (7%), and Idaho (<1%). In 6 out of those 16 years, however, Alaska was the major provider of the year's CWT Chinook salmon bycatch in the GOA.

Table 59 Observed Number and Mark Expansion of CWT Chinook salmon bycatch of the GOA groundfish fishery by run year and state or province of origin, 1995–2010

	Total		Mean		Average % of Total	
Region	Observed Number	Mark Expansion	Observed Number	Mark Expansion	Observed Number	Mark Expansion
Alaska	177	1197.1	11.1	74.8	31%	33%
British Columbia	193	1873.7	12.1	117.1	34%	52%
Idaho	1	1.0	0.1	0.1	0%	0%
Oregon	121	272.5	7.6	17.0	21%	8%
Washington	76	236.3	4.8	14.8	13%	7%
Total	568	3580.6	35.5	223.8	100%	100%

2010 data are preliminary
Source: Appendix 7

Alaskan Chinook salmon represented by CWTs and harvested in the GOA originated from two basins, Cook Inlet and Southeast Alaska. Most of the CWT Alaskan Chinook salmon recovered in the GOA originated from Southeast Alaska (Table 60). Since 1995, 73% of the observed CWTs of Alaska-origin Chinook salmon in the GOA originated from Southeast Alaska and 27% from Cook Inlet. When accounting for mark expansions, Southeast Alaska provided 91% of Alaska-origin Chinook salmon bycatch in the GOA, with Cook Inlet at 9%.

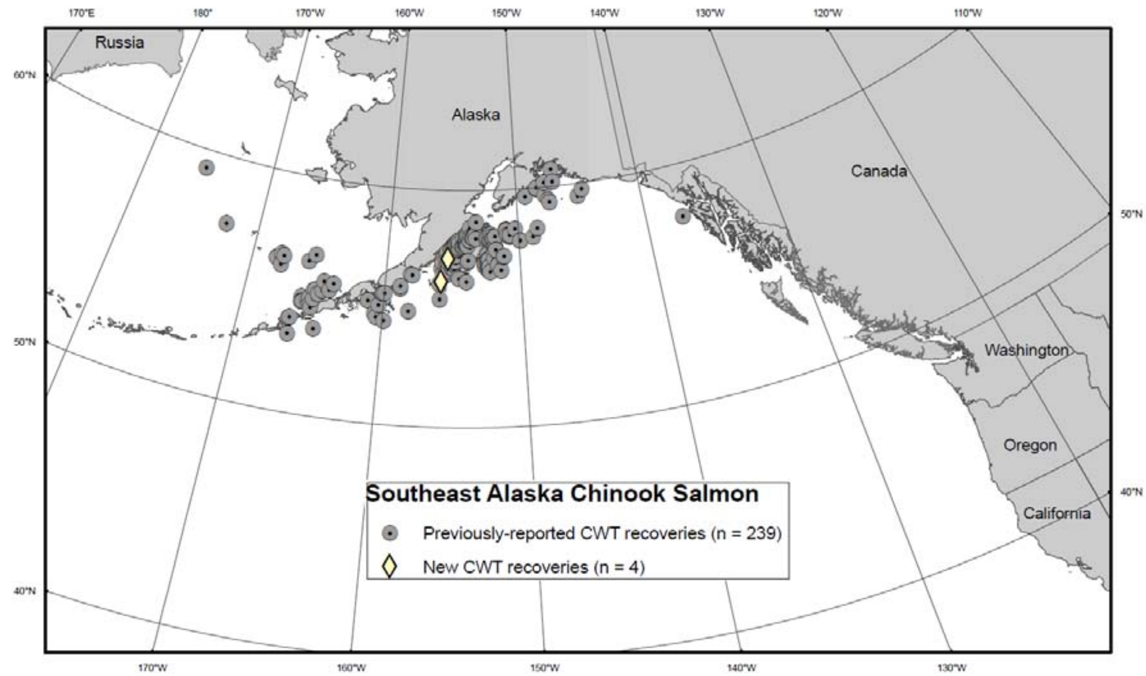
Table 60 Observed Number and Mark Expansion of CWT Alaska-origin Chinook salmon bycatch of the GOA groundfish fishery by run year and release basin, 1995–2010

	Cook Inlet, Alaska		Southeast Alaska		Alaska TOTAL	
Run Year	Observed Number	Mark Expansion	Observed Number	Mark Expansion	Observed Number	Mark Expansion
1995	1	4.0	3	8.0	4	11.9
1996	4	10.7	10	81.7	14	92.4
1997	1	5.3	1	12.1	2	17.4
1998	14	41.4	16	116.4	30	157.8
1999	20	37.6	25	206.6	45	244.3
2000	2	4.2	22	220.7	24	224.9
2001	2	2.0	8	98.2	10	100.2
2002	1	1.0	9	46.2	10	47.2
2003	0	0.0	2	22.4	2	22.4
2004	0	0.0	3	30.5	3	30.5
2005	0	0.0	3	33.6	3	33.6
2006	0	0.0	10	58.3	10	58.3
2007	0	0.0	13	99.1	13	99.1
2008	2	2.0	1	14.8	3	16.8
2009	1	1.0	3	39.4	4	40.4
2010*	0	0.0	0	0.0	0	0.0
TOTAL	48	109.2	129	1087.9	177	1197.1
mean	3.0	6.8	8.1	68.0	11.1	74.8
average % of total	27%	9%	73%	91%	100%	100%

*preliminary
Source: Appendix 7

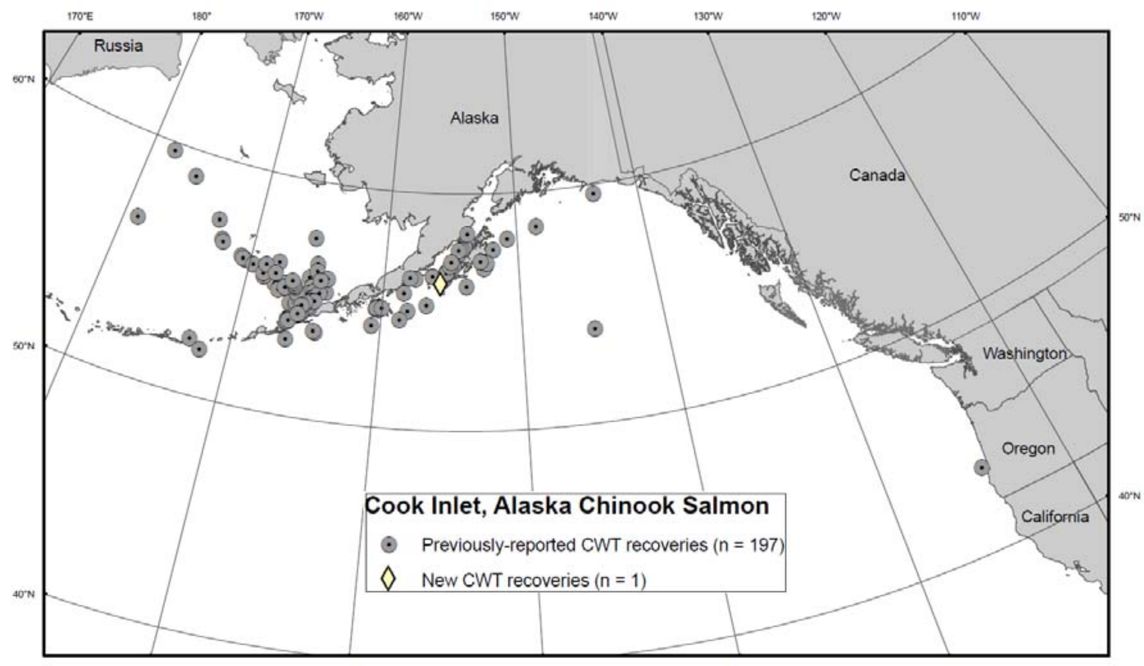
Maps of CWT Chinook salmon distribution in the North Pacific Ocean, GOA, and Bering Sea by state or province of origin are shown (Figure 11 through Figure 17). These maps are compiled from CWT recoveries from high seas commercial fisheries and research surveys, 1981–2010, and are updated annually (Celewycz et al. 2010). High seas commercial fisheries include fisheries that occur in the Alaska EEZ.

Figure 11 Ocean distribution for Cook Inlet Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary



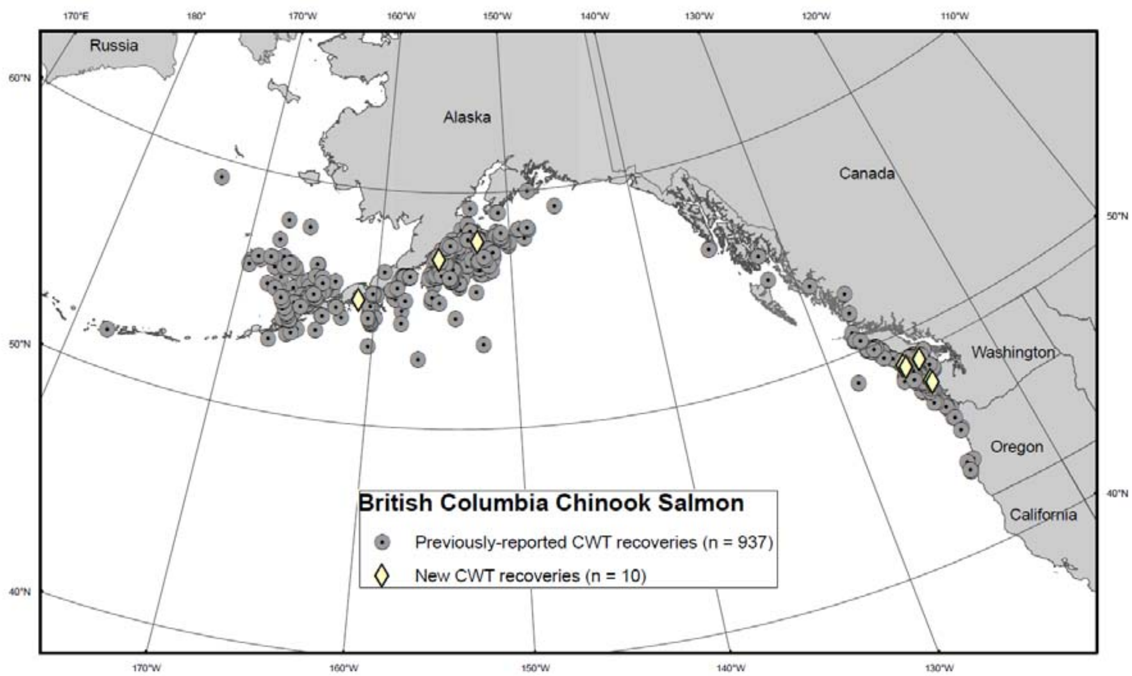
Source: Appendix 7

Figure 12 Ocean distribution for Southeast Alaska Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary.



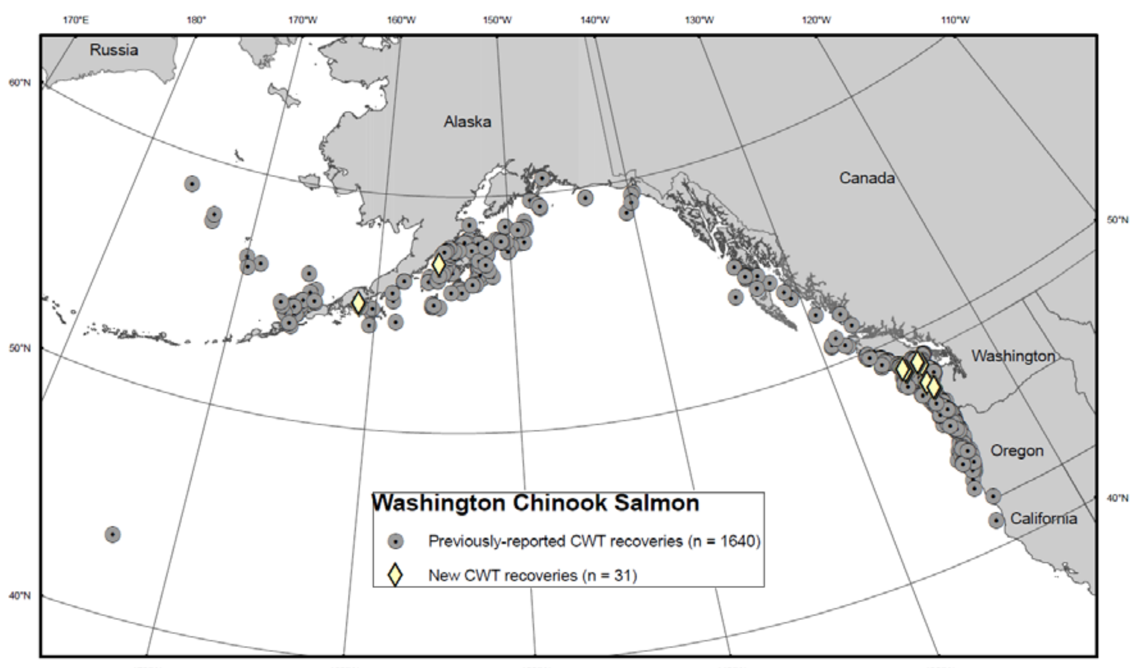
Source: Appendix 7

Figure 13 Ocean distribution for British Columbia Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary.



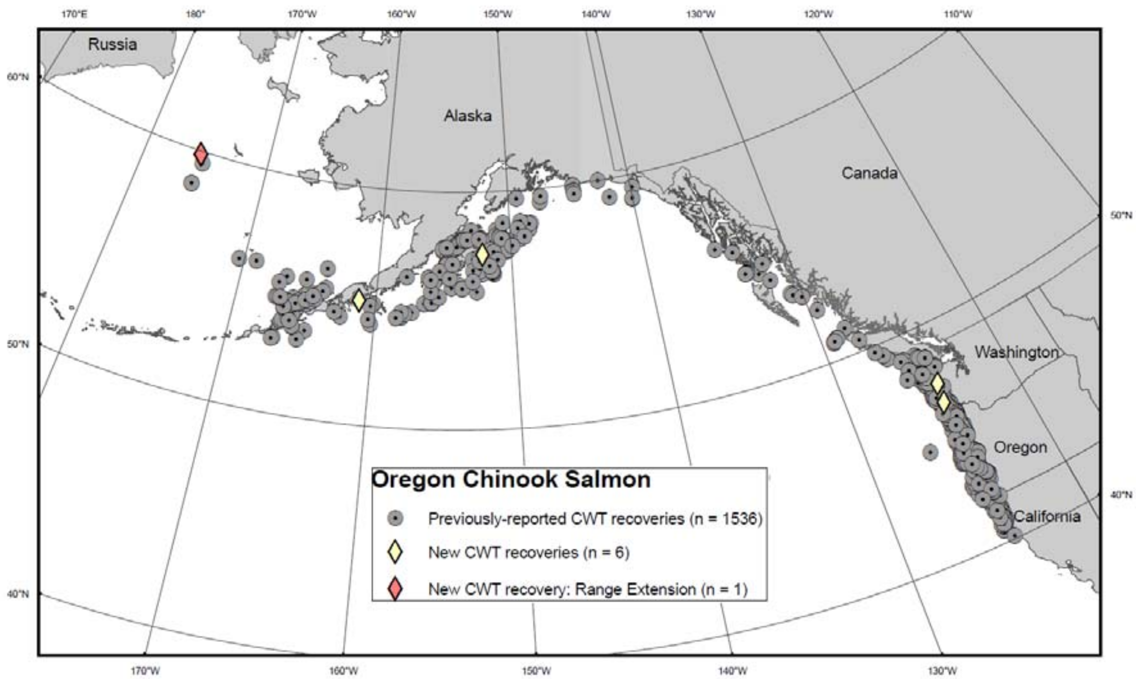
Source: Appendix 7

Figure 14 Ocean distribution for Washington Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary.



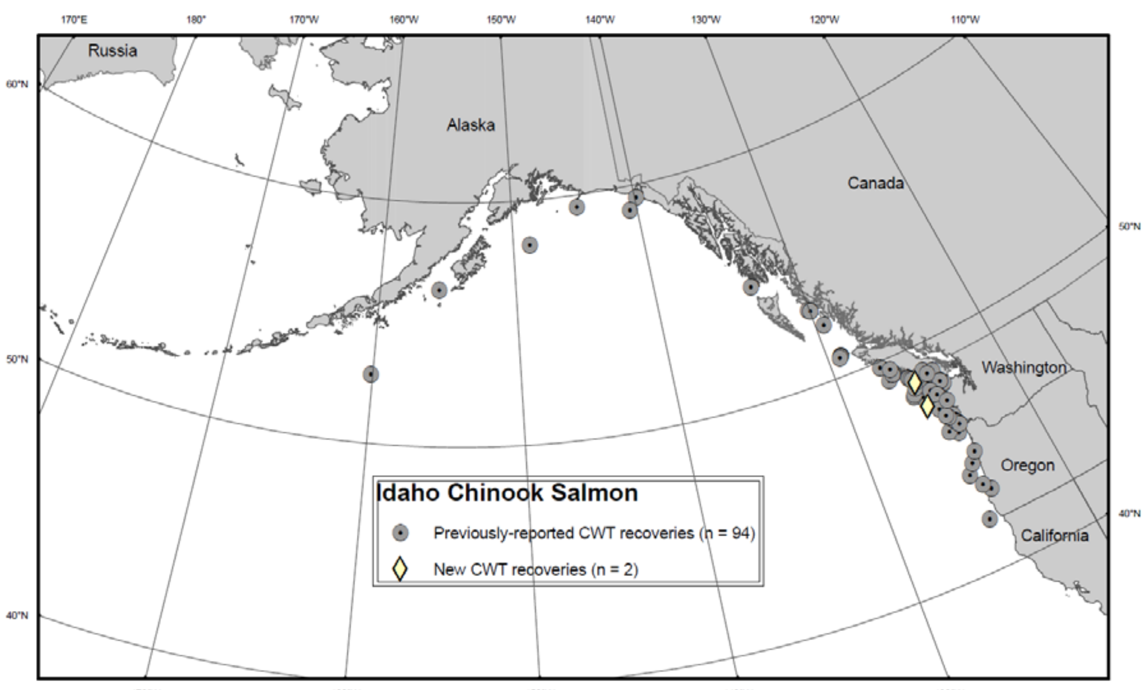
Source: Appendix 7

Figure 15 Ocean distribution for Oregon Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary



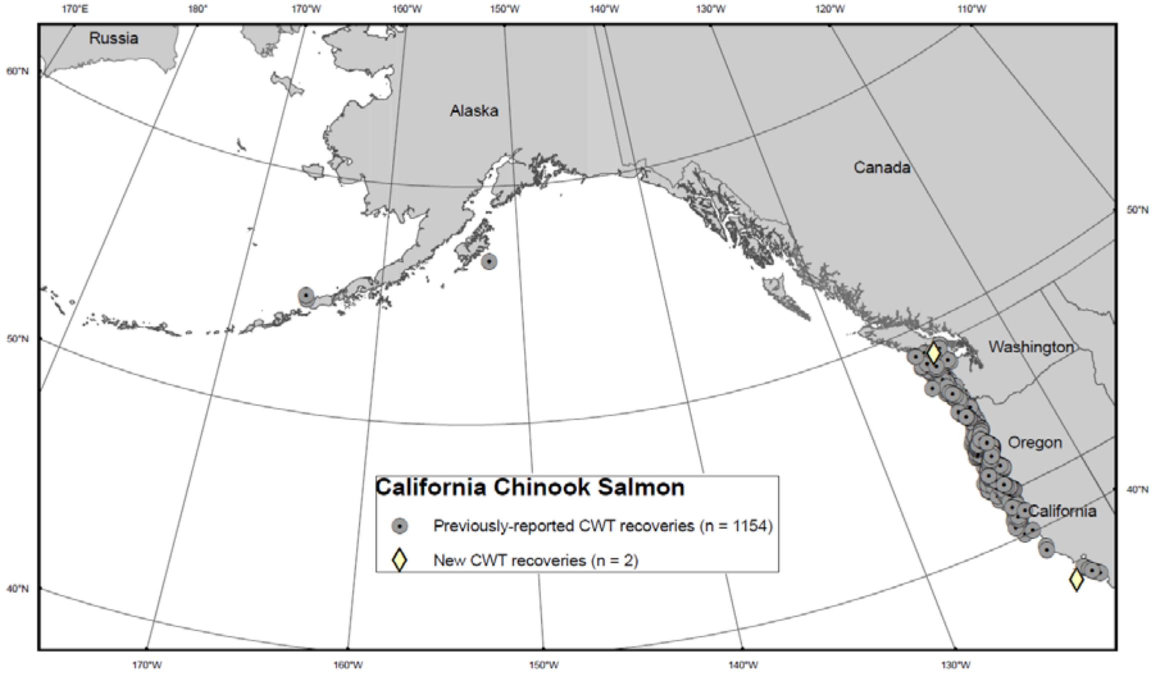
Source: Appendix 7

Figure 16 Ocean distribution for Idaho Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary.



Source: Appendix 7

Figure 17 Ocean distribution for California Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary.



Source: Appendix 7

Most of the Chinook salmon represented by CWTs and harvested in the GOA originated from hatchery production (Table 61). Overall since 1995, 96% of the CWT Chinook salmon bycatch was of hatchery origin, 3% from wild stocks, and 1% of mixed hatchery-wild stocks. For Alaska-origin CWT Chinook salmon however, wild stocks increased to 8% of the bycatch of Alaskan stocks in the GOA, with hatcheries providing the other 92%. For all the CWT Chinook salmon that have been released in Alaska from the 1992 brood onward, 87% were of hatchery origin, and 13% were from wild stocks. Washington was the only other state of origin for wild stocks recovered in the GOA.

Table 61 Observed Number of CWT Chinook salmon captured in the bycatch of the GOA groundfish fishery by state or province of origin, 1995-2010*

Origin	Rearing Type				TOTAL
	Unknown	Hatchery	Mixed	Wild	
Alaska	0	163	0	14	177
British Columbia	0	193	0	0	193
Idaho	1	0	0	0	1
Oregon	0	121	0	0	121
Washington	0	69	5	2	76
TOTAL	1	546	5	16	568
average % of total	0%	96%	1%	3%	100%

*preliminary
Source: Appendix 7

Chinook salmon represented by CWTs and recovered in the GOA were composed of a variety of run-types, and the percentage of each run-type varied by state or province of origin (Table 62). The different designated run-types are determined by the tagging agency. Overall, the most prevalent run-type of CWT Chinook salmon in the GOA was Spring, followed by Fall, Summer, and small numbers of other run-types. Percent composition of different run-types varied by state or province of origin. For Alaska stocks, 100% of CWT recoveries were Spring run-type. For British Columbia, the most prevalent run-type was Summer (41%), followed by Fall (33%) and Spring (26%). Washington Chinook salmon were predominantly Fall run-type (57%), followed by Summer (26%), Spring (9%), Late Fall (5%), and Late Fall Upriver Bright (3%). Oregon Chinook salmon were predominantly Spring (55%), followed by Fall (43%) and Winter (2%).

Table 62 Percent run-type of CWT Chinook salmon captured in the bycatch of the GOA groundfish fishery by state or province of origin, 1995–2010

Origin	Run-type						TOTAL
	Spring	Summer	Fall	Winter	Late Fall	Late Fall Upriver Bright	
Alaska	100%	0%	0%	0%	0%	0%	100%
British Columbia	26%	41%	33%	0%	0%	0%	100%
Oregon	55%	0%	43%	2%	0%	0%	100%
Washington	9%	26%	57%	0%	5%	3%	100%
Mean	49%	19%	30%	0%	1%	0%	100%

*preliminary
Source: Appendix 7

4.3.3.2 Genetic Analysis of Salmon Bycatch

While genetic and scale pattern derived stock composition analyses have been completed for available sample sets from the Chinook salmon bycatch of the BSAI pollock trawl fishery (Myers and Rogers, 1988; Myers et al., 2004; NMFS, 2009b; Guyon et al., 2010a; Guyon et al., 2010b), limited sampling has precluded stock composition of the salmon bycatch in the GOA pollock trawl fishery. For example, from the Chinook salmon bycatch in the GOA, there are only approximately 19 genetic samples from the 2007 "B" season, 38 from 2008, and 10 from 2009. This small number of Chinook salmon bycatch samples is insufficient to represent the annual catch for stock composition analysis, especially for an average annual bycatch of 21,596 between 2007 and 2009. Efforts are currently underway to improve genetic sampling in the GOA (Martin Loefflad, personal communication, 2011) so that stock composition analysis of the GOA bycatch can be accurately completed. More refined regional stock composition analyses than that currently available using the Alaska Department of Fish and Game (ADF&G) single nucleotide polymorphism (SNP) baseline (Templin et al., 2011) will require a combined approach using both CWT information (Celewycz et al., 2010) and increased baseline coverage of Pacific Northwest salmon populations.

For the 2010 genetic analyses, approximately 1,000 Chinook salmon axillary process samples have been received by Auke Bay Lab from the Alaska groundfish fisheries bycatch. Although the exact collection locations are protected under the Magnuson-Stevens Fishery Conservation and Management Act, approximate locations are available based on the cruise number and offload or haul number through interrogations of the Observer Database. As in previous years, it is anticipated that the vast majority of Chinook salmon bycatch samples will be from the Bering Sea pollock trawl fishery.

In 2009, a study was completed providing recommendations for improving sample representation to meet the data requirements for estimating geographic stock origins of the Bering Sea salmon bycatch based on genetic markers (Pella and Geiger, 2009). The report proposed a systematic random sampling regimen for the collection of both Chinook salmon and chum bycatch samples, whereby observers would sample every n^{th} fish from the census of salmon. Because all Chinook salmon stocks are not randomly distributed at sea (Guyon et al., 2010a; NMFS, 2009b), systematic random sampling was preferred as a means to generate a random sample set from a non-uniform distribution. An unbiased sample set, achieved by incorporating randomness at all levels of sampling so that each fish caught in the bycatch has an equal probability of being included in the sample set, is required for producing unbiased stock composition estimates of the salmon bycatch, both in the Bering Sea and the GOA. In addition, the sample set must be large enough to facilitate analysis of stock identification at pre-determined time and space domains. Due to the presence of a wide variety of salmon stocks in both the GOA and the Bering Sea, a goal of 400 representative genetic samples was established based on (1) sample sizes used in previous genetic analyses (Guyon et al., 2010a; Guyon et al., 2010b; NMFS, 2009b), and (2) recommendations that the coefficient of variation be no greater than 50% (defined as Standard Deviation/Estimated Value) for estimates with a 95% confidence that the individual stock contributed to the fishery (Marlowe and Busack, 1995). Even with these criteria, a sample set of 400 would only be 2% of a hypothetical total bycatch of 20,000. Given the non-random distribution of stocks, it is possible that even with a sample set size of 400, that the sample set may not be fully representative of rare stocks.

Salmon scales have been collected by the Observer Program from the Alaska groundfish fisheries. The Observer Program currently has 28,389 Chinook salmon scales from the BSAI and 8,138 Chinook salmon scales from the GOA (personal communication, Patti Nelson, January 2011). Collected scales are placed in envelopes, and each scale packet contains several scales from the same fish. These scales have been used to verify the observer's species identification, to age the salmon, and to identify life history characteristics. A report prepared for the Council in 1983 found higher percentages of ocean-type (freshwater age-0) Chinook salmon in the GOA than in the Bering Sea (Myers and Rogers, 1983). Age information is listed for both the Shumagin and Chirikof International North Pacific Fisheries Commission statistical areas. This information highlights that the age compositions of the Bering Sea and GOA Chinook salmon bycatch are very different and suggests stock compositions may also be different (personal communication, Kate Myers and Jeff Guyon, January 2011). Freshwater age-0 fish are more common in the Pacific Northwest and California. However, hatcheries in Alaska have also released freshwater age-0 Chinook salmon. A stock identification analysis of freshwater age-0 fish was not conducted. While possible, genetic stock composition analysis from scales can be difficult due to: (1) low amounts of DNA from scales, (2) lack of available scales in the preferred area due to loss during capture, and/or (3) potential contamination issues from mixing of scales between fish during hauls. Most importantly, the scales would have to have been collected in a representative manner without bias.

4.3.4 Management and assessment of Chinook salmon stocks

North Pacific Chinook salmon are the subject of commercial, subsistence, personal use, and sport/recreational (used interchangeably) fisheries. Chinook salmon are the least abundant of the five salmon species found on both sides of the Pacific Ocean and the least numerous in the Alaska commercial harvest. The majority of the Alaska commercial catch is made in Southeast Alaska, Bristol Bay, and the Arctic-Yukon-Kuskokwim area. The majority of catch is made with troll gear and gillnets. Approximately 90% of the subsistence harvest is taken in the Yukon and Kuskokwim rivers. The Chinook salmon is one of the most highly prized sport fish in Alaska and is extensively fished by anglers in the Southeast and Cook Inlet areas. The sport fishing harvest of Chinook salmon is over 76,000 fish annually with Cook Inlet and adjacent watersheds contributing over half the catch. Unlike other Pacific salmon species, Chinook salmon rear in inshore marine waters and are, therefore, available to commercial and sport fishers all year round (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.main).

The Alaska State Constitution establishes, as state policy, the development and use of replenishable resources, in accordance with the principle of sustained yield, for the maximum benefit of the people of the state. In order to implement this policy for the fisheries resources of the state, the Alaska Legislature created the Alaska Board of Fisheries (BOF) and the Alaska Department of Fish & Game (ADF&G). The BOF was given the responsibility to establish regulations guiding the conservation and development of the state's fisheries resources, including the distribution of benefits among subsistence, commercial, recreational, and personal uses. ADF&G was given the responsibility to implement the BOF's regulations and management plans through the scientific management of the state's fisheries resources. Scientific and technical advice is provided by ADF&G to the BOF during its rule-making process. The first priority for management is to meet spawning escapement goals in order to sustain salmon resources for future generations. The highest priority use is for subsistence under both state and federal law. Salmon surplus above escapement needs and subsistence uses are made available for other uses (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management).

ADF&G's fishery management activities fall into two categories: inseason management and applied science. For inseason management, the division employs fishery managers near the fisheries. Local fisheries managers are given authority to open and close fisheries to achieve two goals: the overriding goal is conservation to ensure an adequate escapement of spawning stocks, and the secondary goal is an allocation of fish to various user groups based upon management plans developed by the BOF. The BOF develops management plans in open, public meetings after considering public testimony and advice from various scientists, advisors, fishermen, and user interest groups (Woodby et al. 2005). Decisions to open and close fisheries are based on the professional judgment of area managers, the most current biological data from field projects, and fishery performance. Research biologists and other specialists conduct applied research in close cooperation with the fishery managers. The purpose of the division's research staff is to ensure that the management of Alaska's fisheries resources is conducted in accordance with the sustained yield principle and that managers have the technical support they need to ensure that fisheries are managed according to sound scientific principles and utilizing the best available biological data. The division works closely with the Division of Sport Fisheries in the conduct of both management and research activities (http://www.adfg.alaska.gov/index.cfm?adfg=chinook.management).

By far, most salmon in Alaska are caught in commercial troll, gillnet, and purse seine fisheries in which participation is restricted by a limited entry system. Troll gear works by dragging baited hooks through the water. Gillnet gear works by entangling the fish as they attempt to swim through the net. Gillnets are deploying in two ways: from a vessel that is drifting and from an anchored system out from the beach. Purse seines work by encircling schools of fish with nets that are drawn up to create giant "purses" that hold the school until the fish can be brought aboard. Other kinds of gear used in Alaska's smaller fisheries include fishwheels, which scoop fish up as the wheel is turned by river currents (Woodby et al. 2005). More information on the management of Alaska Chinook salmon commercial, sport/recreational, and subsistence fisheries may be found in the RIR, Section 3.7.

4.3.4.1 Escapement goals and Stock of Concern definitions

The Alaska State Constitution, Article VII, Section 4, states that Fish, forests, wildlife, grasslands, and all other replenishable resources belonging to the State shall be utilized, developed, and maintained on the sustained yield principle, subject to preferences among beneficial users." In 2000, the Alaska Board of Fisheries (board) adopted the Sustainable Salmon Fisheries Policy (SSFP) for Alaska, codified in 5 AAC 39.222. The SSFP defines sustained yield to mean an average annual yield that results from a level of salmon escapement that can be maintained on a continuing basis; a wide range of average annual yield levels is sustainable and a wide range of annual escapement levels can produce sustained yields (5 AAC 39.222(f)(38)).

The SSFP contains five fundamental principles for sustainable salmon management, each with criteria that will be used by ADF&G and the board to evaluate the health of the state's salmon fisheries and address any conservation issues and problems as they arise. These principles are (5 AAC 39.222(c)(1-5):

- Wild salmon populations and their habitats must be protected to maintain resource productivity;
- Fisheries shall be managed to allow escapements within ranges necessary to conserve and sustain potential salmon production and maintain normal ecosystem functioning;
- Effective salmon management systems should be established and applied to regulate human activities that affect salmon;
- Public support and involvement for sustained use and protection of salmon resources must be maintained;

- In the face of uncertainty, salmon stocks, fisheries, artificial propagation, and essential habitats must be managed conservatively.

This policy requires that ADF&G describe the extent salmon fisheries and their habitats conform to explicit principles and criteria. In response to these reports the board must review fishery management plans or create new ones. If a salmon stock concern is identified in the course of review, the management plan will contain measures, including needed research, habitat improvements, or new regulations, to address the concern.

A healthy salmon stock is defined as a stock of salmon that has annual runs typically of a size to meet escapement goals and a potential harvestable surplus to support optimum or maximum yield. In contrast, a depleted salmon stock means a salmon stock for which there is a conservation concern. Further, a stock of concern is defined as a stock of salmon for which there is a yield, management, or conservation concern (5 AAC 39.222(f)(16)(7)(35)).

Escapement is defined as the annual estimated size of the spawning salmon stock. Quality of the escapement may be determined not only by numbers of spawners, but also by factors such as sex ratio, age composition, temporal entry into the system, and spatial distribution within salmon spawning habitat ((5 AAC 39.222(f)(10)). Scientifically defensible salmon escapement goals are a Central tenet of fisheries management in Alaska. It is the responsibility of ADF&G to document, establish, and review escapement goals, prepare scientific analyses in support of goals, notify the public when goals are established or modified, and notify the board of allocative implications associated with escapement goals.

The key definitions contained in the SSFP with regard to scientifically defensible escapement goals and resulting management actions are: biological escapement goal, optimal escapement goal, sustainable escapement goal, and sustained escapement threshold. Biological escapement goal (BEG) means the escapement that provides the greatest potential for maximum sustained yield. BEG will be the primary management objective for the escapement unless an optimal escapement or inriver run goal has been adopted. BEG will be developed from the best available biological information and should be scientifically defensible on the basis of available biological information. BEG will be determined by ADF&G and will be expressed as a range based on factors such as salmon stock productivity and data uncertainty (5 AAC 39.222(f)(3)).

Optimal escapement goal (OEG) means a specific management objective for salmon escapement that considers biological and allocative factors and may differ from the SEG or BEG. An OEG will be sustainable and may be expressed as a range with the lower bound above the level of SET (5 AAC 39.222(f)(25)).

Sustainable escapement goal (SEG) means a level of escapement, indicated by an index or an escapement estimate, which is known to provide for sustained yield over a five to ten year period. An SEG is used in situations where a BEG cannot be estimated due to the absence of a stock specific catch estimate. The SEG is the primary management objective for the escapement, unless an optimal escapement or inriver run goal has been adopted by the board. The SEG will be developed from the best available biological information and will be stated as a range that takes into account data uncertainty. The SEG will be determined by ADF&G (5 AAC 39.222(f)(36)).

Sustained escapement threshold (SET) means a threshold level of escapement, below which the ability of the salmon stock to sustain itself is jeopardized. In practice, SET can be estimated based on lower ranges of historical escapement levels, for which the salmon stock has consistently demonstrated the ability to sustain itself. The SET is lower than the lower bound of the BEG and also lower than the lower bound of the SEG. The SET is established by ADF&G in consultation with the board for salmon stocks of management or conservation concern (5 AAC 39.222(f)(39)).

The Policy for Statewide Salmon Escapement Goals is codified in 5 AAC 39.223. In this policy, the board recognizes ADF&G's responsibility to document existing salmon escapement goals; to establish BEGs, SEGs, and SETs; to prepare scientific analyses with supporting data for new escapement goals or to modify existing ones; and to notify the public of its actions. As such, the board will take regulatory actions as may be necessary to address allocation issues arising from new or modified escapement goals and determine the appropriateness of establishing an OEG. In conjunction with the SSFP, this policy recognizes that the establishment of salmon escapement goals is the responsibility of both the board and ADF&G.

4.3.5 Chinook salmon stocks in Alaska

A brief overview of Chinook salmon stocks by area is included in this section. Available information on individual stocks and run strengths varies greatly by river and management area. The 2009 escapement goals, and escapement for 2001-2009, are provided by river for each Alaska region in Appendix 6. Section 4.3.4.1 provides a summary of Alaska Chinook salmon stock performance in 2010.

4.3.5.1 Southeast Alaska and Yakutat

Native Chinook salmon stocks occur throughout Southeast Alaska and Yakutat, primarily in the large mainland rivers and their tributaries. Of the 34 known rivers that produce runs of Chinook salmon the Alsek, Taku, Stikine, Chilkat, and the Behm Canal Rivers (i.e., Unuk, Chickamin, Blossom, and Keta Rivers) are the most important (Pahlke 2010). Many of these important rivers are transboundary systems which originate in Canada and flow through Alaska to the Pacific Ocean. The Pacific Salmon Commission, under the terms of the Pacific Salmon Treaty, address shared ownership and coordinated management of the Taku, Stikine, and Alsek rivers.

Commercial Chinook salmon harvests are based on 3 components: (1) the all-gear Pacific Salmon Treaty defined harvest ceiling, based on coastwide abundance forecasts; (2) directed fisheries on returns to the Stikine and/or Taku rivers, also based on forecasts and harvest sharing agreements contained in the Pacific Salmon Treaty; and (3) production from Alaska enhancement programs (Tingley and Davidson 2010). In addition to commercial fisheries, Chinook salmon are also taken in sport, personal use, and subsistence fisheries. A majority of the Chinook salmon sport harvest occurs in the Ketchikan, Sitka, and Juneau areas.

Spawning escapement is monitored on eleven river systems as biological escapement goals and these counts are used as indicators of relative salmon abundance as part of a coast-wide Chinook salmon model. The Taku, Stikine, and Chilkat rivers make up over 75% of the summed escapement goals in the region.

4.3.5.2 Prince William Sound

The Prince William Sound (PWS) management area encompasses all coastal waters and inland drainages entering the north Central GOA between Cape Suckling and Cape Fairfield. Chinook salmon are harvested in commercial fisheries (primarily by drift gillnets), sport, personal use, and subsistence fisheries. The entire Chinook salmon run originates from wild upriver stocks (Botz et al. 2010).

The Copper River is the only river in the PWS area where Chinook salmon escapement is monitored. In 2003 the Alaska Board of Fisheries set a SEG of 24,000 Chinook salmon for the Copper River. With the exception of 2005, this lower-bound SEG has been achieved in all years since implementation.

4.3.5.3 Cook Inlet

The Cook Inlet management area is divided into 2 areas, the Upper Cook Inlet (northern and Central districts) and the Lower Cook Inlet. The Upper Cook Inlet commercial fisheries management area consists of that portion of Cook Inlet north of the latitude of the Anchor Point Light. There is one optimal escapement goal (Kenai River early run), three biological escapement goals (Kenai River early and late runs, Deshka River), and 18 sustainable escapement goals in effect for Chinook salmon in the Upper Cook Inlet area. Chinook salmon are harvested in the commercial fishery by set and drift gillnet gear and are an important component of subsistence and sport fisheries in the area. Chinook salmon may not be retained in most of the personal use fisheries of Upper Cook Inlet; exceptions include the Kenai River dip net fishery and the Kasilof River fisheries (Shields 2010).

The Deshka River is the only system in northern Cook Inlet where Chinook salmon escapement is monitored inseason with a weir. In 2008 and 2009, the Deshka River Chinook salmon run was below average and failed to meet its escapement goal. Late run Kenai River Chinook salmon runs have been relatively stable and escapement objectives have been consistently achieved or exceeded.

The Lower Cook Inlet management area is comprised of all waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point. There are 3 SEGs in effect for Chinook salmon in the Lower Cook Inlet area. Chinook salmon are not a commercially important species in Lower Cook Inlet and most of the catch occurs incidental to fisheries targeting sockeye (Hammarstrom and Ford 2010).

4.3.5.4 Alaska Peninsula

The North Alaska Peninsula portion of the Alaska Peninsula Management Area includes those waters of the Alaska Peninsula from Cape Sarichef to Cape Menshikof. The majority of Chinook salmon harvest occurs incidental to sockeye salmon fisheries, although directed fisheries do occur. Sport and subsistence fisheries also harvest Chinook salmon in the North Alaska Peninsula area.

The Nelson River is the only river on the North Alaska Peninsula with a Chinook salmon escapement goal. The biological escapement goal is set at 2,400 4,400 Chinook salmon and has been met or exceeded since implemented in 2004 with the exception of 2009 when 2,048 Chinook salmon returned (Hartill and Murphy 2010).

The South Alaska Peninsula Area includes waters from Kupreanof Point west to Scotch Cap. No Chinook salmon are known to spawn in South Alaska Peninsula streams. Chinook salmon are commercially harvested by purse seine, drift gillnet, and set gillnet gear. Most of the Chinook salmon are taken by seine gear incidental to other fisheries. The ten-year average commercial harvest is approximately 5,000 fish (Poetter et al. 2009). Chinook salmon are also taken in subsistence and sport fisheries.

4.3.5.5 Chignik

The Chignik Management Area encompasses all coastal waters and inland drainages of the northwest GOA between Kilokak Rocks and Kupreanof Point. Chinook salmon are harvested in commercial, sport, and subsistence fisheries.

The Chignik River is the only stream with substantial Chinook salmon production in the Chignik area. In 2002, a biological escapement goal was established for the Chignik River at 1,300 2,700 Chinook salmon (Jackson and Anderson 2010). The BEG has been met or exceeded in all years since implementation.

4.3.5.6 Kodiak

The Kodiak Management Area comprises the waters of the Western GOA surrounding the Kodiak Archipelago and that portion of the Alaska Peninsula bordering the Shelikof Straight between Cape Douglas and Kilokak Rocks. The majority of commercial Chinook salmon harvest is taken by seine fishermen during June and early July in the Eastside Kodiak and Mainland districts (Dinnocenzo et al. 2010). Chinook salmon harvest also occurs in sport and subsistence fisheries.

Chinook salmon occur in six streams and biological escapement goals are established for both the Karluk and Ayakulik rivers. Due to weak sockeye salmon runs to Karluk River in 2009, no fishery occurred in the Inner Karluk and Outer Karluk sections of the Southwest Kodiak District which reduced the interception of Karluk Chinook salmon. Despite this, the Karluk River Chinook salmon escapement was below the escapement goal range for the fourth consecutive year. Escapement through the Ayakulik River weir was below the escapement goal range of 4,800-9,600 Chinook salmon in 2006, 2008, and 2009.

4.3.5.7 Bristol Bay

The Bristol Bay Area includes all coastal waters and inland waters east of a line from Cape Newenham to Cape Menshikof. The area is further divided into 5 fishing districts: Togiak, Nushagak, Naknek-Kvichak, Egegik, and Ugashik. Harvests of Chinook salmon in the commercial fishery predominantly occur in the Nushagak District (Morstad et al, 2010). Chinook salmon are popular targets in both the sport and subsistence fisheries.

The Nushagak River has an SEG of 40,000 80,000 Chinook salmon and the Togiak, Naknek, Alagnak, and Egegik rivers all have lower-bound SEGs. Chinook salmon returns to these river systems have generally met escapement goals. In 2009, escapement to the Naknek, Alagnak, and Egegik rivers failed to meet the lower SEG goals.

4.3.5.8 Kuskokwim

The Kuskokwim Management Area includes the Kuskokwim River drainage, all waters of Alaska that flow into the Bering Sea between Cape Newenham and the Naskonat Peninsula, and Nunivak and St Mathew Islands. Kuskokwim River Chinook salmon are harvested primarily for subsistence use, although incidental harvest in the chum salmon commercial fisheries does occur during late June and July, and some sport fishing occurs (Bavilla et al. 2010).

Chinook salmon escapements are evaluated through aerial surveys, by enumeration at weirs, and through a mark and recapture at the mainstem tagging project near Upper Kalskag. The Middle Fork Goodnews River has a biological escapement goal of 1,500 2,900 Chinook salmon. The remaining 13 streams have SEGs which were implemented in either 2005 or 2007. Escapement goals have not been achieved on most river systems since implementation. In 2008 and 2009 minimum escapement goals were not achieved on the Kwethluk, Tuluksak, Cheeneetnuk, or Gagaryah rivers

4.3.5.9 Yukon River

The Yukon Salmon Management Area encompasses the largest river in Alaska. The Yukon River and its tributaries drain an area of approximately 220,000 square miles within Alaska, while the Canadian portion of the river accounts for another 110,000 square miles. The river flows 2,300 miles from its origin 30 miles from the GOA to its terminus in the Bering Sea. Spawning populations of Chinook salmon occur throughout the Yukon River drainage in tributaries from as far downstream as the Archuelinuk River to as far upstream as the headwaters of the Yukon River in Canada.

The Yukon is managed as a single river and catches are reported by district and use (sport, commercial, personal use, and subsistence). Chinook salmon production for many Yukon River stocks has been declining in recent years and the Yukon River Chinook salmon was designated as a Stock of Yield Concern in 2000 (Hayes and Norris 2010). Biological escapement goals have been established for the Chena and Salcha rivers, while SEGs have been established for the East and West Fork Andreafsky, Anvik, Nulato, and Gisasa rivers.

4.3.5.10 Norton Sound

Norton Sound, Port Clarence, and Kotzebue Sound management districts include all waters from Point Romanof in southern Norton Sound to Point Hope at the northern edge of Kotzebue Sound, and St Lawrence Island. There are few Chinook salmon in the Port Clarence District. In the Norton Sound District, only the eastern area has sizeable runs of Chinook salmon and the primary salmon producing rivers are the Shaktoolik and Unalakleet subdistricts. The Shaktoolik and Unalakleet Chinook salmon stock was classified as a stock of yield concern in 2004. Commercial fishing typically begins in June and targets Chinook salmon if sufficient run strength exists (Menard et al. 2010). Sport and subsistence fisheries for Chinook salmon also occur in the Norton Sound area.

Escapement goals are established for five stocks in the Norton Sound Area, all are SEGs: Fish River/ Boston Creek, Kwiniuk River, North River (Unalakleet River), Shaktoolik River, and Unalakleeet/Old Woman River. The 2008 Norton Sound Chinook salmon run was the poorest return on record.

4.3.5.11 Summary of 2010 Alaska Chinook salmon stock status

Following the below average 2007–2009 Chinook salmon runs in Western Alaska, management of the 2010 fisheries was conservative. All of the Chinook salmon runs to Western Alaska started late and most were four to six days late in run timing. The late run combined with inclement weather in early June resulted in a delayed start to most fisheries. No directed Chinook salmon commercial fisheries occurred in the Yukon River, Kuskokwim River, or in Norton Sound in 2010, and only small commercial fisheries occurred in the Nushagak and Kuskokwim Bay (Table 63). Sport fisheries were restricted or closed in the Nushagak River, Yukon (Chena River), Kuskokwim (Kwethluk and Tuluksak rivers), and Unalakleet and Shaktoolik rivers of Norton Sound Area. More significantly, subsistence fisheries in the Nushagak River, two tributaries of the Kuskokwim River (Kwethluk and Tuluksak rivers; USFWS federal closure), and Norton Sound (Unalakleet and Shaktoolik rivers) were restricted or closed. In spite of conservative management strategies, which in some cases were at great cost to the people who rely on these resources for food and income, few escapement goals were achieved in Western Alaska.

Kodiak Island Chinook salmon escapement was well below the previous 10-year average. Returns to the Karluk River did not meet the lower escapement goal despite closures to the subsistence, sport, and commercial fisheries. Escapement through the Ayakulik weir was within the established escapement goal range. The 2010 escapement to the Chignik River was above the escapement goal range and the 5-year average, but below the 10-year average. The Deshka River is the only system in northern Cook Inlet where Chinook salmon escapement is monitored inseason with a weir. 2010 escapement on the Deshka River was within the escapement goal range. Both the early and late run Kenai River escapement goals were achieved.

Table 63 Overview of Alaskan Chinook salmon stock performance, 2010.

Chinook salmon stock	Total run size?	Escapement goals met?[a]	Subsistence fishery?	Commercial fishery?	Sport fishery?	Stock of concern?
Bristol Bay	Poor	0 of 1[b] (4 not surveyed)	Restricted on Nushagak	Limited in Nushagak District	Restricted and closed on Nushagak	No
Kuskokwim	Poor	3 of 7 (7 not surveyed)	Yes, 2 Tributaries closed	None on Kuskokwim River, Limited in Bay	2 Tributaries closed	No
Yukon	Poor	3 of 7	Yes	No directed, some incidental take with chum	1 Tributary closed	Yield
Norton Sound	Poor	1 of 3 (2 not surveyed)	Yes, with restrictions	No	No	Yield
Alaska Peninsula	Below average	1 of 1	Yes	Yes	Yes	No
Kodiak	Below average	1 of 2	Karluk closed	Restricted in Karluk and Ayakulik areas	Karluk closed	Management (Karluk)
Chignik	Average	1 of 1	Yes	Yes	Yes	No
Upper Cook Inlet	Below average	4 of 19 [c]	Yes	Restricted in Northern District	Various restrictions	6 stocks of conern
Lower Cook Inlet	Below average	2 of 3	Yes	Yes, incidental to other fisheries	Yes	No
Prince William Sound	Below average	0 of 1	Yes	Yes	Yes	No
Southeast	Average	9 of 11	Yes	Yes	Yes	No

[a] Some aerial survey-based escapement goals were not assessed due to inclement weather or poor survey conditions, therefore we do not know if the escapement goals were met for these systems.
[b] The Chinook salmon escapement goal was not met on the Nushagak River in 2010.
[c] 2 of the 21 escapement goals were not assessed in 2010.

4.3.5.12 Pacific Northwest Stocks

Chinook salmon stocks in the Pacific Northwest include over 200 stocks from British Columbia, Oregon and Washington State. The specific stocks are listed in 2010 Bering Sea/Aleutian Islands Chinook salmon EIS (Chapter 3, NMFS 2009b). Given the breath of this grouping, it is not possible to identify specific Chinook stocks that may be affected by Chinook salmon bycatch in the GOA. However, a discussion of ESA-listed Chinook salmon stocks in the Pacific Northwest is addressed specifically in Section 4.3.6.

4.3.5.13 Asian Stocks

On the Asian coast, Chinook salmon occur from the Anadyr River area of Siberia southward to Hokkaido, Japan.[24] Chinook salmon occur primarily in Russia, from the Amur River, northward to the Anadyr River (center of abundance is the Kamchatka Peninsula). High seas tagging experiments have provided little information on ocean ranges of Asian Chinook salmon. There are only two Asian coastal recoveries of high-seas tagged Chinook salmon. One was a fish released just off the coast of Hokkaido, Japan, and recovered in Japan, and the other released south of the Aleutians in the Central North Pacific (172°03´W, 49°35´N) and recovered in East Kamchatka (Kamchatka River).

4.3.6 ESA-listed Chinook salmon stocks in the Pacific Northwest

Of the nine Chinook salmon Evolutionarily Significant Units (ESUs) in the Pacific Northwest that are listed under the Endangered Species Act (ESA), three are known to have been caught as bycatch in the Alaska groundfish fisheries. The information currently available on Chinook salmon ESA-listed ESUs in

[24] http://www.adfg.state.ak.us/pubs/notebook/fish/chinook.php

the GOA is from CWTs. Chinook salmon from the Lower Columbia River, Upper Columbia River, and Upper Willamette River Spring ESUs have been recovered in the GOA trawl fishery. Small numbers of the Puget Sound (PS) Chinook salmon ESU, the Snake River Spring/Summer (SRS/S) Chinook salmon ESU, and the Snake River Basin (SRB) steelhead ESUs have been documented by research surveys in the GOA, indicating that these stocks also occur in the GOA. All of the Chinook salmon from ESA-listed ESUs that have been recovered in the GOA trawl fishery have been spring run. One of the Lower Columbia River CWTs recovered in high seas research (2001) was a fall run (personal communication, Adrian Celewycz, November 2010).

In January 2007, the NMFS Northwest Region completed a supplemental biological opinion to the November 30, 2000 biological opinion on the effects of the Alaska groundfish fisheries on ESA-listed salmon (NMFS 2007). An incidental take statement was included in the 2000 and 2007 biological opinions, which established a threshold of 40,000 Chinook salmon caught as bycatch in the GOA groundfish fisheries. The 2000 biological opinion concluded that the GOA groundfish fisheries are not likely to jeopardize the continued existence of ESA-listed Chinook salmon stocks. If, during the course of the fisheries, the specified level of take is exceeded, a reinitiation of consultation is required, along with a review of the reasonable and prudent measures identified in the 2007 supplemental biological opinion.

Because of the high number of Chinook salmon taken in the GOA groundfish fisheries in 2010, the NMFS Alaska Region reinitiated ESA section 7 formal consultation with NMFS Northwest region on the 2010 incidental take of Chinook salmon (Balsiger 2010). The incidental take of Chinook salmon in the 2010 GOA groundfish fisheries was 54,576 fish (NMFS Alaska Region Catch Accounting System February 10, 2011). The consultation is ongoing.

Detailed information on listed stocks is available in updated status reports of listed ESUs (Good et al. 2005 and McElheny et al. 2007), and in the Interim Regional Recovery Plan for Washington management units of the listed ESUs in the Lower Columbia River (LCFRB 2004). Additional information related to the status of Lower Columbia River and Upper Willamette River Chinook salmon is summarized in biological opinions (NMFS 1999; NMFS 2005; NMFS 2007; NMFS 2009a) and the EIS for Amendment 91 (NMFS 2009b). No critical habitat is designated in Alaska waters for the Chinook salmon ESA-listed stocks.

In 2010, NMFS initiated a planned five-year review of Pacific salmon and steelhead populations listed under the ESA to ensure the accuracy and classification of each listing. The review will include the salmon species taken in the GOA fisheries and research cruises. NMFS has developed a strategy for recovery planning in Washington, Idaho, Oregon, and California that combines ESA-listed salmon and steelhead distinct population segments into geographic areas. The Northwest Region has identified its four recovery planning areas, or recovery domains, and has established technical recovery teams of scientists for each domain. Recovery plans in each domain will address all salmon species within that geographic area, and will involve stakeholders on a local level (NMFS 2011). More information on the recovery activities is available from http://www.nwr.noaa.gov/Salmon-Recovery-Planning/ESA-Recovery-Plans/Draft-Plans.cfm.

The only Chinook salmon ESA-listed ESUs that have been documented in the BSAI groundfish fisheries are from the Lower Columbia River and Upper Willamette River, suggesting that spring-run populations from the Lower Columbia River (the Willamette River is a tributary that enters the lower Columbia near Portland, Oregon) are distinct in having the most northerly distribution, at least among the ESA-listed Chinook salmon from the southern United States (NMFS 2009b). Chinook salmon from ESA-listed ESUs are observed more frequently in the GOA groundfish fishery than the BSAI groundfish fishery because the GOA is closer to the streams from which these stocks originate (NMFS 2009b). The probability that an ESA-listed Chinook salmon will be taken in the GOA groundfish fishery depends on the duration of the time period considered and the cumulative total Chinook salmon bycatch over that time. During 2004 through 2010, the total catch of Chinook salmon in the GOA groundfish fishery was 187,414 (Balsiger 2011).

4.3.6.1 Observer program bycatch sampling

Genetic samples, comprised of a pelvic axillary processes, maturity information, sex/length/weight and five scales were collected from Chinook salmon and chum salmon in the 2010 pollock fisheries. In addition, scale samples for species identification and snouts from salmon with a missing adipose fin (CWT recovery) were collected. Vessel observers in the GOA pollock fishery collected genetic samples and associated data only from Chinook salmon and chum salmon encountered in their species composition samples. Shoreside plant observers were not responsible for collecting salmon genetic samples from the pollock deliveries in the GOA.

In 2011, sampling procedures in the GOA will be revised to be consistent with changes occurring in the Bering Sea pollock fishery under Amendment 91 to the FMP for Groundfish of the BSAI (75 FR 53026, August 30, 2010). In 2011, the genetic samples noted above will be taken systematically from all salmon encountered in observed pollock deliveries. This should provide samples from throughout the observed deliveries in the GOA. Detailed instructions on the procedures observers use to collect the data, which are inputs into the estimation process, are in the series of observer manuals available at: http://www.afsc.noaa.gov/FMA/document.htm.

4.3.6.2 Coded-Wire Tag results

The Regional Mark Processing Center maintains a coastwide database for CWT releases and recoveries, as well as associated catch and sample data. Over 50 million salmonids with CWTs are released yearly by 54 federal, provincial, state, tribal, and private entities. This database dates back to the 1970s and contains data contributed by the states of Alaska, Washington, Oregon, Idaho, and California; the province of British Columbia; federal agencies including NMFS, U.S. Fish and Wildlife Service, and Canadian Department of Fisheries and Oceans; and tribal groups including the Columbia River Inter-Tribal Fish Commission, Metlakatla Indian Community, and the Northwest Indian Fisheries Commission. The coastwide CWT database is the authority on the historic and current use of CWTs in West Coast salmon populations, both wild and hatchery. For a complete overview of the Regional Mark Processing Center and the coastwide CWT database go to: http://www.rmpc.org/.

Through this coordinated coastwide system, CWT recovery data have enabled scientists and managers to determine exploitation patterns for individual groups of fish and to assist in decision-making to manage salmon populations. CWTs have been used for cohort analysis into simulation models, identification of migration and exploitation patterns, estimating and forecasting abundance, and in-season regulation of fisheries (PSC 2005). CWTs are increasingly being used with other stock identification technologies such as genetic markers, scale pattern, and otolith banding to provide a better analysis of salmonid population dynamics.

After the CWT tags are decoded, processed, and validated, data from the “observed recoveries” are made available for use in preliminary reports. This includes expansion of the observed recoveries into “estimated recoveries” for the given area time stratum once the catch sample data are available (Nandor et al. 2010). The estimated recoveries and expansion factors are explained below in the discussion on ESA-listed salmon.

4.3.6.3 Processing snouts from adipose fin-clipped salmon at Auke Bay Laboratories CWT Lab

A missing adipose fin indicates that a salmon may have a CWT. Salted snouts from adipose fin-clipped salmon collected by the NMFS Alaska Fisheries Science Center (AFSC) North Pacific Observer Program from the salmon bycatch in the GOA and BSAI groundfish fisheries are periodically sent to the NMFS Auke Bay Laboratories (Auke Bay Lab) CWT Lab from Observer Program offices in Seattle, Dutch Harbor, and Kodiak. After the snouts are processed with the CWT extracted from each snout, read under a microscope, and verified under a microscope, then recovery data associated with each snout are entered into a Microsoft Access database. At this point, the recovery data included with each snout are considered preliminary because they are often incomplete, with missing recovery dates, missing recovery locations, etc. So the recovery data are sent to the AFSC FMA Observer Program for error checking, verification, and filling in the blanks. Once the corrected data are received back at Auke Bay Lab, they are incorporated into the master historical database of all CWTs processed by Auke Bay Lab's CWT Lab. At that point the data are finalized and then available for further analysis.

4.3.6.4 CWT expansions

Ideally, it would be preferable to calculate a total estimated contribution of Chinook salmon from ESA-listed ESUs harvested in the GOA in order to determine the impact of the fishery on these stocks. Total estimated contributions for CWT recoveries can be calculated in a two-step process involving a sampling expansion factor and a marking expansion factor. For an explanation of Recovery Estimation Technique see Appendix 7.

Unfortunately, sampling expansion factors cannot be calculated for the CWT recoveries of ESA-listed ESUs in the GOA because of data limitations. For most of the recoveries of CWTs in the GOA trawl fishery, it is unknown whether the CWTs were collected systematically from inside the observers' species composition sample or non-systematically from outside the observers' species composition sample. A sampling expansion factor can only be calculated from CWTs recovered from inside a sample where the total number of sampled fish is known, as in the percent composition samples. CWT recoveries from outside the percent composition sample ("select" or opportunistic recoveries where the total number of fish examined is unknown) cannot be used to calculate a sampling expansion factor. Of the 69 documented CWT recoveries of Chinook salmon from ESA-listed ESUs in the GOA trawl fishery, only two CWTs are known to have been recovered from inside the sample. Two CWTs are known to have been recovered outside the sample. For the other 65 recoveries, it is unknown whether the CWT was recovered from inside or outside the sample.

However, marking expansions can still be calculated for each CWT recovery from the mark expansion factors for each tag code. Because not all fish in a tag release group are actually tagged with CWTs, marking expansion factors account for the fraction of each release group that is tagged (Appendix 7). Without being able to calculate total estimated contributions because of unknown sampling expansion factors, mark expansions offer the closest approximation to the contribution of Chinook salmon from ESA-listed ESUs in the GOA and BSAI. Mark expansions should be considered a very minimal estimate for the actual total contribution of Chinook salmon from ESA-listed ESUs in the GOA and BSAI.

4.3.6.5 Occurrence of ESA-listed Chinook salmon ESUs in the GOA

Recoveries of CWTs from outside the sample (or from unknown sample origin) are still important for documenting occurrence of ESA-listed ESUs in the GOA trawl fisheries. Chinook salmon from the Lower Columbia River, Upper Willamette River, and Upper Columbia River Spring ESUs have been recovered in the GOA trawl fishery. Since 1984, CWTs have been recovered from 23 Lower Columbia River, 97 Upper Willamette River, and 1 Upper Columbia River Chinook salmon in the GOA trawl fishery, both pre- and post-listing (Table 64). By applying mark expansion factors, the estimated numbers increase to 112 Lower Columbia River, 275 Upper Willamette River, and 1 Upper Columbia River Chinook salmon in the GOA (Table 64). These numbers should be considered as very minimum estimates of the number of ESA-listed ESUs in the GOA groundfish fisheries. Until adequate numbers of CWTs are recovered from inside the observers' samples, where the total number of fish sampled is known, an estimate of total contribution of ESA-listed ESUs in the GOA fishery will remain indeterminable.

Table 64 Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU captured in the bycatch of the GOA trawl fisheries, summed over pre-listing and post-listing periods, 1984–2010

		Chinook salmon in GOA Trawl Fisheries	
Listing Status	**ESU Name**	Observed Number	Mark Expansion
Pre-listing	Lower Columbia River spring Chinook	12	82.1
	Upper Willamette River Chinook	40	129.7
Post-listing	Lower Columbia River spring Chinook	11	29.8
	Upper Willamette River Chinook	57	145.4
	Upper Columbia River spring Chinook	1	1.0

Source: Appendix 7

Research surveys have documented the occurrence of other ESUs of ESA-listed Chinook salmon in the GOA besides the Lower Columbia River, Upper Willamette River, and Upper Columbia River. Small numbers of the Puget Sound Chinook salmon ESU, the Snake River Spring/Summer Chinook salmon ESU, and the Snake River Basin steelhead ESUs have also been recovered in the GOA in addition to the three Chinook salmon ESUs that have been documented in the GOA fishery. Since 1991, CWTs have been recovered from 3 Lower Columbia River, 1 Puget Sound, 5 Snake River Spring/Summer, 4 Upper Columbia River, 11 Upper Willamette River Chinook salmon, and 1 Snake River Basin steelhead in domestic and foreign research surveys in the GOA (Table 65). By applying mark expansion factors, the estimated numbers increase to 6 Lower Columbia River, 1 Puget Sound, 9 Snake River Spring/Summer, 4 Upper Columbia River, 72 Upper Willamette River Chinook salmon, and 1 Snake River Basin steelhead.

Table 65 Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys, post-listing, 1991–2010

		Chinook salmon in GOA Research Surveys	
Listing Status	**ESU Name**	Observed Number	Mark expansion
Post-listing	Lower Columbia River Chinook	3	6.5
	Puget Sound Chinook	1	1.0
	Snake River spring/summer Chinook	5	9.2
	Upper Columbia River spring Chinook	4	4.1
	Upper Willamette River Chinook	11	72.0
	Snake River Basin steelhead	1	1.0

Source: Appendix 7

The Council and NMFS have contracted with Cramer Fish Sciences to develop information to improve estimates of the potential impact of Chinook bycatch on listed ESUs from the Pacific Northwest. Currently, the bycatch estimates are based on the hatchery component of the Chinook salmon runs, and do not take into account the contribution of the wild component of the ESU. The contractor will compile new information on the annual production of stream type (spring run) Chinook salmon ESA-listed ESUs originating from Washington, Oregon, and Idaho. The database will include all production (counted and estimated, tagged and untagged) of both wild and hatchery components of each ESU on an annual basis. With this information, NMFS staff will be able to determine what proportion of wild and hatchery rearing types comprise each spring run Chinook salmon ESU on an annual basis and what proportion of each ESU is represented by CWTs. It is estimated that this work will be completed sometime in 2011.

4.3.7 Hatchery releases

Commercial salmon fisheries exist around the Pacific Rim with most countries releasing salmon fry in varying amounts by species. The North Pacific Anadromous Fish Commission (NPAFC) summarizes information on hatchery releases by country and by area where available. Reports submitted to the NPAFC were used to summarize hatchery information by Country and by US state below (Table 66, Table 67). For more information see the following: Russia (Akinicheva et al. 2008; Anon. 2007; TINRO-centre 2006, 2005); Canada (Cook et al. 2008); USA (Josephson 2008; Josephson 2007; Eggers 2006, 2005; Bartlett 2007, 2006, 2005).

Chinook salmon hatchery releases by country are shown below in Table 66. There are no hatchery releases of Chinook salmon in Japan and Korea and only a limited number in Russia.

Table 66 Hatchery releases of juvenile Chinook salmon in millions of fish

Year	Russia	Japan	Korea	Canada	USA	TOTAL
1999	0.6	-	-	54.4	208.1	263.1
2000	0.5	-	-	53.0	209.5	263.0
2001	0.5	-	-	45.5	212.1	258.1
2002	0.3	-	-	52.8	222.1	275.2
2003	0.7	-	-	50.2	210.6	261.5
2004	1.17	-	-	49.8	173.6	224.6
2005	0.84	-	-	43.5	184.0	228.3
2006	0.78	-	-	40.9	181.2	223.7
2007	0.78	-	-	44.6	182.2	227.6

For Chinook salmon fry, the United States has the highest number of annual releases (80% of total in 2007), followed by Canada (~20%). In Canada, enhancement projects have been on-going since 1977 with approximately 300 different projects for all salmon species (Cook and Irvine 2007). Maximum production for Chinook salmon releases was reached in 1991 with 66 million fish in that year (Cook and Irvine 2007). Releases of Chinook salmon in 2006 occurred in the following regions: Yukon and Transboundary River, Skeena River, North Coast, Central Coast, West Coast and Vancouver Island, Johnstone Strait, Straits of Georgia, and the Lower and Upper Fraser rivers. Of these the highest numbers were released in the West Coast Straits of Georgia (20 million fish) followed by Vancouver Island area (12.4 million fish) the Lower Fraser River (3.3 million fish) (Cook and Irvine 2007).

Of the US releases however, a breakout by area shows that the highest numbers are coming from the State of Washington (63% in 2007), followed by California (19% in 2007), and then Oregon (7% in 2007) (Table 67).

Table 67 USA west coast hatchery releases of juvenile Chinook salmon in millions of fish

Year	Alaska	Washington	Oregon	California	Idaho	WA/OR/CA/ID (combined)	TOTAL
1999	8.0	114.5	30.5	45.4	9.7		208.1
2000	9.2	117.4	32.3	43.8	6.8		209.5
2001	9.9	123.5	28.4	45.0	5.4		212.1
2002	8.4					213.6	222.0
2003	9.3					201.3	210.6
2004	9.35	118.2	17.0	27.4	1.7	164.2	173.6
2005	9.46	117.7	19.2	28.8	8.7	174.5	184.0
2006	10.2	110.5	19.2	29.4	12.0	171.0	181.2
2007	10.5	114.5	13.2	34.8	9.2	171.7	182.2

Hatcheries in Alaska are located in southCentral and southeast Alaska. Prince William Sound and Southeast Alaska are the regions in the state with the greatest amount of salmon enhancement, and pink and chum salmon are the predominant species produced. The Cook Inlet and Kodiak regions also have salmon enhancement programs. Production levels, in terms of egg takes and releases, have largely remained stable. Enhancement programs have matured and are generally operating at current planned capacities (White 2010).

The private nonprofit hatchery corporations produce salmon mainly for commercial harvest. The private nonprofit hatchery corporations recoup their operational costs from a special harvest of returning adult fish, called a cost recovery harvest. All other returning adult fish are available for harvest in Alaska's common property fisheries open to the public (sport, personal use, and subsistence). ADF&G Division of Sport Fish operates two hatcheries, primarily to produce salmonid species intended for both salt and freshwater recreational fisheries at many locations along the coast and in numerous interior lakes (White 2010).

In 2009, the preliminary statewide commercial salmon harvest was 162 million fish. The Alaska salmon enhancement program produced an estimated 45 million adult salmon. An estimated 28 million enhanced salmon were harvested in the common property commercial fishery. The remaining 17 million enhanced salmon were harvested for cost recovery, used for broodstock, or harvested in the personal use/ sport/ subsistence fishery (White 2010).

Statewide, hatchery produced salmon accounted for approximately 16% of the Chinook salmon common property commercial harvest. In Southeast Alaska, the enhancement program accounted for 15% of the salmon in the common property commercial harvest, of which Chinook salmon comprised 23% (White 2010).

4.3.8 Effects of alternatives on Chinook salmon

The impact of the GOA groundfish fisheries on Chinook salmon was analyzed most recently in the Alaska Groundfish Fisheries Harvest Specifications Supplemental EIS (NMFS 2007a). The primary impact of the pollock fishery on Chinook salmon is through direct mortality due to bycatch. The EIS (2007a) 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 bycatch to salmon stock biomass levels. However, the analysis concludes that minimum escapement had generally been met in the preceding years, despite increasing levels of Chinook and chum salmon bycatch 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 below average in most of the GOA, except in Chignik and Southeast Alaska where escapement goals were largely met (Table 63). The Chinook stock composition of the GOA pollock fishery bycatch is not available, however the fishery has been documented to catch Chinook salmon from both Southeast Alaska and Cook Inlet, in the GOA. Chinook salmon bycatch 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 bycatch in the D season in the western GOA. It is not possible to draw any correlation between patterns of bycatch and the status of salmon stocks, especially given the uncertainty associated with estimates of bycatch in the groundfish fisheries, and the lack of data on river of origin of Chinook salmon caught in the bycatch.

Alternative 2 would establish a PSC limit that would be an upper limit on the bycatch of Chinook salmon in the GOA pollock fisheries in the Western and Central GOA. This limit would represent an upper threshold of Chinook salmon bycatch in the GOA pollock fisheries, as the pollock fisheries will be closed when the limit is reached.

One way to evaluate the effect of the alternative PSC limits is to look retrospectively at Chinook salmon bycatch levels from 2003-2010, and 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. The tables identifying when the fishery would have been closed in the Central and Western GOA, under the three PSC limit levels, are Table 20 and Table 21, Table 33 and Table 34, and Table 41 and Table 42 in Sections 3.10.1.1.1, 3.10.1.2.1, and 3.10.1.3.1 of the RIR. The tables showing how that would translate to salmon savings are Table 22 and Table 23, Table 35 and Table 36, and Table 43 and Table 44, in Sections 3.10.1.1.2, 3.10.1.2.2, and 3.10.1.3.2 of the RIR.

In the Central GOA, 2007 was the highest bycatch year, and 2005 was also a higher bycatch year. Under all PSC limit and apportionment options (except the 30,000 Chinook limit using the options that generate the largest allocation to the Central GOAin 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 highest bycatch year 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.

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 high bycatch years 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 bycatch in the GOA pollock fisheries are generally smaller salmon, with an average weight varying between 6 and 9 pounds. Some proportion of the Chinook salmon caught as bycatch 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 bycatch 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 bycatch 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, bycatch composition estimates were available to provide some indication as to the origin of Chinook salmon taken as bycatch in the fishery. 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 bycatch. Therefore our ability to assess the impacts of reducing salmon bycatch on salmon populations is constrained.

If Chinook salmon bycatch 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 bycatch will be curtailed in years of high bycatch, such as 2010 in the Western GOA, and 2005 and 2007 in the Central GOA. Although CWT recoveries provide reliable documentation of the presence of a specific salmon stock in the bycatch, the recoveries to date cannot be used to establish the relative abundance of stocks in the bycatch, nor to estimate the number harvested from any one stock as bycatch due to sampling issues. CWTs do not represent the true composition of all stocks of Chinook salmon in the bycatch in the GOA groundfish fisheries (see Section 4.3.3.1 and Appendix 7). Since 1995, CWTs of Chinook salmon recovered in the GOA groundfish fisheries have originated from British Columbia, Alaska, Oregon, Washington, and Idaho. 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 bycatch, however, it is not possible to determine which, nor to what degree, these stocks are likely to be affected.

Alternative 3 would establish bycatch cooperatives, which would work to identify bycatch hotspots and reduce salmon bycatch by directing fishing away from areas producing high bycatch rates of Chinook salmon. The cooperatives may also institute other gear innovations or fishing practices that reduce salmon bycatch. As with Alternative 2, to the extent that Chinook salmon bycatch is reduced, thus reducing a source of direct mortality on the stocks, there are likely to be beneficial impacts to Chinook salmon stocks. It is not, however, possible to determine to which, nor to what degree, these stocks a benefit is likely to be attributed.

Under both alternatives, it does not appear likely that Chinook salmon bycatch would increase from the status quo. There are currently no bycatch control measures in place for Chinook salmon in the GOA pollock fishery. Either through action to avoid triggering a PSC limit that closes the pollock fishery, or through salmon bycatch avoidance measures instituted through cooperative agreements in the fisheries, or a combination of these actions, the pollock fleet is likely to be increasingly aware of the issue of Chinook salmon bycatch in the fishery, and particularly in high bycatch years, is likely to be actively making efforts to avoid high bycatch rates in order to preserve the opportunity to fully harvest the pollock TAC. 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 the stock composition of Chinook salmon bycatch, this impact is not possible to assess. A more thorough discussion of potential fleet behavior resulting from these alternatives is discussed in the RIR, Sections 3.10 and 3.11. The conclusion, however, is that any impact to the Chinook salmon stocks as a whole, is likely to be insignificant or positive, as bycatch levels either remain the same or are reduced.

4.4 Other fish

Vessels participating in the directed pollock fishery catch other groundfish species incidentally while targeting pollock. Incidental catch levels in the pollock fishery, however, are low. Between 2005 and 2009, approximately 94% of the catch by weight of directed pollock tows was pollock (Dorn et al 2010). The most common species in the incidental catch is arrowtooth flounder, followed by squid, Pacific cod, flathead sole, and eulachon. Other flatfish and rockfish species, halibut, various shark species, jellyfish, and grenadiers are also incidentally caught in the fishery in lesser amounts.

The effects of the GOA pollock fishery on fish species that are caught incidentally has most recently been analyzed in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007). The analysis concludes that under the status quo, the neither the level of mortality nor the spatial and temporal impacts of fishing are likely to jeopardize the sustainability of the target and nontarget fish populations.

Alternative 2 would establish a hard cap that limits bycatch of Chinook salmon in the GOA pollock fishery. A lower hard cap may result in the pollock fishery closing before the TAC is reached, which may reduce impacts of this fishery on incidental catch species. A higher hard cap would allow for pollock fishing at current levels, and impacts would likely be similar to the status quo fishery. Fishing pressure on incidental catch species is unlikely to increase under Alternative 2, therefore the impacts are likely insignificant compared to the status quo.

Alternative 3 would establish bycatch cooperatives, which would work to identify bycatch hotspots. If cooperatives are able to identify and avoid fishing in high bycatch areas, the pollock season could be as long as the status quo fishery or potentially longer. If pollock catch rates are lower in areas identified as outside of the bycatch hotspots, however, longer fishing seasons involving more fishing effort could result in increases in incidental catch. In addition, shifts in fishing locations may increase localized impacts on some incidental catch species. However, the GOA pollock TACs are relatively small in relation to the capacity of the trawl fleet to harvest the TAC, and seasons are likely to remain short. Consequently, Alternative 3 is not likely to result in adverse impacts to incidental catch species, and the impacts of Alternative 3 are likely insignificant.

4.5 Marine mammals

A number of concerns may be related to marine mammals and potential impacts of fishing. For individual species, these concerns include—

- listing as endangered or threatened under the Endangered Species Act (ESA);
- protection under the Marine Mammal Protection Act (MMPA);
- announcement as candidate or being considered as candidates for ESA listings;
- declining populations in a manner of concern to state or federal agencies;
- experiencing large bycatch or other mortality related to fishing activities; or
- being vulnerable to direct or indirect adverse effects from some fishing activities.

Marine mammals have been given various levels of protection under the current fishery management plans of the Council, and are the subjects of continuing research and monitoring to further define the nature and extent of fishery impacts on these species. The Alaska groundfish harvest specifications environmental impact statement (NMFS 2007a) provides the most recent information regarding fisheries interactions with marine mammals. The most recent status information is available in the draft 2010 Marine Mammal Stock Assessment Reports (SARs) (Allen and Angliss 2010).

Marine mammals, including those currently listed as endangered or threatened under the ESA, that may be present in the action area are listed in Table 68. All of these species are managed by NMFS, with the exception of Northern Sea Otter, which is managed by U.S. Fish and Wildlife Service. ESA Section 7 consultations with respect to the actions of the federal groundfish fisheries have been completed for all of the ESA-listed species, either individually or in groups. Of the species listed under the ESA and present in the action area, several species may be adversely affected by commercial groundfish fishing. These include Steller sea lions, humpback whales, fin whales, and sperm whales (NMFS 2006a and NMFS 2010a). In 2000, a Biological Opinion concluded that the FMPs are likely to jeopardize the continued existence of the Western distinct population segment (DPS) of Steller sea lions and adversely modify its designated critical habitat (NMFS 2000). In 2001, a Biological Opinion was released that provided protection measures that did not jeopardize the continued existence of the Steller sea lion or adversely modify its designated critical habitat; that opinion was supplemented in 2003.

In 2006, NMFS reinitiated a FMP-level Section 7 consultation on the effects of the groundfish fisheries on Steller sea lions, humpback whales, and sperm whales to consider new information on these species and their interactions with the fisheries (NMFS 2006a). A draft Biological Opinion (BiOp) was released in July 2010 (NMFS 2010b). The draft opinion found that the effects of the groundfish fisheries may be likely to jeopardize the continued existence and adversely modify designated critical habitat (JAM) for Steller sea lions. The draft BiOp also found that the groundfish fisheries were not likely to jeopardize the continued existence of humpback or sperm whales. Because the draft BiOp found that the groundfish fisheries may cause JAM for Steller sea lions, a reasonable and prudent alternative (RPA) was included. The final BiOp was released in November 2010, and NMFS implemented the Steller sea lion protection measures in the RPA on January 1, 2011 (NMFS 2010b) by interim final rule (75 FR 77535, December 13, 2010, corrected 75 FR 81921, December 29, 2010). The RPA did not change the Steller sea lion protection measures in the GOA. Incidental take statements for Steller sea lions, humpback whales, fin whales, and sperm whales were completed on February 10, 2011 (Balsiger 2011).

Table 68 Marine mammals likely to occur in the Gulf of Alaska

	Species	Stocks
NMFS Managed Species		
Pinnipedia	Steller sea lion*	Western U.S (west of 144° W long.) and Eastern U.S. (east of 144° W long.)
	Northern fur seal**	Eastern Pacific
	Harbor seal	Southeast Alaska, Gulf of Alaska, Bering Sea
	Ribbon seal	Alaska
	Northern elephant seal	California
Cetacea	Beluga Whale*	Cook Inlet
	Killer whale	Eastern North Pacific Northern Resident, Eastern North Pacific Alaska Resident, Eastern North Pacific GOA, Aleutian Islands, and Bering Sea transient, AT1 transient**, West Coast Transient
	Pacific White-sided dolphin	North Pacific
	Harbor porpoise	Southeast Alaska, Gulf of Alaska, and Bering Sea
	Dall's porpoise	Alaska
	Sperm whale*	North Pacific
	Baird's beaked whale	Alaska
	Cuvier's beaked whale	Alaska
	Stejneger's beaked whale	Alaska
	Gray whale	Eastern North Pacific
	Humpback whale*	Western North Pacific, Central North Pacific
	Fin whale*	Northeast Pacific
	Minke whale	Alaska
	North Pacific right whale*	North Pacific
	Blue whale*	North Pacific
	Sei whale*	North Pacific
USFWS Managed Species		
Mustelidae	Northern sea otter*[3]	Southeast Alaska, SouthCentral Alaska, Southwest Alaska

Source: Allen and Angliss 2010.
*ESA-listed species; **Listed as depleted under the MMPA.
[1] Steller sea lions are listed as endangered west of Cape Suckling and threatened east of Cape Suckling.
[2] NMFS designated critical habitat for the northern right whale on July 6, 2006 (71 FR 38277).
[3] Northern sea otters are under the jurisdiction of the USFWS

4.5.1 Marine Mammals Status

The GOA supports one of the richest assemblages of marine mammals in the world. Twenty-two species are present from the orders Pinnipedia (seals and sea lions), Carnivora (sea otters), and Cetacea (whales, dolphins, and porpoises). Some marine mammal species are resident throughout the year, while others migrate into or out of Alaska fisheries management areas. Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf (Lowry et al. 1982).

The PSEIS (NMFS 2004) provides descriptions of the range, habitat, diet, abundance, and population status for marine mammals. The most recent marine mammal stock assessment reports for the strategic GOA marine mammal stocks (Steller sea lions, northern fur seals, harbor porpoise, North Pacific right whales, humpback whales, sperm whales, and fin whales) were updated in the 2010 Draft SARs (Allen and Angliss 2010). Northern sea otters were assessed in 2008. The information from NMFS (2004) and Allen and Angliss (2010) are incorporated by reference. The SARs provide population estimates, population trends, and estimates of the potential biological removal (PBR) levels for each stock.[25] The SARs also identify potential causes of mortality and whether the stock is considered a strategic stock under the MMPA.

The Alaska Groundfish Harvest Specifications EIS provides information on the effects of the groundfish fisheries on marine mammals (NMFS 2007a). Direct and indirect interactions between marine mammals and groundfish fishing vessels may occur due to overlap in the size and species of groundfish harvested in the fisheries that are also important marine mammal prey, and due to temporal and spatial overlap in marine mammal occurrence and commercial fishing activities. This discussion focuses on those marine mammals that may interact with or be affected by the GOA pollock fishery. These species are listed in Table 69 and Table 70. Note that Table 70 includes Southern Resident killer whales. This stock does not occur in the GOA, but this analysis considers the potential effects of Chinook salmon bycatch in the GOA pollock fishery on prey availability for this population of killer whales. The GOA pollock fishery takes Chinook salmon from Pacific Northwest stocks, which are important prey for the Southern Resident killer whales. Additional background information is provided here on the status of ESA-listed species.

Steller sea lion

The Steller sea lion inhabits many of the shoreline areas of the GOA, using these habitats as seasonal rookeries and year-round haulouts. The Steller sea lion has been listed as threatened under the ESA since 1990. In 1997, the population was split into two stocks or DPS based on genetic and demographic dissimilarities, the Western and eastern stocks. Because of a pattern of continued decline in the Western DPS, was listed as endangered on May 5, 1997 (62 FR 30772), while the eastern DPS remains listed as threatened. NMFS is currently considering delisting the EDPS (75 FR 77602, December 13, 2010). The western DPS inhabits an area of Alaska approximately from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters (west of 144° W longitude).

Throughout the 1990s, particularly after critical habitat was designated, various closures of areas around rookeries, haulouts, and some offshore foraging areas were designated. These closures affect commercial harvests of pollock, Pacific cod, and Atka mackerel, which are important components of the western DPS of Steller sea lion diet. In 2001, a Biological Opinion was released that provided protection measures that would not jeopardize the continued existence of the Steller sea lion or adversely modify its designated critical habitat; that opinion was supplemented in 2003, and after court challenge, these protection measures remain in effect today (NMFS 2001, Appendix A). A detailed analysis of the effects of these protection measures is provided in the *Steller Sea Lion Protection Measures Final Supplemental EIS* (NMFS 2001).

[25]The SARs are available on the NMFS Protected Resources Division website at http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2010_draft.pdf

In the GOA, extensive closures are in place for Steller sea lions including no transit zones and closures of critical habitat around rookeries and haulouts. Pollock is an important prey species for Steller sea lions (NMFS 2010b). The harvest of pollock in the GOA is temporally dispersed into 4 seasons (§ 679.23). Based on the most recent completed biological opinion, these harvest restrictions on the pollock fishery decrease the likelihood of disturbance, incidental take, and competition for prey to ensure the groundfish fisheries do not jeopardize the continued existence or adversely modify the designated critical habitat of Steller sea lions (NMFS 2000, NMFS 2001, and NMFS 2010b).

A detailed discussion of Steller sea lion population trends in the GOA is included in the most recent Biological Opinion (NMFS 2010b) and is summarized here. Based on non-pup counts of Steller sea lions on trend sites throughout the range of the western DPS in theGOA and Aleutian Islands, the overall population trend for the western DPS of Steller sea lions is stable and may be increasing, but the trend is not statistically significant. The number of non-pups counted at trend sites increased by12% between 2000 and 2008. However, counts increased by only 1% between 2004 and 2008 (DeMaster 2009).

Population trends differ across the range of the western DPS. Non-pup counts have declined in the Aleutian Islands, with the decline being most severe in the west and becoming less of a decline towards the east (7% decline in Area 543, 1% to 4% decline in Areas 542 and 541; NMFS 2010b). Pup and non-pup counts in the remainder of the western DPS range are either stable or increasing, ranging from 0% to 5% increases in population growth from 2000 to 2008 (NMFS 2010b).

Northern Sea Otter

The southwest Alaska DPS of northern sea otter is listed as threatened under the ESA (70 FR 46366, August 9, 2005). This population segment ranges from the Western Aleutian Islands to the Central GOA. NMFS completed an informal consultation on northern sea otters in 2006 and found that the Alaska fisheries were not likely to adversely affect northern sea otters (Mecum 2006). The USFWS has determined that, based on available data, northern sea otter abundance is not likely to be significantly affected by commercial fishery interaction at present (Allen and Angliss 2010), and commercial fishing is not likely a factor in the population decline (70 FR 46366, August 9, 2005). Otters feed primarily in the rocky near shore areas on invertebrates, while groundfish fisheries are conducted further offshore on groundfish species (Funk 2003). Trawl closures where sea otters feed reduce potential interaction between trawl vessels and sea otters and ensure the clam habitat used by sea otters is not disturbed. Critical habitat for sea otters has been designated and is located primarily in nearshore waters (74 FR 51988, October 8, 2009), reducing the potential for effects by Federal fisheries. The USFWS is developing a recovery plan for the southwest Alaska DPS of northern sea otters.

Table 69 Status of Pinnipedia and Carnivora stocks potentially affected by the action

Pinnipedia and Carnivora species and stock	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
Steller sea lion – Western (W) and Eastern (E) Distinct Population Segment (DPS)	Endangered (W) Threatened (E)	Depleted & a strategic stock	For the WDPS, regional increases in counts in trend sites of some areas have been offset by decreased counts in other areas so that the overall population of the WDPS appears to have stabilized (NMFS 2010a). The EDPS is steadily increasing and is being considered for delisting.	WDPS inhabits Alaska waters from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. EDPS inhabit waters east of Prince William Sound to Dixon Entrance. Occur throughout AK waters, terrestrial haulouts and rookeries on Pribilof Islands, Aleutian Islands, St. Lawrence Island, and off the mainland. Use marine areas for foraging. Critical habitat designated around major rookeries, haulouts, and foraging areas.
Northern fur seal Eastern Pacific	None	Depleted & a strategic stock	Recent pup counts show a continuing decline in the number of pups surviving in the Pribilof Islands. NMFS researchers found an approximately 9% decrease in the number of pups born between 2004 and 2006. The pup estimate decreased most sharply on St. Paul Island.	Fur seals occur throughout Alaska waters, but their main rookeries are located in the Bering Sea on Bogoslof Island and the Pribilof Islands. Approximately 55% of the worldwide abundance of fur seals is found on the Pribilof Islands (NMFS 2007b). Forages in the pelagic area of the Bering Sea during summer breeding season, but most leave the Bering Sea in the fall to spend winter and spring in the N. Pacific.
Harbor seal – Gulf of Alaska	None	None	A moderate to large population decline has occurred in the GOA stock.	GOA stock found primarily in the coastal waters and may cross over into the Bering Sea coastal waters between islands.
Ribbon seal Alaska	None*	None	Reliable data on population trends are unavailable.	Widely dispersed throughout the Bering Sea and Aleutian Islands in the summer and fall. Associated with ice in spring and winter and may be associated with ice in summer and fall. Occasional movement into the GOA (Boveng et al. 2008)
Northern sea otters – SW Alaska	Threatened**	Depleted & a strategic stock	The overall population trend for the southwest Alaska stock is believed to be declining, particularly in the Aleutian Islands.	Coastal waters from Central GOA to W Aleutians within the 40 m depth contour. Critical habitat designated in primarily nearshore waters with few locations into federal waters in the GOA.

Source: Allen and Angliss 2010; List of Fisheries for 2011 (75 FR 68468, November 8, 2010).
Northern fur seal pup data available from http://www.alaskafisheries.noaa.gov/newsreleases/2007/fursealpups020207.htm.
*NMFS determined that ribbon seals were not to be listed on September 23, 2008. The Center for Biological Diversity and Greenpeace filed suit against NMFS regarding this decision on September 3, 2009.
**Northern sea otter information from http://www.nmfs.noaa.gov/pr/pdfs/sars/seaotter2008_ak_sw.pdf and 74 FR 51988, October 8, 2009

Cook Inlet Beluga Whale

In 2008, the Cook Inlet DPS of beluga whales was listed as an endangered species under the ESA following a significant population decline. NMFS has identified more than one third of Cook Inlet as critical habitat. In 2010, NMFS estimated the Cook Inlet beluga whale population to be 340 individuals, up from the 2009 estimate of 321 whales, although the 10-year annual trend is still declining 1.1% per year. Historical abundance is estimated at approximately 1,300 whales (NMFS 2008). Cook Inlet belugas primarily occur in the northern portion of Cook Inlet. Beluga whales do not normally transit outside of Cook Inlet, and thus are unlikely to encounter vessels fishing in the federal groundfish fisheries. NMFS has determined that the only potential impact of the groundfish fisheries on Cook Inlet belugas is though competition for prey species (Brix 2009).

Southern Resident Killer Whale

The DPS of Southern Resident Killer Whales (SRKWs) was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). SRKWs range from the Queen Charlotte Islands to Central California. The population declined from historical abundance estimates of 140-200 whales in the 1960s and 1970s to fewer than 90 whales in recent years, and was listed as endangered under the ESA in 2005. The stock is currently under a 5-year status review (75 FR 17377, April 6, 2010). Numerous factors have likely caused the decline, including a reduction in availability of preferred prey. SRKWs forage selectively for Chinook salmon which are relatively large compared with other salmon species, have high lipid content, and are available year-round (Ford and Ellis 2006). In inland waters, the diet of SRKWs consists of 82% Chinook salmon during May through September (Hanson et al. 2010). Stock of origin investigations have found that SRKWs forage on Chinook salmon from the Fraser River, Puget Sound runs, and other Washington and Oregon runs. There have been recent observational reports of SRKWs in poor body condition (Durban et al. 2009). Ford et al. (2005) found a correlation between the reduction in Chinook salmon abundance off Alaska, British Columbia, and Washington and decreased survival of Northern and SRKWs. In 2009, NMFS released a Biological Opinion that evaluates the effects of the ocean salmon fisheries off Washington, Oregon, and California on SRKWs, and found that the proposed action is not causing jeopardy or adverse modification (NMFS 2009). NMFS is currently conducting a scientific review of new evidence that strongly suggests that Chinook salmon abundance is very important to the survival and recovery of SRKWs, which may have implications for salmon fisheries and other activities that affect Chinook salmon abundance.

Table 70 Status of Cetacea stocks potentially affected by the action

Cetacea species and stock	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
Killer whale – AT1 Transient, E N Pacific transient, W Coast transient, Alaska resident, Southern resident	Southern resident endangered; remaining stocks none	AT1 depleted, The rest of the stocks: None	Southern residents have declined by more than half since 1960s and 1970s. Unknown abundance for the Alaska resident; and Eastern North Pacific GOA, Aleutian Islands, and Bering Sea transient stocks. The minimum abundance estimate for the Eastern North Pacific Alaska Resident stock is likely underestimated because researchers continue to encounter new whales in the Alaskan waters.	Southern resident do not occur in GOA. Transient-type killer whales from the GOA, Aleutian Islands, and Bering Sea are considered to be part of a single population.
Dall's porpoise Alaska	None	None	Reliable data on population trends are unavailable.	Found in the offshore waters from coastal Western Alaska throughout the GOA.
Pacific white-sided dolphin	None	None	Reliable data on population trends are unavailable.	Found throughout the GOA.
Harbor porpoise GOA	None	Strategic	Reliable data on population trends are unavailable.	Primarily in coastal waters in the GOA, usually less than 100 m.
Humpback whale – Western and Central North Pacific	Endangered and under status review	Depleted & a strategic stock	Increasing. The Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) abundance estimate for the North Pacific represents an annual increase of 4.9% since 1991–93. SPLASH abundance estimates for Hawaii show annual increases of 5.5% to 6.0% since 1991-1993 (Calambokidis et al. 2008).	W. Pacific and C. North Pacific stocks occur in GOA waters and may mingle in the North Pacific feeding area.

Cetacea species and stock	Status under the ESA	Status under the MMPA	Population trends	Distribution in action area
North Pacific right whale Eastern North Pacific	Endangered	Depleted & a strategic stock	This stock is considered to represent only a small fraction of its precommercial whaling abundance and is arguably the most endangered stock of large whales in the world. A reliable estimate of trend in abundance is currently not available.	Before commercial whaling on right whales, concentrations were found in the GOA, eastern Aleutian Islands, south-Central Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). During 1965–99, following large illegal catches by the U.S.S.R., there were only 82 sightings of right whales in the entire eastern North Pacific, with the majority of these occurring in the Bering Sea and adjacent areas of the Aleutian Islands (Brownell et al. 2001). Critical habitat near Kodiak Island in the GOA
Fin whale Northeast Pacific	Endangered	Depleted & a strategic stock	Abundance may be increasing but surveys only provide abundance information for portions of the stock in the Central-eastern and southeastern Bering and coastal waters of the Aleutian Islands and the Alaska Peninsula. Much of the North Pacific range has not been surveyed.	Found in the GOA, Bering Sea and coastal waters of the Aleutian Islands.
Beluga whale-Cook Inlet	Endangered	Depleted & a strategic stock	2008 abundance estimate of 375 whales is unchanged from 2007. Trend from 1999 to 2008 is not significantly different from zero.	Occurrence only in Cook Inlet.
Minke whale Alaska	None	None	There are no data on trends in Minke whale abundance in Alaska waters.	Common in the Bering and Chukchi Seas and in the inshore waters of the GOA. Not common in the Aleutian Islands.
Sperm whale North Pacific	Endangered	Depleted & a strategic stock	Abundance and population trends in Alaska waters are unknown.	Inhabit waters 600 m or more depth, south of 62°N lat. Widely distributed in North Pacific. Found year-round In GOA.
Baird's, Cuvier's, and Stejneger's beaked whale	None	None	Reliable data on population trends are unavailable.	Occur throughout the GOA.

Sources: Allen and Angliss 2010; List of Fisheries for 2011 (75 FR 68468, November 8, 2010); http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm. North Pacific right whale included based on NMFS (2006a) and Salveson (2008). AT1 Killer Whales information based on 69 FR 31321, June 3, 2004. North Pacific Right Whale critical habitat information: 73 FR 19000, April 8, 2008. For beluga whales: 73 FR 62919, October 27, 2008.

4.5.2 Effects on Marine Mammals

4.5.2.1 Significance Criteria for Marine Mammals

Table 71 contains the significance criteria for analyzing the effects of the proposed action on marine mammals. These criteria are from the 2006–2007 groundfish harvest specifications environmental assessment/final regulatory flexibility analysis (EA/FRFA) (NMFS 2006b). These criteria are applicable to this action because this analysis and the harvest specifications analysis both analyze the effects of groundfish fisheries on marine mammals. That EA/FRFA provided the latest ideas on determining the significance of effects on marine mammals based on similar information that is available for this EA/RIR. The first criterion under the prey species column and the third criterion under the disturbance column in the table were further refined for this analysis from NMFS (2006b) to address impacts on prey species by both harvesting and potential impacts on the habitat that support prey species. Significantly beneficial impacts are not possible with the management of groundfish fisheries as no beneficial impacts to marine mammals are likely with groundfish harvest. Generally, changes to the fisheries do not benefit marine mammals in relation to incidental take, prey availability, and disturbances; changes increase or decrease potential adverse impacts. The only exception to this may be in instances when marine mammals target prey from fishing gear, as seen with killer whales and sperm whales removing fish from hook-and-line gear. In this example, the prey availability is enhanced for these animals because they need less energy for foraging.

Table 71 Criteria for determining significance of impacts to marine mammals

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

4.5.2.2 Incidental Take Effects

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the incidental take effects of the groundfish fisheries on marine mammals (NMFS 2007a) and is incorporated by reference. Marine mammals can be taken in groundfish fisheries by entanglement in gear (e.g., trawl, longline, and pot) and, rarely, by ship strikes for some cetaceans. Table 5-5 lists the species of marine mammals taken in the GOA pollock fishery during the most recent five years of observer data that have been analyzed (Allen and Angliss 2010). In addition to these species, the List of Fisheries for 2011 reports that fin whale and northern elephant seal have been taken in previous years in the GOA pollock trawl fishery, but not recently (75 FR 68468, November 8, 2010). Marine mammals that are not listed in Table 5-5 are assumed to be unlikely to be incidentally taken by any of the alternatives due to the absence of incidental take and entanglement records. No records exist of Alaska groundfish fisheries takes of North Pacific right whales.

Potential take in the GOA pollock fishery is well below the Potential Biological Removal (PBR) for all marine mammals which have a PBR determined (Table 72). This means that predicted take would be below the maximum number of animals that may be removed from these marine mammal stocks while allowing the stocks to reach or maintain their optimum sustainable population. Table 72 provides more detail on the levels of take based on the most recent SAR (Allen and Angliss 2010). The GOA pollock trawl fishery is a Category III fisheries based on annual mortality and serious injury of a stock being less than or equal to 1% of the PBR level. Overall, very few marine mammals are reported taken in the GOA pollock trawl fishery. Considering the number of marine mammals taken incidentally in the fishery in relation to the PBR, it is unlikely that incidental takes would impact the subsistence harvest of marine mammals. While possible, the incidence of ship strikes and/or serious injury to whales from ships involved in the Alaska groundfish fisheries are likely to be minimal and not expected to result in an adverse population level effects.

Table 72 Estimated mean annual mortality of marine mammals from observed GOA pollock fisheries compared to the total mean annual human-caused mortality and potential biological removal

Marine mammal species and stock	5 years of data used to calculate total mean annual human-caused mortality	Mean annual mortality from GOA pollock fishery	Total mean annual human-caused mortality*	Potential biological removal
Steller sea lions (Western)	2004–2008	1.33 (CV: 0.66)	223.8	254
Dall's porpoise (GOA)	2002–2006	0.48 (CV: 0.70)	29.6	undetermined

* Does not include research mortality. Other human-caused mortality is predominantly subsistence harvests for sea lions.
Note: Mean annual mortality is expressed in number of animals and includes both incidental takes and entanglements. The averages are from the most recent 5 years of data since the last SAR update, which may vary by stock. Groundfish fisheries mortality calculated based on Allen and Angliss (2010).

Incidental Take Effects under Alternative 1: Status Quo

The effects of the status quo fisheries on incidental takes of marine mammals are detailed in the 2007 harvest specifications EIS (NMFS 2007a). The potential take of marine mammals in the GOA pollock fishery is well below the PBRs or a very small portion of the overall human caused mortality for those species for which a PBR has not been determined (Table 5-5).

Incidental Take Effects under Alternative 2: Hard Caps

The range of hard caps under Alternative 2 may result in different potential for incidental takes of marine mammals. A lower hard cap may result in the pollock fishery closing early, before the TAC is reached, which would reduce the potential for incidental takes in areas where marine mammals may interact with pollock fishing vessels. A higher hard cap would allow for more pollock fishing and more potential for interaction and incidental takes of marine mammals than a lower cap. Component 2 to Alternative 2 would increase observer coverage in the GOA pollock fishery by requiring vessels less than 60 ft LOA to carry observers for 30% of fishing days. This fleet harvests a substantial portion of the Western GOA pollock TAC. Expanded observer coverage would enhance monitoring of incidental takes of marine mammals in the GOA pollock fishery.

Alternative 2 may reduce the potential adverse effects of incidental takes on marine mammals compared to the status quo. Under the status quo fisheries, the number of incidental takes is well below the PBRs and is a very small proportion of overall total human caused mortality. Because Alternative 2 may further reduce this mortality, it is not likely to cause adverse population level effects for marine mammals. **Because Alternative 2 is not likely to result in adverse population level effects from the incidental take of marine mammals, the impacts of Alternative 2 on marine mammals is likely insignificant.**

Incidental Take Effects under Alternative 3: Bycatch Cooperatives

Alternative 3 would establish bycatch cooperatives, which may affect the management and distribution of the salmon bycatch cap across the sectors. If cooperatives are able to identify bycatch hotspots and avoid fishing in these areas, the pollock season could potentially be longer than under a hard cap if the fleet is successful in reducing its bycatch. Under this scenario, the fishing season could potentially be as long as the status quo fishery or longer if pollock catch rates are lower in areas identified as outside of the bycatch hotspots. Longer fishing seasons, involving more vessel-days of effort, could potentially increase the likelihood of incidental takes of marine mammals relative to the status quo. However, the GOA pollock TACs are relatively small compared to the capacity of the trawl fleet, and seasons are likely to remain short. Therefore, **Alternative 3 is not likely to result in adverse population level effects from**

the incidental take of marine mammals, and the impacts of Alternative 3 on marine mammals is likely insignificant.

4.5.2.3 Harvest of Prey Species

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the effects of the groundfish fisheries on prey species for marine mammals (NMFS 2007a) and is incorporated by reference. Harvests of marine mammal prey species in the GOA groundfish fisheries may limit foraging success through localized depletion, overall reduction in prey biomass, and dispersion of prey, making it more energetically costly for foraging marine mammals to obtain necessary prey. Overall reduction in prey biomass may be caused by removal of prey or disturbance of prey habitat. The timing and location of fisheries relative to foraging patterns of marine mammals and the abundance of prey species may be a more relevant management concern than total prey removals. The GOA pollock fishery may impact availability of key prey species of Steller sea lions, harbor seals, northern fur seals, ribbon seals; and fin, minke, humpback, beluga, and resident killer whales. Animals with more varied diets (humpback whales) are less likely to be impacted than those that eat primarily pollock and salmon, such as northern fur seals. Table 73 shows the GOA marine mammal species and their prey species that may be impacted by the GOA pollock fishery. Pollock and salmon prey are in **bold**.

Table 73 Prey species used by GOA marine mammals that may be impacted by the GOA pollock fishery

Species	Prey
Fin whale	Zooplankton, squid, fish (herring, cod, capelin, and **pollock**), and cephalopods
Humpback whale	Zooplankton, schooling fish (**pollock**, herring, capelin, saffron, cod, sand lance, Arctic cod, and **salmon**)
Minke whale	Pelagic schooling fish (including herring and **pollock**)
Beluga whale	Wide variety of invertebrates and fish including **salmon and pollock**
Killer whale	Marine mammals (transients) and fish (residents) including herring, halibut, **salmon**, and cod.
Ribbon seal	Cod, **pollock**, capelin, eelpout, sculpin, flatfish, crustaceans, and cephalopods.
Northern fur seal	**Pollock**, squid, herring, **salmon**, capelin
Harbor seal	Crustaceans, squid, fish (including **salmon**), and mollusks
Steller sea lion	**Pollock**, Atka mackerel, Pacific herring, Capelin, Pacific sand lance, Pacific cod, and **salmon**

Sources: NOAA 1988; NMFS 2004; NMFS 2007b; Nemoto 1959; Tomilin 1957; Lowry et al. 1980; Kawamura 1980; and http://www.adfg.state.ak.us/pubs/notebook/marine/orca.php

Seven species of marine mammals that occur in the GOA are documented to eat pollock, and seven eat salmon (Table 5-6). Salmon are primarily summer prey species for Steller sea lions (NMFS 2010b), resident killer whales (NMFS 2004), beluga whales (NMFS 2008), and northern fur seals (NMFS 2007b). In the GOA, Steller sea lions depend on pollock as a principal prey species (NMFS 2007b).

Chinook salmon bycatch in the pollock fishery may intercept salmon that would otherwise have been available as prey for marine mammals. Coded-wire tag (CWT) recoveries from Chinook salmon bycatch in the GOA provide information on occurrence of specific salmon stocks in the GOA. Although CWT recoveries provide reliable documentation of the presence of a stock in the bycatch, the recoveries to date can't be used to establish the relative abundance of stocks in the bycatch, nor to estimate the number harvested from any one stock as bycatch due to sampling issues. CWTs do not represent the true composition of all stocks of Chinook salmon in the bycatch in the GOA groundfish fisheries (see Section 4.3.3.1 and Appendix 7). Since 1995, 34% of the observed CWTs of Chinook salmon in the GOA fishery have originated from British Columbia, followed by Alaska (31%), Oregon (21%), Washington (13%), and Idaho (<1%). MARK expansions of the CWT recoveries estimate Chinook salmon to have originated in British Columbia (52%), Alaska (33%), Oregon (8%), Washington (7%), and Idaho (<1%). It is important to note that in 6 out of the 16 years that CWT recovery data were collected, the majority of tagged fish were from Alaska. (See Appendix 7 for a more detailed explanation of CWT recoveries and expansion factors). MARK expansions should be considered a minimum estimate of the actual bycatch of specific Chinook salmon stocks. Genetic analysis and Adult equivalency (AEQ) analysis on Chinook salmon bycatch in the GOA is not yet available. NMFS is currently working on improving the sampling process for Chinook salmon in the GOA.

Several marine mammals do not primarily depend on pollock or salmon, but may be impacted indirectly by any effects that pelagic trawl gear may have on benthic habitat. Table 74 lists marine mammals that may depend on benthic prey and known depths of diving. Diving activity may be associated with foraging. The EFH EIS provides a description of the effects of pollock fishing on benthic habitat (NMFS 2005a), including the effects of the pollock fishery in the GOA. Overall, effects from pelagic trawl fisheries are considered minimal. Trawl performance standards for the directed pollock fishery at 50 CFR 679.7(a)(14) reduce the likelihood of pelagic trawl gear use on the bottom. In the GOA, estimated reductions of epifaunal and infaunal prey due to fishing are less than 1% for all substrate types. For living structure, overall impacts ranged between 3% and 7% depending on the substrate. In some local areas where pollock aggregate, effects are greater.

Sperm whales are not likely to be affected by any potential impacts on benthic habitat from pollock fishing because they generally occur in deeper waters than where the pollock fishery is conducted (Table 74). Harbor seals and sea otters are also not likely to have any benthic habitat affected by the pollock fishery because they occur primarily along the coast where pollock fishing is not conducted. Cook Inlet beluga whales are not likely to have benthic habitat supporting prey species affected by the pollock fishery because they do not range outside of Cook Inlet and do not overlap spatially with the trawl fisheries.

Table 74 Benthic dependent GOA marine mammals, foraging locations, and diving depths

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

Sources: Allen and Angliss 2010; Burns et al. 1981; http://www.adfg.state.ak.us/pubs/notebook/marine/rib-seal.php; http://www.afsc.noaa.gov/nmml/species/species_ribbon.php; http://www.adfg.state.ak.us/pubs/notebook/marine/harseal.php; http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm

Prey Availability Effects under Status Quo: Alternative 1

The Alaska Groundfish Harvest Specifications EIS determined that competition for key prey species under the status quo fishery is not likely to constrain the foraging success of marine mammals or cause population declines (NMFS 2007a). In the GOA, the exception is Steller sea lions, which potentially compete for prey with the GOA pollock fisheries (NMFS 2001, 2007a). The introduction to this section reviewed the marine mammal species that depend on pollock or salmon, and the potential impacts of the pollock fishery on benthic habitat that supports marine mammal prey. Below is additional information regarding potential effects of the GOA pollock fishery on prey availability for Steller sea lions, Cook Inlet belugas, and SRKW.

Steller sea lions

The following information on Steller sea lion diet is summarized from the Biological Opinion (NMFS 2010b) and is incorporated by reference. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods. Prey species can be grouped into those that tend to be consumed seasonally, when they become locally abundant or aggregated when spawning (e.g., herring, Pacific cod, eulachon, capelin, salmon and Irish lords), and those that are consumed and available to Steller sea lions more or less year-round (e.g., pollock, cephalopods, Atka mackerel, arrowtooth flounder, rock sole and sand lance.

Stomach content analysis from animals in Kodiak in the 1970s showed that walleye pollock was the most important prey in fall, winter, and spring, while in summer the most frequently eaten prey were small forage fishes (capelin, herring, and sand lance) (Merrick and Calkins 1996). Prey occurrence of pollock, Pacific cod, and herring were higher in the 1980s than in the 1950s -1970s in stomach content samples for both eastern and Western Steller sea lion populations. In a recent study in the Kodiak Archipelago, the most frequent Steller sea lion prey were found to be Pacific sand lance, walleye pollock, arrowtooth flounder, Pacific cod, salmon, and Pacific herring (McKenzie and Wynne 2008). Other studies since 1990 have shown that pollock continue to be a dominant prey species in the GOA. Pacific cod is also an important prey species in winter in the GOA. Salmon was eaten most frequently during the summer months in the GOA.

The effects of the status quo GOA pollock fishery and State-managed salmon fisheries on prey availability for Steller sea lions were evaluated in the recent Biological Opinion (NMFS 2010b), and were not found to cause adverse population-levels effects on Steller sea lions. Steller sea lion protection measures in the GOA are sufficient to ensure that the groundfish fisheries are not likely to jeopardize the continued existence of Steller sea lions or adversely modify its designated critical habitat (NMFS 2010b).

<u>Killer Whales</u>

Northern resident killer whales consume salmon that are migrating to spawning streams in nearshore waters in Alaska (NMFS 2004). Recent studies have shown that Southern Resident killer whales forage selectively for Chinook salmon which are relatively large compared with other salmon species, have high lipid content, and are available year-round (Ford and Ellis 2006). In inland waters of Washington and British Columbia, the diet of SRKWs consists of 82% Chinook salmon during May through September (Hanson et al. 2010). Stock of origin investigations have found that SRKWs forage on Chinook salmon from the Fraser River, Puget Sound runs, and other Washington and Oregon runs.

Chinook salmon bycatch in the pollock fishery may intercept salmon that would otherwise have been available as prey for Northern and Southern Resident killer whales. Any competition with the pollock fishery for Chinook salmon would depend on the extent to which the fishery intercepts salmon that would have otherwise been available to killer whales as prey. Data are not available to quantitatively evaluate the extent of this effect.

<u>Cook Inlet Beluga Whales</u>

The following information on Cook Inlet beluga diet is from the 2008 Recovery Plan (NMFS 2008) and is incorporated by reference. Cook Inlet belugas feed on a wide variety of species, focusing on specific species when they are seasonally abundant. The groundfish fisheries directly harvest and incidentally catch several species that are important prey species for belugas, including pollock, Pacific cod, yellowfin sole, starry flounder, and staghorn sculpin. Because pollock is not likely to occur in large amounts in Cook Inlet, and appears to be eaten only in spring and fall, it is not likely an important prey species for Cook Inlet beluga whales. The groundfish fisheries also catch eulachon and salmon, which are energetically rich food sources and important prey species in spring and summer, respectively.

Cook Inlet beluga whales are not likely to compete with the GOA pollock fishery for pollock because their occurrence does not overlap spatially with the pollock fishery. Any competition with the pollock fishery for Chinook salmon would depend on the extent to which the fishery intercepts salmon that would have otherwise been available to Cook Inlet belugas as prey. Data are not available to quantitatively evaluate the extent of this effect. Even though the GOA pollock fishery takes Cook Inlet salmon as bycatch, it is not likely that the number of salmon taken under status quo would have a measurable effect on Cook Inlet beluga whales. Of the Alaska Chinook salmon CWT recoveries, 9% are estimated to be Cook Inlet fish. Returns of Chinook salmon are in the thousands of fish based on the number of river systems in the inlet with Chinook salmon runs, and the effects of GOA bycatch on the volume of Cook Inlet spawning runs is likely not substantial.

Other marine mammals

Ribbon seals, northern fur seals, and minke, fin, and humpback whales potentially compete with the GOA pollock fishery for pollock because of the overlap of their occurrence with the location of this fishery. Ribbon seals, fin whales, and humpback whales have a more diverse diet than minke whales and northern fur seals, and may therefore have less potential to be affected by any competition with the fishery. There is no evidence that the harvest of pollock in the GOA is likely to cause population level effects on these marine mammals.

Based on a review of marine mammal diets, and an evaluation of the status quo harvests of potential prey species in the GOA pollock fishery, the effects of Alternative 1 on prey availability for marine mammals are not likely to cause population level effects and are therefore insignificant.

Prey Availability Effects under Alternative 2

A hard cap on the number of Chinook salmon taken in the pollock fishery could benefit those species that depend on salmon (e. g. Steller sea lions, Northern and Southern Resident killer whales, beluga whales, harbor seals, ribbon seals, and northern fur seals) by limiting harvests of salmon in high bycatch years. If the hard cap results in the pollock fishery closing before the TAC is reached, it could also increase the availability of pollock to marine mammals. If the hard cap results in additional fishing effort in less productive pollock areas with less salmon bycatch, the shift in fishing location may result in additional pollock being available in those areas where salmon is concentrated, and would provide a benefit if these areas are also used by pollock- and salmon-dependent marine mammals for foraging. A higher hard cap would be less constraining on the fishery and would likely result in effects on prey availability similar to the status quo. A lower hard cap would be more constraining on the fishery, making more salmon available for prey; and may also increase availability of pollock if the fishery is closed before the pollock TAC is reached.

In addition, Component 2 to Alternative 2 would increase observer coverage in the GOA pollock fishery by requiring vessels less than 60 ft LOA to carry observers for 30% of fishing days. This fleet harvests a substantial portion of the Western GOA pollock TAC. Expanded observer coverage would enhance the ability of managers to monitor Chinook salmon bycatch and close the fishery when the cap is reached, further enhancing the availability of prey.

Consequently, **Alternative 2 may reduce the potential effects of the GOA pollock fishery on the availability of prey for marine mammals, especially in years when the salmon cap is reached and pollock fishing may be constrained. It is not likely that the potential effects would result in population level effects on marine mammals, and therefore the effects of Alternative 2 and Component 2 are likely insignificant.**

Alternative 3: Bycatch Cooperatives

Alternative 3 would establish bycatch cooperatives, which would work to identify bycatch hotspots. If cooperatives are able to identify areas of high Chinook salmon bycatch and avoid fishing in these areas, the overall bycatch of salmon could be reduced and, if this occurs, more salmon would be available to marine mammals. Under this scenario, the fleet may be more likely to catch the entire pollock TAC. Consequently, Alternative 3 may be less likely to leave a portion of the pollock TAC unharvested and available to marine mammals which utilize this prey resource than the hard caps proposed in Alternative 2. Overall, **Alternative 3 has the potential to increase the availability of prey resources, particularly salmon, to marine mammals in the GOA compared to Alternatives 1 and 2. The amount of pollock harvested would still be constrained by the TACs, and therefore the effects of the fishery on the availability of pollock for marine mammals would be similar to Alternative 1. Because the availability of pollock, salmon, or benthic prey to marine mammals under Alternative 3 is not likely to result in population level effects for marine mammals, the effects of Alternative 3 are likely insignificant.**

4.5.2.4 Disturbance

Disturbance Effects under Status Quo: Alternative 1

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the disturbance of marine mammals by the groundfish fisheries (NMFS 2007a). The EIS concluded that the status quo fishery does not cause disturbance to marine mammals that may cause population level effects. Fishery closures limit the potential interaction between fishing vessels and marine mammals (e.g., 3-nm no groundfish fishing areas around Steller sea lion rookeries). **Because disturbances to marine mammals under the status quo fishery are not likely to cause population level effects, the impacts of Alternative 1 are likely insignificant.**

Disturbance Effects under Alternative 2: Hard Caps

The effects of the proposed hard caps on disturbance would be similar to the effects on incidental takes. If the pollock fishery closes early because the hard cap is reached, then less potential exists for disturbance of marine mammals. If the pollock fishery increases the duration of fishing in areas with lower concentrations of pollock to avoid areas of high salmon bycatch, there may be more potential for disturbance if this increased fishing activity overlaps with areas used by marine mammals. Fishing under the higher hard cap is likely similar to status quo because it is less constraining than fishing under the lower caps and less likely to cause a change in fishing activities.

None of the disturbance effects on other marine mammals under Alternative 2 are expected to result in population level effects on marine mammals. Disturbance effects are likely to be localized and limited to a small portion of any particular marine mammal population**. Because disturbances to marine mammals under Alternative 2 are not likely to result in population level effects, the impacts of Alternative 2 are likely insignificant.**

Disturbance Effects under Alternative 3: Bycatch Cooperatives

The effects of Alternative 3 on disturbance to marine mammals are similar to the effects of this alternative on incidental takes. If bycatch cooperatives are able to identify bycatch hotspots and avoid fishing in these areas, the pollock season could potentially be longer than under a hard cap if the fleet is successful in reducing its bycatch. Consequently, the fishing season could potentially be as long as the status quo fishery or longer if pollock catch rates are lower in areas identified as outside of the bycatch hotspots. Longer fishing seasons, involving more vessel-days of effort, could potentially increase the likelihood of disturbance of marine mammals relative to the status quo. However, the GOA pollock TACs are relatively small in relation to the vessel capacity to harvest the TAC, and seasons are likely to remain short. **Because disturbances to marine mammals under Alternative 3 are not likely to result in population level effects, the impacts of Alternative 3 are likely insignificant.**

4.6 Seabirds

4.6.1 Seabird Species and Status

Thirty-eight species of seabirds breed in Alaska. Breeding populations are estimated to contain 36 million individual birds in Alaska, and total population size (including subadults and nonbreeders) is estimated to be approximately 30% higher. Five additional species that breed elsewhere but occur in Alaskan waters during the summer months contribute another 30 million birds.

Species nesting in Alaska

Tubenoses-Albatrosses and relatives: Northern Fulmar, Fork-tailed Storm-petrel, Leach's Storm-petrel
Kittiwakes and terns: Black-legged Kittiwake, Red-legged Kittiwake, Arctic Tern, Aleutian Tern
Pelicans and cormorants: Double-crested Cormorant, Brandt's Cormorant, Pelagic Cormorant, Red-faced Cormorant
Jaegers and gulls: Pomarine Jaeger, Parasitic Jaeger, Bonaparte's Gull, Mew Gull, Herring Gull, Glaucous-winged Gull, Glaucous Gull, Sabine's Gull
Auks: Common Murre, Thick-billed Murre, Black Guillemot, Pigeon Guillemot, Marbled Murrelet, Kittlitz's Murrelet, Ancient Murrelet, Cassin's Auklet, Parakeet Auklet, Least Auklet, Wiskered Auklet, Crested Auklet, Rhinoceros Auklet, Tufted Puffin, Horned Puffin

Species that visit Alaska waters

Tubenoses: Short-tailed Albatross, Black-footed Albatross, Laysan Albatross, Sooty Shearwater, Short-tailed Shearwater
Gulls: Ross's Gull, Ivory Gull

As noted in the PSEIS, seabird life history includes low reproductive rates, low adult mortality rates, long life span, and delayed sexual maturity. These traits make seabird populations extremely sensitive to changes in adult survival and less sensitive to fluctuations in reproductive effort. The problem with attributing population changes to specific impacts is that, because seabirds are long-lived animals, it may take years or decades before relatively small changes in survival rates result in observable impacts on the breeding population.

More information on seabirds in Alaska's EEZ may be found in several NMFS, Council, and USFWS documents:

- The URL for the USFWS Migratory Bird Management program is at: http://alaska.fws.gov/mbsp/mbm/index.htm
- Section 3.7 of the PSEIS (NMFS 2004a) provides background on seabirds in the action area and their interactions with the fisheries. This may be accessed at http://www.fakr.noaa.gov/sustainablefisheries/seis/final062004/Chaps/chpt_3/chpt_3_7.pdf
- The annual Ecosystems Considerations chapter of the SAFE reports has a chapter on seabirds. Back issues of the Ecosystem SAFE reports may be accessed at http://www.afsc.noaa.gov/REFM/REEM/Assess/Default.htm.
- The Seabird Fishery Interaction Research webpage of the Alaska Fisheries Science Center: http://www.afsc.noaa.gov/refm/reem/Seabirds/Default.htm

- The NMFS Alaska Region's Seabird Incidental Take Reduction webpage: http://www.fakr.noaa.gov/protectedresources/seabirds.html
- The BSAI and GOA Groundfish FMPs each contain an "Appendix I" dealing with marine mammal and seabird populations that interact with the fisheries. The FMPs may be accessed from the Council's home page at http://www.fakr.noaa.gov/npfmc/default.htm
- Washington Sea Grant has several publications on seabird takes, and technologies and practices for reducing them: http://www.wsg.washington.edu/publications/online/index.html
- The seabird component of the environment affected by the groundfish FMPs is described in detail in Section 3.7 of the PSEIS (NMFS 2004a).
- Seabirds and fishery impacts are also described in Chapter 9 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a).

4.6.1.1 ESA-Listed Seabirds in the GOA

Several species of conservation concern occur in the GOA (Table 75). Short-tailed albatross is listed as endangered under the ESA, and Steller's eider is listed as threatened. Kittlitz's Murrelet is a candidate species for listing under the ESA, and the U.S. Fish and Wildlife Service (USFWS) is currently working on a 12-month finding for Black-footed albatross.

Table 75 ESA-listed and candidate seabird species that occur in the GOA

Common Name	Scientific Name	ESA Status
Short-tailed Albatross	*Phoebaotria albatrus*	Endangered
Steller's Eider	*Polysticta stelleri*	Threatened
Kittlitz's Murrelet	*Brachyramphus brevirostris*	Candidate
Black-footed Albatross	*Phoebastria nigripes*	FWS working on 12 month finding

Short-tailed albatross

Short-tailed albatross (*Phoebaotria albatrus*) is currently listed as endangered under the ESA. Short-tailed albatross populations were decimated by hunters and volcanic activity at nesting sites in the early 1900s, and the species was reported to be extinct in 1949. In recent years, the population has recovered at a 7% to 8% annual rate. The world population of short-tailed albatross in 2009 was estimated at 3,000 birds. The majority of nesting occurs on Torishima Island in Japan, where an active volcano threatens the colony. As part of a five-year project, chicks have been translocated from Torishima Island to a new breeding colony on Mukojima in the Ogasawara Islands, without the volcanic threat. In February 2011, researchers noted the first return of a short-tailed albatross chick to its hand-reared home on Mukojima.

No critical habitat has been designated for the short-tailed albatross in the United States, since the population growth rate does not appear to be limited by marine habitat loss (NMFS 2004b). Short-tailed albatross feeding grounds are continental shelf breaks and areas of upwelling and high productivity. Short-tailed albatross are surface feeders, foraging on squid and forage fish.

Steller's eider

Steller's eider (*Polysticta stelleri)* is listed as threatened under the ESA. While designated critical habitat for Steller's eiders does overlap with fishing grounds, there has never been an observed take of this species off Alaska (USFWS 2003a and 2003b, NMFS 2008), and no take estimates are produced by AFSC. Therefore, impacts to Steller's eider are not analyzed in this document.

Black-footed Albatross

The black-footed albatross (*Phoebastria nigripes*) is a species of concern because some of the major colony population counts may be decreasing or are of unknown status. World population estimates range from 275,000 to 327,753 individuals (Brooke 2004), with a total breeding population of 58,000 pairs (USFWS 2006). In 2004, a petition was filed to list the black-footed albatross under the ESA. USFWS found that the petition was warranted and is currently working on a 12-month finding. Black-footed albatrosses occur in Alaska waters mainly in the northern GOA (Figure 18). Naughton et al (2007) published a conservation plan for laysan and black-footed albatrosses that lists fisheries bycatch as the most significant source of mortality for both species, but notes that bycatch off Alaska is a small fraction of the worldwide bycatch of these species. There have not been reported takes of black-footed albatross with trawl gear in Alaska.

Kittlitz's Murrelet

Kittlitz's murrelet (*Brachyramphus brevirostris*) is a small diving seabird that forages in shallow waters for capelin, Pacific sandlance, zooplankton, and other invertebrates. It feeds near glaciers, icebergs, and outflows of glacial streams, sometimes nesting up to 45 miles inland on rugged mountains near glaciers. Most recent population estimates indicate that it has the smallest population of any seabird considered a regular breeder in Alaska (9,000 to 25,000 birds). This species appears to have undergone significant population declines in several of its core population centers. USFWS believes that glacial retreat and oceanic regime shifts are the factors that are most likely causing population-level declines in this species. Kittlitz’s murrelet is currently a candidate species for listing under the ESA. No Kittlitz's murrelets were reported taken in the observed groundfish fisheries between 1993 and 2001 (NMFS 2004a).

4.6.1.2 Status of ESA consultations on seabirds

FWS has primary responsibility for managing seabirds, and has evaluated effects of the BSAI and GOA FMPs and the harvest specifications process on currently listed species in two Biological Opinions (USFWS 2003a and 2003b). Both Biological Opinions concluded that the groundfish fisheries off Alaska, including the GOA pollock fishery, are unlikely to jeopardize populations of listed species or adversely modify or destroy critical habitat for listed species. The current population status, life history, population biology, and foraging ecology of these species, as well as a history of ESA Section 7 consultations and NMFS actions carried out as a result of those consultations are described in detail in Section 3.7 of the PSEIS (NMFS 2004a).

In 1997, NMFS initiated a Section 7 consultation with USFWS on the effects of the Pacific halibut fishery off Alaska on the short-tailed albatross. USFWS issued Biological Opinion in 1998 that concluded that the Pacific halibut fishery off Alaska was not likely to jeopardize the continued existence of the short-tailed albatross. USFWS issued an Incidental Take Statement of two short-tailed albatross in a 2-year period (e.g., 1998/1999, 2000/2001, 2002/2003), reflecting what the agency anticipated the incidental take could be from the fishery action. Under the authority of ESA, USFWS identified non-discretionary reasonable and prudent measures that NMFS must implement to minimize the impacts of any incidental take.

Two updated USFWS biological opinions were published in 2003:

- Section 7 Consultation Biological Opinion on the Effects of the Total Allowable Catch-Setting Process for the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fisheries to the Endangered Short-tailed Albatross (*Phoebastria albatrus*) and Threatened Steller's Eider (*Polysticta stelleri*) (USFWS 2003b).
- Section 7 Consultation Programmatic Biological Opinion on the Effects of the Fishery Management Plans for the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fisheries

on the Endangered Short-tailed Albatross (*Phoebastria albatrus*) and Threatened Steller's Eider (*Polysticta stelleri*) (USFWS 2003a).

Although USFWS has determined that the short-tailed albatross is adversely affected by hook-and-line Pacific halibut and groundfish fisheries off Alaska, both USFWS opinions concurred with NMFS and concluded that the Gulf of Alaska and Bering Sea and Aleutian Islands Management Area fishery actions are not likely to jeopardize the continued existence of the short-tailed albatross or Steller's eider or result in adverse modification of Steller's eider critical habitat. USFWS also concluded that these fisheries are not likely to adversely affect the threatened spectacled eider. The Biological Opinion on the TAC-setting process updated incidental take limits to—

- four short-tailed albatross taken every 2 years in the hook-and-line groundfish fishery off Alaska, and
- two short-tailed albatross taken in the groundfish trawl fishery off Alaska while the biological opinion is in effect (approximately 5 years).

These incidental take limits are in addition to the previous take limit set in 1998 for the Pacific halibut hook-and-line fishery off Alaska of two short-tailed albatross in a 2-year period. The 2003 Biological Opinion on the TAC-setting process also included mandatory terms and conditions that NMFS must follow in order to be in compliance with the ESA. These include implementation of seabird deterrent measures, outreach and training of fishing crews on proper deterrence techniques, training observers in seabird identification, and retention of all seabird carcasses until observers can identify and record takes, continued analysis and publication of estimated incidental take in the fisheries, collection of information regarding the efficacy of seabird protection measures, cooperation in reporting sightings of short-tailed albatross, and continued research and reporting on the incidental take of short-tailed albatross in trawl gear.

USFWS also released a short-tailed albatross recovery plan in September 2008 (USFWS 2008). This recovery plan describes site-specific actions necessary to achieve conservation and survival of the species, downlisting and delisting criteria, and estimates of time and cost required to implement the recovery plan. Because the primary threat to the species recovery is the possibility of an eruption of Torishima Island, the most important recovery actions include monitoring the population and managing habitat on Torishima Island, establishing two or more breeding colonies on non-volcanic islands, monitoring the Senkaku population, and conducting telemetry and other research and outreach. Translocation of chicks to new colonies has begun. USFWS estimates that short-tailed albatross may be delisted in the year 2030, if new colony establishment is successful.

4.6.1.3 Seabird Distribution in the Gulf of Alaska

Figure 18 depicts the observed distributions of several seabird species from the North Pacific Pelagic Seabird Database (NPPSD 2004). The NPPSD represents a consolidation of pelagic seabird data collected from the Central and North Pacific Ocean, the Bering Sea, the Chukchi Sea, and the Beaufort Sea. The NPPSD was created to synthesize numerous disparate datasets including at-sea boat based surveys, stations, land-based observations, and fixed-wing and helicopter aerial surveys collected since 1972 (Drew and Piatt 2004). There are very few observations of short-tailed albatross in the NPPSD, so Figure 19 is included to show observed locations on short-tailed albatross on surveys from 2002-2004 (Melvin et al. 2006). Melvin et al. (2006) provides the most current and comprehensive data on seabird distribution patterns off Alaska. Seabird data were collected during International Pacific Halibut Commission (IPHC) halibut surveys, NMFS sablefish surveys, Alaska Department of Fish and Game (ADF&G) Southeast Inside sablefish surveys, and ADF&G Prince William Sound sablefish surveys.

Satellite Tracking of Short-tailed Albatross

USFWS and Oregon State University placed 52 satellite tags on Laysan, black-footed, and short-tailed albatrosses in the Central Aleutian Islands to study movement patterns of the birds in relation to commercial fishing activity and other environmental variables. From 2002 to 2006, 21 individual short-tailed albatrosses (representing about 1% of the entire population) were tagged, including adults, sub-adults, and hatch-year birds. During the non-breeding season, short-tailed albatross ranged along the Pacific Rim from southern Japan through Alaska and Russia to northern California, primarily along continental shelf margins (Suryan et al. 2006).

Eleven of the 14 birds had sufficient data to analyze movements within Alaska. Within Alaska, albatrosses spent varying amounts of time among NMFS reporting areas, with six of the areas (521, 524, 541, 542, 543, 610) being the most frequently used (Suryan et al. 2006). Non-breeding albatross concentrate foraging in oceanic areas characterized by gradients in topography and water column productivity. The primary hot spots for short-tailed albatrosses in the Northwest Pacific Ocean and Bering Sea occur where a variety of underlying physical processes enhance biological productivity or prey aggregations. The Aleutian Islands, in particular, were a primary foraging destination for short-tailed albatrosses.

Figure 18 Observations of seabird species with conservation status and/or likely to interact with fishing gear in the Gulf of Alaska. (NPPSD 2004)

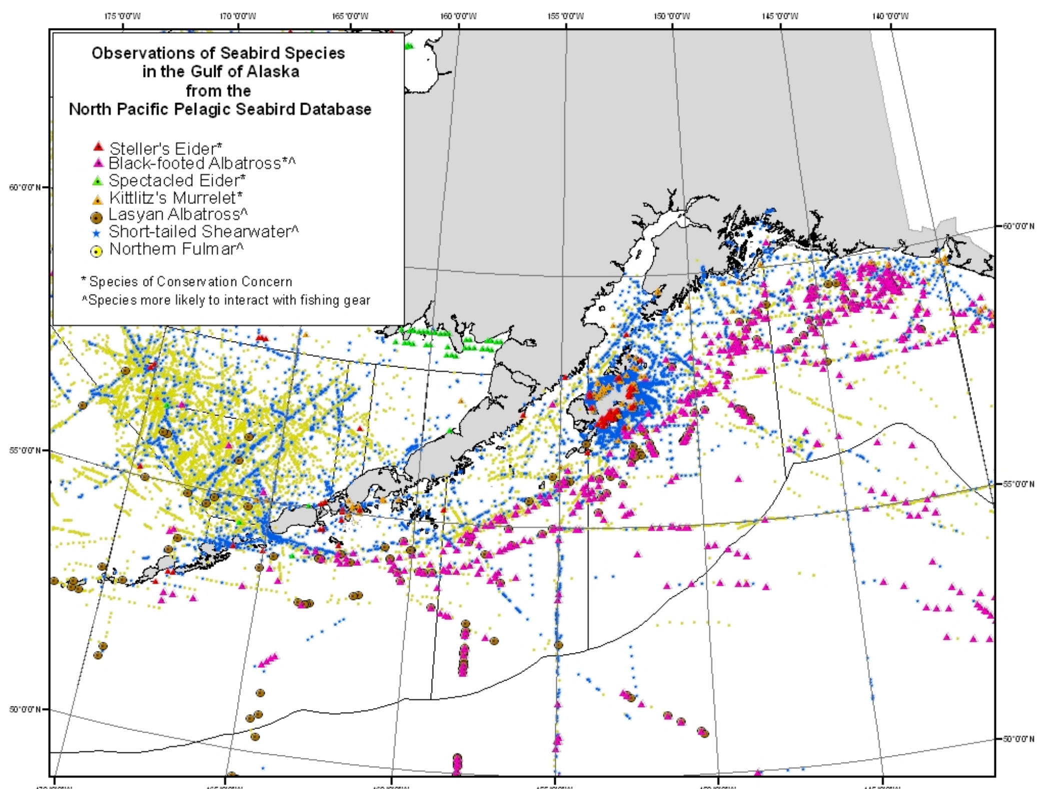
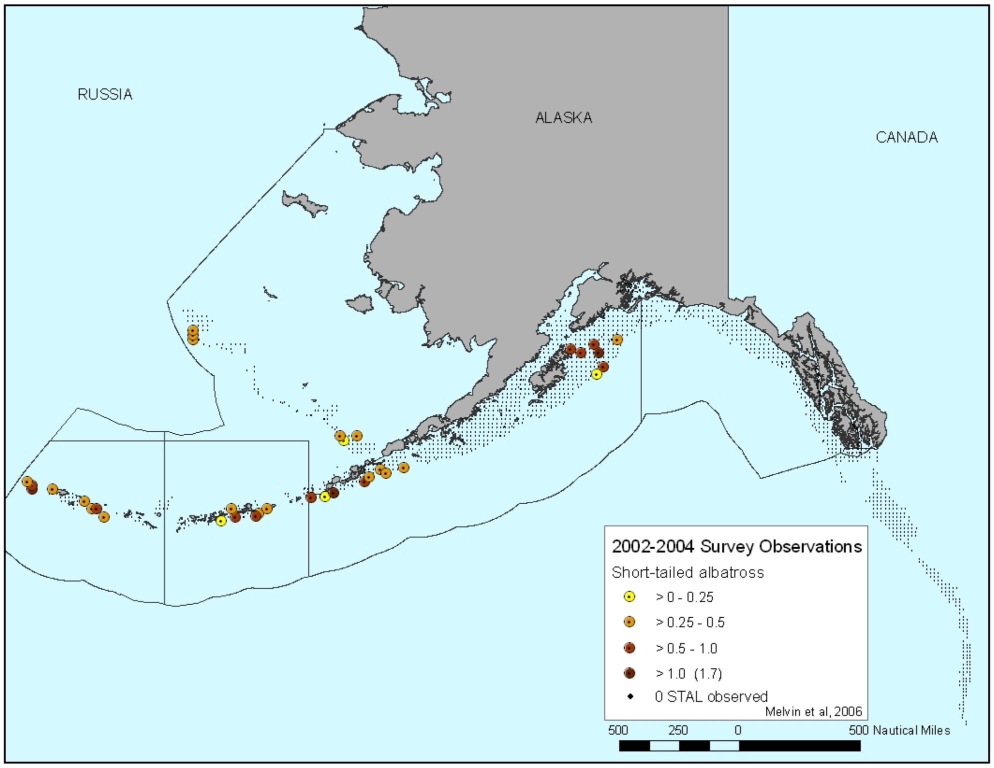


Figure 19 Observations of short-tailed albatrosses (Melvin et al, 2006).



Short-tailed Albatross Takes in Alaska Fisheries

Table 76 lists the short-tailed albatrosses reported taken in Alaska fisheries since 1983. With the exception of one take in the Western GOA, all takes occurred along the shelf break in the Bering Sea. The Western GOA take was in the hook-and-line halibut fishery. No takes were reported from 1999 through 2009. No takes with trawl gear have been reported.

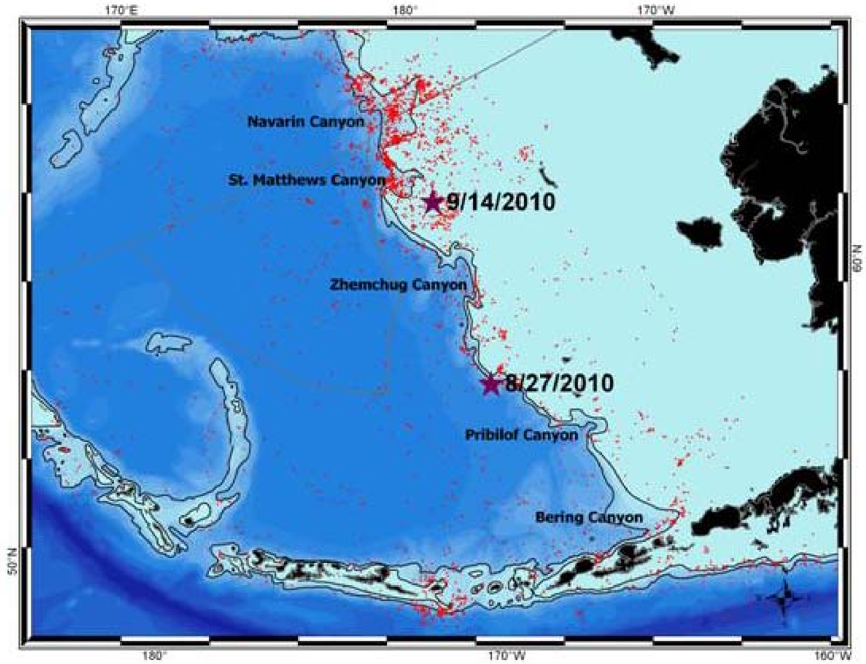
Table 76 Reported takes of short-tailed albatross in Alaska fisheries

Date of take	Location	Fishery	Age when taken
July 1983	BS	brown crab	juvenile (4 mos)
1 Oct 87	GOA	halibut	juvenile (6 mos)
28 Aug 95*	EAI	hook-and-line	sub-adult (16 mos)
8 Oct 95	BS	hook-and-line	sub-adult
27 Sept 96	BS	hook-and-line	sub-adult (5 yrs)
21 Sept 98	BS	Pacific cod hook-and-line	adult (8 yrs)
28 Sept 98	BS	Pacific cod hook-and-line	sub-adult
27 Aug 2010	BS	Pacific cod hook-and-line	Sub-adult (7 yrs 10 mos)
14 Sept 2010	BS	Pacific cod hook-and-line	Sub-adult (3 yrs 10 mos)

Source: AFSC.

While the incidental take statement take limits for short-tailed albatross have never been met or exceeded, two short-tailed albatrosses were taken in the BSAI hook-and-line Pacific cod fishery in 2010 (Table 76 and Figure 20). The first bird was taken on August 27, 2010, at 56 37' N and 172 57' W in NMFS reporting area 523. The second bird was also taken in the BSAI, on September 14, 2010, at 59 20' N and 176 33' W in NMFS reporting area 521. The last short-tailed albatross take, previous to these two, occurred in 1998. NMFS is working closely with industry and the observer program to understand the specific circumstances of these incidents, and to help prevent future takes.

Figure 20 Map of two recent short-tailed albatross takes in Alaska <u>hook-and-line fisheries</u> (purple stars). Red dots indicate satellite tagging data from birds tagged between 2001-2010.



Credits: Yamashina Institute for Ornithology, Oregon State University, USFWS, and Ministry of Environment Japan.

4.6.2 Effects on Seabirds

The PSEIS identifies how the GOA groundfish fisheries activities may directly or indirectly affect seabird populations (NMFS 2004a). Direct effects may include incidental take in fishing gear and vessel strikes. Indirect effects may include reductions in prey (forage fish) abundance and availability, disturbance to benthic habitat, discharge of processing waste and offal, contamination by oil spills, presence of nest predators in islands, and disposal of plastics, which may be ingested by seabirds.

4.6.2.1 Significance Criteria for Seabirds

Table 77 explains the criteria used in this analysis to evaluate the significance of the effects of fisheries on seabird populations in the GOA. These criteria are used in the analysis of alternatives and options that follows, and are from the 2006–2007 groundfish harvest specifications environmental assessment/final regulatory flexibility analysis (EA/FRFA) (NMFS 2006). These criteria are applicable to this action because this analysis and the harvest specifications analysis both analyze the effects of groundfish fisheries on seabirds, and are the most recent criteria available. The first criterion in the table was further refined for this analysis from NMFS (2006) to clearly provide a criterion for “insignificant impact” and to be consistent with other analyses of environmental components in this EA/RIR.

Table 77 Criteria used to determine significance of impacts on seabirds

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

4.6.2.2 Incidental Take of Seabirds in Trawl Fisheries

The impacts of the Alaska groundfish fisheries on seabirds were analyzed in the Alaska Harvest Specifications EIS (NMFS 2007). That document evaluates the impacts of the alternative harvest strategies on seabird takes, prey availability, and seabird ability to exploit benthic habitat. The focus of this analysis is similar, as any changes to the pollock fishery in the GOA could change the potential for direct take of seabirds. Potential changes in prey availability (seabird prey species caught in the pollock trawl fishery) and disruption of bottom habitat via the intermittent contact with non-pelagic trawl gear under different levels of harvest are discussed in NMFS (2007). These changes would be closely associated with changes in take levels because of the nature of the alternatives using caps and spatial restrictions. Therefore, all impacts are addressed by focusing on potential changes in seabird takes.

Seabirds can interact with trawl fishing vessels in several ways. Birds foraging at the water surface or in the water column are sometimes caught in the trawl net as it is brought back on board. These net-entangled birds are referred to as “bycatch” and are recorded by fisheries observers as discussed below. In addition to getting caught in the fishing nets of trawl vessels, some species strike cables attached to the infrastructure of vessels or collide with the infrastructure itself. Large winged birds such as albatrosses are most susceptible to mortalities from trawl-cable strikes (CCAMLR 2006a). Third wire cables have been prohibited in some southern hemisphere fisheries since the early 1990s due to substantial albatross mortality from cable strikes. No short-tailed albatross or black-footed albatross have been observed taken with trawl gear in Alaska fisheries, but mortalities to Laysan albatrosses have been observed.

Average annual incidental take of birds recovered in the nets from trawling operations in the GOA was 87 birds per year from 2002-2006 (NMFS 2008). Northern fulmars and alcids comprised 100% of these takes. During 1993-2006, shearwaters also comprised approximately 10% of takes. The estimated takes of gulls, fulmars, and shearwaters in the entire groundfish fishery are very small percentages of these species' populations (NMFS 2008).

Seabird bycatch in the GOA trawl fisheries is relatively low. However, there are presently no standardized observer data on seabird mortality from trawl third wire collisions in Alaskan waters. To date, striking of trawl vessels or gear by the short-tailed albatross has not been reported by observers. The probability of short-tailed albatross collisions with third wires or other trawl vessel gear in Alaskan waters cannot be assessed; however, given the available observer data and the observed at-sea locations of short-tailed albatrosses relative to trawling effort, the possibility of such collisions cannot be completely discounted. USFWS' biological opinion included an ITS of two short-tailed albatross for the trawl groundfish fisheries off Alaska (USFWS 2003).

4.6.2.3 Prey Availability Disturbance of Benthic Habitat

As noted in Table 78, prey species of seabirds in the GOA are not usually fish that are targeted by non-pelagic commercial fishing gear. However, seabird species may be impacted indirectly by effects of the non-pelagic trawl gear on the benthic habitat of seabird prey, such as clams, bottom fish, and crab. The essential fish habitat final environmental impact statement provides a description of the effects of trawling on bottom habitat in the appendix (NMFS 2005), including the effects of the commercial fisheries on the GOA slope and shelf.

It is not known how much seabird species use benthic habitat directly, although research funded by the North Pacific Research Board has been conducted on foraging behavior of seabirds in the Bering Sea in recent years. Thick-billed murres easily dive to 100 m, and have been documented diving to 200 m; common murres also dive to over 100 m. Since cephalopods and benthic fish compose some of their diet, murres could be foraging on or near the bottom (K. Kuletz, USFWS, personal communication, October 2008).

A description of the effects of prey abundance and availability on seabirds is found in the PSEIS (NMFS 2004a) and the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). Detailed conclusions or predictions cannot be made regarding the effects of forage fish bycatch on seabird populations or colonies. NMFS (2007b) found that the potential impact of the entire groundfish fisheries on seabird prey availability was limited due to little or no overlap between the fisheries and foraging seabirds based on either prey size, dispersed foraging locations, or different prey (NMFS 2007a). The majority of bird groups feed in vast areas of the oceans, are either plankton feeders or surface or mid-water fish feeders, and are not likely to have their prey availability impacted by the nonpelagic trawl fisheries. There is no directed commercial fishery for those species that compose the forage fish management group, and seabirds typically target juvenile stages rather than adults for commercial target species. Most of the forage fish bycatch is smelt taken in the pollock fishery, which is not included in this action.

Table 78 Seabirds in the Gulf of Alaska: foraging habitats and common prey species. (USFWS 2006; Dragoo 2010)

Species	Foraging habitats	Prey
Short-tailed albatross	Surface seize and scavenge	Squid, shrimp, fish, fish eggs
Black-footed albatross	Surface dip, scavenge	Fish eggs, fish, squid, crustaceans, fish waste
Laysan albatross	Surface dip	Fish, squid, fish eggs and waste
Spectacled eider	Diving	Mollusks and crustaceans
Steller's eider	Diving	Mollusks and crustaceans
Black-legged kittiwake	Dip, surface seize, plunge dive	Fish, marine invertebrates
Murrelet (Kittlitz's and marbled)	Surface dives	Fish, invertebrates, macroplankton
Shearwater spp.	Surface dives	Crustaceans, fish, squid
Northern fulmar	Surface fish feeder	Fish, squid, crustaceans
Murres spp.	Diving fish-feeders offshore	Fish, crustaceans, invertebrates
Cormorants spp.	Diving fish-feeders nearshore	Bottom fish, crab, shrimp
Gull spp.	Surface fish feeder	Fish, marine invertebrates, birds
Auklet spp.	Surface dives	Crustaceans, fish, jellyfish
Tern spp.	Plunge, dive	Fish, invertebrates, insects
Petrel spp.	Hover, surface dip	Zooplankton, crustaceans, fish
Jaeger spp.	Hover and pounce	Birds, eggs, fish
Puffin spp.	Surface dives	Fish, squid, other invertebrates

Seabirds that feed on benthic habitat, including Steller's eiders, scoters, cormorants, and guillemots, may feed in areas that could be directly impacted by nonpelagic trawl gear (NMFS 2004b). A 3-year otter trawling study in sandy bottom of the Grand Banks showed either no effect or increased abundance in mollusc species after trawling (Kenchington et al. 2001), but clam abundance in these studies was depressed for the first 3 years after trawling occurred. McConnaughey, Mier, and Dew (2000) studied trawling effects using the Bristol Bay area Crab and Halibut Protection Zone. They found more abundant infaunal bivalves (not including *Nuculana radiata*) in the highly fished area compared to the unfished area. In addition to abundance, clam size is of huge importance to these birds. However, handling time is very important to birds foraging in the benthos, and their caloric needs could change if a stable large clam population is converted to a very dense population of small first year clams. Additional impacts from nonpelagic trawling may occur if sand lance habitat is adversely impacted. This would affect a wider array of piscivorous seabirds that feed on sand lance, particularly during the breeding season, when this forage fish is also used for feeding chicks.

Recovery of fauna after the use of nonpelagic trawl gear may also depend on the type of sediment. A study in the North Sea found biomass and production in sand and gravel sediments recovering faster (2 years) than in muddy sediments (4 years) (Hiddink, Jennings, and Kaiser 2006). The recovery rate may be affected by the animal's ability to rebury itself after disturbance. Clams species may vary in their ability to rebury themselves based on grain size and whether they are substrate generalist, substrate specialist, or substrate sensitive species (Alexander, Stanton, and Dodd 1993).

4.6.2.4 Alternative 1 Status Quo

Incidental Take

The effects of the status quo fisheries on incidental take of seabirds are described in the 2007 harvest specifications EIS (NMFS 2007). Estimated takes in the GOA trawl groundfish fisheries average 87 birds per year and primarily consist of northern fulmars (98%; NMFS 2008). These take estimates are small in comparison to seabird population estimates, and under the status quo alternative, it is reasonable to conclude that the impacts would continue to be similar. However, observers are not able to monitor all seabird mortality associated with trawl vessels. Several research projects are currently underway to provide more information on these interactions.

Spatial restrictions on the pollock trawl fishery in the GOA were established as part of the Steller sea lion protection measures. These closures decrease the potential for interactions with seabirds in these areas. These restrictions are not anticipated to change, so this protection would continue to be provided under any of the alternatives in this analysis.

Prey Availability and Benthic Habitat

The status quo groundfish fisheries do not harvest seabird prey species in an amount that would decrease food availability enough to impact survival rates or reproductive success, nor do they impact benthic habitat enough to decrease seabird prey base to a degree that would impact survival rates or reproductive success.

4.6.2.5 Alternative 2

Incidental Take

The range of hard caps under Alternative 2 could potentially decrease the number of incidental takes of seabirds in the GOA trawl fisheries. A lower hard cap may preclude pollock fishing in the GOA at some point in the fishing season, which would reduce the potential for incidental takes in fishing areas that overlap with seabird distributions. A higher hard cap would allow for more pollock fishing and more incidental takes of seabirds than a lower cap. Component 2 to Alternative 2 would increase observer coverage in the GOA pollock trawl fishery by extending the 30% coverage requirement to vessels less than 60 ft LOA. This fleet harvests a substantial portion of the Western GOA pollock TAC. Expanded observer coverage would enhance monitoring of incidental takes of seabirds in the GOA pollock fishery and has the potential to improve the accuracy of estimates of incidental take of seabirds, but would not significantly affect seabirds at the population level.

Prey Availability and Benthic Habitat

Under a hard cap, the fishing season has the potential to be shorter than the status quo fishery in high bycatch years. Decreased fishing effort could further reduce any removals of seabird prey species and further mitigate any effects on benthic habitat at an insignificant level.

4.6.2.6 Alternative 3

Incidental Take

Under the cooperative provisions in Alternative 3, vessels carrying an LLP would be required to join a bycatch cooperative. Vessel reporting requirements would be used to identify salmon hotspots and to determine an appropriate set of measures to limit fishing in identified hotspots. These provisions have the potential to allow the fleet to catch the entire pollock TAC. Thus, the length of the fishing season could potentially be the same as the status quo fishery, or longer if the fleet spends more time fishing in areas with lower pollock catch rates in order to avoid salmon. In either case, the effects on incidental takes of seabirds are likely insignificant. The GOA pollock TACs are relatively small and seasons are likely to remain short. Relatively few incidental takes of seabirds occur in the GOA trawl fisheries, and the number of takes is not likely to increase to a significant level under Alternative 3.

Prey Availability and Benthic Habitat

Decreased fishing effort could further decrease any removals of seabird prey species and further mitigate any effects on benthic habitat. If the fleet spends a longer time fishing in areas with low pollock catch rates in order to avoid salmon, impacts to benthic habitat and potential removals of non-target species that are prey for marine mammals have some potential to increase. However, the effects on prey availability and benthic habitat are very likely to be insignificant.

4.6.2.7 Summary of Effects

Many seabird species utilize the marine habitat of the GOA. Several species of conservation concern and many other species could potentially interact with trawl cables. The AFSC estimates of incidental takes are small relative to total estimates of seabird populations. However, those estimates do not include cable-related trawl mortalities. Recent modeling suggests that even if there were to be a large increase in trawl cable incidental takes of short-tailed albatross (the only seabird listed as endangered under the ESA), it would have negligible effects on the recovery of the species. Table 79 summarizes the action alternatives' impacts to seabird populations.

Table 79 Summary of impacts to seabirds from alternatives in this analysis

Alternative	Impact on incidental take of seabirds in Alaska waters	Impact on prey density and benthic habitat
Alternative 1	Seabird takes and disruptions to benthic habitat and prey availability are at low levels and are mitigated (to some degree) by current spatial restrictions on the fisheries in the Gulf of Alaska. Insignificant effects.	Seabird takes and disruptions to benthic habitat and prey availability are at low levels and are mitigated (to some degree) by current spatial restrictions on the fisheries in the Gulf of Alaska. Insignificant effects.
Alternative 2	Seabirds are taken by fisheries in minor amounts compared to population levels. Insignificant effects. Increased observer coverage would improve monitoring of incidental takes.	Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects. Insignificant effects.
Alternative 3	Seabirds are taken by fisheries in minor amounts compared to population levels. Insignificant effects.	Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects. Insignificant effects.

4.7 Habitat

Fishing operations may change the abundance or availability of certain habitat features used by managed fish species to spawn, breed, feed, and grow to maturity. These changes may reduce or alter the abundance, distribution, or productivity of species. The effects of fishing on habitat depend on the intensity of fishing, the distribution of fishing with different gears across habitats, and the sensitivity and recovery rates of specific habitat features. In 2005, NMFS and the Council completed the EIS for EFH Identification and Conservation in Alaska (NMFS 2005). The EFH EIS evaluates the long term effects of fishing on benthic habitat features, as well as the likely consequences of those habitat changes for each managed stock based on the best available scientific information. Maps and descriptions of EFH for the GOA groundfish species are available in the EFH EIS (NMFS 2005). This document also describes the importance of benthic habitat to different groundfish species and the impacts of different types of fishing gear on benthic habitat.

4.7.1 Effects of the alternatives

The effects of the GOA pollock trawl fishery on benthic habitat and EFH were analyzed in the EFH EIS (NMFS 2005). The GOA pollock fishery is prosecuted with pelagic trawl gear. Trawl performance standards for the directed pollock fishery at 50 CFR 679.7(a)(14) reduce the likelihood of pelagic trawl gear use on the bottom. Year-round area closures protect sensitive benthic habitat. Appendix B to the EFH EIS describes how pelagic trawl gear impacts habitat. The long-term effects index (LEI) estimates the proportion of habitat attributes that would be lost if recent fishing patterns continued. In the GOA, estimated reductions of epifaunal and infaunal prey due to fishing are less than 1% for all substrate types. For living structure, LEI impacts ranged between 3% and 7% depending on the substrate. Local areas with LEI values in excess of 50% occur to the east of Kodiak Island in Barnabus, Chiniak, and Marmot Gullies. These areas support high densities of pollock. In addition to impacting benthic habitat, the pollock fishery catches salmon prey species incidentally, including squid, capelin, eulachon, and herring. The catches of these prey species are very small relative to the overall populations of these species. Thus, fishing activities are considered to have minimal and temporary effects on prey availability for salmon.

The analysis in the EFH EIS concludes that current fishing practices in the GOA pollock trawl fishery have minimal or temporary effects on benthic habitat and essential fish habitat. These effects are likely to continue under **Alternative 1**, and are not considered to be significant.

Alternative 2 would establish a hard cap that limits bycatch of Chinook salmon in the GOA pollock fishery. A lower hard cap may result in the pollock fishery closing before the TAC is reached, which may reduce impacts of this fishery on benthic habitat. A higher hard cap would allow for more pollock fishing, and impacts to benthic habitat may be similar to the status quo fishery. Component 2 to Alternative 2 would increase observer coverage in the GOA pollock fishery by requiring vessels less than 60 ft LOA to carry observers for 30% of fishing days. This fleet harvests a substantial portion of the Western GOA pollock TAC. Expanded observer coverage would enhance monitoring of incidental catches in the GOA pollock fishery.

Alternative 2 may reduce the potential adverse effects of fishing on benthic habitat compared to the status quo. Overall, under the status quo fisheries, the GOA pollock fishery has minimal effects on benthic habitat, although localized areas are more heavily impacted. To the extent that Alternative 2 reduces effort in the GOA pollock fishery, this alternative would reduce impacts on habitat relative to the status quo. **Because Alternative 2 is not likely to result in adverse effects to habitat, the impacts of Alternative 2 are likely insignificant.**

Alternative 3 would establish bycatch cooperatives, which would work to identify bycatch hotspots. If cooperatives are able to identify and avoid fishing in high bycatch areas, the pollock season could be as long as the status quo fishery or potentially longer. If pollock catch rates are lower in areas identified as outside of the bycatch hotspots, longer fishing seasons involving more fishing effort could increase impacts of the pollock fishery on benthic habitat. In addition, shifts in fishing locations may increase impacts to some areas. However, the GOA pollock TACs are relatively small in relation to the capacity of the trawl fleet to harvest the TAC, and seasons are likely to remain short. **Consequently, Alternative 3 is not likely to result in adverse impacts to habitat, and the impacts of Alternative 3 are likely insignificant.**

Mitigation

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

Summary of Effects

The EFH EIS (NMFS 2005) 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 (Alternative 1). 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. It is possible that impacts may increase slightly in other areas due to displaced fishing effort, particularly under Alternative 3, but in context of the entire GOA, these impacts are not likely to be substantial. 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.

4.8 Ecosystem

Ecosystems consist of communities of organisms interacting with their physical environment. Within marine ecosystems, competition, predation, and environmental disturbance cause natural variation in recruitment, survivorship, and growth of fish stocks. Human activities, including commercial fishing, can also influence the structure and function of marine ecosystems. Fishing may change predator-prey relationships and community structure, introduce foreign species, affect trophic diversity, alter genetic diversity, alter habitat, and damage benthic habitats.

The GOA pollock fishery potentially impacts the GOA ecosystem by relieving predation pressure on shared prey species (i.e., species which are prey for both pollock and other species), reducing prey availability for predators of pollock, altering habitat, imposing bycatch mortality, or by ghost fishing caused by lost fishing gear. Ecosystem considerations for the GOA groundfish fisheries are summarized annually in the GOA Stock Assessment and Fishery Evaluation report (Zador and Gaichas 2010). These considerations are summarized according to the ecosystem effects on the groundfish fisheries as well as the potential fishery effects on the ecosystem.

Effects of the Alternatives

An evaluation of the effects of the GOA pollock fisheries on the ecosystem is discussed annually in the Ecosystem Considerations section of the pollock chapter of the SAFE report (Dorn et al 2010), and was evaluated in the Harvest Specifications EIS (NMFS 2007). This analysis concluded that the current GOA pollock fisheries do not produce population-level impacts to marine species or change ecosystem-level attributes beyond the range of natural variation. Consequently, Alternative 1 is not expected to have a significant impact on the ecosystem.

Alternatives 2 and 3 will either maintain or reduce the overall level of pollock harvest from the status quo. The level of fishing effort by pollock vessels is not expected to change, except in years where the fishery is closed early due to the attainment of the Chinook salmon PSC cap. With the exception of the most constraining PSC cap levels applied in the Central GOA (which would have closed the fishery in the B season in two of eight years, applying the cap retrospectively (Table 20, in Section 3.10.1.1.1)), the implementation of a PSC limit would not have constrained the pollock fishery in either regulatory area in the past eight years, except in the D season. At an ecosystem level, the effects of reducing fishing to this extent are not expected to be significant. While the location and timing of fishing activities may show some localized changes due to the fleet’s efforts to find areas with low Chinook salmon bycatch rates, overall the fleet is constrained by Steller sea lion protection measures in the location and timing of the pollock fishery. As a result, Alternatives 2 and 3 are not likely to have a significant impact on the ecosystem.

4.9 Cumulative effects

This section analyzes the cumulative effects of the actions considered in this environmental assessment. A cumulative effects analysis includes the effects of past, present, and reasonably foreseeable future action (RFFA). The past and present actions are described in several documents and are incorporated by reference. These include the PSEIS (NMFS 2004), the EFH EIS (NMFS 2005), and the harvest specifications EIS (NMFS 2007a). This analysis provides a brief review of the RFFA that may affect environmental quality and result in cumulative effects. Future effects include harvest of federally managed fish species and current habitat protection from federal fishery management measures, harvests from state managed fisheries and their associated protection measures, efforts to protect endangered species by other federal agencies, and other non-fishing activities and natural events.

The most recent analysis of RFFAs for the groundfish fisheries is in the Harvest Specifications EIS (NMFS 2007a). No additional RFFAs have been identified for this proposed action. The RFFAs are described in the Harvest Specifications EIS Section 3.3 (NMFS 2007a), are applicable for this analysis, and are incorporated by reference. A summary table of these RFFAs is provided below (Table 80). The table summarizes the RFFAs identified applicable to this analysis that are likely to have an impact on a resource component within the action area and timeframe. Actions are understood to be human actions (e.g., a proposed rule to designate northern right whale critical habitat in the Pacific Ocean), as distinguished from natural events (e.g., an ecological regime shift). CEQ regulations require a consideration of actions, whether taken by a government or by private persons, which are reasonably foreseeable. This is interpreted as indicating actions that are more than merely possible or speculative. Actions have been considered reasonably foreseeable if some concrete step has been taken toward implementation, such as a Council recommendation or the publication of a proposed rule. Actions simply “under consideration” have not generally been included because they may change substantially or may not be adopted, and so cannot be reasonably described, predicted, or foreseen. Identification of actions likely to impact a resource component within this action’s area and time frame will allow the public and Council to make a reasoned choice among alternatives.

Table 80 Reasonable Foreseeable Future Actions.

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

Reasonably foreseeable future actions that may affect target and prohibited species are shown in Table 80. Ecosystem management, rationalization, and traditional management tools are likely to improve the protection and management of target and prohibited species, including pollock and Chinook salmon and are not likely to result in significant effects when combined with the direct and indirect effects of Alternatives 2 and 3. Ongoing research efforts are likely to improve our understanding of the interactions between the harvest of pollock and salmon. NMFS is conducting or participating in several research projects to improve understanding of the ecosystems, fisheries interactions, and gear modifications to reduce salmon bycatch. The State of Alaska manages the commercial salmon fisheries off Alaska. The State's first priority for management is to meet spawning escapement goals to sustain salmon resources for future generations. Subsistence use is the highest priority use under both State and Federal law. Surplus fish beyond escapement needs and subsistence use are made available for other uses, such as commercial and sport harvests. The State carefully monitors the status of salmon stocks returning to Alaska streams and controls fishing pressure on these stocks. Other government actions and private actions may increase pressure on the sustainability of target and prohibited fish stocks either through extraction or changes in the habitat or may decrease the market through aquaculture competition, but it is not clear that these would result in significant cumulative effects. Any increase in extraction of target species would likely be offset by federal management. These are further discussed in Sections 4.1.3 and 7.3 of the Harvest Specifications EIS (NMFS 2007).

Reasonably foreseeable future actions for non-specified and forage species include ecosystem-sensitive management, traditional management tools, and private actions. Impacts of ecosystem-sensitive management and traditional management tools are likely to be beneficial as more attention is brought to the taking of non-specified species in the fisheries and accounting for such takes.

Reasonably foreseeable future actions for marine mammals and seabirds include ecosystem-sensitive management; rationalization; traditional management tools; actions by other federal, state, and international agencies; and private actions, as described in Sections 8.4 and 9.3 of the Harvest Specifications EIS (NMFS 2007a). Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to marine mammals and seabirds by considering these species more in management decisions, and by improving the management of the pollock fishery through the restructured observer program, catch accounting, seabird avoidance measures, and vessel monitoring systems (VMS). Research into marine mammal and seabird interactions with the pollock fisheries are likely to lead to an improved understanding leading to trawling methods that reduce adverse impacts of the fisheries. Changes in the status of species listed under the ESA, the addition of new listed species or critical habitat, and results of future Section 7 consultations may require modifications to groundfish fishing practices to reduce the impacts of these fisheries on listed species and critical habitat. Any change in protection measures for marine mammals likely would have insignificant effects because any changes would be unlikely to result in the PBR being exceeded and would not be likely to result in jeopardy of continued existence or adverse modification or destruction of designated critical habitat. Additionally, since future TACs will be set with existing or enhanced protection measures, it is reasonable to assume that the effects of the fishery on the harvest of prey species and disturbance will likely decrease in future years.

Any action by other entities that may impact marine mammals and seabirds will likely be offset by additional protective measures for the federal fisheries to ensure ESA-listed mammals and seabirds are not likely to experience jeopardy or adverse modification of critical habitat. Direct mortality by subsistence harvest is likely to continue, but these harvests are tracked and considered in the assessment of marine mammals and seabirds. The cumulative effect of these impacts in combination with measures proposed under Alternatives 2 and 3 is not likely to be significant.

Reasonably foreseeable future actions for habitat and the ecosystem include ecosystem-sensitive management; rationalization; traditional management tools; actions by other federal, state, and international agencies; and private actions, as detailed in Sections 10.3 and 11.3 of the Harvest Specifications EIS (NMFS 2007). Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to ecosystems and habitat by considering ecosystems and habitat more in management decisions and by improving the management of the fisheries through the observer program, catch accounting, seabird and marine mammal protection, gear restrictions, and VMS.

Continued fishing under the harvest specifications is likely the most important cumulative effect on EFH but the EFH EIS (NMFS 2005) has determined that this effect is minimal. The Council is also considering improving the management of non-specified species incidental takes in the fisheries to provide more protection to this component of the ecosystem. Any shift of fishing activities from federal waters into state waters would likely result in a reduction in potential impacts to EFH because state regulations prohibit the use of trawl gear in much of state waters. Nearshore impacts of coastal development and the management of the Alaska Water Quality Standards may have an impact on EFH, depending on the nature of the action and the level of protection the standards may afford. Development in the coastal zone is likely to continue, but Alaska overall is lightly developed compared to coastal areas elsewhere and therefore overall impact to EFH are not likely to be great. The GOA pollock fishery has been independently certified to the Marine Stewardship Council environmental standard for sustainable fishing. Overall, the cumulative effects on habitat and ecosystems are under Alternatives 2 and 3 are not likely to be significant.

Considering the direct and indirect impacts of the proposed action when added to the impacts of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of the reasonably foreseeable future actions listed above, the cumulative impacts of the proposed action are determined to be not significant.

5 Management and enforcement considerations

5.1 Background (Status quo)

NMFS estimates Chinook salmon bycatch 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 and bycatch 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.

5.1.1 Observer program sampling

The Observer Program collects catch and bycatch data used for management and inseason monitoring of groundfish fisheries. Federal regulations (50 CFR 679.50) define observer sampling of groundfish fisheries based on vessel size and participation in specific management programs like the Central GOA Rockfish Pilot program. Catcher vessels in the inshore sector are required to carry observers based on vessel length:

- 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.

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% observer coverage in the federal fisheries including previously uncovered sectors such as the commercial halibut sector and less than 60 feet in length overall (LOA) groundfish sector (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.

Data from observed vessels are used to estimate the numbers of salmon, by species, taken as bycatch in the Alaska groundfish fisheries. Chinook salmon are the dominant salmon species taken as bycatch in the GOA, followed by chum salmon. Very small numbers of sockeye salmon, coho salmon, pink salmon, and steelhead are also taken as bycatch in the GOA groundfish fisheries. Chinook salmon are caught as bycatch primarily in the directed pollock trawl fisheries, although some Chinook salmon are also taken as bycatch in other trawl target fisheries (see Section 4.3).

In the GOA pollock fishery, observers transmit their at-sea sample data to the NMFS upon their arrival in port. All offload related data, including the salmon census information, are submitted 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 GOA pollock fishery the vast majority of observer data are submitted via fax. Observers are deployed in the field for up to three months at a time, and debrief with Fisheries Monitoring and Analysis (FMA) Division staff following their deployment to ensure the data were collected following NMFS protocols. Errors may be identified and corrections made to the data during the debriefing process. The 2010 data will not be finalized until all observers have returned from the field, are debriefed, and quality control on the data is completed. Generally, the observer data are finalized in late February to early March of the year following the fishery. Any 2010 information should be considered to be preliminary until the observer data are finalized after the fishing year is completed.

5.1.1.1 Sampling on catcher vessels delivering to shoreside processors

When an observer is deployed on a catcher vessel, they are responsible for assessing the fishing activities and determining how to sample the unsorted catch for species composition and biological information using methodologies described in the Observer Program Sampling Manual (AFSC 2011). In the pollock catcher vessel (CV) fisheries, observers are instructed to sample every haul for composition and biological data. In rare cases, an observer is unable to sample all the hauls during a trip. This is usually a result of observer injury, or rough weather preventing the observer from completing their duties. For each sampled haul, observers are instructed to collect a random species composition sample of the total catch. Observers are trained and encouraged to use a systematic sample whenever it is logistically feasible, and they strive to take multiple, equal sized samples from throughout the haul to obtain the largest sample size possible. However vessel layout, gear handling methods and the associated safety concerns, often restricts an observer's access to unsorted catch at sea. As a result, in the GOA pollock fishery, observer samples are often obtained opportunistically and sample fractions vary.

Pollock caught in the GOA on CVs delivering to shoreside processors are generally either dropped or mechanically pumped from a codend (i.e., the end of the trawl net where catch accumulates) directly into Refrigerated Seawater (RSW) tanks. Observers attempt to obtain random, species composition samples by collecting small amounts of catch as it flows from the codend to the RSW tanks. This particular sampling method is difficult and dangerous, as observers must obtain a relatively small amount of fish from the catch flowing out of the codend as it is emptied into the RSW tanks. A large codend may contain over 100 metric tons (mt) of fish. The sampling is typically done on-deck, where the observer is exposed to the elements and subject to the operational hazards associated with the vessel crew's hauling, lifting, and emptying of the codend into the large hatches leading to the tanks. In contrast, the sampling methods used on catcher/processors (CPs) and motherships allow observers to collect larger samples under more controlled conditions because the observer is able to collect samples downstream of the fish holding tanks, just prior to the catch sorting area that precedes the fish processing equipment. Additionally, on CPs and motherships, the observer is below deck and has access to catch weighing scales and an observer sampling station.

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 CVs. Instead, whenever possible, estimates of salmon bycatch by CVs are based on a full count or census of the salmon bycatch at the shoreside processor.

Vessel operators 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. Currently, retention of salmon is not required in the GOA groundfish fishery if an observer is not aboard. While a prohibited species, requiring discard at sea, the retention of salmon PSC in the pollock fishery is very common; however, since many of these CVs are not required to carry an observer at all times this practice may not be consistent throughout the entire fleet.

5.1.1.2 Sampling for salmon at shoreside processors

When a CV 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 censused at the shoreside processor are added to any discarded salmon at sea to obtain a final census of all salmon in each observed delivery.

Shoreside processors in the GOA are not required to sort and weigh all catch by species prior to entering the factory. Therefore, several GOA 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 bycatch from a pollock delivery occurs inside the processing area of the shoreside processor. 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. Catch Monitoring and Control Plan require 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.

In the GOA, 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 was present. Further complications in shoreside processor based salmon accounting occur when multiple CVs are delivering simultaneously, making it difficult or impossible to determine to which CV’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.

In the GOA pollock fishery, vessel observers are instructed to collect biological data from randomly selected salmon found at sea and at the shoreside processor. The biological data include sex/length, FMA identification scales, sex/length/weight, genetics and coded wire tags (CWT). All salmon species contribute to sex/length, FMA identification scales, and CWT data, but currently genetics and sex/length/weight data is only collected from chum and Chinook salmon. Using a similar method in the BSAI pollock CV fishery, observers are instructed to follow a random systematic sample design to collect data for chum and Chinook salmon. These fish could be found at-sea within the observers’ at-sea composition samples, as part of the at-sea discard of salmon sorted from the catch by the crew that is not included in the composition samples, or during the offload at the shoreside processor.

Biological data from the salmon species other than chum and Chinook salmon are only collected from those fish encountered within the at-sea composition samples or from those encountered during the offload at the shoreside processor. Biological data on from salmon are not collected at sea from fish outside of the observers’ composition samples.

5.1.1.3 Plant observer duties

Federal regulations (50 CFR 679.50) require certain levels of observer coverage for shoreside processors or stationary floating processors:

- Shoreside processors or stationary floating processors that process 1,000 mt or more during a month are required to have an observer present at the facility each day they receive or process groundfish during that month. In Kodiak processors have traditionally been able to reduce observer costs by sharing one observer between two processors simultaneously.
- Shoreside processors or stationary floating processors that process between 500 mt and 1,000 mt during a month are required to have an observer present at the facility at least 30 percent of the days they receive or process groundfish during that month. In Kodiak processors have traditionally been able to reduce observer costs by sharing one observer between two processors simultaneously.
- Shoreside processors or stationary floating processors that process less than 500 mt during a month are not subject to observer coverage requirements.

Plant observers serve many duties at shoreside processors. During pollock deliveries in the GOA, they assist the vessel observer during the offload by providing information about where the sorting of salmon should occur and provide breaks to the vessel observers as needed. For unobserved vessels, plant observers collect biological samples from the target species for the delivery. However, plant observers do not complete a census or collect salmon genetics information from unobserved vessels. Plant observers do not collect information about salmon bycatch in the GOA pollock fishery for several reasons. First, because of coverage requirements there is frequently no observer present at the shoreside processor since processing facilities in the GOA often share an observer. For example, plant observers in Kodiak may be assigned to two shoreside processors simultaneously and accommodations are not located on site at these plants. Secondly, when a plant observer is present, they may have other duties and are not able to monitor the entire offload of every unobserved vessel delivery so it is not possible for them to census every salmon nor it is possible to collect a random sample from the offload. In addition, because of the way sorting occurs at many of the GOA shoreside processors, it is difficult for a plant observer to determine which vessel a salmon came from. At times, salmon from a previous vessel are added to another vessel's sorted catch. Finally, without data from an observer at sea, salmon discards at sea are not known. For all of these reasons, any sample the plant observer may take would be potentially biased and would not provide useful information for fisheries management, regulatory enforcement, and stock assessment.

5.1.2 Prohibited Species Catch estimation

NMFS determines the number of Chinook salmon caught as bycatch in the GOA groundfish fisheries using the catch accounting system (CAS) and details of the catch and bycatch estimation methods are described in detail in a NOAA Technical Memorandum (Cahalan et al. 2010). The CAS was developed to receive catch reports from multiple sources, evaluate data for duplication and errors, and estimate total catch by species (or species group). The catch estimates are specific to species and fisheries to allow effective monitoring of the catch allocations in the annual harvest specifications. In general, the degree to which a seasonal or annual allocation requires NMFS management is often inversely related to the size of the allocation. Typically, the smaller the catch limit, the more intensive the management required to ensure that it is not exceeded.

Data from the Observer Program and mandatory fishing industry reports are the two sources of information used to estimate catch and bycatch 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. eLandings was implemented in 2005 by NMFS, Alaska Department of Fish and Game, and the International Pacific Halibut Commission as a joint program to reduce reporting redundancy and consolidate industry-reported fishery landing information. Each industry report submitted via eLandings undergoes error checking. Data are then stored in a database and made available to the three collaborating agencies. There are two basic eLandings report types used for catch estimation:

- Production Reports: At-sea production reports are mandatory for CPs and motherships that are issued a Federal Fishing Permit. At-sea production reports include information about the gear type used, area fished, and product weights (post-processed) by species. As of 2009, the at-sea fishing fleet has submitted these reports daily. Prior to 2009, these reports were submitted weekly. Shorebased plants also complete production reports, but these are not used for PSC estimation.
- Landing Reports: when a CV makes a delivery to a shoreside processor or a mothership a landing report is required. Upon making a landing, a representative of the shoreside processor or mothership submits the landing report into eLandings and a paper "fish ticket" is printed for both the processor and the CV representative. The collection period for a landing report is a trip for shoreside processors and a delivery for each CV that delivers to a mothership. A trip for CVs delivering to a shoreside processor is defined as the time period between when fishing gear is first deployed and the day the vessel offloads groundfish (50 CFR 679.2). Landing reports are mandatory for all processors required to have a federal processing permit, including motherships who receive groundfish from federally permitted CVs.

NMFS estimates of prohibited species catch (PSC) are derived from independent observer data, rather than from industry reported catch. In the CAS, the observer data are used to create bycatch rates (a ratio of the estimated PSC to the estimated total catch in sampled hauls). For trips that are unobserved, the PSC 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., CVs), 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.

As described in Section 5.1.1, observer sampling for salmon on pollock CVs in the GOA is conducted as follows: 1) samples are taken from each tow while the vessel is at sea, and 2) the entire observed offload is followed into the shoreside processor as the catch is delivered and a census (a total count of every salmon) of salmon is completed by the vessel observer. Any PSC that is discarded at sea is assessed by the onboard observers and the total amount of PSC discarded is added to the shoreside census information to obtain the total amount of species-specific PSC for the trip. NMFS uses the total discard information (salmon censused at the plant plus any discarded salmon at sea) to create PSC rates that are applied to unobserved vessels. 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[26], 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 bycatch. Pollock hauls from both observed and unobserved vessels are

[26] In the fall of 2010, NMFS discovered that a particular unintentional fleet behavior was causing inconsistent results in the use of a sample or the offload census. The problem was that the programming language was automatically selecting the at-sea samples more frequently than was necessary. The particular behavior was when vessels were splitting deliveries or tying up at the dock before delivery (for example, if they went to the fuel dock), resulting in the offload census data not being used in the salmon estimate. NMFS has implemented a programming improvement, for all of 2010 and into the future, which allows the offload census data to be the source of the salmon estimate in these cases.

mixed in the tender's hold, therefore it is also not possible to distinguish what bycatch 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.

The catch estimation methods are designed to provide an estimate of catch and bycatch 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. As is described in Section 5.1.1, in the GOA 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.

5.1.2.1 PSC estimation in the State fisheries

NMFS uses the CAS to estimate the amount of PSC in the parallel fisheries, which occur in state waters. Because the system is set up to make the estimates in state waters, PSC in the state's guideline harvest level (GHL) fisheries is estimated as well. The method of estimating PSC is the same in state waters GHL fisheries as in federal fisheries. PSC is estimated on unobserved trips by matching observer-based rates with the groundfish catch based on year, week, trip target, gear, and area. In the GOA, the only state waters GHL fishery for pollock occurs in Prince William Sound (PWS). NMFS estimates for the number of Chinook salmon in this fishery are shown in Table 81. The number of Chinook salmon caught in the PWS pollock fishery is low relative to the total trawl fisheries and the average for 2003 through 2010 is 187 Chinook salmon.

Table 81 Estimated Chinook salmon prohibited species catch (in numbers) from the Prince William Sound pollock fishery and all trawl fisheries in the Gulf of Alaska, by year

Year	Chinook salmon (#) in PWS pollock	Chinook salmon (#) in GOA trawl
2003	38	15,396
2004	141	17,745
2005	63	31,270
2006	187	19,004
2007	137	40,356
2008	177	16,139
2009	480	8,430
2010	276	54,576

Source: NMFS Catch Accounting System

5.1.3 Proportion of GOA groundfish catch that is observed

There is a greater prevalence of smaller vessels participating in the GOA groundfish fisheries than in the Bering Sea fisheries, particularly CVs less than 60 feet LOA. As described in Section 5.1.1, current observer coverage requirements are generally based on vessel length. The proportion of total catch that is observed in GOA groundfish fisheries is much lower than, for example, in the Bering Sea fisheries since the majority of the GOA fleet is subject to 30% observer coverage. Table 82 illustrates the total groundfish catch in the Western and Central GOA, the total groundfish that is caught while an observer is onboard the vessel, and the resulting percentage (observed/total). In the Western GOA, the proportion of catch that is caught while an observer is onboard ranges from 25 % to 36% over the years 2004 through 2007; in the Central GOA the range is from 32% to 37%. In comparison, the average percentage of observed catch in the Bering Sea is approximately 86%, and in the Aleutian Islands is approximately 95%. Please note that the percentage of observed catch provides only a gross overview and does not necessarily reflect the quality of information. The goal is to have an unbiased estimate that is sufficiently precise to meet the management need for the information. However the precision of catch estimates depends upon the number of trips that are observed and the fraction of hauls that are sampled (Karp and McElderry 1999). Because of the relatively lower levels of observer coverage in the Western GOA, estimates of salmon bycatch are less precise than in the Central GOA pollock or the groundfish fisheries in the Bering Sea. To what degree they are less precise, however, is not known, as current PSC estimates do not include a measure of uncertainty.

Table 82 Total catch, observed catch, and percent observed catch by area and year

Area	Year	Total (mt)	Observed (mt)	Percent
Western GOA	2004	50,853	14,414	28%
	2005	53,142	13,195	25%
	2006	51,944	17,253	33%
	2007	46,968	16,882	36%
Central GOA	2004	108,707	37,744	35%
	2005	120,030	41,586	35%
	2006	131,271	42,349	32%
	2007	118,871	44,113	37%

Note: This table does not include jig gear, but does include all targets.
Source: http://www.alaskafisheries.noaa.gov/sustainablefisheries/inseason/percent_observed.pdf

As shown in Table 83, the bulk of Chinook salmon catch estimates occur on trips without an observer. In general, the percentage of Chinook salmon caught for observed trips versus the amount estimated from PSC rates are lower for the Western GOA than the Central GOA. There are several reasons for this disparity: 1) fleet-wide bycatch rates maybe high; 2) Chinook salmon catch on observed trips maybe low, resulting in low-trip specific estimates; 3) a single trip has high observed Chinook salmon that creates a single high trip-specific estimate and a fleet-wide increase, the magnitude of which is dependent on the nature of available observer data; and 4) lack of observed trips resulting in more Chinook salmon being estimated on a fleet-wide basis. In general, the majority of fleet-wide bycatch rates are based on an aggregation of observer data corresponding to the federal reporting area and week in which the vessel caught pollock.

Table 83 Sum of Chinook salmon bycatch in the pollock fishery, by reporting area and year, on unobserved and observed trips

		Estimated Chinook salmon by Trip Type		
GOA Area	**Year**	**Unobserved (#)**	**Observed (#)**	**Observed (%)**
Western	2003	621	117	16
	2004	2,188	139	6
	2005	5,099	852	14
	2006	3,965	564	12
	2007	3,056	303	9
	2008	2,106	10	<1
	2009	418	23	5
	2010	27,916	3,788	12
Central	2003	2,581	976	27
	2004	7,514	3,141	29
	2005	15,965	5,465	26
	2006	8,283	2,855	26
	2007	9,134	22,513	71
	2008	5,604	2,367	30
	2009	1,307	816	38
	2010	8,330	4,004	32

Source: NMFS Catch Accounting System

The disparity between Chinook salmon mortality from observed trips versus estimated from PSC rates is particularly evident in the Western GOA (Table 84). This is largely due to a lack of observed trips since a large component of the fleet is less than 60’ LOA.

Table 84 Area and seasonal summary of the estimated percentage of Chinook salmon catch occurring on observed trips between 2003 and 2010

	Western GOA Season				Central GOA Season			
	A	B	C	D	A	B	C	D
Average %	12	2	0	9	28	34	30	22
Minimum %	0	0	0	<1	19	16	17	12
Maximum % (years)	24 (2003)	11 (2006)	21 (2009)	17 (2006)	42 (2008)	79 (2007)	68 (2009)	35 (2004)
Years where <=1%	2009	2007-2010, 2003-2005	2007-2008	2008	--	--	--	--

Source: NMFS Catch Accounting System

5.1.4 Inseason management of GOA pollock fisheries

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 open. High-pulsed fisheries are challenging to manage, and a brief explanation of these challenges for the pollock fishery is provided.

Prior to the fishery opening, the processors that have historically participated in the pollock fisheries are contacted and the amount of expected effort is calculated. NMFS then queries historical harvest rates based on that effort and projects a range of possible catch rates. To account for uncertainty and to be conservative, estimated catch is calculated using historical maximum catch rates and the most recent information. NMFS then projects a closure date and makes a decision whether to announce a closure prior to the opening of the season or to manage inseason. Managing inseason is defined as allowing the fishery to open with no closure date announced, collecting information while the fishery is ongoing, and using that information to project a closure date.

The decision to manage inseason is made if the seasonal allocation is large enough to allow NMFS the time to assess the catch and close the fishery before the seasonal allocation is exceeded. The weekday that the fishery opens must also be taken into account. To close a fishery, NMFS processes the required paperwork at least one working day ahead of the closure. Closures for Friday, Saturday, or Sunday are decided before Friday. This leaves Monday through Thursday as the window in which NMFS collects the information needed to manage inseason and processes the closure for high-pulsed fisheries.

There is a risk that the fleet will not harvest the entire seasonal allocation in which case a reopening may be necessary. To reopen the fishery, NMFS has to ensure that all catch information has been reported and that there is enough remaining allocation to support the reopening. This decision making process usually occurs approximately three to five days after the closure, by which time NMFS has enough information to make a decision. NMFS will then calculate catch rates, determine why the allocation was not fully harvested, and examine other factors (such as weather, participation) before determining if a reopening is necessary. If a reopening is necessary, NMFS must then go through the same protocol and associated timeline for processing and publishing a closure. To ensure the fleet has prior notice, NMFS usually will reopen a fishery at least three days after the day it is announced. The end result is that there is usually about a week between the closure and the subsequent reopening.

5.1.4.1 Area 610 pollock fishery

Table 85 shows that from 2007 through 2010 an average of three shoreside processors and 20 CV participated in the Western GOA pollock fishery (Area 610). In prior years NMFS has seen as many as five shoreside processors and 27 CVs participating in a pollock season.

Table 85 Number of shoreside processors and catcher vessels in the Area 610 pollock fishery by year and season

Season	2007		2008		2009		2010		Average 2003-2010	
	Processors	Vessels	Processors	Vessels	Processors	Vessels	Processors	Vessels	Processors	Vessels
A Season	2	20	2	15	2	15	5	20	3	20
B Season	2	12	3	10	3	17	4	19	3	13
C Season	4	13	3	11	5	19	4	20	4	18
D Season	3	12	4	14	3	18	4	20	4	18

Source: NMFS Catch Accounting System

Most pollock fisheries have the highest catch on the first day, followed by a lower catch day, and then the catch rates increase up to a level that indicates plant processing capacity. Unlike Areas 620 and 630, the Area 610 pollock fishery uses tender vessels. Tenders are used to decrease CV transit time and increase processing capacity. Table 86 shows that the Area 610 pollock fishery can have a daily catch rate as high as 2,246 mt. However, in recent years, the fleet has not sustained that high of a rate. After the first day, the catch rate decreases but will sustain roughly 1,200 mt per day if fishing is good and weather does not slow down the fishery. Because the Area 610 pollock fishery is largely prosecuted by CVs less than 60 feet LOA, weather is a factor that is considered in all management decision. Table 86 shows expected catch rates in the Area 610 pollock fishery by season from 2003 through 2010.

Table 86 Maximum daily catch rates and catch projections in the Area 610 pollock fishery by season

Season	Max daily catch rates		Rough Projections		
	2003-2010 high	2008-2010 High	2 day	3 day	4 day
A Season	2,246	1,544	2,250	3,850	5,400
B Season	2,053	1,376	2,000	3,400	4,800
C Season	1,790	927	1,500	2,300	3,250
D Season	1,742	1,206	1,800	3,000	4,200

Source: NMFS Catch Accounting System

5.1.4.2 Area 620 pollock fishery

Table 87 shows that from 2007 through 2010 an average of seven shoreside processing plants and up to 36 CVs participated in the Area 620 pollock fishery. In most years this fishery is prosecuted by the Kodiak processors and CVs with limited effort from the Western GOA fleet.

Table 87 Number of shoreside processors and CVs in the Area 620 pollock fishery by year and season

	2007		2008		2009		2010		Average 2003-2010	
Season	Processors	Vessels	Processors	Vessels	Processors	Vessels	Processors	Vessels	Processors	Vessels
A Season	7	20	5	24	7	27	7	32	7	28
B Season	7	33	8	35	6	30	8	35	7	36
C Season	1	5	3	7	2	2	7	23	5	13
D Season	5	7	6	13	5	22	8	32	6	17

Source: NMFS catch Accounting System

Area 620 is usually managed inseason. Most Area 620 seasonal allocations are larger than for Areas 610 and 630. NMFS also uses vessel monitoring systems to monitor when CVs move to the Area 620 fishery. Due to the distance and the opportunity in other fisheries, Pacific cod and Area 630 pollock, usually take priority over the Area 620 pollock fishery. The Kodiak fleet is also more organized and usually informs NMFS several days before they will begin to harvest Area 620 pollock. This allows NMFS to leave 620 open until the fleet begins to harvest pollock and allows for more precise management.

Once the Area 620 pollock fishery is underway, it is still a high-pulsed fishery. Table 88 shows the catch rates can exceed 2,800 mt per day. However distances to and from Area 620 fishing grounds range from 12 to 18 hours each way, so CVs can only make a maximum of one trip every two days. Offload time, fishing time, weather, sea conditions, and processing capacity of shoreside processing facilities impact the vessels and result in an average of one trip every three days. This creates fluctuating catch rates that require NMFS to consider trip limits, vessel capacity, and catch rates when making a closure decision.

Table 88 Maximum daily catch rates and catch projections in the Area 620 pollock fishery by season

	Max daily catch rates		Rough Projections*		
Season	2003-2010 high	2008-2010 High	2 day	3 day	4 day
A Season	1,935	1,895	2,850	3,800	4,750
B Season	2,862	2,862	4,300	5,700	7,100
C Season	1,337	1,337	2,000	2,700	3,350
D Season	1,833	1,787	2,700	3,600	4,500
*Projections in 620 assume vessels are already in 620 when the fishery starts.					

Source: NMFS Catch Accounting System

5.1.4.3 Area 630 pollock fishery

Table 89 shows that from 2007 through 2010 an average of seven shoreside processors and 30 CVs participated in the pollock fishery in Area 630. In 2009 and 2010 the number of CVs has been increasing. The pollock fishery in this area is entirely prosecuted by CVs that deliver to Kodiak shoreside processors.

Table 89 Number of shoreside processors and catcher vessels in the Area 630 pollock fishery by year and season

	2007		2008		2009		2010		Average 2003-2010	
Season	Processors	Vessels	Processors	Vessels	Processors	Vessels	Processors	Vessels	Processors	Vessels
A Season	6	23	6	23	7	33	7	32	7	25
B Season	6	19	na	na	2	2	7	32	5	20
C Season	6	22	8	25	7	30	7	33	7	29
D Season	6	14	6	21	7	27	7	30	6	24

Source: NMFS Catch Accounting System

The Area 630 pollock fishery is very high paced and is rarely managed inseason. Pre-announced closures generally never exceed two days with 12-hour openings being common in some years. The reliance on pre-announced closures can result in multiple reopenings in a single season for the fleet to catch the allocation. This is mostly the result of poor catch rates, bad weather, and price disputes. Catch rates can exceed 3,500 mt a day as seen in Table 90. This high catch rate has resulted in seasonal overages preventing the subsequent season from opening because there was not enough of an allocation remaining to support a directed fishery.

Table 90 Maximum daily catch rates and catch projections in the Area 630 pollock fishery by season

	Max daily catch rates		Rough Projections*		
Season	2003-2010 high	2008-2010 High	12 hr	1 day	2 day
A Season	3,342	3,342	2,500	3,350	6,700
B Season	3,571	1,844	1,500	1,850	3,700
C Season	3,396	3,396	2,600	3,400	6,800
D Season	2,576	2,459	1,900	2,450	4,900
*Closures in 630 rarely exceed 2 day opening unless fleet is organized					

Source: NMFS catch Accounting System

5.1.5 Tender vessels

Tender vessels are vessels that receive catch from CVs and deliver it to a processing plant. Currently, there are no observers required aboard tender vessels. NMFS sampling protocols require observers to obtain unbiased samples and in order to accomplish this, observers must ensure that no fish have been removed from the codend prior to taking a sample. Since tender vessels are not set up to sort or process fish, observer sampling protocols cannot be followed.

In recent years, there has been very little, if any, observer coverage aboard CVs delivering catch to tender vessels. The main reason is the majority of the fleet that delivers to tender vessels is less than 60 feet LOA and does not require an observer. If an observer is deployed aboard a vessel delivering to a tender, the observer would only obtain their at-sea samples and the census at the shoreside processor would not occur, because the vessel observer does not travel with the fish to the processor for sorting. Further, tender vessels frequently take deliveries from several CVs and mix the catch in the RSW tanks. Even if a vessel observer traveled with the catch to the shoreside processor there would be no way to monitor the catch from the tender vessel delivery and conduct the census. Similarly, plant observers do not collect biological data from tender deliveries because they do not know which CV or what area the fish originated. Additionally, these deliveries may have been sorted at sea, so any data collected has the potential to be biased.

5.2 Alternative 2, Component 1: Hard Cap

The component would implement Chinook salmon bycatch 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. As is described in Section 5.1, the catch monitoring infrastructure does not exist in the GOA to the same degree that it did in the Bering Sea when Amendment 91 was being developed. NMFS Office of Law Enforcement personnel will be needed to perform additional monitoring of the apportionment of the cap between the Western and Central GOA rather than a GOA-wide cap, since one area might be open and another one closed.

However, most federal groundfish fisheries are managed similarly; therefore, enforcement is familiar with these monitoring challenges.

5.2.1 Prohibited Species Catch (PSC) estimation under a hard cap

This action will require modifications to the CAS to accommodate hard cap allocations by area. However, simple caps by area are not complicated and will not require a large programming effort. This assessment is based on the assumption that this action will not require the type of total census catch accounting implemented under Amendment 91 in the Bering Sea.

As is described in Section 5.1.2, PSC 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 PSC estimates may make it difficult to manage a hard cap. FMA Division staff ensures that data were collected following NMFS protocols and it is normal for there to be many data modifications during this “debriefing” and quality control process. If observers have access to the ATLAS software to enter data then the timeliness and quality of their data is increased. The ATLAS software contains business rules to perform many quality control and data validity checks, which dramatically increase the quality of the preliminary data. When data is transmitted electronically, instead of submitted via fax, the time before the data are available for management decreases by 1 to 3 days. ***For these reasons, NMFS recommends that this action include the requirement for ATLAS software on the CVs and the ability for the observer to transmit their data directly from the vessel’s computer with the ATLAS software***. Many vessels in the fleet already have email capability. The transmission capacity on the vessels less than 60 feet LOA is unknown but the transmission could be done at sea via satellite communication or via a wireless connection at the dock.

On unobserved trips, NMFS estimates of PSC are derived from PSC rates on observed trips which are applied to landings data. For trips that are unobserved, the PSC rates are applied to industry supplied landings of retained catch. As described in Section 5.1.2, the system makes use of whatever observer data are available and if observer data are not available, the system aggregates (post-stratifies) until an appropriate PSC rate can be generated. If a Chinook salmon hard cap for the pollock fishery is put in place and the cap is allocated between areas, there is a possibility that the observer data from one area will contribute to the PSC estimate from the other area. Increasing observer coverage throughout the GOA will mitigate some of the impact of very little observer data being available for the PSC estimates.

As described in Section 5.1.2, NMFS currently estimates the amount of PSC in the state GHL fisheries, and on average the PWS pollock fishery has been one percent of the Central and Western GOA fishery. NMFS will stay consistent with this methodology, and will continue to estimate Chinook PSC in state GHL fisheries. However, NMFS plans to program the CAS so that PSC in the state GHL fishery will not count toward the Western and Central GOA hard caps.

5.2.2 Observer sampling

Under this action NMFS is not contemplating changing the duties for vessel observers or plant observers. There are no anticipated changes to observer coverage aboard tender vessels. Therefore, the sampling procedures described under Section 5.1.1 would remain the same under the hard cap scenario. However, some monitoring provisions should be implemented to assist a vessel observer in obtaining better census information.

5.2.2.1 Vessel observers

Currently, no requirement exists for GOA shoreside processors to sort and weigh catch to species within a designated sorting area and many shoreside processors do no sorting before the fish enter the processing facility. This creates a situation in which the vessel observer is sorting out salmon species as they enter the tanks. Frequently, the observer is the only person sorting on a line that was not designed to allow for complete sorting of bycatch. The belts that feed the tanks are frequently short, narrow, and move extremely quickly, and there is high potential that salmon will be missed during the observer sorting.

Also, because of the relatively short duration of the offloads in Kodiak, the vessel observer is frequently on another trip or another vessel by the time "after scale" salmon are found and thus these fish are not included in the observer census information. In the past, shoreside processors in the GOA pollock fisheries have simply added these salmon to another vessel's landing report.

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 bycatch, identifying salmon to species is difficult unless the observer has the fish in hand. Therefore, each of these provisions includes salmon of all species.**

- **Require that sufficient assistance is available to help the observer in sorting out salmon of all species from the location where the observer completes their sorting at the shoreside processor or stationary floating processor.**
- **Require any "after scale" salmon, or salmon found after the observer's location of sorting at the plant, to be either returned to the vessel observer if the vessel observer is at the shoreside processor or to the plant observer with specific information about where the salmon was found and which vessel it came from.**
- **Require GOA shoreside processors to track salmon found inside the processing facility back to the specific vessel it came from and record these salmon on the appropriate landing report (or "fish ticket").**

5.2.2.2 Plant observers

As highlighted above, NMFS is not contemplating any changes to observer duties for observers assigned to GOA shoreside processors or stationary floating processors. Plant observers will not be conducting a census of unobserved pollock deliveries, nor collecting genetic samples from salmon of any species for unobserved deliveries because conditions in the GOA pollock fishery do not allow an observer to obtain an unbiased sample. These conditions include the following:

- There is no way to verify that all salmon have been retained aboard the vessel until delivery at the processor;
- 100% coverage by plant observers may not exist in shoreside processors receiving deliveries of GOA pollock so an observer may be assigned to multiple processors at the same time, and;
- Sorting conditions at several GOA shoreside processors do not allow a plant observer to be sure all salmon have been sorted and are assigned to the appropriate vessel.

Plant observers will continue to assist vessel observers in sorting pollock offloads, obtaining salmon counts and collecting biological samples from observed trips.

5.2.2.3 Retention of salmon

As is described in the section above, current regulations require vessels operators to discard salmon when an observer is not aboard. However, when an observer is aboard they are required to allow for sampling by an observer before discarding prohibited species. In the pollock fishery it is very common for vessel operators to retain all salmon because of the operational characteristics where large volumes of pollock are brought aboard and rapidly stowed in below-deck tanks. 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. Because of the differences in regulatory requirements depending on whether or not an observer is aboard, as well as the practical logistics associated with detecting and discarding salmon in this fishery, **NMFS recommends that as part of this action the regulations are modified to require full retention of all salmon**.

It is important to note, however, that regulations for full retention will not modify the observer duties. NMFS will have no way of verifying that full retention of salmon has occurred aboard unobserved vessels. Therefore, at this time, NMFS will not be modifying the observer sampling protocols as described in Section 5.1.1, and the requisite elements are not in place in the GOA to implement the same census and sampling system that is going into effect in 2011 in the Bering Sea under Amendment 91.

SeaShare, an organization participating in the Alaska food bank donation program, does not currently receive deliveries of GOA Chinook salmon. Since the recent increase in bycatch, however, there has been interest in expanding the program to the GOA. A requirement for full retention of salmon might encourage the expansion of this program.

5.2.3 Inseason management of hard caps

As explained in Section 5.1, Chinook salmon PSC are estimated using observer data applied to landed catch. If a vessel takes an observer, there is a period of time before the data is available to NMFS. The typical time between fishing activity and when NMFS is able to view the data are a few days to over a week after the delivery. Due to this time lag and the short length of the pollock fisheries as explained in the prior section, NMFS will be unable to estimate the total number of Chinook salmon PSC that will accrue toward a hard cap until after the pollock season has closed.

NMFS will only be able to determine the amount of Chinook salmon PSC being harvested 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 PSC will be derived from bycatch rates and, as is described in Section 5.1, the PSC estimates will vary and change as more observer data and catch data enters the CAS. Even if data were available for NMFS to announce a pollock fishery closure due to Chinook salmon PSC, the PSC estimate would likely change as more data became available. Thus, with the fast-paced nature of the pollock fisheries, precise management of Chinook salmon PSC limit will be difficult.

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 PSC estimate can be derived, and then determine whether to open subsequent seasons. When deciding about whether to open the subsequent seasons, NMFS will estimate 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. A larger Chinook salmon hard cap will allow NMFS more flexibility in making these decisions.

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 PSC.

5.2.3.1 Example

The following provides an example of inseason management using data from 2005 and managing under a hard cap of 14,175 salmon in the Central GOA, proposed option A (22,500 GOA cap) under Component 1.

The A season in Areas 620 and 630 opened January 20, 2005, and the A season allocation of pollock for both areas was harvested by March 2, 2005, after multiple reopenings. During that A season, 10,955 Chinook salmon were caught and 17,760 mt of pollock was harvested in the Central GOA. This resulted in an overall rate of .62 Chinook salmon per mt of pollock.

A decision to open the B season on March 10, 2005, would have to take into account that only 3,220 Chinook salmon and 13,766 mt of B season pollock remain. At the rate indicated in the A season, NMFS would estimate 8,535 Chinook salmon would be caught and this would exceed the PSC limit by 5,355 salmon. Therefore, NMFS would project that only 5,200 mt of pollock could be allowed to be caught in the B season in order to prevent exceeding the Chinook salmon hard cap.

In this example, Area 630 B season pollock would be opened for 12 hours on March 10, as NMFS announced in 2005, and would have announced a Central GOA pollock fishery closure due to Chinook salmon PSC on March 15, 2005. NMFS would have the data to determine how many Chinook salmon were caught in the B season around March 22, 2005. On March 22, 2005, the NMFS CAS showed 13,479 Chinook salmon were taken, leaving only 696 remaining. NMFS would then determine that a reopener could not be allowed as catch rates of pollock combined with the incidental catch rate of salmon would exceed the PSC limit. Directed fishing for pollock would be prohibited for the remainder of 2005. This would leave approximately half of the Central GOA pollock allocation or around 26,000 mt of pollock unharvested.

5.3 Alternative 2, Component 2: Increased Observer Coverage

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 60feet 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.

5.3.1 Logistics of placing observers

Under observer restructuring, NMFS has developed a method and timeline for preparing vessels less than 60 feet LOA to obtain observer coverage. Under the restructured program, efforts will be made to ensure observers are available during the time periods selected and are located in the remote ports around Alaska to ensure the least amount of disruption to a vessel’s fishing schedule. Because the affected fleet fishes during a relatively short time period and the ports they come into 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.

Also, under the restructured observer program, provisions will be in place to reduce a vessel’s ability to manipulate an observer’s deployment. However, under Component 2 of Alternative 1 and without the provisions required under the restructured observer program in place, the opportunity exists for vessels to take an observer on a trip that may not be representative of true fishing effort.

Vessels do not need to provide any special equipment for the observer to do their work. Observers board a vessel with their own survival suit, sampling baskets, and scales for weighing fish. Observers need some deck space to measure and weigh fish and to take biological samples. In general, observers are usually able to work within the existing layout of vessels. However, industry may be able to assist by working with the observer or program staff to establish a safe place where the observer can work. There is no requirement for a small vessel to provide a sample station or motion-compensated flow or platform scales; those requirements are restricted to large factory vessels.

5.3.2 Safety examinations

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 (50 CFR 600.746 and 679.50). The only potential exception in current regulations is for vessels less than 26 feet LOA in remote locations. If the vessel does not have a valid safety decal, it is considered inadequate for the purposes of carrying an observer. Observers are instructed not to board a vessel if the safety decal is absent or has expired. Therefore, it behooves any vessel selected for observer coverage to undergo a USCG safety equipment examination prior to carrying an observer to avoid potential fishing delays for lack of a current safety decal. Once issued, the decal is valid for two years. If a vessel has a current decal that would not expire during the time an observer would be onboard, an additional inspection would not be necessary. NMFS does not consider absence of a decal as a valid criterion for exemption from the observer coverage requirement.

The dockside examinations are free and provide a thorough vessel check including examination of all safety equipment. The examinations are conducted by qualified USCG personnel, or a third party organization accepted and designated by the USCG. If the vessel passes the examination, a decal is issued indicating that the vessel is in compliance with all applicable USCG regulations. The regulations vary based on type and length of vessel, area of operation, seasonal conditions, number of people on board, whether the vessel is documented or state registered, and also the date the vessel was constructed or converted. These regulations can be found in the “Federal Requirements for Commercial Fishing Industry Vessels” pamphlet available from the USCG. Ability to obtain an inspection may be limited in remote ports but should be readily available in any port with a marine safety detachment office or through special arrangement with the USCG.

5.3.3 Correlation with the Observer Restructuring Action

The goals of the restructured observer program are to improve observer data quality, increase equity in the cost and burden of carrying an observer among the industry, and increase NMFS’ ability to be flexible in responding to current and future management needs of individual fisheries (NPFMC 2010). As mentioned above, the Council’s motion for a restructured observer program would remove observer coverage requirements based on vessel length and processing volume at 50 CFR 679.50 and would eliminate all exemptions from observer coverage (e.g., for vessels less than 60’ LOA). Instead, operations would be classified into two coverage categories: greater than or equal to 100% coverage or less than 100% coverage. Operations in the less than 100% category would participate in a restructured program where NMFS contracts with service providers to deploy observers in a randomized fashion. Vessels and processors included in the restructured program would pay an exvessel value-based fee on their groundfish and halibut landings to pay for the observer coverage in the less than 100% category.

Under the Council’s motion, all GOA trawl CVs regardless of length (except those participating in the Central GOA rockfish fishery), would be included in the less than 100% category. NMFS would determine the level of observer coverage required to monitor regulatory compliance and yield statistically reliable estimates of catch and bycatch in this sector. Through the process of transitioning to a restructured program, NMFS will resolve logistical challenges for monitoring previously un-observed vessels including those participating in fisheries with short openings. Data gaps resulting from un-observed CVs, including the high proportion of less than 60 feet LOA vessels participating in the Western GOA pollock fisheries, are anticipated to be resolved under a restructured program.

Various aspects of observer program restructuring would be impacted should the Council decide to extend observer coverage to vessels less than 60 feet LOA through this action. Adjustments to the regulations at 50 CFR 679.50 through this action would delay NMFS’s existing efforts to revise 50 CFR 679.50 to implement a restructured observer program. Additionally, fee proceeds to implement a restructured program would be reduced as fewer vessels would pay the full exvessel value fee in the year prior to deploying observers under a restructured program. This is because, in lieu of Federal funding to cover the initial year of the program, operations would be liable for the difference between their observer coverage costs under the status quo and the exvessel fee liability. The Council’s decision to approve a 1.25% exvessel value fee assumed that the less than 60’ catcher vessel fleet would pay the full fee liability in the year prior to deploying observers under a restructured program since they are currently exempt from observer coverage.

In sum, the Council recently took action to remedy data quality and cost equity deficiencies resulting from the current structure of the observer program. Remedies anticipated through a restructured observer program are anticipated between 6 and 18 months later than what may be achieved by increasing observer coverage in the less than 60 feet LOA GOA pollock trawl fleet assuming a mid-2012 implementation of any measures approved under this action. However, the anticipated timeline to restructure the observer program could be delayed should the Council take action to increase observer coverage in the less than 60 feet LOA fleet prior to restructuring given the interactions described above.

5.3.4 PSC estimation

Extending the existing 30% observer coverage requirements for vessels 60 feet LOA to 125 feet LOA to trawl vessels less than 60 feet LOA that are directed fishing for pollock in the Central or Western GOA will increase the amount of information that is available for PSC estimates including Chinook salmon. However, the majority of the fleet that would be affected by increased coverage would be vessels less than 60’ LOA in the Western GOA (Table 91) and, to our knowledge, the majority of these vessels deliver their catch to tender vessels instead of shoreside processing facilities.

As described in Section 5.1, salmon PSC estimates from vessels delivering catch to tender vessels is derived from the at-sea observer samples rather than whole haul census of salmon at the shoreside processor. Assessment of the number of trips with deliveries made to tender vessels is not possible using historical information because landing reports do not consistently indicate if the delivery occurred on a tender vessel. In other words, delivery information is linked to the shoreside processor rather than tendering vessels, resulting in landings that effectively look like they were made at a processor, thus leaving the tendering vessel unidentified.

Table 91 Number of catcher vessels <60’ length overall harvesting pollock by year and area

	Year							
	2003	2004	2005	2006	2007	2008	2009	2010
Western GOA	20	17	18	18	16	16	17	20
Central GOA	4	5	4	3	*	*	*	4

Source: NMFS Catch Accounting System (* = confidential data)

NMFS will continue to estimate PSC 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 PSC estimates will be based on expanded estimates of salmon bycatch 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. Given the number of unknowns within this sector of the fishery, NMFS encourages the industry to work with the Council for future actions so that NMFS has a better understanding of the operations aboard tender vessels or 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 seasonal coverage in the Western GOA. However, the additional coverage may not increase the precision of PSC estimates since the PSC estimates will be based on at-sea sampling for Chinook salmon which is a relatively uncommon species. An uncommon species like Chinook salmon is characterized by an over-dispersed data distribution that has a high frequency of low values, but on occasion has very large estimated values due to patchy distribution. Thus, an increase in coverage may also increase the probability of detecting a large bycatch event. The magnitude of the large event may be dampened somewhat through averaging across observer data with lower bycatch rates. This process occurs during the calculation of PSC rates when data are aggregated, but the degree to which an influential observer record is “averaged down” depends on the amount of observer data used in the rate and the magnitude of the high Chinook salmon estimate. Additionally, the trip where the high Chinook salmon catch occurred will have a trip-specific Chinook salmon estimate. This “high” trip will have estimates that remain high regardless of coverage levels on other trips.

On the other hand, an increase in observer coverage may also increase the stability of PSC rates, making inseason predictions of PSC more reliable. Chinook salmon estimates would be linked to a trip rather than a fleet-wide rate that can fluctuate through time as it is updated with more data. The increased coverage may also dampen some of the effects from a large bycatch event.

5.4 Alternative 3: Mandatory Salmon Bycatch Cooperatives

The primary monitoring and enforcement role for NMFS under this alternative will be to (1) provide a list of the number of eligible LLP licenses that meet the participation standards in each regulatory area to define the threshold number of licenses required for a cooperative to form, and (2) review the annual cooperative applications for the applicable terms and conditions. This section also discusses cooperative contract requirements established by the Council motion and notes the challenges that a cooperative may face independently monitoring and enforcing those provisions.

5.4.1 Listing the Number of Eligible LLP licenses to meet the cooperative formation requirements

The Council’s motion requires that a cooperative must be assigned more than a specific percentage (either 25 or 33 percent) of the LLP licenses that participated in the applicable regulatory area in the preceding year to form a cooperative.[27] This analysis assumes that this participation would be measured by at least one landing in the directed pollock fishery in the applicable management area (Central GOA or Western GOA) in the preceding year.

[27] In considering using a license basis for this action, the Council should consider that stacking of licenses could be used to increase negotiating leverage in the formation of cooperatives, if each stacked license is counted toward meeting the threshold. An alternative approach would be to define the threshold using vessels. Changing the threshold index to vessels would prevent persons from deriving additional leverage through the stacking of licenses. A vessel threshold provision may be implemented by either directly counting the participating vessel toward the threshold or through federal fisheries permits assigned to the vessel.

To facilitate cooperative formation, NMFS would provide a list of the licenses (or vessels) that participated in each regulatory area in the preceding year, to inform so that LLP holders in each area of the licenses that would count toward the threshold and the number of licenses needed to meet that threshold. NMFS would provide this list of LLP licenses meeting the minimum landing requirements shortly after the end of each year to ensure that LLP license holders who were omitted from the list have a reasonable opportunity to establish that they met the landing requirements, and to provide more time for cooperative formation. At a minimum, NMFS would post the list of LLP licenses meeting the landing requirement in each area 12 weeks prior to the cooperative application deadline to ensure any discrepancies between NMFS and LLP holder landings data can be resolved prior to the application deadline.

5.4.2 Review of Contract Provisions

This alternative will be administered, primarily, through cooperative submission of agreements, which would be reviewed by NMFS, prior to the cooperative being approved, and annual reports. To ensure that the cooperative agreements contain the requisite elements and the cooperatives perform only the prescribed functions, NMFS would substantively review cooperative agreements. The review would first assess whether each cooperative agreement, on its face, complies with the requirements, permissions, and prohibitions defined for cooperatives. Specifically, the agreement must include the following elements: a system to share Chinook salmon bycatch information, a salmon retention requirement, measures to identify and limit fishing in hotspots, a monitoring program and penalties for failure to comply with cooperative requirements. The cooperative would also be permitted to have rules that promote gear innovations and fishing practices that contribute to Chinook salmon avoidance and vessel performance standards. The agreement could not contain provisions beyond those specifically authorized or any allocations of pollock or Chinook salmon bycatch.

In addition, NMFS review would examine the substance of these measures, specifically assessing the extent to which a measure is reasonably calculated to achieve a Chinook salmon bycatch control purpose, while providing all members with a reasonable fishing opportunity. This more substantive review would be used to ensure that the cooperative performs its prescribed functions in a legally permissible manner and to maintain NMFS' regulatory authority over the fishery.

To facilitate NMFS' review of cooperative applications, the Council could consider adding a requirement that each cooperative application include a supporting statement. That statement would be required to:

- Identify the specific enumerated element(s) that each measure addresses or the specific function(s) that each measure performs; and
- The rationale for each measure (specifically describing how the measure will serve a Chinook salmon bycatch control objective, while ensuring a fair opportunity to all participants in the fishery).

Requiring cooperatives to include this statement in their annual applications would streamline NMFS' review of applications. The reviewer would have a description of each measure with the cooperative's rationale for the measure to assess whether those measures are permissible (i.e., whether the measures address each of the requisite elements in a legally permissible manner without allocating Chinook salmon PSC or pollock, and are reasonably expected to control Chinook salmon bycatch without depriving any participant of a reasonable fishing opportunity). These statements could draw on prior years' experiences in the fishery, including discussion of the effects of the measure (if used previously) and other measures, to provide evidentiary support for the inclusion of the measure in the cooperative's agreement. Cooperative annual reports, submitted at the end of each season, would be required to describe effects of each cooperative measure and how that measure addressed Chinook salmon PSC in the preceding season. Since additional measures may be included in an agreement to ensure fair fishing opportunities within and among cooperatives, the need for and rationale behind those rules would also be incorporated in a cooperative's annual report. This system of applications and reports should provide an effective foundation for agency consideration of annual cooperative applications.

For approval of an application, NMFS would require that each cooperative measure be reasonably expected to limit or reduce Chinook salmon bycatch without depriving any participants of a fair fishing opportunity. Such a standard is appropriate, given the current understanding of Chinook salmon bycatch and its causes in the GOA pollock fisheries. Over time, as the fleet develops a better understanding of Chinook salmon avoidance, the types of measures adopted by cooperative should be expected to evolve, as will cooperative application descriptions of the measures and their rationale and annual reporting on effects of measures.

This review will be required to ensure that under the alternative, NMFS retains final authority over the management of the fishery. Cooperatives would only be permitted to adopt the specific types of measures that are directly authorized and only after NMFS has expressly approved the actual measures. Requiring cooperatives to identify the authority for each measure, as well as the nexus between each measure and the cooperative's objective of limiting or reducing Chinook salmon bycatch while maintaining fair fishing opportunities, should streamline NMFS consideration of cooperative applications. In addition, annual reporting (together with other evidence concerning fishery performance) can be used to assess the validity of assertions concerning the effectiveness of measures in future cooperative applications. Applications consistent with cooperative regulations would be approved. In the event that NMFS review concludes that some measures are not permissible or the cooperative fails to include some required elements in the agreement, the cooperative formation would not be approved. As with most other applications, cooperative applications would be permitted to be amended to achieve compliance with regulatory requirements and could be subsequently approved.

The second primary means of cooperative oversight would be through the review of annual reports. At the end of each year a cooperative would be required to submit an annual report describing the cooperative's performance in the preceding season. The report would describe the both the cooperative's compliance and performance record with respect to the specific measures included in the cooperative agreement (i.e., salmon retention, gear innovations and fishing practices, vessel reporting requirements and hotspot identification and fishing limitations, vessel performance standards, information sharing, and monitoring). Reports would chronicle any rewards or penalties. Chinook salmon bycatch would be described seasonally, identifying any notable Chinook salmon bycatch occurrences or circumstances in the fishery. Annual reports would be used to assess the compliance of the cooperative with its agreement during the season. In addition, these annual reports, along with catch data from the preceding seasons, would form the foundation for assessing the substance of future cooperative applications.

In the event that multiple cooperatives form in a regulatory area, an intercooperative agreement would be required. NMFS would also review and approve intercooperative agreements, in a manner similar to the review of cooperative agreements. Since the intercooperative agreement is only intended to ensure no cooperative's Chinook salmon avoidance efforts result in the cooperative being effectively preempted in the fishery, the review of the agreement need not reach the substance of the agreement. Each cooperative's assent that the intercooperative agreement provides its members with a fair opportunity in the fishery adequately protect this interest. The intercooperative would also be required to provide a report at the end of each year describing the measures used to ensure that each of the cooperatives party to the agreement were able to pursue Chinook salmon avoidance without sacrificing a fair opportunity in the fishery. This level of reporting should be adequate to ensure that each cooperative is fairly positioned to protect the interests of its members in the fishery.

5.4.3 Enforcement of Contract Provisions by a Cooperative

NMFS does not anticipate changing its management of pollock with the formation of Chinook salmon bycatch cooperatives. Unlike cooperatives that have been formed in programs like Amendment 80 and the GOA Rockfish Pilot Program, in this case, the cooperatives will not have the opportunity to manage their own allocation of pollock (or Chinook salmon PSC, in the event a Chinook salmon cap is adopted as a part of this action). Since no allocations of pollock or Chinook salmon PSC are made (or permitted) under this cooperative structure, NMFS will be compelled to continue to manage the fishery as a limited access "race for fish". As a result, at times when the fleet poses a threat of exceeding a constraining total allowable catch (or PSC limit), the fishery will be closed. As under current management, as long as the fleet is able to demonstrate to the satisfaction of NMFS that it will deploy effort in a manner that eliminates that threat, the fishery may remain open. Yet, under this derby management, cooperatives will be challenged to slow fishing in a manner that enables members to collect and distribute information concerning Chinook salmon bycatch and adopt other measures to control bycatch.

As noted previously, **the implementation of the requirement that all vessels retain all salmon bycatch will not affect management of the fisheries. Only counts of salmon from observed vessels will be used for management of the fisheries.** In addition, it should be noted that in no case will plant observers be required to count salmon or take samples of salmon[28]. Given this characteristic of the observer program, the Council should consider modifying the motion's requirements for cooperatives to provide:

> **A requirement that all vessels retain all salmon bycatch until such time as an observer (if one is present) would have an opportunity to determine the number of salmon and collect scientific samples and biological data.**

On observed vessels, salmon counts and sampling (even those taken at the plant) are administered by vessel observers. On unobserved vessels, any counting or sampling of salmon would be at the discretion of the cooperatives. A cooperative may choose to implement such a count as a part of its internal management of Chinook salmon bycatch measures. In addition, sampling salmon from unobserved vessels may be undertaken by a cooperative as a part of a research endeavor. In any such case, sampling would need to be administered under a scientifically acceptable protocol to ensure that research products are valid and usable.

[28] Although some plant observers may voluntarily assist with unofficial counts of salmon at the plant, those counts are not part of their duties and should not be regarded as officially collected data.

6 Initial regulatory flexibility analysis

6.1 Introduction

This Initial Regulatory Flexibility Analysis (IRFA) addresses the statutory requirements of the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996 (5 U.S.C. 601-612). This IRFA evaluates the potential adverse economic impacts on small entities directly regulated by the proposed action.

The RFA, first enacted in 1980, was designed to place the burden on the government to review all regulations to ensure that, while accomplishing their intended purposes, they do not unduly inhibit the ability of small entities to compete. The RFA recognizes that the size of a business, unit of government, or nonprofit organization frequently has a bearing on its ability to comply with a Federal regulation. Major goals of the RFA are: (1) to increase agency awareness and understanding of the impact of their regulations on small business, (2) to require that agencies communicate and explain their findings to the public, and (3) to encourage agencies to use flexibility and to provide regulatory relief to small entities.

The RFA emphasizes predicting significant adverse economic impacts on small entities as a group distinct from other entities, and on the consideration of alternatives that may minimize adverse economic impacts, while still achieving the stated objective of the action. When an agency publishes a proposed rule, it must either 'certify' that the action will not have a significant adverse economic impact on a substantial number of small entities, and support that certification with the 'factual basis' upon which the decision is based; or it must prepare and make available for public review an IRFA. When an agency publishes a final rule, it must prepare a Final Regulatory Flexibility Analysis (FRFA).

In determining the scope, or 'universe', of the entities to be considered in an IRFA, NMFS generally includes only those entities that are directly regulated by the proposed action. If the effects of the rule fall primarily on a distinct segment, or portion thereof, of the industry (e.g., user group, gear type, geographic area), that segment would be considered the universe for the purpose of this analysis.

6.2 IRFA requirements

Until the Council makes a final decision on a preferred alternative, a definitive assessment of the proposed management alternatives cannot be conducted. In order to allow the agency to make a certification decision, or to satisfy the requirements of an IRFA of the preferred alternative, this section addresses the requirements for an IRFA. Under 5 U.S.C., Section 603(b) of the RFA, each IRFA is required to contain:

- A description of the reasons why action by the agency is being considered;
- A succinct statement of the objectives of, and the legal basis for, the proposed rule;
- A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply (including a profile of the industry divided into industry segments, if appropriate);
- A description of the projected reporting, record keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
- An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap, or conflict with the proposed rule;
- A description of any significant alternatives to the proposed rule that accomplish the stated objectives of the proposed action, consistent with applicable statutes, and that would minimize any significant

economic impact of the proposed rule on small entities. Consistent with the stated objectives of applicable statutes, the analysis shall discuss significant alternatives, such as:

1. The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;
2. The clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;
3. The use of performance rather than design standards;
4. An exemption from coverage of the rule, or any part thereof, for such small entities.

In preparing an IRFA, an agency may provide either a quantifiable or numerical description of the effects of a proposed action (and alternatives to the proposed action), or more general descriptive statements, if quantification is not practicable or reliable.

6.3 Definition of a small entity

The RFA recognizes and defines three kinds of small entities: (1) small businesses, (2) small non-profit organizations, and (3) small government jurisdictions.

Small businesses. Section 601(3) of the RFA defines a 'small business' as having the same meaning as 'small business concern', which is defined under Section 3 of the Small Business Act (SBA). 'Small business' or 'small business concern' includes any firm that is independently owned and operated and not dominant in its field of operation. The SBA has further defined a "small business concern" as one "organized for profit, with a place of business located in the United States, and which operates primarily within the United States or which makes a significant contribution to the U.S. economy through payment of taxes or use of American products, materials or labor…A small business concern may be in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the firm is a joint venture there can be no more than 49 percent participation by foreign business entities in the joint venture."

The SBA has established size criteria for all major industry sectors in the United States, including fish harvesting and fish processing businesses. Effective January 5, 2006, a business involved in fish harvesting is a small business if it is independently owned and operated, not dominant in its field of operation (including its affiliates), and if it has combined annual gross receipts not in excess of $4.0 million for all its affiliated operations worldwide.[29] A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $4.0 million criterion for fish harvesting operations. Finally, a wholesale business servicing the fishing industry is a small business if it employs 100 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide.

The SBA has established "principles of affiliation" to determine whether a business concern is "independently owned and operated." In general, business concerns are affiliates of each other when one

[29]Effective January 6, 2006, SBA updated the Gross Annual Receipts thresholds for determining "small entity" status under the RFA. This is a periodic action to account for the impact of economic inflation. The revised threshold for "commercial fishing" operations (which, at present, has been determined by NMFS HQ to include catcher-processors, as well as catcher vessels) changed from $3.5 million to $4.0 million in annual gross receipts, from all its economic activities and affiliated operations, worldwide.

concern controls or has the power to control the other, or a third party controls or has the power to control both. The SBA considers factors such as ownership, management, previous relationships with or ties to another concern, and contractual relationships, in determining whether affiliation exists. Individuals or firms that have identical or substantially identical business or economic interests, such as family members, persons with common investments, or firms that are economically dependent through contractual or other relationships, are treated as one party with such interests aggregated when measuring the size of the concern in question. The SBA counts the receipts or employees of the concern whose size is at issue and those of all its domestic and foreign affiliates, regardless of whether the affiliates are organized for profit, in determining the concern's size. However, business concerns owned and controlled by Indian Tribes, Alaska Regional or Village Corporations organized pursuant to the Alaska Native Claims Settlement Act (43 U.S.C. 1601), Native Hawaiian Organizations, or Community Development Corporations authorized by 42 U.S.C. 9805 are not considered affiliates of such entities, or with other concerns owned by these entities solely because of their common ownership.

Affiliation may be based on stock ownership when: (1) a person is an affiliate of a concern if the person owns or controls, or has the power to control 50 percent or more of its voting stock, or a block of stock which affords control because it is large compared to other outstanding blocks of stock, or (2) if two or more persons each owns, controls or has the power to control less than 50 percent of the voting stock of a concern, with minority holdings that are equal or approximately equal in size, but the aggregate of these minority holdings is large as compared with any other stock holding, each such person is presumed to be an affiliate of the concern.

Affiliation may be based on common management or joint venture arrangements. Affiliation arises where one or more officers, directors, or general partners, controls the board of directors and/or the management of another concern. Parties to a joint venture also may be affiliates. A contractor and subcontractor are treated as joint venturers if the ostensible subcontractor will perform primary and vital requirements of a contract or if the prime contractor is unusually reliant upon the ostensible subcontractor. All requirements of the contract are considered in reviewing such relationship, including contract management, technical responsibilities, and the percentage of subcontracted work.

<u>Small organizations.</u> The RFA defines "small organizations" as any not-for-profit enterprise that is independently owned and operated, and is not dominant in its field.

<u>Small governmental jurisdictions.</u> The RFA defines "small governmental jurisdictions" as governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of fewer than 50,000.

6.4 Reason for considering the proposed action

The Council has identified the following problem statement regarding the affected areas and sectors for the proposed action. Further background information and detail on the intent of the proposed action is provided in Sections 3.3 and 3.5.

> *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 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 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.*

6.5 Objectives of proposed action and its legal basis

Under the authority of the Magnuson-Stevens Act, the Secretary of Commerce (NMFS Alaska Regional Office) and the North Pacific Fishery Management Council have the responsibility to prepare fishery management plans and associated regulations for the marine resources found to require conservation and management. NMFS is charged with carrying out the Federal mandates of the Department of Commerce with regard to marine fish, including the publication of Federal regulations. The Alaska Regional Office of NMFS, and Alaska Fisheries Science Center, research, draft, and support the management actions recommended by the Council. The GOA groundfish fisheries are managed under the Gulf of Alaska Groundfish Fishery Management Plan (GOA FMP). The proposed action represents amendments to the GOA groundfish FMP, as well as amendments to associated Federal regulations.

The objective of the proposed action is to implement Chinook salmon PSC limits for the Central and Western GOA pollock fisheries, increase observer coverage to better monitor Chinook salmon bycatch by participants in those fisheries, and require harvesters in those fisheries to participate in a cooperative(s) to give all participants the tools and incentives to reduce Chinook salmon bycatch.

6.6 Description of the alternatives considered

This analysis evaluates three primary alternatives. **Alternative 1** is the no action alternative, which reflects the status quo of no Chinook salmon PSC limits in the Central Gulf and Western Gulf pollock fisheries. It also does not require vessels that are less than 60' LOA to carry observers when fishing for pollock in the GOA. **Alternative 2** would establish an overall PSC limit for the Central Gulf and Western GOA pollock fisheries. The three overall limits considered by the Council are 15,000 Chinook, 22,500 Chinook, and 30,000 Chinook. The overall PSC limit would be divided between the two areas based either on historic pollock TACs, historic Chinook salmon bycatch, or a combination of the two. A total of 18 different options were defined by the Council to divide the overall PSC limits between the Central and Western Gulf. Alternative also contains a component that mandates 30% observer coverage on vessel that are less than 60' when they participate in Central or Western GOA trawl fisheries that are under the authority of the Council. This includes all pollock fisheries when the pollock catch is deducted from the Federal TAC and the participant holds a Federal Fisheries Permit.

Alternative 3 would create a requirement that any vessel participating in the Central GOA (areas 620 and 630) or Western GOA (area 610) pollock fisheries join a limited purpose Chinook salmon bycatch control cooperative. The cooperative's authority would be limited to specific measures intended to address Chinook salmon bycatch, including required salmon retention to allow for biological sampling, bycatch reporting to identify Chinook salmon hotspots, information sharing and limits on fishing in Chinook salmon hotspots, promotion of gear innovations, vessel performance standards to create individual incentives for bycatch control, and monitoring to ensure compliance with the cooperative agreement. Cooperatives would not be permitted to adopt measures other than those specifically authorized and would not be permitted to develop allocations of either pollock or the Chinook salmon PSC cap. Cooperatives would also be required provide an annual report to the Council that would include the cooperative agreement, as well as a description of the various measures adopted by the cooperative and their performance and Chinook salmon bycatch seasonally in the fishery.

Cooperative formation would require a minimum percentage of the licenses that participated in the fishery in the preceding year either more than 25 percent or more that 33 percent of those licenses depending on the option selected. This provision would allow for the formation of up to two or three cooperatives in each management area. Cooperatives would be required to accept any person eligible for the cooperative as a member on the subject to the same terms and conditions that apply to other cooperative members, without any disadvantage for not having a history in the fishery. In the event more than one cooperative forms in a management area, the cooperatives would be required to enter an intercooperative agreement to ensure that no cooperative is disadvantaged in the fishery as a result of its efforts to avoid Chinook salmon. The intercooperative would also be required to a report to the Council describing the measures included in the agreement and their effects.

The suite of alternatives under consideration is provided below.

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.

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

d) proportional to the historical pollock TAC (2006-2010 or 2001-2010 average).
e) 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.
f) As a combination of options (a) and (b) at a ration 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). Chinook salmon PSC limits shall be managed by NMFS in-season similar to halibut PSC limits.

If a Chinook salmon PSC limit is implemented midyear in the year of implementation, an amount should be deducted from the annual PSC limit in that year. The deduction should be equal to the contribution that would have been made based on historical averages (selected above) in the seasons preceding implementation.

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.

To be eligible to participate in the Central Gulf of Alaska or Western Gulf of Alaska pollock fishery, the holder of an appropriately endorsed License Limitation Program license would be required to join a

Chinook salmon bycatch control cooperative. Each cooperative would be formed for participation in a single regulatory area (e.g., Central Gulf of Alaska or Western Gulf of Alaska).

To form, a cooperative is required to have more than:

a) 25 percent; or
b) 33 percent;

of the licenses that participated in the applicable regulatory area in the preceding year. Any cooperative is required to accept as a member any eligible person, subject to the same terms and conditions that apply to all other cooperative members. In addition, the cooperative agreement shall not disadvantage any eligible person entering the fishery for not having an established Chinook salmon bycatch history in the fishery. Each cooperative agreement shall contain:

- A requirement that all vessels retain all salmon bycatch until the plant observers have an opportunity to determine the number of salmon and collect scientific data and biological samples.
- Vessel reporting requirements to be used to identify salmon hotspots and an appropriate set of measures to limit fishing in identified hotspots.
- A system of information sharing intended to provide vessels with timely information concerning Chinook salmon bycatch rates.
- A monitoring program to**:**
- ensure compliance with the full retention requirement, catalogue gear use and fishing practices and their effects on Chinook salmon bycatch rates, ensure compliance with vessel reporting requirements and limits on fishing under the system of salmon hotspots, determine compliance with any measures that require use of fishing gear or practices to avoid Chinook salmon PSC, and verify vessel performance and implement any system of rewards and penalties related to vessel performance.
- A set of contractual penalties for failure to comply with any cooperative requirements.

Cooperative agreements may also contain the following measures:

- Measures to promote gear innovations and the use of gear and fishing practices that contribute to Chinook salmon avoidance.
- A system of vessel performance standards that creates individual incentives for Chinook salmon avoidance, which could include rewards or penalties based on Chinook salmon bycatch.

Cooperatives may have no measures except those specifically authorized by this action (and shall not include any measures that directly allocate access to any portion of the total allowable catch or any PSC limit).

Each cooperative shall annually provide a report to the Council that includes the cooperative agreement and describes the cooperative's compliance with the specific requirements for cooperatives and the cooperative's performance with respect to those requirements (including salmon retention, gear innovations and fishing practices, vessel reporting requirements and hotspot identification and fishing limitations, vessel performance standards, information sharing, and monitoring). Cooperative reports shall also document any rewards or penalties related to vessel performance and any penalties for failure to comply with the cooperative agreement. The cooperative report should also describe the Chinook salmon bycatch seasonally, identifying any notable Chinook salmon bycatch occurrences or circumstances in the fishery. As a part of its report, a cooperative shall describe each measure adopted by the cooperative, the rationale for the measure (specifically describing how a measure is intended to serve the objective of addressing Chinook salmon PSC, while ensuring a fair opportunity to all participants in the fishery), and the effects of the measure.

In the event more than one cooperative is created within a regulatory area, those cooperatives will be required to enter an intercooperative agreement prior to beginning fishing. The intercooperative agreement will establish rules to ensure that no cooperative (or its members) are disadvantaged in the fishery by its efforts to avoid Chinook salmon.

The parties to any intercooperative agreement shall annually provide a report to the Council including the intercooperative agreement and describing each measure in the agreement, the rationale for the measure (specifically describing how a measure is intended to serve the objective of addressing Chinook salmon PSC, while ensuring a fair opportunity to all participants in the fishery), and the effect of the measure.

The requirement for salmon PSC to be discarded at sea would not apply to directed GOA pollock fishing.

6.7 Number and description of directly regulated small entities

The entities directly regulated by this action are those entities that participate in harvesting groundfish from the federal or parallel pollock target fisheries of the Central or Western GOA. It does not include entities that only harvest pollock from a GHL fishery in the Central or Western GOA (currently the only pollock GHL fishery in those areas is the Prince William Sound pollock fishery).

Table 92 shows the estimated number of small and other entities in the Central and Western Gulf pollock fisheries directly regulated by the proposed action. Fishing vessels are considered small entities if their total annual gross receipts, from all their activities combined, are less than $4.0 million. The tables in this section provide estimates of the number of harvesting vessels that are considered small entities. These estimates may overstate the number of small entities (and conversely, understate the number of large entities) for two reasons.

First, these estimates include only groundfish revenues earned from activity in the EEZ off Alaska. Some of these vessels may also be active in the salmon and other state managed fisheries off of Alaska, or in fisheries in the off the west coast of the U.S.

Second, the RFA requires a consideration of affiliations between entities for the purpose of assessing if an entity is small. The estimates in Table 92 do not take into account all affiliations between entities. There is not a strict one-to-one correlation between vessels and entities; many persons and firms are known to have ownership interests in more than one vessel, and many of these vessels with different ownership, are otherwise affiliated with each other. For example, vessels in the AFA catcher vessel sectors are categorized as large entities for the purpose of the RFA under the principles of affiliation, due to their being part of the AFA pollock cooperatives. However, vessels that have other types of affiliation, (i.e., ownership of multiple vessel or affiliation with processors) not tracked in available data may be misclassified as a small entity.

Table 92 show the number of harvesting vessels that participated in the Central and Western Gulf pollock fisheries from 2003 2010 to provide information on how the number of directly regulated entities would have changed over time. However, this analysis will focus on the number of entities that were active in 2010. It is those vessels that are assumed to be directly regulated by this action. There are 37 catcher vessels that fished for pollock in the Central or Western Gulf pollock fisheries that were members of a cooperative. These vessels were members of an American Fisheries Act cooperative for Bering Sea pollock, a Rockfish Program cooperative in the GOA, a Bering Sea Crab Cooperative, or members of two or more of the cooperatives. The remaining 26 vessels were not part of a cooperative and are considered to be small entities.

Table 92 Estimated numbers of directly regulated entities (vessels) in the Central and Western Gulf of Alaska pollock fisheries under Alternative 2

	Entities		
Year	Small	Other	Total
2003	30	43	73
2004	24	44	68
2005	24	42	66
2006	23	42	65
2007	20	39	59
2008	22	39	61
2009	21	41	62
2010	26	37	63

Source: NOAA Catch Accounting Data, 2003-2010.

It is important to note that if Alternative 3 is selected as part of the Council's preferred alternative, all the directly regulated entities in this action would be required to join a cooperative. Once the vessels joined a cooperative, they would no longer be considered a small entity because of the affiliation standards.

6.8 Recordkeeping and reporting requirements

These requirements are described in Section 5. Further information to be added later.

6.9 Federal rules that may duplicate, overlap, or conflict with proposed action

No relevant Federal rules have been identified that would duplicate or overlap with the proposed action under Alternatives 2 or 3. Some current Federal regulations would need modification to implement the proposed action to impose Chinook PSC limits, require retention of Chinook salmon in the Central and Western GOA pollock fisheries, require cooperative membership to participate in the Central and Western Gulf pollock fisheries, and restructure the observer program to require 30% coverage on vessels less than 60 ft. These regulatory changes are described in detail in the RIR and Section 5. Further information to be added later.

6.10 Description of significant alternatives to the proposed action

An IRFA also requires a description of any significant alternatives to the proposed action(s) that accomplish the stated objectives, are consistent with applicable statutes, and that would minimize any significant economic impact of the proposed rule on small entities.

Alternatives that were considered but not advanced are discussed in Section **Error! Reference source not found.**. One option in the Council's December, 2010 motion (original motion) would have allowed the Chinook salmon PSC limit for the GOA pollock fishery to be applied to the Central and Western GOA as a whole, rather than requiring it to be apportioned between the two areas. Based on public testimony and preliminary data, the Council removed this option from the analysis. The pollock fishery in the two regulatory areas has different participants, fishing practices, and timing, and also the pattern of Chinook salmon encounters differs between the areas. A GOA-wide cap would change dynamics across these fisheries, and potentially allow participants in one area to adversely affect the fishery in the other area. Consequently, the Council chose to remove this option from the analysis in February 2011.

An alternative to a mandatory cooperative structure of Alternative 3 is a cooperative structure that allows participants who choose not to join a cooperative, an opportunity to fish outside of cooperative was considered but not advanced for analysis. Such a structure might be preferred to a mandatory cooperative structure, as it would avoid any complications arising from a requirement that a participant join an association to access the fishery. The complication for a structure with a limited access opportunity is the development of rules for that limited access fishing that both ensure its participants a reasonable fishing opportunity and creates incentives to reduce Chinook salmon PSC without disproportionately reducing the incentive for cooperatives to pursue Chinook PSC avoidance measures. Any limited access structure would be intended to allow limited access participants to fish, but not gain a competitive advantage over the cooperative participants. Cooperatives, however, are likely to attempt to use time constraints on effort (e.g., delaying fishing while members monitor Chinook PSC rates) to reduce Chinook bycatch. Developing a management system for a limited access fishery that allows flexibility to delay starts or suspend fishing is likely unworkable for the agency. A further complication would likely arise from any management measures intended to reduce Chinook PSC in the limited access fishery. These measures would need to be static, modified only through Council actions. The need to resort to Council action for their modification would delay any implementation of those measures, which could provide either limited access participants with an advantage in the fishery over cooperative participants or an incentive for cooperatives not to implement effective measures that could jeopardize their success in the fishery. For these reasons, a cooperative program with a limited access option was not advanced for analysis.

The Council considered a variety of cooperative formation rules. Since the LLP GOA trawl endorsements qualify vessels for all trawl fisheries, and many qualified licenses are not used in the pollock fisheries, any formation threshold based only on eligibility for the fishery was believed to give undue influence to licenses that may have no dependence or interest in the fishery. Thresholds that considered catch quantities (such as a threshold requiring licenses that accounted for in excess of 25 percent of the total catch in the fishery from the preceding year), were not advanced, as such a threshold would be over complex to administer and could require annually releasing of confidential catch data.

Further information to be added later.

7 FMP and Magnuson-Stevens Act considerations

7.1 Magnuson-Stevens Act National Standards

Below are the 10 National Standards as contained in the Magnuson-Stevens Act, and a brief discussion of the consistency of the proposed alternatives with those National Standards, where applicable.

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

The proposed action would impose a PSC limit and/or mandatory cooperative membership in the Western/ Central GOA pollock fishery. In most years, these management measures are not anticipated to prevent the pollock fishery from achieving annual total allowable catch. The pollock stock is not currently in danger of overfishing and is considered stable. Additionally, the proposed action may reduce the bycatch of Chinook salmon species. While these are not subject to a Federal fishery managed under the Magnuson-Stevens Act, a reduction in bycatch mortality of Chinook salmon species may result in an increase in yield from the directed fisheries. In terms of achieving "optimum yield" from a fishery, the Act defines "optimum", with respect to yield from the fishery, as the amount of fish which—

(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;

(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduce by any relevant economic, social, or ecological factor; and

(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overall benefits to the Nation may be affected by the proposed action, though our ability to quantify those

effects is quite limited. Overall net benefits to the Nation would not be expected to change to an identifiable degree between the alternatives under consideration.

National Standard 2 — Conservation and management measures shall be based upon the best scientific information available.

Information in this analysis represents the most current, comprehensive set of information available to the Council, recognizing that some information (such as operational costs) is unavailable. Information previously developed on the GOA pollock fishery, as well as the most recent information available, has been incorporated into this analysis. It represents the best scientific information available.

National Standard 3 — To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The annual TACs are set for GOA pollock according to the Council and NMFS's harvest specification process. NMFS conducts the stock assessments for this species and makes allowable biological catch recommendations to the Council. The Council sets the TAC for this species based on the most recent stock assessment and survey information. GOA pollock will continue to be managed as a single stock under the alternatives in this analysis.

National Standard 4 — Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fishermen, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Nothing in the alternatives considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and states of the Pacific Northwest, participate in the major sectors affected by these allocations. No discriminations are made among fishermen based on residency or any other criteria.

National Standard 5 — Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.

Efficiency in the context of this change refers to economic efficiency. The analysis presents information relative to the relative importance of economic efficiency versus other considerations and provides information on the economic risks associated with the proposed bycatch reduction measures.

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

All of the alternatives under consideration in the proposed action appear to be consistent with this standard.

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

All of the alternatives under consideration appear to be consistent with this standard.

National Standard 8 — Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

Many of the coastal communities in the Central and Western GOA, as well as coastal communities elsewhere in Alaska and the Pacific Northwest, participate in the GOA pollock fishery in one way or another, such as homeport to participating vessels, the location of processing activities, the location of support businesses, the home of employees in the various sectors, or as the base of ownership or operations of various participating entities. A summary of the level of fishery engagement and dependence in the communities of vessels affected by the proposed action is provided in the RIR (Section 3.6.5).

An analysis of the alternatives suggests that while impacts may be noticeable at the individual operation level for at least a few vessels, the impacts at the community level for any of the involved fishing communities would be well under the level of significance. The sustained participation of these fishing communities is not put at risk by any of the alternatives being considered. Economic impacts to participating communities would not likely be noticeable at the community level, so consideration of efforts directed at a further minimization of adverse economic impacts to any given community is not relevant.

National Standard 9 — Conservation and management measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The proposed action is specifically intended to control bycatch of Chinook salmon in the pollock fishery. The practicability of bycatch reduction is discussed in the analysis of the impacts of the various alternatives and options.

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

The alternatives under consideration appear to be consistent with this standard. None of the alternatives or options proposed would change safety requirements for fishing vessels. In fact, the requirement to put observers on under 60 foot vessels under Alternative 2 would, if anything, increase the safety of these fishing vessels, as their compliance with Federal safety standards would be inspected more regularly. No safety issues have been identified relevant to the proposed action.

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

Section 303(a)(9) of the Magnuson-Stevens Act requires that any plan or amendment include a fishery impact statement which shall assess and describe the likely effects, if any, of the conservation and management measures on (a) participants in the fisheries and fishing communities affected by the plan or amendment; and (b) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants taking into account potential impacts on the participants in the fisheries, as well as participants in adjacent fisheries.

The alternative actions considered in this analysis are described in Section 2. The impacts of these actions on participants in the fisheries and fishing communities are the topic of the RIR and IRFA (Sections 3 and 6).

Fishery Participants

The proposed actions directly impact participants in the GOA pollock fishery occurring in the Western and Central GOA. From 2003 to 2010, there have been a total of 65 different vessels participating in the directed fishery.

Fishing Communities

The fishing communities that are expected to be potentially directly impacted by the proposed action are those communities which serve as homeports to the vessels potentially affected by the area closures, where they offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. Information on the residence of the vessel crew and processing crew that work aboard the potentially affected vessels is not readily available; however, generally companies operating vessels in the Central GOA groundfish sector tend to recruit crew from many locations.

Detailed information on the range of fishing communities relevant to the proposed action may be found in a number of other documents, including the *Alaska Groundfish Fisheries Final Programmatic Supplemental EIS* (NMFS 2004), *Sector and Regional Profiles of the North Pacific Groundfish Fishery* (Northern Economics and EDAW 2001), and in a technical paper (Downs 2003) supporting the *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005) as well as that EIS itself. These sources also include specific characterizations of the degree of individual community and regional engagement in, and dependency upon, the North Pacific groundfish fishery.

Participants in Fisheries in Adjacent Areas

Neither the proposed action nor alternatives considered would significantly affect participants in the fisheries conducted in adjacent areas under the authority of another Council.

7.3 GOA FMP — Groundfish Management Policy Priorities

The alternatives discussed in this action accord with the management policy of the GOA Groundfish FMP. The Council's management policy (NPFMC 2009) includes the following objectives:

- Control the bycatch of prohibited species through prohibited species catch limits or other appropriate measures.
- Continue and improve current incidental catch and bycatch management program.
- Continue to manage incidental catch and bycatch through seasonal distribution of total allowable catch and geographical gear restrictions.
- Continue program to reduce discards by developing management measures that encourage the use of gear and fishing techniques that reduce bycatch which includes economic discards.

By proposing a PSC limit and participation in mandatory cooperatives to control salmon bycatch, the Council is consistent with its management policy.

8 NEPA Summary

One of the purposes of an environmental assessment is to provide the evidence and analysis necessary to decide whether an agency must prepare an environmental impact statement (EIS). The Finding of No Significant Impact (FONSI) is the decision maker's determination that the action will not result in significant impacts to the human environment, and therefore, further analysis in an EIS is not needed. The Council on Environmental Quality regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." An action must be evaluated at different spatial scales and settings to determine the context of the action. Intensity is evaluated with respect to the nature of impacts and the resources or environmental components affected by the action. NOAA Administrative Order (NAO) 216-6 provides guidance on the National Environmental Policy Act (NEPA) specifically to line agencies within NOAA. It specifies the definition of significance in the fishery management context by listing criteria that should be used to test the significance of fishery management actions (NAO 216-6 §§ 6.01 and 6.02). These factors form the basis of the analysis presented in this EA/RIR/IRFA. The results of that analysis are summarized here for those criteria.

Context: For this action, the setting is the Western and Central GOA pollock fishery. Any effects of this action are limited to these regulatory areas. The effects of this action on society are on individuals directly and indirectly participating in these fisheries and on those who use the ocean resources. Because this action concerns the use of a present and future resource, this action may have impacts on society as a whole or regionally.

Intensity: Considerations to determine intensity of the impacts are set forth in 40 CFR 1508.27(b) and in the NAO 216-6, Section 6. Each consideration is addressed below in order as it appears in the NMFS Instruction 30-124-1 dated July 22, 2005, Guidelines for Preparation of a FONSI. The sections of the EA that address the considerations are identified.

1) Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

(EA Section 4.2). No. No significant adverse impacts on target species were identified for Alternatives 2 or 3. Under Alternative 2, the implementation of 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 with no change from the status quo. Alternative 3 would establish bycatch cooperatives, which would promote information hsaring to avoid areas with high bycatch rates. If pollock catch rates are lower in areas with lower Chinook salmon bycatch rates, it may take more fishing effort to catch the pollock TAC, which may have ancillary effects on other target incidental catch species. However, target species are managed under harvest specifications that prevent overfishing. Therefore, no impacts on the sustainability of any target species are expected.

2) Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?

(EA Section 4.3 and 4.4). No. To the extend that Chinook salmon bycatch is controlled or reduced as a result of this action, it will likely have beneficial impacts on Chinook salmon stocks. As the bycatch composition of Chinook stocks is not known, it is not possible to assess how these benefits are likely to affect individual stocks. Potential effects of Alternative 2 on other non-target and prohibited species are expected to be insignificant and similar to status quo, as fishing pressure is unlikely to increase. Under Alternative 3, it is possible that fishing seasons may be somewhat extended due to efforts under the cooperatives to avoid areas with high bycatch rates, however the effects are unlikely to result in significant adverse impacts. Therefore the alternatives are not likely to jeopardize the sustainability of any nontarget/prohibited species.

3) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in the fishery management plans (FMPs)?

(EA Section 4.7). No. No significant adverse impacts were identified for Alternatives 2 or 3 on ocean or coastal habitats or EFH. The OGA pollock fishery under the status quo has minimal effect on benthic habitat, though localized areas are more heavily impacted. To the extent that longer fishing seasons involveing more fishing effort result under Alternative 3, there may be some increased impact on benthic habitat. However, the GOA pollock TACs are relatively small in relation to the capacity of the trawl fleet to harvest the TAC, and seasons are likely to remain short. Substantial damage to ocean or coastal habitat or EFH by Alternatives 2 or 3 is not expected.

4) Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?

(EA Section 7.1). No. Public health and safety will not be affected in any way not evaluated under previous actions or disproportionately as a result of the proposed action. The proposed action for Alternatives 2 and 3 will not change fishing methods (including gear types), nor will they substantially change timing of fishing, which is largely dictated by Steller sea lion protection measures.

5) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?

(EA Section 4.5, 4.6, and 4.3.6). No. Alternatives 2 and 3 would not change the Steller sea lion protection measures, ensuring the action is not likely to result in adverse effects not already considered under previous ESA consultations for Steller sea lions and their critical habitat. While localized changes to the distribution of the fishery may occur under Alternative 3, the overall location of fishing will likely remain within the established footprint of the GOA pollock fishery, and will not disturb areas identified as critical habitat for any ESA-listed species beyond effects already considered. For ESA-listed Chinook salmon, implementing a PSC limit would increase the likelihood that the GOA groundfish fisheries will remain below the threshold identified in the incidental take statement. Consequently, the alternatives are not likely to adversely affect ESA-listed species or their designated critical habitat.

6) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

(EA Section 4.8). No significant adverse impacts on biodiversity or ecosystem function were identified for Alternatives 2 or 3. No significant effects are expected on biodiversity, the ecosystem, marine mammals, or seabirds, as overall the GOA pollock fleet is constrained in the location and timing of the fishery by Steller sea lion protection measures.

7) Are significant social or economic impacts interrelated with natural or physical environmental effects?

(RIR Sections 3.10, 3.11). Socioeconomic impacts of this action result from the potential that the pollock fishery will be closed before the TAC is achieved, or additional costs associated with the cooperative as vessels are required to slow down the fishery in order to avoid areas with high bycatch rates. The impacts increase as the PSC limit becomes more constraining. Under the most constraining cap, the pollock fishery in the Central GOA would have been closed early in five of the last ten years, at a cost of $6 million to $9 million. Beneficial social impacts may occur for those who depend on directed fisheries for Chinook salmon, however there is insufficient information to determine how specific Chinook stocks will be impacted by this proposed action.

8) Are the effects on the quality of the human environment likely to be highly controversial?

This action is directly affects the GOA pollock fishery in the Western and Central GOA, and it is a fishery of value to the groundfish fleet. There is uncertainty associated with the estimates of Chinook salmon bycatch for the unobserved portion of the groundfish fleet, and the uncertainty surrounding the origin of Chinook stocks caught as bycatch in the fishery. However, development of the proposed action has involved participants from the scientific and fishing communities and the potential impacts on the human environment are understood (EA, Section 4).

9) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

(EA Section 2). No. This action would not affect any categories of areas on shore. This action takes place in the geographic area of the Central and Western GOA. The land adjacent to this marine area may contain archeological sites of native villages. This action would occur in adjacent marine waters so no impacts on these cultural sites are expected. The marine waters where the fisheries occur contain ecologically critical areas. Effects on the unique characteristics of these areas are not anticipated to occur with this action because of the amount of fish removed by vessels are within the total allowable catch (TAC) specified harvest levels and the alternatives provide protection to EFH and ecologically critical nearshore areas.

10) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

No. The potential effects of the action are well understood because of the fish species, harvest methods involved, and area of the activity. For marine mammals and seabirds, enough research has been conducted to know about the animals' abundance, distribution, and feeding behavior to determine that this action is not likely to result in population effects (EA Sections 4.5 and 4.6). The potential impacts of different gear types on habitat also are well understood, as described in the EFH EIS (NMFS 2005) (EA Section 4.7).

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

(EA Section 4.9). No. Beyond the cumulative impact analyses in the 2006 and 2007 harvest specifications EA and the Groundfish Harvest Specifications EIS, no other additional past or present cumulative impact issues were identified. The combination of effects from the cumulative effects and this proposed action are not likely to result in significant effects for any of the environmental component analyzed and are therefore not significant.

12) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?

(EA Section 2). No. This action will have no effect on districts, sites, highways, structures, or objects listed or eligible for listing in the National Register of Historic Places, nor cause loss or destruction of significant scientific, cultural, or historical resources. Because this action occurs in marine waters, this consideration is not applicable to this action.

13) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

(EA Section 2). No. This action poses no effect on the introduction or spread of nonindigenous species into the GOA beyond those previously identified because it does not change fishing, processing, or shipping practices that may lead to the introduction of nonindigenous species.

14) Is the proposed action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

No. This action would control the risk of high Chinook salmon bycatch occurring in the GOA pollock fishery. This action does not establish a precedent for future action because bycatch control measures have been frequently used as a management tool for the protection of marine resources in the Alaska groundfish fisheries. Pursuant to NEPA, for all future actions, appropriate environmental analysis documents (EA or EIS) will be prepared to inform the decision makers of potential impacts to the human environment and to implement mitigation measures to avoid significant adverse impacts.

15) Can the proposed action reasonably be expected to threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment?

No. This action poses no known violation of federal, state, or local laws or requirements for the protection of the environment. The proposed action would be conducted in a manner consistent, to the maximum extent practicable, with the enforceable provisions of the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972, and its implementing regulations.

16) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

(EA Section 4.2, 4.3, 4.4, and 4.9). No. The effects on target and non-target species from the alternatives are not significantly adverse as the overall harvest of these species will not be affected. No cumulative effects were identified that added to the direct and indirect effects on target and nontarget species would result in significant effects.

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11 Appendices

Appendix 1 GOA Pollock Target Fishery Openings and Closures

Appendix 2 GOA Chinook salmon PSC Caps Based on Midyear Implementation

Appendix 3 Weekly GOA Pollock Catch, Estimated Chinook salmon Bycatch, and Chinook salmon Bycatch Rates

Appendix 4 Estimated Daily Cost of Observers on 30% Vessels Operating out of King Cove & Sand Point

Appendix 5 Chapter 3 of the Pacific Salmon Treaty

Appendix 6 Escapement goals and 2001-2009 escapement levels, by region and system

Appendix 7 2010 Annual Report for the Alaska Groundfish Fisheries Salmon Incidental Catch and Endangered Species Act Consultation

Appendix 1 GOA Pollock Target Fishery Openings and Closures

Area	Season	2006	2007	2008	2009	2010
Western GOA						
610	A	Jan 20-Jan 22 (TAC) Jan 26-Jan 27 (TAC)	Jan 20-Jan 22 (TAC) Feb 5-Feb 7 (TAC) Feb 8-Feb 10 (TAC)	Jan 20-Jan 22 (TAC)	Jan 20-Jan 22 (TAC) Mar 1-Mar 3 (TAC)	Jan 20-Feb 27 (TAC)
	B	Mar 10-Mar 14 (TAC)	Mar 10-Mar 13 (TAC) Mar 16-Mar 18 (TAC) Mar 21-Mar 23 (TAC)	Mar 3-Mar 4 (TAC) Mar 7-May 31 (Reg)	Mar 10-Mar 12 (TAC)	Mar 10-Apr 12 (TAC)
	C	Aug 25-Aug 28 (TAC) Aug 31-Sep 3 (TAC) Sep 6-Sep 27 (TAC)	Aug 25-Oct 1 (Reg)	Aug 25-Sep 4 (TAC)	Aug 25-Aug 31 (TAC)	Aug 25-Sep 10 (TAC)
	D	Oct 1-Nov 1 (Reg)	Oct 1-Nov 1 (Reg)	Oct 1-Oct 6 (TAC) Oct 12-Oct 14 (TAC)	Oct 1-Oct 6 (TAC)	Oct 1-Oct 9 (TAC) Oct 14-Oct 17 (TAC)
Central GOA						
620	A	Jan 20-Mar 10 (Reg)	Jan 20-Mar 10 (Reg)	Jan 20-Mar 10 (Reg)	Jan 20-Mar 6 (TAC)	Jan 20-Feb 25 (TAC)
	B	Mar 10-Mar 21 (TAC)	Mar 10-Mar 27 (TAC)	Mar 10-Mar 26 (TAC)	Mar 10-Mar 14 (TAC)	Mar 10-Mar 16 (TAC)
	C	Aug 25-Aug 28 (TAC) Aug 31-Sep 3 (TAC) Sep 6-Oct 1 (TAC)	Aug 25-Sep 10 (TAC) Sep 21-Sep 28 (TAC)	Aug 25-Sep 6 (TAC)	Aug 25-Aug 26 (TAC) Sep 29-Oct 1 (Reg)	Aug 25-Sep 7 (TAC)
	D	Oct 1-Nov 1 (Reg)	Oct 1-Nov 1 (Reg)	Oct 1-Nov 1 (Reg)	Oct 1-Oct 4 (TAC)	Oct 1-Oct 6 (TAC)
630	A	Jan 20-Feb 15 (TAC)	Jan 20-Jan 22 (TAC) Feb 6-Feb 8 (TAC) Feb 12-Feb 14 (TAC) Mar 1-Mar 2 (TAC)	Jan 20-Jan 22 (TAC) Jan 25-Jan 27 (TAC) Feb 23-Feb 25 (TAC)	Jan 20-Jan 22 (TAC) Feb 11-Feb 11 (TAC) Mar 9-Mar 10 (Reg)	Jan 20-Feb 5 (TAC) Feb 28-Mar 2 (TAC)
	B	Mar 10-Mar 10 (TAC)	Mar 10-Mar 11 (TAC)	Mar 10-Mar 11 (TAC)	Mar 10-Mar 11 (TAC)	Mar 10-Mar 10 (TAC) Mar 22-Mar 25 (TAC)
	C	Aug 25-Sep 27 (TAC)	Aug 25-Aug 28 (TAC) Sep 15-Sep 18 (TAC) Sep 21-Sep 23 (TAC) Sep 25-Oct 1 (Reg)	Aug 25-Aug 26 (TAC) Sep 1-Sep 19 (TAC)	Aug 25-Aug 26 (TAC) Sep 29-Oct 1 (TAC)	Aug 25-Aug 27 (TAC) Sep 18-Sep 19 (TAC)
	D	Oct 1-Nov 1 (Reg)	Oct 1-Nov 1 (Reg)	Oct 1-Oct 10 (Reg)	Oct 1-Oct 1 (TAC)	Oct 1-Oct 2 (2400 A.l.t.) (TAC) Oct 15-Oct 18 (TAC)

Note, the reason for closure is given in parentheses.
Source: NOAA Annual Inseason Management Reports (2006-2010)

Appendix 2 GOA Chinook salmon PSC Caps Based on Midyear Implementation

The cap numbers assume that the program was implemented prior to the season listed in the column. Therefore, the column for the "A" season shows the entire allocation because it assumes the program would be implemented prior to the start of the trawl fishery.

Chinook salmon PSC cap (in fish) generated during each season by alternative (15,000 Chinook salmon cap)

		Total Chinook Allocation Prior to the Start of the Season Listed (15,000 Chinook Cap)							
		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 on	2006-2010	9,401	7,185	3,459	2,111	5,599	4,626	3,270	1,814
pollock TAC)	2001-2010	9,477	7,243	3,487	2,128	5,523	4,564	3,225	1,790
Option b (based on	2006-2010	9,122	6,972	3,356	2,048	5,878	4,857	3,433	1,905
Chinook bycatch)	2001-2010	10,068	7,695	3,704	2,261	4,932	4,075	2,880	1,598
Suboption: exclude	2006 & 2008 & 2009	11,246	8,596	4,138	2,525	3,754	3,101	2,192	1,216
2007 and 2010 data)	2001-2006, 2008-2009	11,612	8,875	4,273	2,607	3,388	2,799	1,978	1,098
Option c(i)	2006-2010	9,191	7,025	3,382	2,064	5,809	4,799	3,392	1,882
Using 25% from	2006 & 2008 & 2009	10,785	8,243	3,968	2,422	4,215	3,483	2,461	1,366
Option a and 75%	2001-2010	9,920	7,582	3,650	2,228	5,080	4,197	2,967	1,646
from Option b	2001-2006, 2008-2009	11,078	8,467	4,076	2,488	3,922	3,240	2,290	1,271
Option c(ii)	2006-2010	9,261	7,078	3,408	2,080	5,739	4,742	3,351	1,860
Using 50% from	2006 & 2008 & 2009	10,324	7,890	3,799	2,318	4,676	3,864	2,731	1,515
Option a and 50%	2001-2010	9,772	7,469	3,596	2,194	5,228	4,319	3,053	1,694
from Option b	2001-2006, 2008-2009	10,544	8,059	3,880	2,368	4,456	3,682	2,602	1,444
Option c(iii)	2006-2010	9,331	7,132	3,433	2,095	5,669	4,684	3,310	1,837
Using 75% from	2006 & 2008 & 2009	9,862	7,538	3,629	2,215	5,138	4,245	3,000	1,665
Option a and 25%	2001-2010	9,624	7,356	3,541	2,161	5,376	4,442	3,139	1,742
from Option b	2001-2006, 2008-2009	10,010	7,651	3,683	2,248	4,990	4,123	2,914	1,617

Source: NOAA Catch Accounting Data

Chinook salmon PSC cap (in fish) generated during each season by alternative (22,500 Chinook salmon cap)

		Total Chinook Allocation Prior to the Start of the Season Listed (22,500 Chinook Cap)							
		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 on	2006-2010	14,101	10,778	5,189	3,166	8,399	6,939	4,904	2,722
pollock TAC)	2001-2010	14,215	10,864	5,230	3,192	8,285	6,846	4,838	2,685
Option b (based on	2006-2010	13,682	10,458	5,034	3,072	8,818	7,285	5,149	2,857
Chinook bycatch)	2001-2010	15,102	11,542	5,557	3,391	7,398	6,113	4,320	2,397
Suboption: exclude	2006 & 2008 & 2009	16,870	12,893	6,207	3,788	5,630	4,652	3,288	1,825
2007 and 2010 data)	2001-2006, 2008-2009	17,418	13,313	6,409	3,911	5,082	4,199	2,968	1,647
Option c(i)	2006-2010	13,787	10,538	5,073	3,096	8,713	7,199	5,088	2,823
Using 25% from	2006 & 2008 & 2009	16,177	12,365	5,953	3,633	6,323	5,224	3,692	2,049
Option a and 75%	2001-2010	14,880	11,373	5,475	3,341	7,620	6,296	4,450	2,469
from Option b	2001-2006, 2008-2009	16,617	12,701	6,114	3,731	5,883	4,861	3,435	1,906
Option c(ii)	2006-2010	13,892	10,618	5,112	3,119	8,608	7,112	5,027	2,790
Using 50% from	2006 & 2008 & 2009	15,485	11,836	5,698	3,477	7,015	5,796	4,096	2,273
Option a and 50%	2001-2010	14,658	11,203	5,393	3,292	7,842	6,479	4,579	2,541
from Option b	2001-2006, 2008-2009	15,816	12,089	5,820	3,552	6,684	5,522	3,903	2,166
Option c(iii)	2006-2010	13,997	10,698	5,150	3,143	8,503	7,026	4,966	2,756
Using 75% from	2006 & 2008 & 2009	14,793	11,307	5,443	3,322	7,707	6,368	4,500	2,497
Option a and 25%	2001-2010	14,437	11,034	5,312	3,242	8,063	6,662	4,709	2,613
from Option b	2001-2006, 2008-2009	15,016	11,476	5,525	3,372	7,484	6,184	4,371	2,425

Source: NOAA Catch Accounting Data

Chinook salmon PSC cap (in fish) generated during each season by alternative (30,000 Chinook salmon cap)

		Total Chinook Allocation Prior to the Start of the Season Listed (30,000 Chinook Cap)							
		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 on	2006-2010	18,802	14,370	6,918	4,222	11,198	9,253	6,539	3,629
pollock TAC)	2001-2010	18,953	14,486	6,974	4,256	11,047	9,127	6,451	3,580
Option b (based on	2006-2010	18,243	13,943	6,713	4,097	11,757	9,714	6,865	3,810
Chinook bycatch)	2001-2010	20,136	15,390	7,409	4,521	9,864	8,151	5,760	3,197
Suboption: exclude	2006 & 2008 & 2009	22,493	17,191	8,276	5,051	7,507	6,203	4,384	2,433
2007 and 2010 data)	2001-2006, 2008-2009	23,224	17,750	8,545	5,215	6,776	5,599	3,957	2,196
Option c(i)	2006-2010	18,383	14,050	6,764	4,128	11,617	9,599	6,784	3,765
Using 25% from	2006 & 2008 & 2009	21,570	16,486	7,937	4,844	8,430	6,965	4,923	2,732
Option a and 75%	2001-2010	19,840	15,164	7,300	4,455	10,160	8,395	5,933	3,292
from Option b	2001-2006, 2008-2009	22,156	16,934	8,152	4,975	7,844	6,481	4,580	2,542
Option c(ii)	2006-2010	18,522	14,157	6,815	4,159	11,478	9,483	6,702	3,719
Using 50% from	2006 & 2008 & 2009	20,647	15,781	7,597	4,636	9,353	7,728	5,462	3,031
Option a and 50%	2001-2010	19,544	14,938	7,191	4,389	10,456	8,639	6,106	3,388
from Option b	2001-2006, 2008-2009	21,089	16,118	7,760	4,735	8,911	7,363	5,204	2,888
Option c(iii)	2006-2010	18,662	14,263	6,867	4,191	11,338	9,368	6,621	3,674
Using 75% from	2006 & 2008 & 2009	19,724	15,075	7,258	4,429	10,276	8,490	6,000	3,330
Option a and 25%	2001-2010	19,249	14,712	7,083	4,322	10,751	8,883	6,278	3,484
from Option b	2001-2006, 2008-2009	20,021	15,302	7,367	4,496	9,979	8,245	5,827	3,234

Source: NOAA Catch Accounting Data

Appendix 3 Weekly GOA Pollock Catch, Estimated Chinook salmon Bycatch, and Chinook salmon Bycatch Rates

"Chinook salmon by week" is the estimated Chinook salmon catch by the pollock fleet that week. "Chinook salmon year-to-date" is the total estimated Chinook salmon bycatch for the year, through that week. "Pollock by week" is the weekly catch of pollock. "Pollock year-to-date" is the annual pollock catch through that week. "Chinook salmon per mt of Pollock" is that week's estimated Chinook salmon bycatch divided by that week's pollock catch. "Vessels" is the number of vessels that reported activity in the pollock fishery that week. "Processors" is the number of processors that were reported to have taken deliveries from the pollock fishery that week. It should be noted that the processor information was not available to the analyst for the 2010 fishing year, so that information is not included in the tables.

Central Gulf (15,000 Chinook Salmon Cap): Shaded area shows when the cap associated with the smallest cap would be exceeded and a dark vertical line shows when the largest cap would be exceeded

		Week (week of the year - based landings date converted to week ending date reported in the NOAA Catch Accounting Data)																								
Year	Data	3	4	5	6	7	8	9	10	11	12	13	14	18	20	34	35	36	37	38	39	40	41	42	43	44
2003	Chinook by Week		335	2		207	118	26		38	130	33	12		*		*					563	1,655			
	Chinook Year-to-date		335	337		543	661	688		726	856	889	901		*		1,339					1,902	3,557			
	Pollock by Week		603	110		2,275	3,222	1,078		1,120	3,441	4,275	3,479		*		*					2,110	3,776			
	Pollock Year-to-date		603	713		2,988	6,209	7,287		8,407	11,848	16,122	19,602		*		25,405					27,514	31,290			
	Chinook per mt Pollock		0.56	0.02		0.09	0.04	0.02		0.03	0.04	0.01	0.00		1.22		0.07					0.27	0.44			
	Vessels		10	2		19	16	9		13	25	26	27		*		28					27	27			
	Processors		6	3		5	5	4		3	4	4	4		*		5					5	5			
2004	Chinook by Week		*	*	*	507	1,823	985		865	706	*					*	*	*	614		670	2,835	45	*	*
	Chinook Year-to-date		*	*	*	558	2,381	3,366		4,231	4,936	*					6,367	*	6,460	7,074		7,744	10,579	10,624	*	10,655
	Pollock by Week		*	*	*	2,101	4,204	1,532		7,371	8,570	*					*	*	*	2,849		1,451	3,214	624	*	*
	Pollock Year-to-date		*	*	*	2,256	6,460	7,992		15,363	23,933	*					28,590	*	29,330	32,179		33,630	36,844	37,468	*	38,311
	Chinook per mt Pollock		0.00	1.90	0.18	0.24	0.43	0.64		0.12	0.08	0.02					0.37	0.42	0.11	0.22		0.46	0.88	0.07	0.02	0.06
	Vessels		3	3	*	15	23	18		32	39	8					32	*	8	31		20	27	8	4	*
	Processors		*	*	*	6	7	6		6	6	*					7	*	3	6		6	6	4	3	*
2005	Chinook by Week			*	*	5,019	2,534	1,917	679	2,076	1,628	*							127	343	220	926	1,792	*	*	767
	Chinook Year-to-date			*	*	5,825	8,358	10,276	10,955	13,030	14,658	*							14,862	15,205	15,425	16,352	18,144	*	20,662	21,429
	Pollock by Week			*	*	3,462	3,925	6,293	3,566	6,715	10,226	*							847	1,697	1,215	1,688	3,527	*	*	641
	Pollock Year-to-date			*	*	3,986	7,911	14,204	17,770	24,485	34,710	*							36,204	37,902	39,117	40,805	44,332	*	46,161	46,802
	Chinook per mt Pollock			1.78	1.29	1.45	0.65	0.30	0.19	0.31	0.16	0.12							0.15	0.20	0.18	0.55	0.51	0.39	1.42	1.20
	Vessels			*	*	24	26	27	29	38	42	6							14	26	23	17	19	*	18	12
	Processors			*	*	6	6	6	6	6	6	*							4	6	6	6	6	*	6	4
2006	Chinook by Week	*	*	50	52	436	417	487	845	1,688	781			*		*	*	1,062	1,629	914	80	397	568	621	223	109
	Chinook Year-to-date	*	58	108	161	597	1,014	1,501	2,345	4,034	4,815			*		*	5,536	6,598	8,227	9,141	9,221	9,618	10,186	10,806	11,029	11,138
	Pollock by Week	*	*	291	449	3,960	2,461	3,706	5,013	9,180	3,181			*		*	*	1,772	1,324	1,377	574	1,097	1,509	2,062	979	262
	Pollock Year-to-date	*	339	629	1,078	5,037	7,498	11,204	16,217	25,397	28,577			*		*	31,345	33,117	34,441	35,818	36,391	37,488	38,997	41,058	42,037	42,299
	Chinook per mt Pollock	0.13	0.18	0.17	0.12	0.11	0.17	0.13	0.17	0.18	0.25			0.39		0.08	0.26	0.60	1.23	0.66	0.14	0.36	0.38	0.30	0.23	0.42
	Vessels	4	3	7	7	21	22	30	36	41	36			*		*	25	21	21	15	11	18	21	18	11	5
	Processors	*	3	5	5	6	6	6	6	6	6			*		*	6	6	6	6	5	6	6	6	5	5
2007	Chinook by Week		*		*		43	376	108	1,689	24,673	1,177						*	*	296	594	915	259	451	470	361
	Chinook Year-to-date		*		*		45	421	529	2,218	26,891	28,068						*	28,303	28,599	29,192	30,107	30,366	30,816	31,286	31,647
	Pollock by Week		*		*		1,660	2,369	2,680	3,209	8,058	4,547						*	*	1,182	1,720	1,283	737	970	1,298	823
	Pollock Year-to-date		*		*		1,748	4,118	6,797	10,006	18,064	22,610						*	24,192	25,374	27,094	28,377	29,114	30,084	31,382	32,205
	Chinook per mt Pollock		0.03		0.00		0.03	0.16	0.04	0.53	3.06	0.26						0.01	0.25	0.25	0.35	0.71	0.35	0.46	0.36	0.44
	Vessels		3		*		10	21	24	28	31	32						4	18	15	13	8	9	9	6	5
	Processors		*		*		5	6	6	6	6	6						*	6	6	6	4	6	6	3	3
2008	Chinook by Week		65	*		*	160	323	2,070	1,882	798	1,103						19		73		180	884	*	*	*
	Chinook Year-to-date		65	*		*	283	606	2,676	4,558	5,356	6,459						6,478		6,551		6,731	7,616	*	*	7,971
	Pollock by Week		264	*		*	2,403	2,751	3,029	4,229	3,156	3,763						665		2,852		1,266	4,616	*	*	*
	Pollock Year-to-date		264	*		*	2,778	5,529	8,558	12,787	15,943	19,706						20,371		23,223		24,489	29,104	*	*	30,769
	Chinook per mt Pollock		0.25	0.68		0.16	0.07	0.12	0.68	0.44	0.25	0.29						0.03		0.03		0.14	0.19	0.24	0.26	0.11
	Vessels		3	*		*	21	20	22	32	28	28						8		25		13	20	10	3	3
	Processors		3	*		*	6	6	5	7	6	6						4		8		6	7	4	*	*
2009	Chinook by Week		30	*	*	*	*	*	481	666							*					*	*			
	Chinook Year-to-date		30	*	*	*	*	*	706	1,372							*					*	2,123			
	Pollock by Week		527	*	*	*	*	*	4,399	9,289							*					*	*			
	Pollock Year-to-date		527	*	*	*	*	*	5,457	14,746							*					*	22,700			
	Chinook per mt Pollock		0.06	0.42	0.33	0.42	0.47	0.30	0.11	0.07							0.00					0.09	0.09			
	Vessels		8	*	*	*	*	*	27	32							*					31	*			
	Processors		6	*	*	*	*	*	7	7							*					6	*			
2010	Chinook by Week		*	*	34	184	1,030	2,163	496	131	66	608						226	1,195	1,061	342	2,477	1,257	824	196	
	Chinook Year-to-date		*	42	77	260	1,290	3,453	3,949	4,080	4,147	4,755						4,980	6,175	7,236	7,578	10,056	11,313	12,138	12,334	
	Pollock by Week		*	*	347	434	2,647	4,383	3,543	6,591	5,016	2,662						952	2,902	3,396	1,254	4,555	4,153	794	260	
	Pollock Year-to-date		*	144	491	925	3,572	7,955	11,499	18,089	23,105	25,768						26,720	29,621	33,017	34,272	38,827	42,980	43,773	44,033	
	Chinook per mt Pollock		0.99	0.00	0.10	0.42	0.39	0.49	0.14	0.02	0.01	0.23						0.24	0.41	0.31	0.27	0.54	0.30	1.04	0.75	
	Vessels		*	3	4	3	23	31	31	33	33	32						8	22	32	15	31	30	9	5	
	Processors		#	#	#	#	#	#	#	#	#	#						#	#	#	#	#	#	#	#	

Central Gulf (22,500 Chinook Salmon Cap): Shaded area shows when the cap associated with the smallest cap would be exceeded and a dark vertical line shows when the largest cap would be exceeded

		Week (week of the year - based landings date converted to week ending date reported in the NOAA Catch Accounting Data)																								
Year	Data	3	4	5	6	7	8	9	10	11	12	13	14	18	20	34	35	36	37	38	39	40	41	42	43	44
2003	Chinook by Week		335	2		207	118	26		38	130	33	12		*		*					563	1,655			
	Chinook Year-to-date		335	337		543	661	688		726	856	889	901		*		1,339					1,902	3,557			
	Pollock by Week		603	110		2,275	3,222	1,078		1,120	3,441	4,275	3,479		*		*					2,110	3,776			
	Pollock Year-to-date		603	713		2,988	6,209	7,287		8,407	11,848	16,122	19,602		*		25,405					27,514	31,290			
	Chinook per mt Pollock		0.56	0.02		0.09	0.04	0.02		0.03	0.04	0.01	0.00		1.22		0.07					0.27	0.44			
	Vessels		10	2		19	16	9		13	25	26	27		*		28					27	27			
	Processors		6	3		5	5	4		3	4	4	4		*		5					5	5			
2004	Chinook by Week		*	*	*	507	1,823	985		865	706	*					*	*	*	614		670	2,835	45	*	*
	Chinook Year-to-date		*	*	*	558	2,381	3,366		4,231	4,936	*					6,367	*	6,460	7,074		7,744	10,579	10,624	*	10,655
	Pollock by Week		*	*	*	2,101	4,204	1,532		7,371	8,570	*					*	*	*	2,849		1,451	3,214	624	*	*
	Pollock Year-to-date		*	*	*	2,256	6,460	7,992		15,363	23,933	*					28,590	*	29,330	32,179		33,630	36,844	37,468	*	38,311
	Chinook per mt Pollock		0.00	1.90	0.18	0.24	0.43	0.64		0.12	0.08	0.02					0.37	0.42	0.11	0.22		0.46	0.88	0.07	0.02	0.06
	Vessels		3	3	*	15	23	18		32	39	8					32	*	8	31		20	27	8	4	*
	Processors		*	*	*	6	7	6		6	6	*					7	*	3	6		6	6	4	3	*
2005	Chinook by Week			*	*	5,019	2,534	1,917	679	2,076	1,628	*							127	343	220	926	1,792	*	*	767
	Chinook Year-to-date			*	*	5,825	8,358	10,276	10,955	13,030	14,658	*							14,862	15,205	15,425	16,352	18,144	*	20,662	21,429
	Pollock by Week			*	*	3,462	3,925	6,293	3,566	6,715	10,226	*							847	1,697	1,215	1,688	3,527	*	*	641
	Pollock Year-to-date			*	*	3,986	7,911	14,204	17,770	24,485	34,710	*							36,204	37,902	39,117	40,805	44,332	*	46,161	46,802
	Chinook per mt Pollock			1.78	1.29	1.45	0.65	0.30	0.19	0.31	0.16	0.12							0.15	0.20	0.18	0.55	0.51	0.39	1.42	1.20
	Vessels			*	*	24	26	27	29	38	42	6							14	26	23	17	19	*	18	12
	Processors			*	*	6	6	6	6	6	6	*							4	6	6	6	6	*	6	4
2006	Chinook by Week	*	*	50	52	436	417	487	845	1,688	781			*		*	*	1,062	1,629	914	80	397	568	621	223	109
	Chinook Year-to-date	*	58	108	161	597	1,014	1,501	2,345	4,034	4,815			*		*	5,536	6,598	8,227	9,141	9,221	9,618	10,186	10,806	11,029	11,138
	Pollock by Week	*	*	291	449	3,960	2,461	3,706	5,013	9,180	3,181			*		*	*	1,772	1,324	1,377	574	1,097	1,509	2,062	979	262
	Pollock Year-to-date	*	339	629	1,078	5,037	7,498	11,204	16,217	25,397	28,577			*		*	31,345	33,117	34,441	35,818	36,391	37,488	38,997	41,058	42,037	42,299
	Chinook per mt Pollock	0.13	0.18	0.17	0.12	0.11	0.17	0.13	0.17	0.18	0.25			0.39		0.08	0.26	0.60	1.23	0.66	0.14	0.36	0.38	0.30	0.23	0.42
	Vessels	4	3	7	7	21	22	30	36	41	36			*		*	25	21	21	15	11	18	21	18	11	5
	Processors	*	3	5	5	6	6	6	6	6	6			*		*	6	6	6	6	5	6	6	6	5	5
2007	Chinook by Week		*		*		43	376	108	1,689	24,673	1,177						*	*	296	594	915	259	451	470	361
	Chinook Year-to-date		*		*		45	421	529	2,218	26,891	28,068						*	28,303	28,599	29,192	30,107	30,366	30,816	31,286	31,647
	Pollock by Week		*		*		1,660	2,369	2,680	3,209	8,058	4,547						*	*	1,182	1,720	1,283	737	970	1,298	823
	Pollock Year-to-date		*		*		1,748	4,118	6,797	10,006	18,064	22,610						*	24,192	25,374	27,094	28,377	29,114	30,084	31,382	32,205
	Chinook per mt Pollock		0.03		0.00		0.03	0.16	0.04	0.53	3.06	0.26						0.01	0.25	0.25	0.35	0.71	0.35	0.46	0.36	0.44
	Vessels		3		*		10	21	24	28	31	32						4	18	15	13	8	9	9	6	5
	Processors		*		*		5	6	6	6	6	6						*	6	6	6	4	6	6	3	3
2008	Chinook by Week		65	*		*	160	323	2,070	1,882	798	1,103						19		73		180	884	*	*	*
	Chinook Year-to-date		65	*		*	283	606	2,676	4,558	5,356	6,459						6,478		6,551		6,731	7,616	*	*	7,971
	Pollock by Week		264	*		*	2,403	2,751	3,029	4,229	3,156	3,763						665		2,852		1,266	4,616	*	*	*
	Pollock Year-to-date		264	*		*	2,778	5,529	8,558	12,787	15,943	19,706						20,371		23,223		24,489	29,104	*	*	30,769
	Chinook per mt Pollock		0.25	0.68		0.16	0.07	0.12	0.68	0.44	0.25	0.29						0.03		0.03		0.14	0.19	0.24	0.26	0.11
	Vessels		3	*		*	21	20	22	32	28	28						8		25		13	20	10	3	3
	Processors		3	*		*	6	6	5	7	6	6						4		8		6	7	4	*	*
2009	Chinook by Week		30	*	*	*	*	*	481	666							*					*	*			
	Chinook Year-to-date		30	*	*	*	*	*	706	1,372							*					*	2,123			
	Pollock by Week		527	*	*	*	*	*	4,399	9,289							*					*	*			
	Pollock Year-to-date		527	*	*	*	*	*	5,457	14,746							*					*	22,700			
	Chinook per mt Pollock		0.06	0.42	0.33	0.42	0.47	0.30	0.11	0.07							0.00					0.09	0.09			
	Vessels		8	*	*	*	*	*	27	32							*					31	*			
	Processors		6	*	*	*	*	*	7	7							*					6	*			
2010	Chinook by Week		*	*	34	184	1,030	2,163	496	131	66	608						226	1,195	1,061	342	2,477	1,257	824	196	
	Chinook Year-to-date		*	42	77	260	1,290	3,453	3,949	4,080	4,147	4,755						4,980	6,175	7,236	7,578	10,056	11,313	12,138	12,334	
	Pollock by Week		*	*	347	434	2,647	4,383	3,543	6,591	5,016	2,662						952	2,902	3,396	1,254	4,555	4,153	794	260	
	Pollock Year-to-date		*	144	491	925	3,572	7,955	11,499	18,089	23,105	25,768						26,720	29,621	33,017	34,272	38,827	42,980	43,773	44,033	
	Chinook per mt Pollock		0.99	0.00	0.10	0.42	0.39	0.49	0.14	0.02	0.01	0.23						0.24	0.41	0.31	0.27	0.54	0.30	1.04	0.75	
	Vessels		*	3	4	3	23	31	31	33	33	32						8	22	32	15	31	30	9	5	
	Processors		#	#	#	#	#	#	#	#	#	#						#	#	#	#	#	#	#	#	

Central Gulf (30,000 Chinook Salmon Cap): Shaded area shows when the cap associated with the smallest cap would be exceeded and a dark vertical line shows when the largest cap would be exceeded

		Week (week of the year - based landings date converted to week ending date reported in the NOAA Catch Accounting Data)																								
Year	Data	3	4	5	6	7	8	9	10	11	12	13	14	18	20	34	35	36	37	38	39	40	41	42	43	44
2003	Chinook by Week		335	2		207	118	26		38	130	33	12		*		*					563	1,655			
	Chinook Year-to-date		335	337		543	661	688		726	856	889	901		*		1,339					1,902	3,557			
	Pollock by Week		603	110		2,275	3,222	1,078		1,120	3,441	4,275	3,479		*		*					2,110	3,776			
	Polllock Year-to-date		603	713		2,988	6,209	7,287		8,407	11,848	16,122	19,602		*		25,405					27,514	31,290			
	Chinook per mt Pollock		0.56	0.02		0.09	0.04	0.02		0.03	0.04	0.01	0.00		1.22		0.07					0.27	0.44			
	Vessels		10	2		19	16	9		13	25	26	27		*		28					27	27			
	Processors		6	3		5	5	4		3	4	4	4		*		5					5	5			
2004	Chinook by Week		*	*	*	507	1,823	985		865	706	*					*	*	*	614		670	2,835	45	*	*
	Chinook Year-to-date		*	*	*	558	2,381	3,366		4,231	4,936	*					6,367	*	6,460	7,074		7,744	10,579	10,624	*	10,655
	Pollock by Week		*	*	*	2,101	4,204	1,532		7,371	8,570	*					*	*	*	2,849		1,451	3,214	624	*	*
	Polllock Year-to-date		*	*	*	2,256	6,460	7,992		15,363	23,933	*					28,590	*	29,330	32,179		33,630	36,844	37,468	*	38,311
	Chinook per mt Pollock		0.00	1.90	0.18	0.24	0.43	0.64		0.12	0.08	0.02					0.37	0.42	0.11	0.22		0.46	0.88	0.07	0.02	0.06
	Vessels		3	3	*	15	23	18		32	39	8					32	*	8	31		20	27	8	4	*
	Processors		*	*	*	6	7	6		6	6	*					7	*	3	6		6	6	4	3	*
2005	Chinook by Week			*	*	5,019	2,534	1,917	679	2,076	1,628	*							127	343	220	926	1,792	*	*	767
	Chinook Year-to-date			*	*	5,825	8,358	10,276	10,955	13,030	14,658	*							14,862	15,205	15,425	16,352	18,144	*	20,662	21,429
	Pollock by Week			*	*	3,462	3,925	6,293	3,566	6,715	10,226	*							847	1,697	1,215	1,688	3,527	*	*	641
	Polllock Year-to-date			*	*	3,986	7,911	14,204	17,770	24,485	34,710	*							36,204	37,902	39,117	40,805	44,332	*	46,161	46,802
	Chinook per mt Pollock			1.78	1.29	1.45	0.65	0.30	0.19	0.31	0.16	0.12							0.15	0.20	0.18	0.55	0.51	0.39	1.42	1.20
	Vessels			*	*	24	26	27	29	38	42	6							14	26	23	17	19	*	18	12
	Processors			*	*	6	6	6	6	6	6	*							4	6	6	6	6	*	6	4
2006	Chinook by Week	*	*	50	52	436	417	487	845	1,688	781			*		*	*	1,062	1,629	914	80	397	568	621	223	109
	Chinook Year-to-date	*	58	108	161	597	1,014	1,501	2,345	4,034	4,815			*		*	5,536	6,598	8,227	9,141	9,221	9,618	10,186	10,806	11,029	11,138
	Pollock by Week	*	*	291	449	3,960	2,461	3,706	5,013	9,180	3,181			*		*	*	1,772	1,324	1,377	574	1,097	1,509	2,062	979	262
	Polllock Year-to-date	*	339	629	1,078	5,037	7,498	11,204	16,217	25,397	28,577			*		*	31,345	33,117	34,441	35,818	36,391	37,488	38,997	41,058	42,037	42,299
	Chinook per mt Pollock	0.13	0.18	0.17	0.12	0.11	0.17	0.13	0.17	0.18	0.25			0.39		0.08	0.26	0.60	1.23	0.66	0.14	0.36	0.38	0.30	0.23	0.42
	Vessels	4	3	7	7	21	22	30	36	41	36			*		*	25	21	21	15	11	18	21	18	11	5
	Processors	*	3	5	5	6	6	6	6	6	6			*		*	6	6	6	6	5	6	6	6	5	5
2007	Chinook by Week		*		*		43	376	108	1,689	24,673	1,177						*	*	296	594	915	259	451	470	361
	Chinook Year-to-date		*		*		45	421	529	2,218	26,891	28,068						*	28,303	28,599	29,192	30,107	30,366	30,816	31,286	31,647
	Pollock by Week		*		*		1,660	2,369	2,680	3,209	8,058	4,547						*	*	1,182	1,720	1,283	737	970	1,298	823
	Polllock Year-to-date		*		*		1,748	4,118	6,797	10,006	18,064	22,610						*	24,192	25,374	27,094	28,377	29,114	30,084	31,382	32,205
	Chinook per mt Pollock		0.03		0.00		0.03	0.16	0.04	0.53	3.06	0.26						0.01	0.25	0.25	0.35	0.71	0.35	0.46	0.36	0.44
	Vessels		3		*		10	21	24	28	31	32						4	18	15	13	8	9	9	6	5
	Processors		*		*		5	6	6	6	6	6						*	6	6	6	4	6	6	3	3
2008	Chinook by Week		65	*		*	160	323	2,070	1,882	798	1,103						19		73		180	884	*	*	*
	Chinook Year-to-date		65	*		*	283	606	2,676	4,558	5,356	6,459						6,478		6,551		6,731	7,616	*	*	7,971
	Pollock by Week		264	*		*	2,403	2,751	3,029	4,229	3,156	3,763						665		2,852		1,266	4,616	*	*	*
	Polllock Year-to-date		264	*		*	2,778	5,529	8,558	12,787	15,943	19,706						20,371		23,223		24,489	29,104	*	*	30,769
	Chinook per mt Pollock		0.25	0.68		0.16	0.07	0.12	0.68	0.44	0.25	0.29						0.03		0.03		0.14	0.19	0.24	0.26	0.11
	Vessels		3	*		*	21	20	22	32	28	28						8		25		13	20	10	3	3
	Processors		3	*		*	6	6	5	7	6	6						4		8		6	7	4	*	*
2009	Chinook by Week		30	*	*	*	*	*	481	666							*					*	*			
	Chinook Year-to-date		30	*	*	*	*	*	706	1,372							*					*	2,123			
	Pollock by Week		527	*	*	*	*	*	4,399	9,289							*					*	*			
	Polllock Year-to-date		527	*	*	*	*	*	5,457	14,746							*					*	22,700			
	Chinook per mt Pollock		0.06	0.42	0.33	0.42	0.47	0.30	0.11	0.07							0.00					0.09	0.09			
	Vessels		8	*	*	*	*	*	27	32							*					31	*			
	Processors		6	*	*	*	*	*	7	7							*					6	*			
2010	Chinook by Week		*	*	34	184	1,030	2,163	496	131	66	608						226	1,195	1,061	342	2,477	1,257	824	196	
	Chinook Year-to-date		*	42	77	260	1,290	3,453	3,949	4,080	4,147	4,755						4,980	6,175	7,236	7,578	10,056	11,313	12,138	12,334	
	Pollock by Week		*	*	347	434	2,647	4,383	3,543	6,591	5,016	2,662						952	2,902	3,396	1,254	4,555	4,153	794	260	
	Polllock Year-to-date		*	144	491	925	3,572	7,955	11,499	18,089	23,105	25,768						26,720	29,621	33,017	34,272	38,827	42,980	43,773	44,033	
	Chinook per mt Pollock		0.99	0.00	0.10	0.42	0.39	0.49	0.14	0.02	0.01	0.23						0.24	0.41	0.31	0.27	0.54	0.30	1.04	0.75	
	Vessels		*	3	4	3	23	31	31	33	33	32						8	22	32	15	31	30	9	5	
	Processors		#	#	#	#	#	#	#	#	#	#						#	#	#	#	#	#	#	#	

Western Gulf (15,000 Chinook Salmon Cap): Shaded area shows when the cap associated with the smallest cap would be exceeded and a dark vertical line shows when the largest cap would be exceeded

		Week (week of the year - based on landings date converted to week ending date reported in the NOAA Catch Accounting Data)																								
Year	Data	3	4	5	6	7	8	9	10	11	12	13	14	15	16	34	35	36	37	38	39	40	41	42	43	44
2003	Chinook by Week		72							*	*	*				*	548					80				
	Chinook Year-to-date		72							*	*	*				*	658					738				
	Pollock by Week		4,174							*	*	*				*	5,872					4,645				
	Pollock Year-to-date		4,174							*	*	*				*	11,325					15,970				
	Chinook per mt Pollock		0.02							0.02	0.02	0.04				0.09	0.09					0.02				
	Vessels		27							*	5	5				*	18					18				
	Processors		3							*	*	*				*	4					4				
2004	Chinook by Week		*							*							69	16	*			449	833	274		
	Chinook Year-to-date		*							*							755	771	*			1,220	2,053	2,327		
	Pollock by Week		*							*							5,699	1,834	*			2,663	4,091	1,003		
	Pollock Year-to-date		*							*							13,505	15,338	*			18,030	22,121	23,124		
	Chinook per mt Pollock		0.06							0.12							0.01	0.01	0.00			0.17	0.20	0.27		
	Vessels		20							10							19	16	*			17	19	14		
	Processors		*							*							4	3	*			4	4	4		
2005	Chinook by Week		234	94						*							121	264				213	2,245	2,166		
	Chinook Year-to-date		234	329						*							1,062	1,327				1,539	3,785	5,951		
	Pollock by Week		5,639	1,672						*							3,265	5,847				1,605	5,274	5,251		
	Pollock Year-to-date		5,639	7,311						*							12,779	18,626				20,231	25,505	30,756		
	Chinook per mt Pollock		0.04	0.06						0.28							0.04	0.05				0.13	0.43	0.41		
	Vessels		22	16						11							20	21				24	24	22		
	Processors		3	3						*							3	3				4	4	4		
2006	Chinook by Week	*	*						120	180						*	*	*	*	118	63	486	515	139	*	*
	Chinook Year-to-date	*	*						1,938	2,118						*	*	*	*	2,508	2,571	3,057	3,572	3,712	*	4,529
	Pollock by Week	*	*						3,185	4,627						*	*	*	*	2,087	591	2,904	1,859	394	*	*
	Pollock Year-to-date	*	*						7,391	12,019						*	*	*	*	17,673	18,264	21,167	23,026	23,421	*	24,427
	Chinook per mt Pollock	0.42	0.45						0.04	0.04						0.03	0.07	0.10	0.09	0.06	0.11	0.17	0.28	0.35	1.14	0.08
	Vessels	22	20						17	18						13	13	11	9	13	10	20	18	10	3	2
	Processors	*	*						3	3						*	*	*	*	3	3	3	3	3	*	*
2007	Chinook by Week	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
	Chinook Year-to-date	*	*		1,212				*	*	1,671					*	*	*	*	*	*	*	*	*	*	3,359
	Pollock by Week	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
	Pollock Year-to-date	*	*		3,327				*	*	8,670					*	*	*	*	*	*	*	*	*	*	17,303
	Chinook per mt Pollock	0.14	0.12		0.49				0.01	0.02	0.18					0.04	0.09	0.00	0.17	0.03	0.08	0.08	0.14	0.32	0.36	0.39
	Vessels	20	12		13				4	12	10					8	7	*	*	3	4	6	8	9	7	4
	Processors	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
2008	Chinook by Week		*						*	*	*	*	*	*	*		166	*				358	*	*		
	Chinook Year-to-date		*						*	*	*	*	*	*	*		1,360	*				1,850	*	2,116		
	Pollock by Week		*						*	*	*	*	*	*	*		2,887	*				3,721	*	*		
	Pollock Year-to-date		*						*	*	*	*	*	*	*		6,956	*				12,733	*	14,828		
	Chinook per mt Pollock		0.16						0.31	0.55	0.76	0.64	0.08	0.11	0.01		0.06	0.06				0.10	0.12	0.16		
	Vessels		4						14	4	4	3	6	7	*		11	10				14	13	11		
	Processors		*						*	*	*	*	*	*	*		3	*				3	3	*		
2009	Chinook by Week		*						*	110							33	*				111	67			
	Chinook Year-to-date		*						*	217							249	*				374	441			
	Pollock by Week		*						*	2,853							2,387	*				2,912	1,979			
	Pollock Year-to-date		*						*	6,021							8,408	*				12,031	14,010			
	Chinook per mt Pollock		0.13						0.03	0.04							0.01	0.02				0.04	0.03			
	Vessels		4						15	17							19	11				18	17			
	Processors		*						*	3							4	*				3	3			
2010	Chinook by Week		91	238	409	51	18	143		198	151	35	120	304	*		*	825	643			3,038	21,064	3,921		
	Chinook Year-to-date		91	329	738	789	807	950		1,148	1,299	1,334	1,454	1,758	*		2,091	2,915	3,558			6,596	27,660	31,581		
	Pollock by Week		229	714	1,884	813	445	796		1,078	921	209	667	1,965	*		*	4,251	2,934			1,090	5,363	757		
	Pollock Year-to-date		229	942	2,826	3,640	4,085	4,881		5,959	6,880	7,089	7,755	9,720	*		11,371	15,622	18,556			19,646	25,009	25,766		
	Chinook per mt Pollock		0.40	0.33	0.22	0.06	0.04	0.18		0.18	0.16	0.17	0.18	0.15	0.06		0.20	0.19	0.22			2.79	3.93	5.18		
	Vessels		6	8	17	14	8	9		13	9	6	7	16	*		18	20	17			20	20	13		
	Processors		#	#	#	#	#	#		#	#	#	#	#	#		#	#	#			#	#	#		

Western Gulf (22,500 Chinook Salmon Cap): Shaded area shows when the cap associated with the smallest cap would be exceeded and a dark vertical line shows when the largest cap would be exceeded

		Week (week of the year - based on landings date converted to week ending date reported in the NOAA Catch Accounting Data)																								
Year	Data	3	4	5	6	7	8	9	10	11	12	13	14	15	16	34	35	36	37	38	39	40	41	42	43	44
2003	Chinook by Week		72							*	*	*				*	548					80				
	Chinook Year-to-date		72							*	*	*				*	658					738				
	Pollock by Week		4,174							*	*	*				*	5,872					4,645				
	Pollock Year-to-date		4,174							*	*	*				*	11,325					15,970				
	Chinook per mt Pollock		0.02							0.02	0.02	0.04				0.09	0.09					0.02				
	Vessels		27							*	5	5				*	18					18				
	Processors		3							*	*	*				*	4					4				
2004	Chinook by Week		*							*							69	16	*			449	833	274		
	Chinook Year-to-date		*							*							755	771	*			1,220	2,053	2,327		
	Pollock by Week		*							*							5,699	1,834	*			2,663	4,091	1,003		
	Pollock Year-to-date		*							*							13,505	15,338	*			18,030	22,121	23,124		
	Chinook per mt Pollock		0.06							0.12							0.01	0.01	0.00			0.17	0.20	0.27		
	Vessels		20							10							19	16	*			17	19	14		
	Processors		*							*							4	3	*			4	4	4		
2005	Chinook by Week		234	94						*							121	264				213	2,245	2,166		
	Chinook Year-to-date		234	329						*							1,062	1,327				1,539	3,785	5,951		
	Pollock by Week		5,639	1,672						*							3,265	5,847				1,605	5,274	5,251		
	Pollock Year-to-date		5,639	7,311						*							12,779	18,626				20,231	25,505	30,756		
	Chinook per mt Pollock		0.04	0.06						0.28							0.04	0.05				0.13	0.43	0.41		
	Vessels		22	16						11							20	21				24	24	22		
	Processors		3	3						*							3	3				4	4	4		
2006	Chinook by Week	*	*						120	180						*	*	*	*	118	63	486	515	139	*	*
	Chinook Year-to-date	*	*						1,938	2,118						*	*	*	*	2,508	2,571	3,057	3,572	3,712	*	4,529
	Pollock by Week	*	*						3,185	4,627						*	*	*	*	2,087	591	2,904	1,859	394	*	*
	Pollock Year-to-date	*	*						7,391	12,019						*	*	*	*	17,673	18,264	21,167	23,026	23,421	*	24,427
	Chinook per mt Pollock	0.42	0.45						0.04	0.04						0.03	0.07	0.10	0.09	0.06	0.11	0.17	0.28	0.35	1.14	0.08
	Vessels	22	20						17	18						13	13	11	9	13	10	20	18	10	3	2
	Processors	*	*						3	3						*	*	*	*	3	3	3	3	3	*	*
2007	Chinook by Week	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
	Chinook Year-to-date	*	*		1,212				*	*	1,671					*	*	*	*	*	*	*	*	*	*	3,359
	Pollock by Week	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
	Pollock Year-to-date	*	*		3,327				*	*	8,670					*	*	*	*	*	*	*	*	*	*	17,303
	Chinook per mt Pollock	0.14	0.12		0.49				0.01	0.02	0.18					0.04	0.09	0.00	0.17	0.03	0.08	0.08	0.14	0.32	0.36	0.39
	Vessels	20	12		13				4	12	10					8	7	*	*	3	4	6	8	9	7	4
	Processors	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
2008	Chinook by Week		*						*	*	*	*	*	*	*		166	*				358	*	*		
	Chinook Year-to-date		*						*	*	*	*	*	*	*		1,360	*				1,850	*	2,116		
	Pollock by Week		*						*	*	*	*	*	*	*		2,887	*				3,721	*	*		
	Pollock Year-to-date		*						*	*	*	*	*	*	*		6,956	*				12,733	*	14,828		
	Chinook per mt Pollock		0.16						0.31	0.55	0.76	0.64	0.08	0.11	0.01		0.06	0.06				0.10	0.12	0.16		
	Vessels		4						14	4	4	3	6	7	*		11	10				14	13	11		
	Processors		*						*	*	*	*	*	*	*		3	*				3	3	*		
2009	Chinook by Week		*						*	110							33	*				111	67			
	Chinook Year-to-date		*						*	217							249	*				374	441			
	Pollock by Week		*						*	2,853							2,387	*				2,912	1,979			
	Pollock Year-to-date		*						*	6,021							8,408	*				12,031	14,010			
	Chinook per mt Pollock		0.13						0.03	0.04							0.01	0.02				0.04	0.03			
	Vessels		4						15	17							19	11				18	17			
	Processors		*						*	3							4	*				3	3			
2010	Chinook by Week		91	238	409	51	18	143		198	151	35	120	304	*		*	825	643			3,038	21,064	3,921		
	Chinook Year-to-date		91	329	738	789	807	950		1,148	1,299	1,334	1,454	1,758	*		2,091	2,915	3,558			6,596	27,660	31,581		
	Pollock by Week		229	714	1,884	813	445	796		1,078	921	209	667	1,965	*		*	4,251	2,934			1,090	5,363	757		
	Pollock Year-to-date		229	942	2,826	3,640	4,085	4,881		5,959	6,880	7,089	7,755	9,720	*		11,371	15,622	18,556			19,646	25,009	25,766		
	Chinook per mt Pollock		0.40	0.33	0.22	0.06	0.04	0.18		0.18	0.16	0.17	0.18	0.15	0.06		0.20	0.19	0.22			2.79	3.93	5.18		
	Vessels		6	8	17	14	8	9		13	9	6	7	16	*		18	20	17			20	20	13		
	Processors		#	#	#	#	#	#		#	#	#	#	#	#		#	#	#			#	#	#		

Western Gulf (30,000 Chinook Salmon Cap): Shaded area shows when the cap associated with the smallest cap would be exceeded and a dark vertical line shows when the largest cap would be exceeded

		Week (week of the year - based on landings date converted to week ending date reported in the NOAA Catch Accounting Data)																								
Year	Data	3	4	5	6	7	8	9	10	11	12	13	14	15	16	34	35	36	37	38	39	40	41	42	43	44
2003	Chinook by Week		72							*	*	*				*	548					80				
	Chinook Year-to-date		72							*	*	*				*	658					738				
	Pollock by Week		4,174							*	*	*				*	5,872					4,645				
	Polllock Year-to-date		4,174							*	*	*				*	11,325					15,970				
	Chinook per mt Pollock		0.02							0.02	0.02	0.04				0.09	0.09					0.02				
	Vessels		27							*	5	5				*	18					18				
	Processors		3							*	*	*				*	4					4				
2004	Chinook by Week		*							*							69	16	*			449	833	274		
	Chinook Year-to-date		*							*							755	771	*			1,220	2,053	2,327		
	Pollock by Week		*							*							5,699	1,834	*			2,663	4,091	1,003		
	Polllock Year-to-date		*							*							13,505	15,338	*			18,030	22,121	23,124		
	Chinook per mt Pollock		0.06							0.12							0.01	0.01	0.00			0.17	0.20	0.27		
	Vessels		20							10							19	16	*			17	19	14		
	Processors		*							*							4	3	*			4	4	4		
2005	Chinook by Week		234	94						*							121	264				213	2,245	2,166		
	Chinook Year-to-date		234	329						*							1,062	1,327				1,539	3,785	5,951		
	Pollock by Week		5,639	1,672						*							3,265	5,847				1,605	5,274	5,251		
	Polllock Year-to-date		5,639	7,311						*							12,779	18,626				20,231	25,505	30,756		
	Chinook per mt Pollock		0.04	0.06						0.28							0.04	0.05				0.13	0.43	0.41		
	Vessels		22	16						11							20	21				24	24	22		
	Processors		3	3						*							3	3				4	4	4		
2006	Chinook by Week	*	*						120	180						*	*	*	*	118	63	486	515	139	*	*
	Chinook Year-to-date	*	*						1,938	2,118						*	*	*	*	2,508	2,571	3,057	3,572	3,712	*	4,529
	Pollock by Week	*	*						3,185	4,627						*	*	*	*	2,087	591	2,904	1,859	394	*	*
	Polllock Year-to-date	*	*						7,391	12,019						*	*	*	*	17,673	18,264	21,167	23,026	23,421	*	24,427
	Chinook per mt Pollock	0.42	0.45						0.04	0.04						0.03	0.07	0.10	0.09	0.06	0.11	0.17	0.28	0.35	1.14	0.08
	Vessels	22	20						17	18						13	13	11	9	13	10	20	18	10	3	*
	Processors	*	*						3	3						*	*	*	*	3	3	3	3	3	*	*
2007	Chinook by Week	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
	Chinook Year-to-date	*	*		1,212				*	*	1,671					*	*	*	*	*	*	*	*	*	*	3,359
	Pollock by Week	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
	Polllock Year-to-date	*	*		3,327				*	*	8,670					*	*	*	*	*	*	*	*	*	*	17,303
	Chinook per mt Pollock	0.14	0.12		0.49				0.01	0.02	0.18					0.04	0.09	0.00	0.17	0.03	0.08	0.08	0.14	0.32	0.36	0.39
	Vessels	20	12		13				4	12	10					8	7	*	*	3	4	6	8	9	7	4
	Processors	*	*		*				*	*	*					*	*	*	*	*	*	*	*	*	*	*
2008	Chinook by Week		*						*	*	*	*	*	*	*		166	*				358	*	*		
	Chinook Year-to-date		*						*	*	*	*	*	*	*		1,360	*				1,850	*	2,116		
	Pollock by Week		*						*	*	*	*	*	*	*		2,887	*				3,721	*	*		
	Polllock Year-to-date		*						*	*	*	*	*	*	*		6,956	*				12,733	*	14,828		
	Chinook per mt Pollock		0.16						0.31	0.55	0.76	0.64	0.08	0.11	0.01		0.06	0.06				0.10	0.12	0.16		
	Vessels		4						14	4	4	3	6	7	*		11	10				14	13	11		
	Processors		*						*	*	*	*	*	*	*		3	*				3	3	*		
2009	Chinook by Week		*						*	110							33	*				111	67			
	Chinook Year-to-date		*						*	217							249	*				374	441			
	Pollock by Week		*						*	2,853							2,387	*				2,912	1,979			
	Polllock Year-to-date		*						*	6,021							8,408	*				12,031	14,010			
	Chinook per mt Pollock		0.13						0.03	0.04							0.01	0.02				0.04	0.03			
	Vessels		4						15	17							19	11				18	17			
	Processors		*						*	3							4	*				3	3			
2010	Chinook by Week		91	238	409	51	18	143		198	151	35	120	304	*		*	825	643			3,038	21,064	3,921		
	Chinook Year-to-date		91	329	738	789	807	950		1,148	1,299	1,334	1,454	1,758	*		2,091	2,915	3,558			6,596	27,660	31,581		
	Pollock by Week		229	714	1,884	813	445	796		1,078	921	209	667	1,965	*		*	4,251	2,934			1,090	5,363	757		
	Polllock Year-to-date		229	942	2,826	3,640	4,085	4,881		5,959	6,880	7,089	7,755	9,720	*		11,371	15,622	18,556			19,646	25,009	25,766		
	Chinook per mt Pollock		0.40	0.33	0.22	0.06	0.04	0.18		0.18	0.16	0.17	0.18	0.15	0.06		0.20	0.19	0.22			2.79	3.93	5.18		
	Vessels		6	8	17	14	8	9		13	9	6	7	16	*		18	20	17			20	20	13		
	Processors		#	#	#	#	#	#		#	#	#	#	#	#		#	#	#			#	#	#		

Appendix 4 Estimated Daily Cost of Observers on 30% Vessels Operating out of King Cove & Sand Point

2009 GOA pollock fishery (vessels < 60 ft):

- During the 1st Quarter (January March) of 2009, 15 vessels participated between week ending dates 01/24 and 03/14.
- During the 2nd Quarter (April June) of 2009, no vessels participated in the fishery.
- During the 3rd Quarter (July September) of 2009, 13 vessels participated between week ending dates 08/29 and 09/05.
- During the 4th Quarter (October December) of 2009, 14 vessels participated between week ending dates 10/03 and 10/10.

Assumptions: (see notes 1-3 below)

Average daily fee per observer currently paid by 30% vessels: $325
Average cost of one round trip airfare between Seattle and King Cove/Sand Point: $1,100
Average cost per observer for occasional miscellaneous charges other than airfare: $452
Average number of travel/port days per observer, charged at the daily fee: 2

Calculations:

Step 1: In 2009, estimated observer deployment would have consisted of:
Estimated total number of observers needed for 3 quarters: 12 (*see note 4 below*)
Total observer deployment days needed to achieve 30% coverage = 107

Step 2: Add two additional days per observer for travel/port time:
12 observers x 2 days = 24 days
Add travel/port & deployment days to calculate total days charged at daily fee:
107 days + 24 days = 131 observer days

Step 3: Roundtrip airfare between Seattle and King Cove/Sand Point = $1,100
Average cost per observer for occasional miscellaneous costs other than airfare = $452
Total average cost of airfare and misc costs per observer: $1,552

Step 4: $1,552 x 12 observers per year = $18,624

Step 5: $18,624 ÷ 131 observer days per year = $142.17/day

Step 6: Average Daily fee: $325
Daily cost of airfare and misc. charges: $142.17
$325 + $142.17 = $467.17

Total estimated daily cost of observers on 30% vessels operating out of King Cove & Sand Point:

$467.17

Notes:

1. Numbers were calculated from example copies of 2010 observer provider industry contracts and an interview of observer providers conducted by NMFS staff (Bob Maier) in February, 2010. Details of the calculation cannot be shown due to confidentiality.
2. Examples of miscellaneous costs include ground transportation, excess baggage, lodging, meals, etc.
3. Airfare represents the cost of two, one-way tickets because date of observer's return in not known in advance.
4. Total estimated observers and total deployment days were calculated using the actual number of distinct vessels under 60 ft. that operated per quarter in the GOA Pollock fishery in 2009. The estimate also took into consideration the current NMFS regulations that limit each observer to working on not more than 4 vessels in a 90 day period.

Appendix 5 Chapter 3 of the Pacific Salmon Treaty

The provisions of this Chapter shall apply for the period 2009 through 2018.

1. The Parties agree that:

(a) Chinook salmon stocks subject to the Pacific Salmon Treaty have varying levels of status with many being healthy and meeting goals for long-term production while others have been identified as conservation concerns, including some in the U.S. Pacific Northwest that have been listed under the U.S. Endangered Species Act;

(b) fishery management measures implemented under the Treaty are appropriate for recovering, maintaining and protecting salmon stocks in Canada and the United States;

(c) while fishing has contributed to the decline of many stocks of concern, the continued depressed status of these stocks generally reflects the long-term cumulative effects of other factors, particularly chronic habitat degradation, in some instances deleterious hatchery practices, and cyclic natural phenomena which may be exacerbated by climate change;

(d) successful Chinook salmon conservation, restoration and harvest management depends on a sustained and bilaterally coordinated program of resource protection, restoration, enhancement, and utilization based upon:

- (i) science-based fishery management regimes that foster healthy and abundant Chinook salmon stocks by contributing to the restoration and rebuilding of depressed natural stocks while providing sustainable harvest opportunities on abundant stocks;
- (ii) implementation of protective and remedial actions identified in local and regional recovery planning processes that address non-fishing factors limiting the abundance, productivity, genetic diversity or spatial structure of natural salmon stocks; and
- (iii) scientifically sound enhancement activities that provide mitigation to fisheries for habitat loss or degradation and/or improve productivity through the appropriate use of artificial propagation and supplementation techniques;

(e) a healthy and productive Chinook salmon resource will impart sustainable benefits for the fisheries of both Parties, contribute other social, economic, and cultural benefits to the people of both Parties, and provide ecosystem benefits to other species;

(f) the harvest levels and other fishery management approaches to target healthy natural and hatchery stocks while constraining impacts on depressed natural stocks, including various spatial and temporal fishery shaping measures that are bilaterally coordinated as necessary, coupled with improvements in fishery management programs prescribed or referenced in this Chapter, are intended to complement recovery actions being undertaken in the fishing and non-fishing sectors in each country.

2. The Parties shall:

(a) implement a comprehensive and coordinated Chinook salmon fishery management program that:

- (i) utilizes an abundance-based framework for managing all Chinook salmon fisheries subject to the Treaty;
- (ii) continues harvest regimes based on annual estimates of abundance that are responsive to changes in production, take into account all fishery induced mortalities and designed to meet MSY or other agreed biologically-based escapement and/or harvest rate objectives; with the understanding that harvest rate management is designed to provide a desired range of escapements over time;
- (iii) contributes to the improvement in trends in spawning escapements of depressed Chinook salmon stocks and is consistent with improved salmon production;
- (iv) seeks to sustain stocks at healthy and productive levels by ensuring that stocks achieve MSY or other agreed biologically-based escapement and/or harvest rate objectives;
- (v) considers the limitations of regulatory systems;

(vi) seeks to preserve biological diversity of the Chinook salmon resource and contributes to restoration of currently depressed stocks by improving the abundance, productivity, genetic diversity and spatial structure of stocks over time;
(vii) specifies fishery management obligations for maintaining healthy stocks, rebuilding depressed naturally spawning stocks and providing a means for sharing the harvest and the conservation responsibility for Chinook salmon stocks coast-wide among the Parties;
(viii) develops additional biological information pursuant to an agreed program of work and incorporates that information into the coastwide management regime, and considers the latest scientific information developed in each country's recovery planning processes;
(ix) includes procedures for changes in management agreed to by the Commission based on scientific advice provided by the Chinook salmon Technical Committee (CTC); and
(x) includes a commitment to discuss within the Commission significant management changes that a Party is considering that may alter the stock or age composition of a fishery regime's catch;

(b) maintain a joint Chinook salmon Technical Committee (the "CTC") reporting, unless otherwise agreed, to the Pacific Salmon Commission, which shall, inter alia,:
(i) evaluate management actions for their consistency with measures set out in this Chapter, and for their potential effectiveness in attaining the specified objectives;
(ii) report annually on catches, harvest rate indices, estimates of incidental mortality and exploitation rates for all Chinook salmon fisheries and stocks harvested within the Treaty area;
(iii) report annually on the escapement of naturally spawning Chinook salmon stocks in relation to the agreed escapement objectives referred to below, evaluate trends in the status of stocks and report on progress in the rebuilding of naturally spawning Chinook salmon stocks;
(iv) evaluate and review existing escapement objectives that fishery management agencies have set for Chinook salmon stocks subject to this Chapter for consistency with MSY or other agreed biologically-based escapement goals and, where needed, recommend goals for naturally spawning Chinook salmon stocks that are consistent with the intent of this Chapter;
(v) recommend standards for the minimum assessment program required to effectively implement this Chapter, provide information on stock assessments relative to these standards and recommend to the Commission any needed improvements in stock assessments;
(vi) review effects of enhancement programs on abundance-based management regimes and recommend strategies for the effective utilization of enhanced stocks;
(vii) recommend research projects, and their associated costs, required to implement this Chapter effectively;
(viii) exchange information necessary to analyze the effectiveness of alternative fishery regulatory measures to satisfy conservation objectives;
(ix) provide a yearly report to the Commission that details the progress in assessment and monitoring for each stock in the Sentinel Stocks Program;
(x) provide a yearly report to the Commission that details the progress in implementing improvements to the CWT program in the treaty area as a result of recommendations from the CWT workgroup;
(xi) provide a yearly report to the Commission that compiles information from the management agencies regarding the conduct and stock specific impacts of any mark-selective fisheries for Chinook salmon in the treaty area, pending bilateral resolution of outstanding technical issues (e.g., methods for estimating incidental mortalities); and
(xii) undertake specific assignments such as those described in Appendix A to this Chapter;

3. Subject to the provision of funding by the Parties ($7.5 million ($C) from Canada and $41.5 million (U.S.) from the United States) for the specific purposes and in the amounts identified in this paragraph and paragraphs 4 and 5, below, and a commitment of $10 million (U.S.) ($2.0 million (U.S.)per year for five years, beginning in 2009) from the Northern Boundary and Transboundary Rivers Restoration and Enhancement Fund and the Southern Boundary Restoration and Enhancement

Fund by the Northern Fund Committee and the Southern Fund Committee, respectively, the Parties agree:

(a) to implement through their respective domestic management authorities a five-year research program (Sentinel Stocks Program) utilizing approximately $2.0 million (U.S.) annually provided by the Northern and Southern Funds as follows:
   (i) the purpose of the program shall be to improve the estimates of escapements of selected Chinook salmon populations in British Columbia, Washington State and Oregon;
   (ii) the Commission shall select a bilateral body of scientists to recommend to the Commission and the Fund Committees how best to utilize these funds for the purposes identified herein;
   (iii) the program shall focus on estimating the escapements of a limited number of stocks consistent with standards to be developed by the bilateral CTC; and
   (iv) stocks shall include a limited number of escapement indicator stocks for the North Oregon coast, Puget Sound (one of which shall be the Stillaguamish River), west coast of Vancouver Island, northern British Columbia and Fraser River;

(b) to provide $7.5 million each in their respective currencies, subject to the availability of funds to implement over a five year period beginning no later than 2010 within their respective jurisdictions critical improvements to the coast wide coded wire tagging program operated by their respective management agencies. The Commission shall select a bilateral body to recommend funding of specific action items identified in the Pacific Salmon Commission Technical Report Number 25 that are priority uses of these funds to improve the precision and accuracy of statistics such as abundance, exploitation rates, survival estimates, etc. for Chinook salmon used by the CTC in support of this Chapter; and

(c) that up to $1.0 million (U.S.) would be made available by the United States Section (using funds appropriated by Congress to implement the U.S. Chinook salmon Agreement) to implement over a two year period beginning in 2009, with guidance from the CTC, specific measures to improve the bilateral Chinook salmon model and related management tools used by the CTC to support implementation of this Chapter.

4. The Parties agree that $30 million (U.S.) of the funding to be provided by the United States identified in paragraph 3, above, is to be made available to Canada to assist in the implementation of this Chapter. Specifically, $15 million (U.S.) is to be provided in each of two U.S. fiscal years from 2009 to 2011, inclusive, or sooner (for a total of $30 million U.S.), with the following understandings:

(a) the bulk of this funding would be used by Canada for a fishery mitigation program designed, among other purposes, to reduce effort in its commercial salmon troll fishery; and

(b) Canada will inform the Commission as to how this funding was utilized in support of the mitigation program within two years of receiving such funding.

5. The Parties agree that the feasibility and effectiveness of mark-selective fisheries warrant continuing investigation and evaluation and, if pursued, should occur subject to the following conditions and/or understandings, as applicable:

(a) mark-selective fisheries for Chinook salmon will be conducted in a manner that reduces fishery impacts on natural spawning salmon relative to non-selective fishing alternatives;

(b) if Canada decides to experiment in 2009 and 2010 with mark-selective fisheries for Chinook salmon and funding is provided by the United States for this purpose, the affected management authorities will collaborate with the Selective Fisheries Evaluation Committee (SFEC) on the design of an appropriate monitoring program;

(c) mark-selective fisheries implemented by either Party that affect stocks subject to the Pacific Salmon Treaty will be sampled, monitored and reported in accordance with applicable protocols recommended by the SFEC and adopted by the Commission; and the SFEC will facilitate the annual exchange of information regarding the conduct of mark-selective fisheries, including estimates of catches of mass-marked hatchery Chinook; and

(d) it is understood that the evaluation of mark-selective fisheries in Canada may be subject to funding or other assistance provided by the State of Washington (with support as appropriate from the United States) in an amount not to exceed $3 million (U.S.), an amount that is included in the United States funding amount identified in paragraph 3, above, with such funding subject to the obtaining of specific legislative authority as may be required and the availability of funds.

6. The Parties agree to implement, beginning in 2009 and extending through 2018, an abundance-based coast-wide Chinook salmon management regime to meet the objectives set forth in paragraph 2(a) above, under which fishery regimes shall be classified as aggregate abundance-based management regimes ("AABM") or individual stock-based management regimes ("ISBM"):

(a) an AABM fishery is an abundance-based regime that constrains catch or total mortality to a numerical limit computed from either a pre-season forecast or an in-season estimate of abundance, from which a harvest rate index can be calculated, expressed as a proportion of the 1979 to 1982 base period. The following regimes will be managed under an AABM regime:
   (i) southeast Alaska (SEAK) sport, net and troll;
   (ii) Northern British Columbia (NBC) troll (Pacific Fishery Management Areas 1-5, 101-105 and 142) and Queen Charlotte Islands (QCI) sport (Pacific Fishery Management Areas 1-2, 101, 102 and 142); and
   (iii) west coast of Vancouver Island (WCVI) troll (Pacific Fishery Management Areas 21, 23-27, and PFMA 121, 123-127) and outside sport (also Pacific Fishery Management Areas 21, 23-27, and 121, 123-127 but with additional time and area specifications which distinguish WCVI outside sport from inside sport);[30]

(b) an ISBM fishery is an abundance-based regime that constrains to a numerical limit the total catch or the total adult equivalent mortality rate within the fisheries of a jurisdiction for a naturally spawning Chinook salmon stock or stock group. ISBM management regimes apply to all Chinook salmon fisheries subject to the Treaty that are not AABM fisheries. The obligations applicable to ISBM fisheries are:
   (i) a general obligation as set out in paragraph 8(c) for all ISBM fisheries which include, but are not necessarily limited to: northern British Columbia marine net and coastal sport (excluding Queen Charlotte Islands), and freshwater sport and net; Central British Columbia marine net, sport and troll and freshwater sport and net; southern British Columbia marine net, troll and sport and freshwater sport and net; West Coast of Vancouver Island inside marine sport and net and freshwater sport and net; south Puget Sound marine net and sport and freshwater sport and net; north Puget Sound marine net and sport and freshwater sport and net; Juan de Fuca marine net, troll and sport and freshwater sport and net; Washington Coastal marine net, troll and sport and freshwater sport and net; Washington Ocean marine troll and sport; Columbia River net and sport; Oregon marine net, sport and troll, and freshwater sport; Idaho (Snake River Basin) freshwater sport and net; and
   (ii) an additional obligation as set out in paragraph 8(c) for those stock groups for which the general obligation is insufficient to meet the agreed escapement objectives.

[30] The part of the West Coast Vancouver Island Chinook salmon sport fishery included in the WCVI AABM Chinook salmon fishery includes:

- Pacific Fishery Management Areas (PFMA) 21, 23, 24 inside the Canadian "surfline" and PFMA 121, 123, 124 during the period October 16 through July 31, plus that portion of PFMA 21, 121, 123, 124 outside of a line generally one nautical mile seaward from the shoreline or existing Department of Fisheries and Oceans surfline, during the period August 1 through October 15.
- PFMA 25, 26, 27 inside the Canadian "surfline" and PFMA 125, 126, 127 during the period October 16 through June 30, plus that portion of PFMA 125, 126, 127 outside of a line generally one nautical mile seaward from the shoreline or existing Department of Fisheries and Oceans surfline, for the period July 1 through October 15.

(c) In 2014, the Commission will review the performance of the conservation program established by this Chapter to evaluate the effectiveness of, and continuing need for, the harvest measures taken for the AABM fisheries, including the provisions for application of paragraph 13.

7. The Parties agree:

(a) to adopt total mortality management to constrain fisheries for Chinook salmon based on total fishing mortality, which is the sum of the landed catch and the associated incidental mortalities from fishing, adjusted for landed catch equivalency;

(b) that, to implement total mortality management, estimates of the encounters of Chinook salmon are required, such that estimates:
   - (i) are developed annually from direct observation of fisheries; or
   - (ii) result from a predictable relationship reviewed by the CTC between encounters and landed catch based on a time series of direct observations of fisheries;

(c) while ISBM fisheries currently employ total mortality management, methods for estimating incidental fishing mortality in ISBM fisheries will be reviewed by the CTC by 2011;

(d) that, total mortality management will be implemented in all AABM fisheries in 2011, once the CTC advises and the Commission agrees that fishery-specific incidental mortality can be reliably estimated;

(e) that, prior to 2011, AABM fisheries shall be managed for the annual ceilings for landed catch provided in Paragraph 10 and Table 1 of this Chapter with jurisdictions striving to avoid increases in incidental mortalities relative to landed catch when compared to those anticipated under a standardized fishery management regime;[31]

(f) that, beginning in 2011, total mortality management shall be implemented as follows:
   - (i) Table 1 of paragraph 10 will be revised, using the average historical relationship between landed catch and incidental mortality observed between 1985 and 1995 across all gears, to calculate the total allowable fishing mortality level for each existing combination of abundance index and allowable landed catch for each AABM fishery,
   - (ii) the annual ceiling for each AABM fishery in a year will be the allowable total fishing mortality expressed in landed catch equivalents;[32]
   - (iii) preseason, the CTC shall estimate the allowable total fishing mortality for the applicable abundance index according to the revised Table 1 referred to in sub-paragraph 7(f)(i), above;
   - (iv) the responsible management jurisdictions shall strive to manage each AABM fishery to ensure that fishing mortalities across all gears do not exceed the total allowable fishing mortalities in landed catch equivalents appropriate for the annual abundance index; and
   - (v) transfers of Chinook salmon mortalities between gears, with the exception of net fisheries, and between landed catch and incidental mortality are allowed and will be made in terms of landed catch equivalents;

(g) that, once total mortality management is implemented, the CTC shall complete an annual post-season assessment which includes:
   - (i) a periodic evaluation of estimates of encounters and incidental mortalities in all fisheries, against standards developed by the CTC;

[31] A standardized fishery regime represents how agencies intended their AABM fisheries to be conducted, in the interim period, under the terms of the 1999 Agreement. Descriptions of standardized regimes for SEAK and NBC AABM fisheries have been submitted and approved by the CTC and published as PSC documents TCCHINOOK(04)-3 and TCCHINOOK(05)-1.

[32] Landed catch equivalents (to be developed by the CTC pursuant to Appendix A) represent means to ensure that changes in the conduct of an AABM fishery do not increase total landed catch equivalent fishing mortality above the levels appropriate to a given abundance index.

(ii) a comparison of post-season estimates of landed catch equivalent fishing mortality against allowable landed catch equivalent fishing mortality as estimated with the post-season abundance index;
(iii) a report of post-season estimates of total mortality; and
(iv) a description of the causes (if identifiable) of significant deviations from expected total mortalities;

(h) that, to the extent an AABM fishery is determined through monitoring and evaluation described in sub-paragraph (g), above, to have a pattern of exceeding the landed catch equivalent fishery mortality set forth in this paragraph, the responsible management jurisdiction shall implement in a timely manner adjustments to its management program designed to bring the fishery into conformity with the total mortality management objectives set forth in this paragraph, the effectiveness of which will be subsequently evaluated by the CTC and included in its annual report described in sub-paragraph (g), above.

8. With respect to ISBM fisheries, the Parties agree that:
(a) fisheries shall be managed over time to contribute to the achievement of agreed MSY or other biologically-based escapement objectives that are consistent with recovering and sustaining healthy and productive stocks and fisheries. Escapement objectives may be expressed in terms of numbers of spawners associated with MSY or derived from exploitation rate limits for naturally spawning stocks;
(b) either or both Parties may implement domestic policies that constrain their respective fishery impacts on depressed Chinook salmon stocks to a greater extent than is required by this Paragraph;
(c) for the purposes of this Chapter, and based on stock-specific information exchanged preseason, Canada and the United States shall limit the total adult equivalent mortality rate in the aggregate of their respective ISBM fisheries to no greater than 63.5 percent and 60 percent, respectively, of that which occurred during the 1979 to 1982 base period on the indicator stocks identified in Attachments IV and V[33] for stocks not achieving their management objectives. This limit shall be referred to as the general obligation. For those stocks for which the general obligation is insufficient to meet the agreed MSY or other biologically-based escapement objectives, the Party in whose waters the stock originates shall further constrain its fisheries to the extent necessary to achieve the agreed MSY or other biologically-based escapement objectives, provided that a Party is not required to constrain its fisheries to an extent greater than the average of that which occurred in the years 1991to 1996. Notwithstanding the foregoing, a Party need not constrain its ISBM impacts on a stock originating in its waters to an extent greater than necessary to achieve the agreed MSY or other biologically-based escapement objectives;
(d) unless otherwise recommended by the CTC and approved by the Commission, the non-ceiling index defined in TCChinook salmon (05)-3 where data are available for the required time periods, the average total annual adult equivalent mortality rate that occurred in 1991 to 1996 (see Attachments IV and V), or an alternative metric recommended by the CTC and approved by the Commission will be used to monitor performance of ISBM fisheries relative to the obligations set forth in this paragraph;
(e) for the purposes of monitoring trends and attributing causes of deviations from expectations, the non-ceiling index, the total annual adult equivalent mortality rates, or alternative metric (as applicable per sub-paragraph (d) above) will be computed for ISBM fisheries on a pre-season basis using forecasted abundance and fishing plans. These statistics will be estimated again using post-season data and refined in subsequent years for each of the escapement indicator stocks listed in Attachments IV and V of this Chapter using the best available data and reported pursuant to sub-paragraph (f) below;
(f) actual ISBM fishery performance relative to the obligations set forth in this paragraph will be evaluated by the CTC and reported annually to the Commission; and
(g) to the extent a Party's ISBM fisheries are determined through the monitoring process described in sub-paragraph (f), above to be inconsistent with the obligations set forth in this paragraph, the

[33] Assuming size limits in effect during 1991-1996.

jurisdiction(s) responsible for managing the ISBM fisheries shall propose and implement in a timely manner a program of additional management actions designed to bring the fisheries expeditiously into conformity with the obligations set forth in this paragraph, the effectiveness of which will be subsequently evaluated by the CTC and included in the report described in sub-paragraph (f) above.

9. The Parties agree:
(a) for the years 2009 to 2018 to reduce the catch limits listed in Table 1 of the 1999 Agreement for the SEAK and WCVI AABM fisheries by 15% and 30% respectively. These reductions have been incorporated into the catch limits provided in Table 1 below;
(b) that the graduated harvest rate approach underlying the catch limits associated with the abundance index values for the AABM fisheries as adjusted is designed to contribute to the achievement of MSY or other agreed biologically-based escapement objectives;
(c) the graduated harvest rate approach is based on a relationship between the aggregate abundance of Chinook salmon stocks available to the fishery and a harvest rate index described in Appendix B;
(d) AABM fisheries shall be managed annually so as not to exceed the catch limits (or total mortalities) designated for the applicable abundance index value for each AABM fishery as provided in Table 1 below and shall be monitored over time to evaluate the effect of the catch limits on the aggregate and stock-specific harvest rates and escapements;
(e) the annual catch (or total mortality) limit applicable to each AABM fishery shall be based upon the best available pre-season predictions of abundance as determined by the CTC; and
(f) where, as determined by the CTC, in-season methods provide an improved estimate of the abundance relative to pre-season indicators alone, in-season adjustments of pre-season catch limits shall be permitted. In such circumstances, pre-season catch limits shall be adjusted by incorporating in-season estimates of abundance.

10. The Parties agree that:
(a) indices identified in this paragraph are consistent with CTC analyses through May 1999. In the event that subsequent analyses modify these values, the relationship between catch and abundance indices specified in Table 1 and detailed in Appendix B will be maintained;
(b) management of the SEAK troll, net, and sport fisheries for Chinook salmon shall be based on the aggregate abundance of Chinook salmon stocks available to the SEAK troll fishery and expanded based on a specific relation or formula to account for the sport and net sectors. Unless otherwise agreed, the total Chinook salmon catch (or total mortalities) in the SEAK troll, sport, and net fisheries shall be managed annually according to catch limits and abundance indices stated in Table 1;
(c) management of the NBC troll and QCI sport fisheries for Chinook salmon shall be based on the aggregate abundance of Chinook salmon stocks available to the NBC troll fishery, and expanded based on a specific relation or formula to account for the QCI sport sector. Unless otherwise agreed, the total Chinook salmon catch (or total mortalities) in the NBC troll and QCI sport fisheries shall be managed annually according to catch limits and abundance indices stated in Table 1; and
(d) management of the WCVI troll and outside sport fisheries for Chinook salmon shall be based on the relationship between the aggregate abundance of Chinook salmon stocks available to the WCVI troll fishery, and expanded based on a specific relation or formula to account for the outside sport sector. Unless otherwise agreed, the total Chinook salmon catch (or total mortalities) in the WCVI troll and outside sport fisheries shall be managed annually according to catch limits and abundance indices stated in Table 1.

11. The Parties agree that, beginning in 2009:
(a) the catch and/or total mortality objectives prescribed or referenced in this Chapter will be monitored and regularly reported to the Commission by the CTC as follows:

(i) for AABM fisheries, performance will be evaluated and monitored using the first post-season CTC model calibration to compute the abundance index to determine, using Table 1, the allowable catch and total mortality;
(ii) for ISBM fisheries, the CTC will annually compute and report the metrics described in Paragraphs 8(c) and 8(d) and, using the best available post-season data and analyses, report performance to the Commission relative to those metrics and the obligations referred to in Paragraphs 8(e) and 8(f);

(b) if a pattern of significant non-performance emerges, the Commission will consider the matter and recommend appropriate remedial action to ensure that the integrity of the coastwide management regime is maintained.

12. The Parties agree:

(a) to continue the procedures and accepted exclusions previously established by the Commission to allow for the exclusion of Chinook salmon catches in selected terminal areas from counting against Treaty catch limitations; and

(b) to continue the procedures previously established by the Commission to allow for hatchery add-ons harvested in AABM fisheries.

13. The Parties agree:

(a) that, whereas managing salmon fisheries to consistently meet MSY or other agreed biologically-based escapement objectives is a precautionary approach to attaining sustainability of stocks and harvest, management actions outlined in sub-paragraphs (c) and (f) below are intended to increase escapements as expeditiously as possible should management as prescribed in paragraphs 8 and 10 fail to meet MSY or other biologically-based escapement objectives;

(b) to implement measures that will effectively protect and conserve biological diversity and production under a broad range of unforeseen circumstances, an adaptive, precautionary approach will incorporate explicit, timely adjustments in fishery regimes; within the context of the review in 2014 identified in paragraph 6, the CTC shall evaluate and report to the Commission for its consideration precautionary criteria additional to those described below (e.g., trends in marine survival rates, sustainable exploitation rates compared to current) to achieve the objectives of sub-paragraph (a) above, for specific stocks of conservation concern;

(c) subject to the provisions of sub-paragraph 13(c)(iii) below, to implement additional management actions in relevant AABM and ISBM fisheries annually as described below for the naturally spawning Chinook salmon stocks or stock groups listed in Attachment I-V. In the circumstances described below that rely on projections of exploitation rates and forecasts of escapement, the methods utilized shall have met standards for precision and accuracy developed by the CTC by February 1 of the first year of their application:

(i) an AABM fishery will be reduced when the majority of indicator stocks within a stock group were observed not to achieve their management objectives in the past year and are forecasted not to achieve their management objectives in the upcoming year, assuming paragraph 8 ISBM obligations are met;

(1) for stocks with escapement-based management objectives, one-year where observed escapement was at least 15% below agreed escapement objectives and a forecast for escapement falls at least 15% below the escapement objective in the coming year;
(2) for stocks with exploitation rate based management objectives, the post season exploitation rate for U.S. ESA listed stocks or Canadian conservation units exceeded agreed stock-specific exploitation rate limits[34] and are projected to exceed those rates in the coming year;

[34] Review of stock-specific exploitation rate limits by the CTC is applicable only for implementing provisions of this Chapter.

(ii) alternatively, an AABM fishery will be reduced when the majority of indicator stocks within a stock group are observed not to achieve their management objectives in the past two consecutive years,

(1) for stocks with escapement-based management objectives, two consecutive years of observed escapements at least 15% below agreed escapement objectives, unless a forecast for escapement will exceed the escapement objective in the coming year, assuming ISBM obligations are met;

(2) for stocks with exploitation rate based management objectives, two consecutive years of post season exploitation rates for U.S. ESA listed stocks or Canadian conservation units have exceeded agreed stock-specific exploitation rate limits.

(iii) The additional management actions to be taken in relevant AABM fisheries in accordance with this paragraph are as follows:

Percentage reduction in Table 1 catch limit	Minimum number of stock groups meeting criteria to trigger additional action
10%	2 stock groups
20%	3 or more stock groups

(iv) ISBM fisheries will be reduced to increase the escapement of the depressed Chinook salmon stocks within the stock group not meeting management obligations when the appropriate criterion defined in sub-paragraphs (c)(i) or (c) (ii) are met. Reductions will be designed to increase escapement by the number of mature fish expected to be saved from the AABM fishery reduction defined in (c) (i) or (c) (ii) above; and

(v) The CTC will notify the Commission of any proposed fishery restrictions to be implemented under this paragraph at its February Annual meeting;

(d) action will be taken consistent with (c)(i) or (c)(ii) for AABM fisheries even if escapement exceeds 85% of the agreed escapement goal as a consequence of harvest levels in ISBM fisheries in the jurisdiction in which the stock originates that were more restrictive than the obligations required pursuant to paragraph 4;

(e) action will not be taken under (c)(i) or (c)(ii) above, for AABM fisheries even if escapement is less than 85% of the agreed escapement goal as a consequence of an ISBM fishery not meeting the general obligation listed under paragraph 8;

(f) in the event that provisions of subparagraphs (d) and (e) above may apply, the CTC will review the management actions taken in the relevant ISBM fisheries, including whether those actions exceeded or fell short of the obligations required pursuant to paragraph 8, and report the matter to the Commission for action;

(g) in consideration of the adjustments to the WCVI AABM fishery agreed to by the Parties and reflected in paragraph 10 and Table 1 of this Chapter, and notwithstanding the provisions of subparagraphs 13(c), (d) and (e) above, additional reductions in the WCVI AABM fishery will not be taken except as otherwise may be agreed by the Commission;

(h) in the event of extraordinary circumstances, either Party may recommend, for conservation purposes, that the Commission consider developing additional management actions in the relevant fisheries to respond to such circumstances. Such a recommendation must be based on circumstances when the continued viability of a stock or stock group would be seriously threatened in the absence of such actions. This recommendation must be part of a coordinated management plan that will include actions taken in all marine and freshwater fisheries that significantly affect the stock or stock group;

(i) the Parties may take other management actions as may be agreed by the Commission, such as time and area restrictions, which have comparable conservation benefits as identified in sub-paragraph (c) above; and

(j) in the event that the provisions of any of subparagraphs 13(c), (d), (e) or (h) above are invoked, the CTC will subsequently provide a report to the Commission.

Table 1 Catches specified for AABM fisheries at levels of the Chinook salmon abundance index. Values for catch at levels of abundance between those stated may be linearly interpolated between adjacent values.

Abundance Index	SEAK	NBC	WCVI
0.25	44,600	32,500	32,100
0.30	50,200	39,000	38,500
0.35	55,700	45,500	44,900
0.40	61,200	52,000	51,300
0.45	66,700	58,500	57,800
0.495	71,700	64,400	63,500
0.50	72,300	65,000	74,900
0.55	77,800	71,500	82,400
0.60	83,300	78,000	89,800
0.65	88,800	84,500	97,300
0.70	94,400	91,000	104,800
0.75	99,900	97,500	112,300
0.80	105,400	104,000	119,800
0.85	110,900	110,500	127,300
0.90	116,500	117,000	134,800
0.95	122,000	123,500	142,300
1.00	127,500	130,000	149,700
1.005	128,700	130,700	172,000
1.05	139,600	136,500	179,700
1.10	151,700	143,000	188,200
1.15	163,800	149,500	196,800
1.20	176,000	156,000	205,400
1.205	199,800	156,700	206,200
1.25	206,700	163,300	213,900
1.30	214,200	170,700	222,500
1.35	221,800	178,000	231,000
1.40	229,400	185,300	239,600
1.45	237,000	192,700	248,100
1.50	244,600	200,000	256,700
1.505	264,400	219,600	257,600
1.55	271,800	226,100	265,300
1.60	280,000	233,400	273,800
1.65	288,200	240,700	282,400
1.70	296,400	248,000	290,900
1.75	304,600	255,300	299,500
1.80	312,900	262,600	308,000
1.85	321,100	269,900	316,600
1.90	329,300	277,200	325,100
1.95	337,500	284,500	333,700
2.00	345,700	291,800	342,300
2.05	353,900	299,100	350,800
2.10	362,200	306,400	359,400
2.15	370,400	313,700	367,900
2.20	378,600	321,000	376,500
2.25	386,800	328,300	385,000

Appendix 6 Escapement goals and 2001-2009 escapement levels, by region and system

Source: Munro, 2010

Table 1.–Southeast Region Chinook salmon escapement goals and escapements, 2001 to 2009.

	2009 Goal Range			Year	Escapement								
System	Lower	Upper	Type	Implemented	2001	2002	2003	2004	2005	2006	2007	2008	2009
Blossom River	250	500	BEG	1997	204	224	203	333	445	339	135	257	123
Keta River	250	500	BEG	1997	343	411	322	376	497	747	311	363	172
Unuk River	1,800	3,800	BEG	2009	10,541	6,988	5,546	3,963	4,742	5,645	5,718[a]	3,109[a]	3,103[a]
Chickamin River	450	900	BEG	1997	1,010	1,013	964	798	924	1,330	893	1,086	611
Andrew Creek	650	1,500	BEG	1998	2,055	1,708	1,160	2,991	1,979	2,124	1,736	981	628
Stikine River	14,000	28,000	BEG	2000	63,523	50,875	46,824	48,900	40,501	24,400	16,442	21,900	12,596
King Salmon River	120	240	BEG	1997	149	155	119	135	143	150	181	120	109
Taku River	19,000	36,000	BEG	2009	46,644	55,044	36,435	75,032	38,725	42,296	14,854	27,383	20,762[a]
Chilkat River	1,750	3,500	BEG	2003	4,517	4,051	5,657	3,422	3,366	3,039	1,442	3,233[a]	4,463[a]
Klukshu (Alsek) River	1,100	2,300	BEG	1998	1,738	2,141	1,661	2,455	1,034	568	674	465	1,535
Situk River	450	1,050	BEG	2003	562	1,000	2,163	698	595	695	677	413	902[a]

[a] Preliminary data.

Table 2.–Central Region (Bristol Bay, Cook Inlet, and Prince William Sound/Copper River) Chinook salmon escapement goals and escapements, 2001 to 2009.

System	2009 Goal Range Lower	2009 Goal Range Upper	Type	Year Implemented	Escapement 2001	2002	2003	2004	2005	2006	2007	2008	2009
Bristol Bay													
Nushagak River	40,000	80,000	SEG	2007	84,665	81,061	72,420	107,683	163,506	117,364	53,344	88,758	73,295
Togiak River	9,300		lower-bound SEG	2007	13,110	9,515	NS	NS	NS	NS	NS	NS	NS
Naknek River	5,000		lower-bound SEG	2007	6,340	7,503	6,081	12,878	NS	NS	5,498	6,559	3,305[a]
Alagnak River	2,700		lower-bound SEG	2007	5,458	3,675	8,209	6,755	5,084	4,278	3,455	1,825	1,957
Egegik River	450		lower-bound SEG	2007	389	646	790	579	335	196	458	162	350[b]
Upper Cook Inlet													
Alexander Creek	2,100	6,000	SEG	2002	2,282	1,936	2,012	2,215	2,140	885	480	150	275
Campbell Creek	50	700	SEG	2008	717	744	747	964	1,097	1,052		439	554
Chuitna River	1,200	2,900	SEG	2002	1,501	1,394	2,339	2,938	1,307	1,911	1,180	586	1,040
Chulitna River	1,800	5,100	SEG	2002	2,353	9,002	NS	2,162	2,838	2,862	5,166	2,514	2,093
Clear (Chunilna) Creek	950	3,400	SEG	2002	2,096	3,496	NS	3,417	1,924	1,520	3,310	1,795	1,205
Crooked Creek	650	1,700	SEG	2002	1,381	958	2,554	2,196	1,903	1,516	964	881	619
Deshka River	13,000	28,000	BEG	2002	27,966	28,535	39,257	57,934	37,725	30,864	18,714	7,533	11,960
Goose Creek	250	650	SEG	2002	NS	565	175	417	468	306	105	117	65
Kenai River Early Run	5,300	9,000	OEG	2005	14,073	6,185	10,097	11,855	16,387	18,428	12,500	11,743[c]	9,800[c]
	4,000	9,000	BEG	2005									
Kenai River Late Run	17,800	35,700	BEG	1999	17,947	30,464	23,736	40,198	26,046	24,423	32,683	23,413[c]	18,000[c]
Lake Creek	2,500	7,100	SEG	2002	4,661	4,852	8,153	7,598	6,345	5,300	4,081	2,004	1,394
Lewis River	250	800	SEG	2002	502	439	878	1,000	441	341	0[d]	120	111
Little Susitna River	900	1,800	SEG	2002	1,238	1,660	1,114	1,694	2,095	1,855	1,731	1,297	1,028
Little Willow Creek	450	1,800	SEG	2002	2,084	1,680	879	2,227	1,784	816	1,103	NC	776
Montana Creek	1,100	3,100	SEG	2002	1,930	2,357	2,576	2,117	2,600	1,850	1,936	1,357	1,460
Peters Creek	1,000	2,600	SEG	2002	4,226	2,959	3,998	3,757	1,508	1,114	1,225	NC	1,283
Prairie Creek	3,100	9,200	SEG	2002	5,191	7,914	4,095	5,570	3,862	3,570	5,036	3,039	3,500
Sheep Creek	600	1,200	SEG	2002	NS	854	NS	285	760	580	400	NC	500
Talachulitna River	2,200	5,000	SEG	2002	3,309	7,824	9,573	8,352	4,406	6,152	3,871	2,964	2,608
Theodore River	500	1,700	SEG	2002	1,237	934	1,059	491	478	958	486	345	352
Willow Creek	1,600	2,800	SEG	2002	3,132	2,533	3,855	2,840	2,411	2,193	1,373	1,255	1,133
Lower Cook Inlet													
Anchor River	5,000		lower-bound SEG	2008	NA	NA	9,238	12,016	11,156	8,945	9,622	5,806	3,455
Deep Creek	350	800	SEG	2002	551	696	1,008	1,075	1,076	507	553	205	483
Ninilchik River	550	1,300	SEG	2008	897	897	517	679	1,259	1,013	543	586	528
Prince William Sound													
Copper River	24,000		lower-bound SEG	2003	28,208	21,502	34,034	30,628	21,607	58,489	34,634	32,413	NA[e]

[a] In 2009, aerial surveys were only flown on Big Creek (2,834 Chinook salmon) and King Salmon River (471 Chinook salmon). Mainstem Naknek River and Paul's Creek were not surveyed in 2009.

[b] Aerial surveys were conducted in the Egegik and King Salmon River systems on August 5, 2009 to provide escapement indices for Chinook salmon and chum salmon. Resulting counts were 350 Chinook, and 277 chum salmon. Water conditions were poor; high and turbid conditions prevented observation on most of the surveyed systems. Chinook salmon escapement indices were well below average in streams surveyed, but should be considered minimum counts due to the poor water conditions. Based on carcass distribution and observed presence, the survey was likely conducted after peak spawning.

[c] Preliminary escapement estimates.

[d] Lewis River diverged into swamp 1/2 mi. below bridge. No water in channel.

[e] The 2009 Copper River Chinook salmon spawning escapement estimate is not available yet. The estimate is generated from a mark-recapture project run by the Native Village of Eyak and LGL Consulting. The spawning escapement estimate is generated by subtracting the upper Copper River state and federal subsistence, state personal use, and sport fishery harvest estimates from the mark-recapture estimate of the inriver abundance. The estimates for the federal and state subsistence and the state personal use fishery harvests are generally not available for ~6 months after the fishery is closed. Additionally, the sport fishery harvest estimate is based on the mail-out survey and is generally available ~12 months after the fishery ends.

Table 3.–Arctic-Yukon-Kuskokwim Region Chinook salmon escapement goals and escapements, 2001 to 2009.

	2009 Goal Range			Year	Escapement								
System	Lower	Upper	Type	Imple-mented	2001	2002	2003	2004	2005	2006	2007	2008	2009
Kuskokwim Area													
North (Main) Fork Goodnews River	640	3,300	SEG	2005	3,561	1,195	3,935	7,462	NS	4,159	NS	NS	NS
Middle Fork Goodnews River	1,500	2,900	BEG	2007	5,398	3,085	2,389	4,348	4,529	4,559	3,852	2,161	1,630
Kanektok River	3,500	8,000	SEG	2005	6,483	NS	6,206	28,375	13,926	8,433	NS	NS	NS
Kogrukluk River	5,300	14,000	SEG	2005	9,298	10,104	11,771	19,651	21,993	19,414	13,029	9,730	9,517
Kwethluk River	6,000	11,000	SEG	2007	NA	8,502	14,474	28,605	NA	14,224	13,267	5,312	5,710
Tuluksak River	1,000	2,100	SEG	2007	997	1,346	1,064	1,475	2,653	1,044	374	665	404
George River	3,100	7,900	SEG	2007	3,309	2,444	4,693	5,207	3,845	4,357	4,883	2,698	3,663
Kisaralik River	400	1,200	SEG	2005	NA	2,285	688	6,913	4,112	4,734	1,373	1,200	NS
Aniak River	1,200	2,300	SEG	2005	NA	1,856	3,514	5,569	NS	5,639	3,984	3,222	NS
Salmon River (Aniak R)	330	1,200	SEG	2005	598	1,236	1,292	2,177	4,097	NS	1,458	1,061	NS
Holitna River	970	2,100	SEG	2005	1,130	1,741	NS	4,842	2,795	3,924	NS	832	NS
Cheeneetnuk River (Stony R)	340	1,300	SEG	2005	NA	730	810	918	1,155	1,015	NS	290	323
Gagaryah River (Stony R)	300	830	SEG	2005	143	452	1,093	670	788	531	1,035	177	303
Salmon River (Pitka Fork)	470	1,600	SEG	2005	1,033	1,276	1,371	1,138	1,809	928	1,014	1,305	632
Yukon River													
East Fork Andreafsky River	960	1,700	SEG	2005	1,065	1,447	1,116	2,879	1,715	590	1,758	278	
West Fork Andreafsky River	640	1,600	SEG	2005	570	917	1,578	1,317	1,492	824	976	262	1,678
Anvik River	1,100	1,700	SEG	2005	1,420	1,713	1,100	3,679	2,421	1,876	1,529	992	832
Nulato River	940	1,900	SEG	2005	1,884	1,584	NS	1,321	553	1,292	2,583	922	2,260
Gisasa River	420	1,100	SEG	2005	1,298	506	NS	731	958	843	593	487	515
Chena River	2,800	5,700	BEG	2001	9,696	6,967	8,739	9,645	NS	2,936	3,576	3,212	5,253
Salcha River	3,300	6,500	BEG	2001	13,328	4,644	15,500	15,761	5,988	10,679	5,639	2,731	12,774
Canada Mainstem	45,000		Agreement	Annual	42,483	42,359	80,594	48,469	68,551	62,933	34,903	34,008	63,876
Norton Sound													
Fish River/Boston Creek	100		lower-bound SEG	2005	33	NS	240	112	46	NS	NS	NS	67[a]
Kwiniuk River	300	550	SEG	2005	261	778	744	663	342	195	194	237	444
North River (Unalakleet R)	1,200	2,600	SEG	2005	1,337	1,484	1,452	1,104	1,015	906	1,948	903	2,352
Shaktoolik River	400	800	SEG	2005	341	82[b]	15[b]	91[b]	74[c]	150[b]	412	NS	129[a]
Unalakleet/Old Woman River	550	1,100	SEG	2005	NS	61[b]	168[b]	398[b]	510[c]	NS	821	NS	1,368

[a] 2009 aerial surveys of the Shaktoolik River and Boston Creek are rated as incomplete as they were conducted on August 9 and 12, respectively, well after peak Chinook salmon spawning. Several carcasses and moribund Chinook salmon were observed on survey.

[b] 2002-2004 and 2006 Shaktoolik River surveys and combined Unalakleet and Old Woman rivers surveys (2002-2004) are not considered complete as they were conducted well before peak spawn. Surveys during these years were rated as acceptable, but the observer noted difficulty enumerating Chinook salmon due to large numbers of pink salmon.

[c] 2005 Shaktoolik and Unalakleet River drainage surveys were conducted during peak spawning periods but Chinook salmon counts thought to be underestimated due to large numbers of pink salmon.

Table 4.–Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) Chinook salmon escapement goals and escapements, 2001 to 2009.

	2009 Goal Range			Year	Escapement								
System	Lower	Upper	Type	Implemented	2001	2002	2003	2004	2005	2006	2007	2008	2009
AK Peninsula													
Nelson River	2,400	4,400	BEG	2004	5,543	6,750	5,154	6,959	4,993	2,516	2,492	5,012	2,048
Chignik													
Chignik River	1,300	2,700	BEG	2002	3,028	3,541	6,412	7,840	6,486	3,535	2,000	1,730	1,680
Kodiak													
Karluk River[a]	3,600	7,300	BEG	2003	4,453	7,175	7,256	7,525	4,798	3,548	1,544	752	1,308
Ayakulik River[b]	4,800	9,600	BEG	2003	13,929	12,552	17,557	24,830	8,340	3,106	6,410	3,071	2,615

[a] The 2006 and 2007 escapements for Karluk River Chinook salmon = (management objective (weir count)) (sportfish catch above the weir). Subsistence harvest data are not available. The 2008 and 2009 escapements are weir counts only.

[b] The 2007 escapement for Ayakulik River Chinook salmon = (management objective (weir count)) (sportfish catch above weir). Subsistence harvest data are not available. The 2008 and 2009 escapements are weir counts only.

Table 5.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Southeast Region.

System	2001	2002	2003	2004	2005	2006	2007	2008	2009
CHINOOK SALMON									
Blossom River	Under	Under	Under	Met	Met	Met	Under	Met	Under
Keta River	Met	Met	Met	Met	Met	Over	Met	Met	Under
Unuk River	Over	Met	Met	Met	Met	Met	Met	Met	Met[a]
Chickamin River	Over	Over	Over	Met	Over	Over	Met	Over	Met
Andrew Creek	Over	Over	Met	Over	Over	Over	Over	Met	Under
Stikine River	Over	Over	Over	Over	Over	Met	Met	Met	Under
King Salmon River	Met	Met	Under	Met	Met	Met	Met	Met	Under
Taku River	Met	Over	Met	Over	Met	Met	Under	Under	Met[b]
Chilkat River	Over	Over	Over[c]	Met	Met	Met	Under	Met	Over
Klukshu (Alsek) River	Met	Met	Met	Over	Under	Under	Under	Under	Met
Situk River	Met	Met	Over[b]	Met	Met	Met	Met	Under	Met

[a] Prior to 2009 goal was based on index count of escapements.
[b] Escapement goal reevaluated, goal range changed.
[c] Escapement goal reevaluated, point goal changed to a range.

Table 6.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Central Region (Bristol Bay, Cook Inlet, and Prince William Sound/Copper River).

System	2001	2002	2003	2004	2005	2006	2007	2008	2009
Chinook salmon									
Bristol Bay									
Nushagak River	Over	Over	Over	Over	Over	Over	Met[a]	Over	Met
Togiak River	Over	Under	NS	NS	NS	NS	NS[b]	NS	NS
Naknek River	Over	Over	Over	Over	NS	NS	Met[b]	Met	Under
Alagnak River							Met	Under	Under
Egegik River							Met	Under	Under
Upper Cook Inlet									
Alexander Creek	Under	Under[a]	Under	Met	Met	Under	Under	Under	Under
Campbell Creek	Over	Over[a,c]	Over	Over	Eliminated			Met[a,c]	Met
Chuitna River	Over	Met[a]	Met	Over	Met	Met	Under	Under	Under
Chulitna River	Over	Over[a]	NS	Met	Met	Met	Over	Met	Met
Clear (Chunilna) Creek	Over	Over[a]	NS	Over	Met	Met	Met	Met	Met
Crooked Creek	Over	Met[a]	Over	Over	Over	Met	Met	Met	Under
Deshka River	Over	Over[a]	Over	Over	Over	Over	Met	Under	Under
Goose Creek	NS	Met[a]	Under	Met	Met	Met	Under	Under	Under
Kenai River Early Run	Met	Under[d]	Met	Met	Over	Over	Over	Over	Over
Kenai River Late Run	Met	Met[a]	Met	Over	Met	Met	Met	Met	Met
Lake Creek	Over	Met[a]	Over	Over	Met	Met	Met	Under	Under
Lewis River	Over	Met[a]	Over	Over	Met	Met	Under	Under	Under
Little Susitna River	Over	Met[a]	Met	Met	Over	Over	Met	Met	Met
Little Willow Creek	Over	Met[a]	Met	Over	Met	Met	Met	NC	Met
Montana Creek	Over	Met[a]	Met	Met	Met	Met	Met	Met	Met
Peters Creek	Over	Over[a]	Over	Over	Met	Met	Met	NC	Met
Prairie Creek	Over	Met[a]	Met	Met	Met	Met	Met	Under	Met
Sheep Creek	NS	Met[a]	NS	Under	Met	Under	Under	NC	Under
Talachulitna River	Over	Over[a]	Over	Over	Met	Over	Met	Met	Met
Theodore River	Over	Met[a]	Met	Under	Under	Met	Under	Under	Under
Willow Creek	Over	Met[a]	Over	Over	Met	Met	Under	Under	Under
Lower Cook Inlet									
Anchor River	Under	Under[d,e]	Under	Over	Eliminated			Met[d,e]	Under
Deep Creek	Met	Met[d]	Over	Over	Over	Met	Met	Under	Met
Ninilchik River	Met	Met[d,f]	Under	Met	Met	Met	Met	Met[d,f]	Under
Prince William Sound									
Copper River	Met	Under	Met[g]	Met	Under	Met	Met	Met	NA

[a] Escapement goal reevaluated, point goal changed to a range.
[b] Escapement goal reevaluated, point goal changed to a lower-bound goal.
[c] Previous escapement goal reinstated.
[d] Escapement goal reevaluated, goal range changed.
[e] Escapement goal from 2001-2004 based on aerial surveys, escapement numbers in Table 2 are not comparable.
[f] Escapement goal reevaluated, current goal based on escapement count over longer period during spawning season, escapement numbers in Table 2 are based on longer counting time.
[g] Escapement goal reevaluated, goal range changed to a lower bound goal.

Table 7.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Arctic-Yukon-Kuskokwim Region.

System	2001	2002	2003	2004	2005	2006	2007	2008	2009
Chinook salmon									
Kuskokwim Area									
North (Main) Fork Goodnews River	Met	Under	Met	Met	NS[a]	Over	NS	NS	NS
Middle Fork Goodnews River	Met	Under	Under	Met	Over[a,b]	Over	Over[a,b]	Met	Met
Kanektok River	Met	NS	Met	Met	Over[a]	Over	NS	NS	NS
Kogrukluk River	Under	Met	Met	Met	Over[a]	Over	Met	Met	Met
Kwethluk River	NA	Met	Over	Over	Over[c]	NA	Over	Under	Under
Tuluksak River							Under	Under	Under
George River							Met	Under	Met
Kisaralik River	Met	Met	Under	Met	Over[a]	Over	Over	Met	NS
Aniak River	Met	Met	Met	Met	NS[a]	Over	Over	Over	NS
Salmon River (Aniak R)	Under	Met	Met	Met	Over[a]	NS	Over	Met	NS
Holitna River	Under	Under	NS	Met	Over[a]	Over	NS	Under	NS
Cheeneetnuk River (Stony R)					Met	Met	NS	Under	Under
Gagaryah River (Stony R)					Met	Met	Over	Under	Met
Salmon River (Pitka Fork)	Under	Under	Met	Under	Over[a]	Met	Met	Met	Met
Yukon River									
East Fork Andreafsky River	Under	Under	Under	Met	Over[a]	Under	Over	Under	
West Fork Andreafsky River	Under	Under	Met	Under	Met[a]	Met	Met	Under	Over
Anvik River	Met	Met	Under	Met	Over[a]	Over	Met	Under	Under
Nulato River	Met	Met	NS	Met	Under[a]	Met	Over	Under	Over
Gisasa River	Met	Under	NS	Met	Met[a]	Met	Met	Met	Met
Chena River	Over	Over	Over	Over	NS[a]	Met	Met	Met	Met
Salcha River	Over	Met	Over	Over	Met	Over	Met	Under	Over
Canada Mainstem[d]	Met	Met	Met	Met	Met	Met	Met	Under	Met
Norton Sound									
Fish River/Boston Creek	Under	NS	Met	Met	Under[e]	NS	NS	NS	Under
Kwiniuk River	Under	Over	Over	Over	Met[f]	Under	Under	Under	Met
North River (Unalakleet R)	Met	Met	Met	Under	Under[b]	Under	Met	Under	Met
Shaktoolik River	Under	Under	Under	Under	Under[f]	Under	Met	NS	Under
Unalakleet/Old Woman River	NS	Under	Under	Under	Under[f]	NS	Met	NS	Over

[a] Escapement goal reevaluated, lower-bound goal changed to a range.
[b] Escapement goal reevaluated, goal value changed.
[c] Previous escapement goal was based on aerial surveys, replaced with escapement goal based on weir counts (see Molyneaux and Brannian 2006).
[d] Agreed escapement goal changed in 2002, 2007, and 2008.
[e] Escapement goal reevaluated, goal range changed to a lower-bound goal.
[f] Escapement goal reevaluated, goal type changed but goal value remained the same.

Table 8.–Assessment of whether escapements met (Met), exceeded (Over), or did not meet (Under) the escapement goal in place at the time of enumeration for Chinook salmon stocks in Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas).

System	2001	2002	2003	2004	2005	2006	2007	2008	2009
Chinook salmon									
AK Peninsula									
Nelson River	Met	Over	Met	Over[a]	Over	Met	Met	Over	Under
Chignik									
Chignik River	Over	Over[a]	Over	Over	Over	Over	Met	Met	Met
Kodiak									
Karluk River	Under	Met	Met[a]	Over	Met	Under	Under	Under	Under
Ayakulik River	Over	Over	Over[a]	Over	Met	Under	Met	Under	Under

[a] Escapement goal reevaluated, goal range changed.

Table 9.–Southeast Region Chinook salmon escapements compared to escapement goals for the years 2001 to 2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CHINOOK SALMON									
Number Below	1	1	2	0	1	1	4	3	5
Number Met	5	5	5	7	7	7	6	7	5
Number Above	5	5	4	4	3	3	1	1	1
% Below	9	9	18	0	9	9	36	27	45
% Met	45	45	45	64	64	64	55	64	45
% Above	45	45	36	36	27	27	9	9	9

Table 10.–Central Region (Bristol Bay, Cook Inlet, Prince William Sound/Copper River) escapements for Chinook salmon compared to escapement goals for the years 2001 to 2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CHINOOK SALMON									
Number Below	2	5	4	2	2	2	7	12	15
Number Met	5	15	9	9	16	17	18	12	12
Number Above	19	8	11	16	6	5	2	2	1
% Below	8	18	17	7	8	8	26	46	54
% Met	19	54	38	33	67	71	67	46	43
% Above	73	29	46	59	25	21	7	8	4

Table 11.–Arctic-Yukon-Kuskokwim Region Chinook salmon escapements compared to current (2009) escapement goals for the years 2001 to 2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CHINOOK SALMON									
Number Below	9	9	6	5	5	4	2	14	6
Number Met	10	10	10	14	7	8	12	7	10
Number Above	2	2	4	4	10	9	8	1	4
% Below	43	43	30	22	23	19	9	64	30
% Met	48	48	50	61	32	38	55	32	50
% Above	10	10	20	17	45	43	36	5	20

Table 12.–Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) escapements for Chinook salmon compared to escapement goals for the years 2001 to 2009.

	2001	2002	2003	2004	2005	2006	2007	2008	2009
CHINOOK SALMON									
Number Below	1	0	0	0	0	2	1	2	3
Number Met	1	1	2	0	2	1	3	1	1
Number Above	2	3	2	4	2	1	0	1	0
% Below	25	0	0	0	0	50	25	50	75
% Met	25	25	50	0	50	25	75	25	25
% Above	50	75	50	100	50	25	0	25	0

Table 17.–Summary of Chinook salmon stocks of concern in Alaska.

Region	System	Species	Level of Concern
Arctic-Yukon-Kuskokwim	Yukon River	Chinook	Yield
	Norton Sound Sub-district 5 & 6	Chinook	Yield

Table 18.–Methods used to enumerate and develop escapement goals for Southeast Region Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Blossom River	Aerial Survey	SRA
Keta River	Aerial Survey	SRA
Unuk River	Mark-Recapture	SRA
Chickamin River	Aerial Survey	SRA
Andrew Creek	Aerial Survey	SRA
Stikine River	Mark-Recapture	SRA
King Salmon River	Aerial Survey	SRA
Taku River	Mark-Recapture	SRA
Chilkat River	Mark-Recapture	Theoretical SRA
Klukshu (Alsek) River	Weir Count	SRA
Situk River	Weir Count	SRA

Table 19.–Methods used to enumerate and develop escapement goals for Central Region (Bristol Bay, Cook Inlet, and Prince William Sound/Copper River) Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Bristol Bay		
Nushagak River	Sonar	SRA, Yield Analysis
Togiak River	Aerial Survey	Risk Analysis
Naknek River	Aerial Survey	Risk Analysis
Alagnak River	Aerial Survey	Risk Analysis
Egegik River	Aerial Survey	Risk Analysis
Upper Cook Inlet		
Alexander Creek	Single Aerial Survey	Percentile
Campbell Creek	Single Foot Survey	Percentile
Chuitna River	Single Aerial Survey	Percentile
Chulitna River	Single Aerial Survey	Percentile
Clear (Chunilna) Creek	Single Aerial Survey	Percentile
Crooked Creek	Weir Count	Percentile
Deshka River	Weir Count	SRA
Goose Creek	Single Aerial Survey	Percentile
Kenai River Early Run	Sonar	SRA
Kenai River Late Run	Sonar	SRA
Lake Creek	Single Aerial Survey	Percentile
Lewis River	Single Aerial Survey	Percentile
Little Susitna River	Single Aerial Survey	Percentile
Little Willow Creek	Single Aerial Survey	Percentile
Montana Creek	Single Aerial Survey	Percentile
Peters Creek	Single Aerial Survey	Percentile
Prairie Creek	Single Aerial Survey	Percentile
Sheep Creek	Single Aerial Survey	Percentile
Talachulitna River	Single Aerial Survey	Percentile
Theodore River	Single Aerial Survey	Percentile
Willow Creek	Single Aerial Survey	Percentile
Lower Cook Inlet		
Anchor River	Sonar, Weir Count	SRA
Deep Creek	Single Aerial Survey	Percentile
Ninilchik River	Weir Count	Percentile
Prince William Sound		
Copper River	Mark-Recapture	Empirical Observation

Table 20.–Methods used to enumerate and develop escapement goals for Arctic-Yukon-Kuskokwim Region Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
Kuskokwim Area		
North (Main) Fork Goodnews River	Peak Aerial Survey	Percentile
Middle Fork Goodnews River	Weir Count	SRA
Kanektok River	Peak Aerial Survey	Percentile
Kogrukluk River	Weir Count	Percentile
Kwethluk River	Weir Count	Percentile
Tuluksak River	Weir Count	Percentile
George River	Weir Count	Percentile
Kisaralik River	Peak Aerial Survey	Percentile
Aniak River	Peak Aerial Survey	Percentile
Salmon River (Aniak R)	Peak Aerial Survey	Percentile
Holitna River	Peak Aerial Survey	Percentile
Cheeneetnuk River (Stony R)	Peak Aerial Survey	Percentile
Gagaryah River (Stony R)	Peak Aerial Survey	Percentile
Salmon River (Pitka Fork)	Peak Aerial Survey	Percentile
Yukon River		
East Fork Andreafsky River	Peak Aerial Survey	Percentile
West Fork Andreafsky River	Peak Aerial Survey	Percentile
Anvik River	Peak Aerial Survey	Percentile
Nulato River	Aerial Survey	Percentile
Gisasa River	Aerial Survey	Percentile
Chena River	Tower, Mark-Recapture	SRA
Salcha River	Tower, Mark-Recapture	SRA
Canada Mainstem	Sonar	Agreement
Norton Sound		
Fish River/Boston Creek	Aerial Survey	Percentile
Kwiniuk River	Tower Count	SRA
North River (Unalakleet R)	Tower Count	Percentile
Shaktoolik River	Unexpanded Aerial Survey	Theoretical SRA
Unalakleet/Old Woman River	Unexpanded Aerial Survey	Theoretical SRA

Table 21.–Methods used to enumerate and develop escapement goals for Westward Region (Alaska Peninsula/Aleutian Islands, Kodiak, and Chignik areas) Chinook salmon stocks.

System	Enumeration Method	Goal Development Method
CHINOOK SALMON		
AK Peninsula		
Nelson River	Weir, Tower Count	SRA, Spawning Habitat Model
Chignik		
Chignik River	Weir Count	SRA
Kodiak		
Karluk River	Weir Count	SRA
Ayakulik River	Weir Count	SRA

Appendix 7 2010 Annual Report for the Alaska Groundfish Fisheries Salmon Incidental Catch and Endangered Species Act Consultation

Note, although the referenced report contains 11 attachments, only Attachments 1-9 are reproduced with the report in this appendix. For the complete report, please contact Mary Grady, at National Marine Fisehries Service, Alaska Region.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

March 3, 2011

MEMORANDUM FOR: William W. Stelle, Jr.
Administrator, Northwest Region

FROM: James W. Balsiger, Ph.D.
FOR Administrator, Alaska Region

SUBJECT: 2010 Annual Report for the Alaska Groundfish Fisheries Salmon Incidental Catch and Endangered Species Act Consultation

We are providing to you the 2010 annual report on salmon incidental catch in the Alaska groundfish fisheries. This report fulfills one of the terms and conditions of the December 2, 2009, and the January 11, 2007, supplements to the November 30, 2000, Biological Opinion (BiOp) regarding Authorization of Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) Groundfish Fisheries. This memorandum and attachments provide the latest information regarding salmon incidental catch in the Alaska groundfish fisheries and the progress on developing management measures to reduce the take of salmon in the groundfish fisheries. Issues addressed include the 2010 incidental catch of salmon, the Coded-Wire Tag (CWT) recoveries, genetic studies, and the development and implementation of new management measures to reduce salmon incidental catch in the Bering Sea and GOA pollock fisheries. Each issue is detailed below.

Incidental Catch of Salmon in the Alaska Fisheries and the Incidental Take Statement for Chinook Salmon

Attachment 1 provides updated information regarding salmon incidental catch in the BSAI and GOA groundfish fisheries for the years 2004 through December 31, 2010. Approximately 87% of this incidental catch occurred in the pollock pelagic trawl fishery.

The amount of Chinook salmon incidental catch in the BSAI groundfish fisheries in 2010 was one of the lowest years on record since 1991 and is estimated at 12,532 fish (Attachment 2). This amount is well below the incidental catch range of 36,000 to 87,500 Chinook salmon in the supplemental BiOp for the BSAI groundfish fisheries. The 2009 supplemental BiOp specified the Incidental Take Statement in the 2007 supplemental BiOp will continue to define the level of expected take in 2010 for all components of the BSAI fishery. The Incidental Take amount for 2011 was revised in accordance with Amendment 91 (NMFS, 2009a). Sector specific salmon catch in the BSAI pollock fishery is provided in Attachment 3. The majority of the salmon bycatch in the pollock fishery continues to be taken by catcher vessels delivery to shoreside processors.

For the GOA groundfish fisheries in 2010, the estimated incidental catch of Chinook salmon was above the incidental take statement of 40,000 fish in the 2007 supplemental BiOp. Of the estimated 54,576 fish incidentally caught in 2010, 79 % was taken in the pelagic trawl fishery (Attachment 1). NMFS Alaska Region reinitiated Endangered Species Act (ESA) Section 7 consultation with the NMFS Northwest Region on November 17, 2010.

Observer Program Bycatch Sampling

The North Pacific Groundfish Observer Program (Observer Program) collects catch data used for management and inseason monitoring of the commercial groundfish fisheries occurring in Federal waters off Alaska. Composition sampling for salmon on observed pollock catcher vessels is conducted as follows: (1) Samples are taken from each tow while the vessel is at-sea, and (2) the entire observed offload is followed into the shoreside processing plant as the catch is delivered and a census (a total count of every salmon) of salmon is completed. Salmon censused at the plant are added to the number of any salmon discarded at sea to obtain a final census of all salmon in each observed delivery. Full retention of salmon is required in the BSAI pollock fisheries and full discard of salmon is required in the GOA groundfish fisheries. In rare circumstances where the off-load census is not completed, NMFS Alaska Region uses the at-sea samples and extrapolates that sample to the entire delivery. The census of the salmon in observed pollock catcher vessel deliveries is then extrapolated to all unobserved pollock catcher vessel deliveries for an overall estimate of salmon bycatch. In 2010, the Bering Sea groundfish fleet had 100% coverage for the catcher/vessels and catcher/processors greater than 125 ft. Catcher vessels between 60 ft. and 125 ft. had at least 30% coverage. The majority of the GOA groundfish fleet is subject to approximately 30% observer coverage. Data from the observed vessels provides an indication of the relative numbers and species of salmon incidentally taken in the Alaska groundfish fisheries.

Genetic samples, comprised of a pelvic axillary processes, maturity information, sex/length/weight and five scales were collected from Chinook and chum salmon in the 2010 pollock fisheries. In addition, scale samples for species identification, and snouts from salmon with a missing adipose fin (CWT recovery) were collected.

In 2010, the data collection guidelines for the collection of genetic samples varied between the BSAI and GOA due to the differences in observer coverage levels between these fisheries. All catcher vessel and catcher processor and mothership observers in the BSAI pollock fishery were instructed to collect a genetic sample from every Chinook and chum salmon encountered in their species composition samples. Plant and floating processor observers were instructed to collect a genetic sample from randomly selected Chinook and chum salmon using a temporal sampling frame.

In contrast, vessel observers in the GOA pollock fishery collected genetic samples and associated data only from Chinook and chum salmon encountered in their species composition samples.

Shoreside plant observers were not responsible for collecting salmon genetic samples from the pollock deliveries in the GOA.

NMFS recently published regulations implementing Amendment 91 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (75 FR 53026, August 30, 2010). With the regulations implementing Amendment 91 effective January 1, 2011, NMFS is requiring 100% observer coverage in the Bering Sea pollock fisheries regardless of vessel length, a census of all salmon species in every haul or fishing trip, and an expanded biological sampling program. Also, shoreside processors are required (under their Catch Monitoring and Control Plan) to provide a location from which the observer will be able to view all sorting and weighing of fish simultaneously. This will greatly improve our information on Chinook salmon bycatch in the Bering Sea pollock fishery. Amendment 91 is discussed further below. In 2011, GOA salmon bycatch sampling procedures will be revised to be as consistent as possible with changes occurring in the Bering Sea pollock fishery. The genetic samples noted above will be collected systematically from all salmon encountered in observed pollock hauls and deliveries. This should provide samples from throughout the observed deliveries in the GOA. Table 1 lists preliminary 2010 estimates of the number of salmon by species measured (by length) and sampled by observers in the BSAI and GOA groundfish fisheries.

Table 1. - Estimated numbers of salmon measured and sampled by observers, by region and species, 2010.

Region	Species	Species Name	# Measured	Total Salmon
BSAI	221	CHUM SALMON	6,611	8,169
BSAI	222	CHINOOK SALMON	4,526	4,792
BSAI	223	COHO SALMON	4	4
BSAI	224	SOCKEYE SALMON	5	7
BSAI	225	PINK SALMON	39	43
GOA	221	CHUM SALMON	126	172
GOA	222	CHINOOK SALMON	4,546	8,506
GOA	223	COHO SALMON	23	27
GOA	224	SOCKEYE SALMON	1	1
GOA	225	PINK SALMON	0	0

Source: Ren Narita, NMFS FMA Observer Program, personal communication, February 2011

Observers are deployed in the field for up to three months at a time, and debrief with FMA Division staff following their deployment. The 2010 data will not be finalized until all observers have returned from the field, are debriefed, and quality control on data is completed. Generally, the observer data are finalized in late February to early March of the year following the fishery. Any catch information provided on 2010 is preliminary until the observer data are finalized after the fishing year is completed.

Coded-Wire Tag Results

CWTs are an important source of information for the stock-specific ocean distribution of those Chinook salmon stocks that are tagged with CWTs and caught as bycatch in the BSAI and GOA groundfish fisheries. The Regional Mark Processing Center (RPMC) operated by the Pacific States Marine Fisheries Commission provides the regional coordination of the organizations involved in marking anadromous salmonids throughout the Pacific Region. The coastwide CWT system is coordinated through the activities of two principal organizations: (1) Regional Mark Committee and (2) Pacific Salmon Commission (established by the United States–Canada Pacific Salmon Treaty) (Nandor et al., 2010). The RMPC is the United States site for exchanging United States CWT data with Canada for Pacific Salmon Treaty requirements. After 40 years, the CWT program in the greater Pacific region of North America continues to be an important tool for salmonid research and management and remains the only stock identification tool that is Pacific coastwide in scope and provides unparalleled information about ocean distribution patterns, fishery impacts, and survival rates for Pacific salmon along the Pacific coast (Nandor et al., 2010).

Although CWT recoveries provide reliable documentation of the presence of a stock in the bycatch, the recoveries to date can't be used to establish the relative abundance of stocks in the bycatch, nor to estimate the number harvested from any one stock as bycatch due to sampling issues. CWTs do not represent the true composition of all stocks of Chinook salmon in the bycatch in the groundfish fisheries. For instance, there are no CWT tagging programs on Western Alaska Chinook salmon stocks, so these stocks are not represented in stock composition estimates based on CWT recoveries. Additionally, not all Chinook salmon stocks along the Pacific coast are marked at equal rates. Furthermore, although there are CWT tagging programs on wild stocks of Chinook salmon all along the Pacific coast, wild stocks are probably under-represented by CWTs as compared with hatchery stocks, which are much easier to tag in large numbers. Exploitation rates for naturally spawning populations of Chinook salmon are difficult to estimate. The capture and tagging of juveniles and enumeration of adult escapement from wild stocks is logistically challenging and costly. The impacts of fisheries on naturally spawning populations can be estimated based on CWT-based age- and fishery-specific exploitation rates of hatchery stock indicators. However, direct validation of the assumption that selected hatchery indicator stocks are representative of their associated natural stocks is also difficult and costly (PSC, 2005).

Sources of uncertainty of CWT-based estimates include variance and bias. Variance exists among estimated catches of and impacts on CWT groups of salmon based on recoveries of individual CWT fish, size of CWT release groups, and sampling rates in fisheries and spawning escapements. Bias, both positive and negative, measures the difference between the expected (or average) values of estimates and the true but unknown quantities being estimated (e.g., total fishery-related mortalities) (PSC, 2005).

Recommendations for improving CWT programs include reviewing the indicator stocks for adequate coverage in representing natural stocks and evaluating all Chinook salmon indicator stocks for consistency with statistical guidelines. The CWT Workgroup has recommended that particular attention be paid to the adequacy of CWT release sizes in light of trends and variability in survival rates and changes in fishery exploitation rates (PSC, 2008).

In 2010, the North Pacific Fishery Management Council (Council) contracted with Cramer Fish Sciences to compile a database of CWT release groups of ESA-listed west coast salmonids based on Mark Center information. In 2011, a new contract was implemented, and CWT analyses in the BSAI and GOA will include a new summary table in the database on the annual production of stream type (spring run) Chinook salmon ESA-listed ESUs originating from Washington, Oregon, and Idaho. The database will include all production (counted and estimated, tagged and untagged) of both wild and hatchery components of each ESU on an annual basis, dating back to when each ESU was first defined by NMFS.

CWT Expansions

Ideally, it would be preferable to calculate a total estimated contribution of Chinook salmon from ESA-listed Evolutionarily Significant Units (ESUs) harvested in the BSAI and GOA in order to determine the impact of groundfish fisheries on these stocks. Total estimated contributions for CWT recoveries can be calculated in a two-step process involving a sampling expansion factor and a marking expansion factor (see Attachment 4 on Recovery Estimation Technique for a more detailed explanation).

Unfortunately, sampling expansion factors cannot be calculated for the CWT recoveries of ESA-listed ESUs in the BSAI and GOA because of data limitations. For most of the recoveries of CWTs in the GOA trawl fishery, it is unknown whether the CWTs were collected from inside or outside the sample. A sampling expansion factor can only be calculated from CWTs recovered from inside a sample where the total number of sampled fish is known. CWT recoveries from outside the sample ("select" recoveries where the total number of fish examined is unknown) cannot be used to calculate a sampling expansion factor. Of the 69 documented CWT recoveries of Chinook salmon from ESA-listed ESUs in the GOA trawl fishery, only two CWTs are known to have been recovered from inside the sample. Two CWTs are known to have been recovered outside the sample. For the other 65 recoveries, it is unknown whether the CWT was recovered from inside or outside the sample. Sampling expansion factors cannot be calculated on CWTs without knowing with reasonable certainty which CWTs were recovered from inside the sample. However, marking expansions can still be calculated for each CWT recovery from the mark expansion factors for each tag code. Because not all fish in a tag release group are actually tagged with CWTs, marking expansion factors account for the fraction of each release group that is tagged (see Recovery Estimation Technique). Without being able to calculate total estimated contributions because of unknown sampling expansion factors, mark expansions offer the closest approximation to the contribution of Chinook salmon from ESA-listed ESUs for the CWTs recovered from the BSAI and GOA groundfish fisheries. Mark expansions should be considered a very minimal estimate for the actual total contribution of Chinook salmon from ESA-listed ESUs in the BSAI and GOA groundfish fisheries.

Occurrence of ESA-listed Chinook salmon ESUs in the GOA and BSAI

Recoveries of CWTs from outside the sample (or from unknown sample origin) are still important for documenting occurrence of Chinook salmon from ESA-listed ESUs in the GOA and BSAI trawl fisheries. Chinook salmon from the Lower Columbia River (LCR), Upper Willamette River (UWR), and Upper Columbia River (UCR) Spring ESUs have been recovered in the GOA trawl fishery. Since 1984, CWTs have been recovered from 23 LCR, 97 UWR, and 1 UCR Chinook salmon in the GOA trawl fishery, and from 9 LCR and 12 UWR Chinook salmon in the BSAI trawl fishery, both pre- and post-listing (Attachment 5, Tables 1 and 2). By applying mark expansion factors, the estimated numbers increase to 112 LCR, 275 UWR, and 1

UCR Chinook salmon in the GOA and 9 LCR and 62 UWR Chinook salmon in the BSAI (Attachment 5, Tables 1 and 2).

These numbers should be considered as very minimum estimates of the number of ESA-listed ESUs in the GOA and BSAI groundfish fisheries. Until adequate numbers of CWTs are recovered from inside the observers' samples, where the total number of fish sampled is known, an estimate of total contribution of ESA-listed ESUs in the GOA fishery will remain unknown and indeterminable.

Research surveys have documented the occurrence of other ESUs of ESA-listed Chinook salmon in the GOA besides the LCR, UWR, and UCR. Small numbers of the Puget Sound (PS) Chinook ESU, the Snake River Spring/Summer (SRS/S) Chinook ESU, and the Snake River Basin (SRB) steelhead ESUs have also been recovered in the GOA. Since 1991, CWTs have been recovered from 3 LCR, 1 PS, 5 SRS/S, 4 UCR, 11 UWR Chinook salmon, and 1 SRB steelhead in domestic and foreign research surveys in the GOA (Attachment 5, Tables 3 and 4). By applying mark expansion factors, the estimated numbers increase to 6 LCR, 1 PS, 9 SRS/S, 4 UCR, 72 UWR Chinook salmon, and 1 SRB steelhead. The purpose of providing these research CWT recoveries is to determine potential occurrence of these ESA-listed ESUs in Alaskan waters where groundfish fisheries occur. They are not intended to represent bycatch of these ESA-listed ESUs in the groundfish fisheries.

Origins of CWT Chinook salmon in the GOA

The majority of CWT Chinook salmon recovered as bycatch in the GOA originated from British Columbia and Alaska. Recoveries of CWT Chinook salmon in the bycatch of the GOA groundfish fishery are summarized by state or province of origin (Attachment 6, Table 1). Since 1995, 34% of the observed CWTs of Chinook salmon in the GOA fishery have originated from British Columbia, followed by Alaska (31%), Oregon (21%), Washington (13%), and Idaho (<1%). When accounting for mark expansions for each tag code (see section on Recovery Estimation Techniques), British Columbia provided 52% of Chinook CWTs recovered in the bycatch, followed by Alaska (33%), Oregon (8%), Washington (7%), and Idaho (<1%). In 6 out of those 16 years, however, Alaska was the major provider of the year's CWT Chinook salmon recovered from the bycatch in the GOA.

Alaskan Chinook salmon represented by CWTs and harvested in the GOA originated from two basins, Cook Inlet and Southeast Alaska. Most of the CWT Alaskan Chinook salmon recovered in the GOA originated from Southeast Alaska (Attachment 7, Table 1). Since 1995, 73% of the observed CWTs of Alaska-origin Chinook salmon in the GOA originated from Southeast Alaska and 27% from Cook Inlet. When accounting for mark expansions, Southeast Alaska provided 91% of Alaska-origin Chinook salmon CWTs recovered from the bycatch in the GOA, with Cook Inlet at 9%.

Maps of CWT Chinook salmon distribution in the North Pacific Ocean, GOA, and Bering Sea by state or province of origin are shown (Attachment 8, Figures 1–7). These maps are compiled from CWT recoveries from high seas commercial fisheries and research surveys, 1981–2010, and are updated annually (Celewycz et al. 2010). The high seas data in these reports includes waters in the U.S. Exclusive Economic Zone.

Most of the Chinook salmon represented by CWTs and harvested in the GOA originated from hatchery production (Attachment 7, Table 2). Overall since 1995, 96% of the CWT Chinook salmon recovered from the bycatch was of hatchery origin, 3% from wild stocks, and 1% of mixed hatchery-wild stocks. For Alaska-origin CWT Chinook salmon, however, wild stocks increased to 8% of the recoveries in the bycatch in the GOA groundfish fishery, with hatcheries providing the other 92%. For all the CWT Chinook salmon that have been released in Alaska from the 1992 brood onward, 87% were of hatchery origin, and 13% were from wild stocks. Washington was the only other state of origin for wild stocks recovered in the GOA.

Chinook salmon represented by CWTs and recovered in the GOA groundfish fishery were composed of a variety of run-types, and the percentage of each run-type varied by state or province of origin (Attachment 7, Table 3). The different designated run-types are determined by the tagging agency. Overall, the most prevalent run-type of CWT Chinook salmon in the GOA was Spring, followed by Fall, Summer, and small numbers of other run-types. Percent composition of different run-types varied by state or province of origin. For Alaska stocks, 100% of CWT recoveries were Spring run-type. For British Columbia, the most prevalent run-type was Summer (41%), followed by Fall (33%) and Spring (26%). Washington Chinook salmon were predominantly Fall run-type (57%), followed by Summer (26%), Spring (9%), Late Fall (5%), and Late Fall Upriver Bright (3%). Oregon Chinook salmon were predominantly Spring (55%), followed by Fall (43%) and Winter (2%).

Genetic Analysis of Salmon Bycatch

Bering Sea Chinook salmon genetic sampling and analysis

Since 1979, four separate stock composition estimates of Chinook salmon bycatch samples from the eastern Bering Sea groundfish fisheries have been made, all showing that the majority of Chinook salmon samples were from Western Alaska stocks. Scale pattern analysis (SPA) was originally used to analyze the 1979–1982 Chinook salmon bycatch, and results suggested that 60% of the fish originated from Western Alaska, 17% from Southcentral Alaska, 14% from Asia, and 9% from Southeast Alaska and British Columbia (Myers and Rogers, 1988). A second study, also based on SPA, showed a similar stock composition from the 1997–1999 Chinook salmon bycatch with 56% from Western Alaska, 31% from Cook Inlet, 8% from Southeast Alaska-British Columbia, and 5% from Russia (Myers et al., 2004).

The third and fourth studies were completed more recently, and both used DNA characteristics available in the Alaska Department of Fish and Game (ADF&G) single nucleotide polymorphism (SNP) genetic baseline (Templin et al*.*, 2011). This baseline includes information for 45 SNP markers assayed in 23,269 fish from 288 collections representing 172 Chinook salmon populations ranging from the Kamchatka Peninsula in Russia to the Central Valley in California. Baseline populations were organized hierarchically into 11–15 large regions based on genetic clustering, geography, and management needs.

Between 2005 and 2009, genetic samples used for these analyses were collected opportunistically by the Observer Program as part of a special project, but sample biases have the potential to affect stock composition analysis results. Consequently, the associated stock composition estimates apply to the sample sets for each analysis and may not represent the entire Chinook salmon bycatch, but at a minimum, give indications of presence or absence of specific stocks and establish efficient protocols for future analyses.

In the first of the two DNA based analyses, the ADF&G used SNPs to estimate the stock composition of the Chinook salmon bycatch in the 2005–2007 Bering Sea pollock fishery based on the available sample set (NMFS, 2009b). Genetic samples of the Chinook salmon bycatch from the fall "B" 2005, spring "A" 2006, and fall "B" 2006 pollock fishing seasons were analyzed, whereas the 2007 "A" (spring) estimates were derived from a limited sample set of 360 salmon collected during a test of a salmon excluder device. The only complete year for which stock composition estimates were available was 2006, and when normalized to total bycatch, approximately 42% of the samples were estimated to come from Western Alaska, 23% from north Alaska Peninsula, 2% from Middle Yukon, 3% from Upper Yukon, 2% from Cook Inlet, 2% from Taku River-transboundary region, 23% from Pacific Northwest, 1% from Russia, and 2% from other regions.

In 2010, the NMFS Alaska Fisheries Science Center Auke Bay Laboratories (Auke Bay Lab) reported genetic stock identification results for a subset of Chinook salmon bycatch samples collected in the Bering Sea from the bycatch of the fall 2007 "B", year 2008, and year 2009 pollock seasons (Guyon et al., 2010a; Guyon et al., 2010b). Samples were genoptyed for the 43 unlinked SNP markers represented in the ADF&G genetic baseline. When annual bycatch sample stock composition estimates were compared, the majority of Chinook salmon bycatch samples originated from Alaska river systems directly flowing into the Bering Sea although estimate deviations were apparent for individual regions specifically with regard to coastal Western Alaska (~42% in 2006 versus ~55% in 2008 and 2009), north Alaska Peninsula (~27% in 2006 and 2008 versus 14% in 2009), Middle/Upper Yukon stocks (~5% in 2006 and 2008 versus 21% in 2009), and the Pacific Northwest (23% in 2006 and ~4% in 2008 and 2009) (Attachment 9). Due to sampling issues, it is unknown whether these changes represent actual changes in the stock composition or reflect inter-annual variability in sample distribution.

When the seasonal estimates were compared, the 2006 and 2008 spring "A" season Chinook salmon stock composition estimates were generally similar with a high proportion of samples from coastal Western Alaska (~45%) and the north Alaska Peninsula (~32%), although they differed significantly in the numbers of samples from the Pacific Northwest (23% in 2006 "A" and 1% in 2008 "A"). With regard to the fall "B" pollock season, Chinook salmon bycatch stock composition estimates from 2007 and 2008 were similar with three-quarters of the samples deriving from coastal Western Alaska. Regional stock composition estimates of the Chinook salmon bycatch between the 2007 "B" and 2008 "B" seasons appear to differ from the 2005 "B" and 2006 "B" seasons, as the most current estimates have a larger proportion from coastal western Alaska (~75% versus ~55%) and decreased numbers from the Pacific Northwest (~5% versus ~22%). However, caution must be used in comparisons across years as there are differences in both the sampling rate and where/when genetic samples were collected from year to year. In addition, the extent to which any salmon stock is impacted by the bycatch of the

Bering Sea trawl fishery is dependent on many factors including (1) the overall size of the bycatch, (2) the age of the salmon caught in the bycatch, (3) the age of the returning salmon, and (4) the total escapement of the affected stocks taking into account lag time for maturity and returning to the river. As such, a higher stock composition estimate one year does not necessarily infer greater impact than a smaller estimate in another year.

Recommendations for improving sample representation

In 2009, a study was completed providing recommendations for improving sample representation to meet the data requirements for estimating geographic stock origins of the Bering Sea salmon bycatch based on genetic markers (Pella and Geiger, 2009). The report proposed a systematic random sampling regimen for the collection of both Chinook and chum bycatch samples, whereby observers would sample every n^{th} fish from the census of salmon. Because all Chinook salmon stocks are not randomly distributed at sea (Guyon et al., 2010a; NMFS, 2009b), systematic random sampling was preferred as a means to generate a random sample set from a non-uniform distribution. An unbiased sample set, achieved by incorporating randomness at all levels of sampling so that each fish caught in the bycatch has an equal probability of being included in the sample set, is required for producing unbiased stock composition estimates of the salmon bycatch, both in the Bering Sea and the GOA. In addition, the sample set must be large enough to facilitate analysis of stock identification at pre-determined time and space domains. Due to the presence of a wide variety of salmon stocks in both the GOA and the Bering Sea, a goal of 400 representative genetic samples was established based on (1) sample sizes used in previous genetic analyses (Guyon et al., 2010a; Guyon et al., 2010b; NMFS, 2009b), and (2) recommendations that the coefficient of variation be no greater than 50% (defined as Standard Deviation/Estimated Value) for estimates with a 95% confidence that the individual stock contributed to the fishery (Marlowe and Busack, 1995). Even with this criteria, a sample set of 400 would only be 2% of a hypothetical total bycatch of 20,000. Given the non-random distribution of stocks, it is possible that even with a sample set size of 400, that the sample set may not be fully representative of rare stocks.

GOA Chinook salmon genetic sampling and analysis

Unlike the Bering Sea, limited sampling of the salmon bycatch has occurred in the GOA where very few genetic samples are available. For example, there are approximately 19 genetic samples from the 2007 “B” season, 38 from 2008, and 10 from 2009. This small number of Chinook salmon bycatch samples is insufficient to represent the annual catch for stock composition analysis, especially for an average annual bycatch of 21,596 between 2007 and 2009. Efforts are currently underway to improve genetic sampling in the GOA (Martin Loefflad, NMFS FMA Observer Program, personal communication, February 2011) so that stock composition analysis of the GOA bycatch can be accurately completed. More refined regional stock composition analyses than that currently available using the ADF&G SNP baseline will require a combined approach using both CWT information (Celewycz et al., 2010) and increased baseline coverage of Pacific Northwest salmon populations.

2010 and 2011 Chinook salmon genetic sampling and analysis

For the 2010 genetic analyses, approximately 1,000 Chinook salmon axillary process samples have been received by Auke Bay Lab from the Alaska groundfish fisheries bycatch. Although the exact collection locations are protected under the Magnuson-Stevens Fishery Conservation and Management Act, approximate locations are available based on the cruise number and offload or haul number through interrogations of the Observer Database. As in previous years, it is anticipated that the vast majority of Chinook salmon bycatch samples will be from the Bering Sea pollock trawl fishery.

Amendment 91 requires that all salmon taken as bycatch in the Bering Sea pollock fishery be sorted by species and counted to ensure compliance with the salmon bycatch caps for the pollock fishery. This has provided additional opportunities for observers to provide representative samples from the salmon bycatch for genetic analysis, and improve the capability to characterize the origin of salmon taken as bycatch in the Bering Sea pollock fishery. In 2011, systematic random sampling is being employed to take genetic samples from every tenth incidental caught Chinook salmon from the pollock trawl fishery. In 2011, GOA salmon bycatch sampling procedures have been revised to be as consistent as possible with changes occurring in the Bering Sea pollock fishery.

Chinook Salmon Management Measures

Bering Sea management measures – Amendment 91

Amendment 91 is an innovative approach to managing Chinook salmon bycatch in the Bering Sea pollock fishery that combines a Prohibited Species Catch (PSC) limit on the amount of Chinook salmon that may be caught incidentally with an incentive plan agreement (IPA) and performance standard designed to minimize bycatch to the extent practicable in all years. Under Amendment 91, the pollock fleet is prevented from exceeding the 60,000 Chinook salmon PSC limit in every year. Each year, NMFS will allocate the 60,000 Chinook salmon PSC limit to the mothership sector, catcher/processor sector, inshore cooperatives, and CDQ groups if an IPA is formed and approved by NMFS. The sector-level performance standard of 47,591 Chinook salmon is a tool to ensure that each sector does not fully harvest its Chinook salmon PSC allocation in most years. For a sector to continue to receive Chinook salmon PSC allocations under the 60,000 Chinook salmon PSC limit, that sector may not exceed its portion of 47,591 in any three years within seven consecutive years. If a sector fails this performance standard, it will permanently be allocated a portion of the 47,591 Chinook salmon PSC limit. All vessels choosing to not participate in an IPA would fish under a portion of the "opt-out" cap of 28,496 Chinook salmon. Chinook salmon PSC limit and would be ineligible to participate in management measures intended to offer flexibility to vessels harvesting pollock.

With the IPA component and the performance standard, Amendment 91, as implemented by the final rule, will result in a greater reduction of Chinook salmon bycatch over time than the PSC limits. NMFS will monitor all salmon bycatch by each vessel in the pollock fishery through a census, 100 % observer coverage, and an expanded biological sampling program. Annual reports and the proposed economic data collection program are designed to evaluate whether and how incentive plans influence a vessel's operational decisions to avoid Chinook salmon bycatch. If information becomes available to indicate that Amendment 91 is not providing the expected Chinook salmon savings, NMFS will work with the Council to take additional actions to minimize Chinook salmon bycatch to the extent practicable. Amendment 91 applies only to management of the Bering Sea pollock fishery and will not affect the management of pollock fisheries in the Aleutian Islands.

Amendment 91 also removed from regulations the 29,000 Chinook salmon PSC limit in the Bering Sea, the Chinook Salmon Savings Areas in the Bering Sea, exemption from Chinook Salmon Savings Area closures for participants in the Voluntary Rolling Hotspot System Intercooperative Agreement (VHRS ICA), and Chinook salmon as a component of the VRHS ICA. The final rule did not change any regulations affecting the management of Chinook salmon in the Aleutian Islands or non-Chinook salmon in the BSAI. The Council is currently considering a separate action to modify the non-Chinook salmon management measures to minimize non-Chinook salmon bycatch in the Bering Sea. For more information see http://www.fakr.noaa.gov/npfmc/current_issues/bycatch/bycatch.htm.

GOA management measures

The Council updated a discussion paper on Chinook salmon bycatch in the GOA in December 2010 and is in the process of evaluating management options to reduce Chinook salmon bycatch in the GOA pollock trawl fisheries (Attachment 10). At the February 2011 meeting, the Council reviewed two staff discussion papers and a workplan to address Chinook salmon bycatch in the GOA. The proposed action includes alternatives to implement Chinook salmon bycatch caps (PSC limits) in the Central and Western GOA pollock fisheries and/or a cooperative program to address Chinook bycatch in these fisheries. The Council plans to take final action on this issue in June 2011, which could allow implementation of the proposed action in mid-2012.

Salmon Excluder Device EFP

Since 2005, several Exempted Fishing Permits (EFPs) have been issued to allow testing of a salmon excluder device on pollock trawl gear. Progress has been made in the development of a device that allows escapement of salmon without escapement of pollock. The Environmental Assessment for EFP 08-02 to support the development of a salmon excluder device (NMFS, 2008) and the final report for the work under EFP 08-02 (Gauvin et al., 2010) detail the steps leading up to the application for this EFP and continuing changes to the design. Working with the industry, Dr. Craig Rose of the Alaska Fisheries Science Center used images of salmon behavior in a pollock trawl net to develop an excluder that would permit the escapement of salmon without the loss of pollock. EFP 08-02 resulted in the current flapper excluder designed to allow escapement during towing (Attachment 11). This design is based on installing the flapper in the straight tube section just ahead of the packing tube or codend. Weight is placed on the forward part of the flapper panel and floatation on the aft section of the escapement hole is used to achieve lift and additional room for escapement. The flapper excluder achieved between 25% and 35% Chinook salmon escapement by number with pollock (groundfish) escapement in the range of one-half to one and one-half percent by weight. As was noted in the final tests on

Pacific Prince, adding artificial light above or around the escapement hole may increase the Chinook escapement rate.

In November 2010, NMFS received an application to issue an EFP from fall 2011 through fall 2012. The primary objective of the research will be the development and testing of an excluder that reduces chum salmon bycatch rates without significant negative effects on pollock fishing. A secondary objective is to improve the Chinook salmon bycatch reduction performance of the final version of the Chinook salmon excluder developed under EFP 08-02. An analysis of this application is currently underway.

Reducing salmon incidental catch continues to be an important issue for the Council, Alaska Region, Western Alaska communities, and the fishing industry. If you have any questions, please contact Mary Grady at mary.grady@noaa.gov or 907-586-7172.

Attachments

1. BSAI and GOA groundfish fisheries total Chinook salmon catch 2004–2010
2. Chinook salmon mortality in BSAI groundfish fisheries
3. Chinook salmon bycatch by sector in Alaska pollock fisheries
4. Recovery Estimation Technique
5. Observed Number and Mark Expansion of ESA-listed CWT Chinook salmon by ESU in BSAI and GOA
6. Observed Number and Mark Expansion of CWT Chinook salmon captured in the bycatch of the GOA groundfish fishery by run year and state or province of origin, 1995–2010
7. Observed Number and Mark Expansion of CWT Alaska-origin Chinook salmon captured in the bycatch of the GOA groundfish fishery by run year and release basin fishery and by state or province of origin, 1995–2010
8. Ocean distribution for Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010.
9. Comparison of yearly stock composition estimates based on available genetic samples from the Bering Sea Chinook salmon bycatch.
10. Council discussion paper on GOA Chinook salmon bycatch
11. Final Report for EFP 08-02 to explore the potential for flapper-style salmon excluders for the Bering Sea pollock fishery

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2010 Annual Report for the Alaska Groundfish Fisheries Salmon Incidental Catch and Endangered Species Act Consultation Errata:

Errata #1

A sentence on page 1 reads: Sector specific salmon catch in the BSAI pollock fishery is provided in Attachment 3.

This sentence should read: Sector specific Chinook salmon bycatch in the Alaska groundfish fisheries is provided in Attachment 3.

Errata #2

On Attachment 3, the heading of Table 1 reads: Chinook salmon bycatch by sector in Alaska pollock fisheries.

The heading of Table 1 should read: Chinook salmon bycatch by sector in the Alaska groundfish fisheries.

Errata #3

On Attachment 3, Table 1: the 2008 and the 2010 numbers for CP and S in the GOA should be switched. The table should read:

Table 1. Chinook salmon bycatch by sector in the Alaska groundfish fisheries

	BSAI			GOA	
Year	CP	S	M	CP	S
2004	17,347	35,865	3,747	2,333	15,445
2005	19,185	50,337	2,704	2,784	28,486
2006	20,546	59,625	5,119	1,628	17,376
2007	36,392	80,847	6,647	2,984	37,411
2008	5,583	16,540	1,328	2,967	12,995
2009	3,842	9,024	639	2,406	6,024
2010	5,007	6,609	581	4,683	49,894
Average	15,415	36,978	2,966	2,826	23,947

2010 data are preliminary
CP=Catcher Processor, M=Mothership, S=Shoreside Processor
Source: NMFS Alaska Region Catch Accounting System, 2/10/2011

Attachment 1

Table 1. BSAI groundfish fisheries total Chinook salmon catch 2004–2010

BSAI Chinook Salmon Count			2004	2005	2006	2007	2008	2009	2010
Trawl Gear	Pelagic	Pollock Target	48,733	65,445	80,954	116,128	20,895	11,977	9,402
	Non-Pelagic	Pacific Cod Target	5,599	3,764	3,620	6,287	2,068	1,054	1,266
		Flatfish	2,166	2,839	680	1,148	246	110	609
		Other Targets	404	123	11	276	231	354	883
Non-Trawl Gear		All Targets	57	55	25	74	19	11	37
TOTAL			**56,960**	**72,226**	**85,290**	**123,913**	**23,460**	**13,505**	**12,197**

BSAI Groundfish			2004	2005	2006	2007	2008	2009	2010
Trawl Gear	Pelagic	Pollock Target	1,452,486	1,461,785	1,474,792	1,341,376	980,865	810,392	803,465
	Non-Pelagic	Pacific Cod Target	109,816	81,216	85,564	93,077	43,859	38,238	36,910
		Flatfish	180,893	192,555	194,683	217,734	293,334	245,562	276,934
		Other Targets	75,530	78,422	80,320	85,251	83,688	99,496	100,458
Non-Trawl Gear		All Targets	160,425	167,116	146,677	122,831	143,843	143,824	137,767
TOTAL			**1,979,151**	**1,981,113**	**1,982,108**	**1,860,288**	**1,545,589**	**1,337,596**	**1,355,582**

BSAI Chinook Salmon Bycatch Rate			2004	2005	2006	2007	2008	2009	2010
Trawl Gear	Pelagic	Pollock Target	0.034	0.045	0.055	0.087	0.021	0.015	0.012
	Non-Pelagic	Pacific Cod Target	0.051	0.046	0.042	0.068	0.047	0.028	0.034
		Flatfish	0.012	0.015	0.003	0.005	0.001	0.000	0.002
		Other Targets	0.005	0.002	0.000	0.003	0.003	0.004	0.009
Non-Trawl Gear		All Targets	0.000	0.000	0.000	0.001	0.000	0.000	0.000
TOTAL			**0.029**	**0.036**	**0.043**	**0.067**	**0.015**	**0.010**	**0.009**

2010 data are preliminary

Source: NMFS Alaska Region Catch Accounting System, 2/10/2011

Table 2. GOA groundfish fisheries total Chinook salmon catch 2004–2010

GOA Chinook Salmon Count			2004	2005	2006	2007	2008	2009	2010
Trawl Gear	Pelagic	Pollock Target	12,506	26,631	15,564	34,990	10,397	2,821	42,862
		Other Targets	-	63	-	304	761	213	156
	Non-Pelagic	Pollock Target	646	1,296	380	50	30	278	1,893
		Pacific Cod Target	908	41	882	624	433	111	442
		Flatfish	2,800	2,853	1,909	2,654	2,822	3,787	7,753
		Other Targets	885	387	263	1,733	1,519	1,219	1,470
Non-Trawl Gear		All Targets	32	-	-	39	-	-	-
TOTAL			**17,777**	**31,270**	**19,004**	**40,395**	**15,962**	**8,430**	**54,576**

GOA Groundfish			2004	2005	2006	2007	2008	2009	2010
Trawl Gear	Pelagic	Pollock Target	57,984	83,218	73,225	51,778	46,485	39,558	74,743
		Other Targets	977	1,433	3,497	4,647	4,522	3,381	4,743
	Non-Pelagic	Pollock Target	7,195	897	3,259	1,351	3,556	1,921	2,994
		Pacific Cod Target	16,785	12,443	11,403	13,605	22,856	8,736	17,228
		Flatfish	20,449	29,622	41,313	42,573	47,036	52,052	42,620
		Other Targets	26,094	21,884	22,148	20,337	20,467	22,579	24,203
Non-Trawl Gear		All Targets	59,180	50,758	53,899	54,092	56,174	55,019	71,109
TOTAL			**188,664**	**200,254**	**208,745**	**188,383**	**201,096**	**183,246**	**237,640**

GOA Chinook Salmon Bycatch Rate			2004	2005	2006	2007	2008	2009	2010
Trawl Gear	Pelagic	Pollock Target	0.216	0.320	0.213	0.676	0.224	0.071	0.573
		Other Targets	-	0.044	-	0.065	0.168	0.063	0.033
	Non-Pelagic	Pollock Target	0.090	1.445	0.117	0.037	0.009	0.145	0.632
		Pacific Cod Target	0.054	0.003	0.077	0.046	0.019	0.013	0.026
		Flatfish	0.137	0.096	0.046	0.062	0.060	0.073	0.182
		Other Targets	0.034	0.018	0.012	0.085	0.074	0.054	0.061
Non-Trawl Gear		All Targets	0.001	-	-	0.001	-	-	-
TOTAL			**17,777**	**31,270**	**19,004**	**40,395**	**15,962**	**8,430**	**54,576**

2010 data are preliminary

Source: NMFS Alaska Region Catch Accounting System, 2/10/2011

Attachment 2

Table 1. Chinook salmon mortality in BSAI groundfish fisheries

	Annual	Annual	Annual	A season	B season	A season	B season	A season	B season
Year	with CDQ	without CDQ	CDQ only	With CDQ		Without CDQ		CDQ only	
1991	na	48,880	na	na	na	46,392	2,488	na	na
1992	41,955	na	na	31,419	10,536	na	na	na	na
1993	46,014	na	na	24,688	21,326	na	na	na	na
1994	43,821	40,635	3,186	38,921	4,900	36,699	3,936	2,223	963
1995	23,436	21,430	2,006	18,939	4,497	18,284	3,146	655	1,351
1996	63,205	60,802	2,402	43,316	19,888	42,028	18,774	1,289	1,114
1997	50,530	48,050	2,481	16,401	34,129	14,905	33,144	1,496	985
1998	55,431	50,313	5,118	18,930	36,501	17,991	32,322	939	4,179
1999	14,599	12,937	1,662	8,794	5,805	8,205	4,732	589	1,073
2000	8,223	7,474	749	6,568	1,655	6,138	1,336	430	319
2001	40,547	37,986	2,561	24,871	15,676	23,093	14,893	1,778	783
2002	39,684	37,581	2,103	26,277	13,407	24,859	12,722	1,418	685
2003	53,571	50,858	2,713	40,044	13,527	38,249	12,609	1,795	918
2004	59,967	56,960	3,007	30,717	29,250	29,588	27,372	1,129	1,878
2005	74,267	72,225	2,042	33,636	40,631	32,334	39,891	1,302	740
2006	87,084	85,290	1,794	62,582	24,502	60,974	24,316	1,608	186
2007	129,567	123,914	5,653	77,108	52,459	74,004	49,910	3,104	2,549
2008	24,167	23,450	717	19,045	5,122	18,441	5,009	604	113
2009	14,008	13,505	503	11,075	2,933	10,661	2,844	414	89
2010	12,532	12,197	335	9,513	3,019	9,178	3,019	335	0
2011	2,498	2,344	154	2,498	na	2,344	na	154	na

Table 2. Chinook salmon mortality in BSAI pollock directed fisheries

	Annual	Annual	Annual	A season	B season	A season	B season	A season	B season
Year	with CDQ	without CDQ	CDQ only	With CDQ		Without CDQ		CDQ only	
1991	na	40,906	na	na	na	38,791	2,114	na	na
1992	35,950	na	na	25,691	10,259	na	na	na	na
1993	38,516	na	na	17,264	21,252	na	na	na	na
1994	33,136	30,593	2,543	28,451	4,686	26,871	3,722	1,580	963
1995	14,984	12,978	2,006	10,579	4,405	9,924	3,053	655	1,351
1996	55,623	53,220	2,402	36,068	19,554	34,780	18,441	1,289	1,114
1997	44,909	42,437	2,472	10,935	33,973	9,449	32,989	1,487	985
1998	51,322	46,205	5,118	15,193	36,130	14,253	31,951	939	4,179
1999	11,978	10,381	1,597	6,352	5,627	5,768	4,614	584	1,013
2000	4,961	4,242	719	3,422	1,539	2,992	1,250	430	289
2001	33,444	30,937	2,507	18,484	14,961	16,711	14,227	1,773	734
2002	34,495	32,402	2,093	21,794	12,701	20,378	12,024	1,416	677
2003	45,586	43,021	2,565	32,609	12,977	30,916	12,105	1,693	872
2004	51,696	48,733	2,963	23,093	28,603	21,964	26,769	1,129	1,834
2005	67,361	65,445	1,916	27,331	40,030	26,032	39,413	1,299	617
2006	82,695	80,954	1,741	58,391	24,305	56,806	24,149	1,585	156
2007	121,757	116,128	5,629	69,408	52,349	66,307	49,821	3,101	2,528
2008	21,535	20,895	640	16,679	4,856	16,075	4,820	604	36
2009	12,424	11,977	447	9,688	2,736	9,330	2,647	358	89
2010	9,737	9,402	335	7,661	2,076	7,326	2,076	335	0
2011	2,462	2,308	336	2,462	na	2,308	na	154	na

2010, 2011 data are preliminary
Source: NMFS Alaska Region Catch Accounting System, 2/14/2011

Attachment 3

Table 1. Chinook salmon bycatch by sector in Alaska pollock fisheries

	BSAI			GOA	
Year	CP	S	M	CP	S
2004	17,347	35,865	3,747	2,333	15,445
2005	19,185	50,337	2,704	2,784	28,486
2006	20,546	59,625	5,119	1,628	17,376
2007	36,392	80,847	6,647	2,984	37,411
2008	5,583	16,540	1,328	12,995	2,967
2009	3,842	9,024	639	2,406	6,024
2010	5,007	6,609	581	49,894	4,683
Average	15,415	36,978	2,966	10,718	16,056

2010 data are preliminary
CP=Catcher Processor, M=Mothership, S=Shoreshide Processor
Source: NMFS Alaska Region Catch Accounting System, 2/10/2011

Attachment 4

Recovery Estimation Technique

The total estimated contributions of ESA-listed salmon ESUs caught in the GOA and BSAI fisheries for each year can be estimated in a two-step process (Nandor et al. 2010). The first step is to calculate a sampling expansion factor (*a*) for each fishery in each year (Johnson 2004):

> *a* = (total catch of each species by fishery by year)/ (sampled catch of each species by fishery by year).

However, a sampling expansion factor can only be calculated from CWTs recovered from *inside* a sample where the number of sampled fish is known. CWT recoveries from *outside* the sample ("select" recoveries where the total number of fish examined is unknown) cannot be used to calculate a sampling expansion factor.

For the sampled catch, the estimated total recoveries of tags for each release group from each ESU by fishery and year are calculated:

$$R_{Ti} = aR_{O};$$

R_{Ti} = estimated total recoveries of tags for the i^{th} release group;
R_{Oi} = observed number of tags for the i^{th} release group release group;
a = sampling expansion factor for each fishery in each year.

The second step is to account for the fraction of each release group of interest that was tagged (Johnson 2004):

$$C_T = \sum_{i=1}^{n} b_i R_{Ti};$$

C_T = the total estimated contribution for a given ESU;
b_i = a marking expansion factor for the i^{th} release group = (total fish released)/ (total fish marked) for the i^{th} release group;
R_{Ti} = estimated total recoveries of tags for the i^{th} release group.

These are the simplest forms of recovery expansion equations (Nandor 2010).

For recoveries in high seas research cruises, because the total catch is usually sampled for tags, the sampling expansion factor (*a*) typically = 1.

Attachment 5

Table 1. Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU captured in the bycatch of the GOA and BSAI trawl fisheries, summed over pre-listing and post-listing periods, 1984–2010

		GOA		BSAI	
Listing Status	**ESU Name**	**Observed Number**	**Mark Expansion**	**Observed Number**	**Mark Expansion**
Pre-listing	Lower Columbia River Chinook	12	82.1	0	0.0
	Upper Willamette River Chinook	40	129.7	2	2.0
Post-listing	Lower Columbia River Chinook	11	29.8	9	9.1
	Upper Willamette River Chinook	57	145.4	10	59.9
	Upper Columbia River spring Chinook	1	1.0	0	0.0

Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 5 cont.

Table 2. Observed Number and Mark Expansion of ESA-listed CWT salmon bycatch of the GOA and BSAI groundfish fisheries by ESU by year

A. Lower Columbia River Chinook ESU			GOA		BSAI	
Listing Status	ESU Name	Run Year	Observed Number	Mark Expansion	Observed Number	Mark Expansion
Pre-listing	Lower Columbia River Chinook	1984	5	14.1	0	0.0
		1985	1	1.0	0	0.0
		1986	0	0.0	0	0.0
		1987	1	1.3	0	0.0
		1988	0	0.0	0	0.0
		1989	0	0.0	0	0.0
		1990	1	1.0	0	0.0
		1991	0	0.0	0	0.0
		1992	1	1.6	0	0.0
		1993	1	60.3	0	0.0
		1994	2	2.8	0	0.0
		1995	0	0.0	0	0.0
		1996	0	0.0	0	0.0
Post-listing	Lower Columbia River Chinook	1997	0	0.0	0	0.0
		1998	2	18.8	0	0.0
		1999	4	5.9	0	0.0
		2000	2	2.0	0	0.0
		2001	2	2.0	1	1.0
		2002	0	0.0	1	1.0
		2003	0	0.0	0	0.0
		2004	1	1.1	3	3.0
		2005	0	0.0	3	3.1
		2006	0	0.0	1	1.0
		2007	0	0.0	0	0.0
		2008	0	0.0	0	0.0
		2009	0	0.0	0	0.0
		2010	0	0.0	0	0.0

Attachment 5, Table 2. cont.

B. Upper Willamette River Chinook ESU			GOA		BSAI	
Listing Status	ESU Name	Run Year	Observed Number	Mark Expansion	Observed Number	Mark Expansion
Pre-listing	Upper Willamette River Chinook	1984	11	16.8	1	1.0
		1985	0	0.0	0	0.0
		1986	0	0.0	0	0.0
		1987	0	0.0	0	0.0
		1988	0	0.0	0	0.0
		1989	0	0.0	0	0.0
		1990	4	4.0	0	0.0
		1991	1	13.3	0	0.0
		1992	4	28.5	0	0.0
		1993	14	52.1	0	0.0
		1994	3	8.8	0	0.0
		1995	2	4.9	0	0.0
		1996	1	1.3	1	1.0
Post-listing	Upper Willamette River Chinook	1997	1	7.5	0	0.0
		1998	4	30.7	0	0.0
		1999	20	49.3	1	1.0
		2000	16	16.6	1	1.0
		2001	7	7.1	1	1.0
		2002	1	1.0	2	12.4
		2003	1	5.3	0	0.0
		2004	1	5.8	1	7.9
		2005	0	0.0	2	10.9
		2006	1	1.0	0	0.0
		2007	0	0.0	0	0.0
		2008	1	6.5	0	0.0
		2009	1	1.8	1	10.2
		2010	3	12.8	1	15.5

Attachment 5, Table 2 cont.

C. Upper Columbia River spring Chinook ESU			GOA		BSAI	
Listing Status	ESU Name	Run Year	Observed Number	Mark Expansion	Observed Number	Mark Expansion
Pre-listing	Upper Columbia River spring Chinook	1984	0	0.0	0	0.0
		1985	0	0.0	0	0.0
		1986	0	0.0	0	0.0
		1987	0	0.0	0	0.0
		1988	0	0.0	0	0.0
		1989	0	0.0	0	0.0
		1990	0	0.0	0	0.0
		1991	0	0.0	0	0.0
		1992	0	0.0	0	0.0
		1993	0	0.0	0	0.0
		1994	0	0.0	0	0.0
		1995	0	0.0	0	0.0
		1996	0	0.0	0	0.0
Post-listing	Upper Columbia River spring Chinook	1997	0	0.0	0	0.0
		1998	1	1.0	0	0.0
		1999	0	0.0	0	0.0
		2000	0	0.0	0	0.0
		2001	0	0.0	0	0.0
		2002	0	0.0	0	0.0
		2003	0	0.0	0	0.0
		2004	0	0.0	0	0.0
		2005	0	0.0	0	0.0
		2006	0	0.0	0	0.0
		2007	0	0.0	0	0.0
		2008	0	0.0	0	0.0
		2009	0	0.0	0	0.0
		2010	0	0.0	0	0.0

Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 5 cont.

Table 3. Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys, post-listing, 1991-2010. No pre-listing ESUs were ever captured in GOA research surveys, and no ESA-listed CWT salmon have ever been recovered in BSAI research surveys

		GOA	
Listing Status	ESU Name	Observed Number	Mark expansion
Post-listing	Lower Columbia River Chinook	3	6.5
	Puget Sound Chinook	1	1.0
	Snake River spring/summer Chinook	5	9.2
	Upper Columbia River spring Chinook	4	4.1
	Upper Willamette River Chinook	11	72.0
	Snake River Basin steelhead	1	1.0

Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Table 4. Observed Number and Mark Expansion of ESA-listed CWT salmon captured in GOA research surveys by ESU, by run year, post-listing, 1991-2010. No pre-listing ESUs were ever captured in GOA research surveys, and no ESA-listed CWT salmon have ever been recovered in BSAI research surveys

A. Lower Columbia River Chinook ESU			GOA	
Listing Status	ESU Name	Run Year	Observed Number	Mark expansion
Post-listing	Lower Columbia River Chinook	1997	0	0.0
		1998	1	4.5
		1999	1	1.0
		2000	0	0.0
		2001	1	1.0
		2002	0	0.0
		2003	0	0.0
		2004	0	0.0
		2005	0	0.0
		2006	0	0.0
		2007	0	0.0
		2008	0	0.0
		2009	0	0.0
		2010	0	0.0

Attachment 5, Table 4 cont.

C. Snake River spring/summer Chinook ESU			GOA	
Listing Status	ESU Name	Run Year	Observed Number	Mark expansion
Post-listing	Snake River spring/summer Chinook	1992	0	0.0
		1993	0	0.0
		1994	0	0.0
		1995	0	0.0
		1996	0	0.0
		1997	0	0.0
		1998	1	2.9
		1999	0	0.0
		2000	0	0.0
		2001	0	0.0
		2002	1	1.1
		2003	3	5.3
		2004	0	0.0
		2005	0	0.0
		2006	0	0.0
		2007	0	0.0
		2008	0	0.0
		2009	0	0.0
		2010	0	0.0

D. Upper Columbia River spring Chinook ESU			GOA	
Listing Status	ESU Name	Run Year	Observed Number	Mark expansion
Post-listing	Upper Columbia River spring Chinook	1999	1	1.0
		2000	2	2.1
		2001	0	0.0
		2002	0	0.0
		2003	1	1.0
		2004	0	0.0
		2005	0	0.0
		2006	0	0.0
		2007	0	0.0
		2008	0	0.0
		2009	0	0.0
		2010	0	0.0

Attachment 5, Table 4 cont.

E. Upper Willamette River Chinook ESU			GOA	
Listing Status	ESU Name	Run Year	Observed Number	Mark expansion
Post-listing	Upper Willamette River Chinook	1998	2	2.3
		1999	0	0.0
		2000	0	0.0
		2001	5	33.6
		2002	3	26.6
		2003	1	9.5
		2004	0	0.0
		2005	0	0.0
		2006	0	0.0
		2007	0	0.0
		2008	0	0.0
		2009	0	0.0
		2010	0	0.0

Attachment 5, Table 4 cont.

F. Snake River Basin steelhead ESU			GOA	
Listing Status	ESU Name	Run Year	Observed Number	Mark expansion
Post-listing	Snake River Basin Steelhead	1991	0	0.0
		1992	0	0.0
		1993	0	0.0
		1994	0	0.0
		1995	0	0.0
		1996	0	0.0
		1997	0	0.0
		1998	1	1.0
		1999	0	0.0
		2000	0	0.0
		2001	0	0.0
		2002	0	0.0
		2003	0	0.0
		2004	0	0.0
		2005	0	0.0
		2006	0	0.0
		2007	0	0.0
		2008	0	0.0
		2009	0	0.0
		2010	0	0.0

Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 6

Table 1. Observed Number and Mark Expansion of CWT Chinook salmon captured in the bycatch of the GOA groundfish fishery by run year and state or province of origin, 1995–2010

	Alaska		British Columbia		Idaho		Oregon		Washington		TOTAL	
Run Year	Observed Number	Mark Expansion	Observed Number	Mark Expansion	Observed Number	Mark Expansion	Observed Number	Mark Expansion	Observed Number	Mark Expansion	Observed Number	Mark Expansion
1995	4	11.9	17	177.3	0	0.0	4	7.0	2	2.0	27	198.2
1996	14	92.4	10	152.9	0	0.0	3	3.5	2	2.0	29	250.7
1997	2	17.4	12	82.9	0	0.0	4	10.6	1	3.7	19	114.6
1998	30	157.8	50	585.3	1	1.0	10	55.2	9	19.0	100	818.3
1999	45	244.3	51	295.9	0	0.0	32	76.7	17	127.9	145	744.7
2000	24	224.9	18	38.1	0	0.0	32	50.0	10	16.2	84	329.1
2001	10	100.2	6	74.8	0	0.0	12	16.5	4	4.0	32	195.6
2002	10	47.2	5	113.0	0	0.0	4	4.3	3	3.7	22	168.2
2003	2	22.4	2	28.6	0	0.0	4	8.3	1	1.0	9	60.3
2004	3	30.5	4	22.0	0	0.0	5	16.9	1	1.1	13	70.6
2005	3	33.6	4	86.5	0	0.0	2	3.1	2	2.2	11	125.4
2006	10	58.3	7	158.3	0	0.0	2	2.1	5	14.5	24	233.1
2007	13	99.1	3	50.9	0	0.0	2	2.1	5	21.3	23	173.3
2008	3	16.8	1	1.0	0	0.0	2	7.9	9	9.8	15	35.6
2009	4	40.4	2	5.2	0	0.0	2	2.8	1	1.1	9	49.4
2010*	0	0.0	1	1.0	0	0.0	1	5.4	4	7.0	6	13.4
TOTAL	177	1197.1	193	1873.7	1	1.0	121	272.5	76	236.3	568	3580.6
mean	11.1	74.8	12.1	117.1	0.1	0.1	7.6	17.0	4.8	14.8	35.5	223.8
average % of total	31%	33%	34%	52%	0%	0%	21%	8%	13%	7%	100%	100%

*preliminary
Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 7

Table 1. Observed Number and Mark Expansion of CWT Alaska-origin Chinook salmon captured in the bycatch of the GOA groundfish fishery by run year and release basin, 1995–2010

	Cook Inlet, Alaska		Southeast Alaska		Alaska TOTAL	
Run Year	**Observed Number**	**Mark Expansion**	**Observed Number**	**Mark Expansion**	**Observed Number**	**Mark Expansion**
1995	1	4.0	3	8.0	4	11.9
1996	4	10.7	10	81.7	14	92.4
1997	1	5.3	1	12.1	2	17.4
1998	14	41.4	16	116.4	30	157.8
1999	20	37.6	25	206.6	45	244.3
2000	2	4.2	22	220.7	24	224.9
2001	2	2.0	8	98.2	10	100.2
2002	1	1.0	9	46.2	10	47.2
2003	0	0.0	2	22.4	2	22.4
2004	0	0.0	3	30.5	3	30.5
2005	0	0.0	3	33.6	3	33.6
2006	0	0.0	10	58.3	10	58.3
2007	0	0.0	13	99.1	13	99.1
2008	2	2.0	1	14.8	3	16.8
2009	1	1.0	3	39.4	4	40.4
2010*	0	0.0	0	0.0	0	0.0
TOTAL	48	109.2	129	1087.9	177	1197.1
mean	3.0	6.8	8.1	68.0	11.1	74.8
average % of total	27%	9%	73%	91%	100%	100%

*preliminary
Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 7 cont.

Table 2. Observed Number of CWT Chinook salmon captured in the bycatch of the GOA groundfish fishery by state or province of origin, 1995–2010

	Rearing Type				
Origin	**Unknown**	**Hatchery**	**Mixed**	**Wild**	**TOTAL**
Alaska	0	163	0	14	177
British Columbia	0	193	0	0	193
Idaho	1	0	0	0	1
Oregon	0	121	0	0	121
Washington	0	69	5	2	76
TOTAL	1	546	5	16	568
average % of total	0%	96%	1%	3%	100%

2010 data are preliminary
Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Table 3. Percent run-type of CWT Chinook salmon captured in the bycatch of the GOA groundfish fishery by state or province of origin, 1995–2010

	Run-type						
Origin	**Spring**	**Summer**	**Fall**	**Winter**	**Late Fall**	**Late Fall Upriver Bright**	**TOTAL**
Alaska	100%	0%	0%	0%	0%	0%	100%
British Columbia	26%	41%	33%	0%	0%	0%	100%
Oregon	55%	0%	43%	2%	0%	0%	100%
Washington	9%	26%	57%	0%	5%	3%	100%
Mean	49%	19%	30%	0%	1%	0%	100%

2010 data are preliminary
Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 8

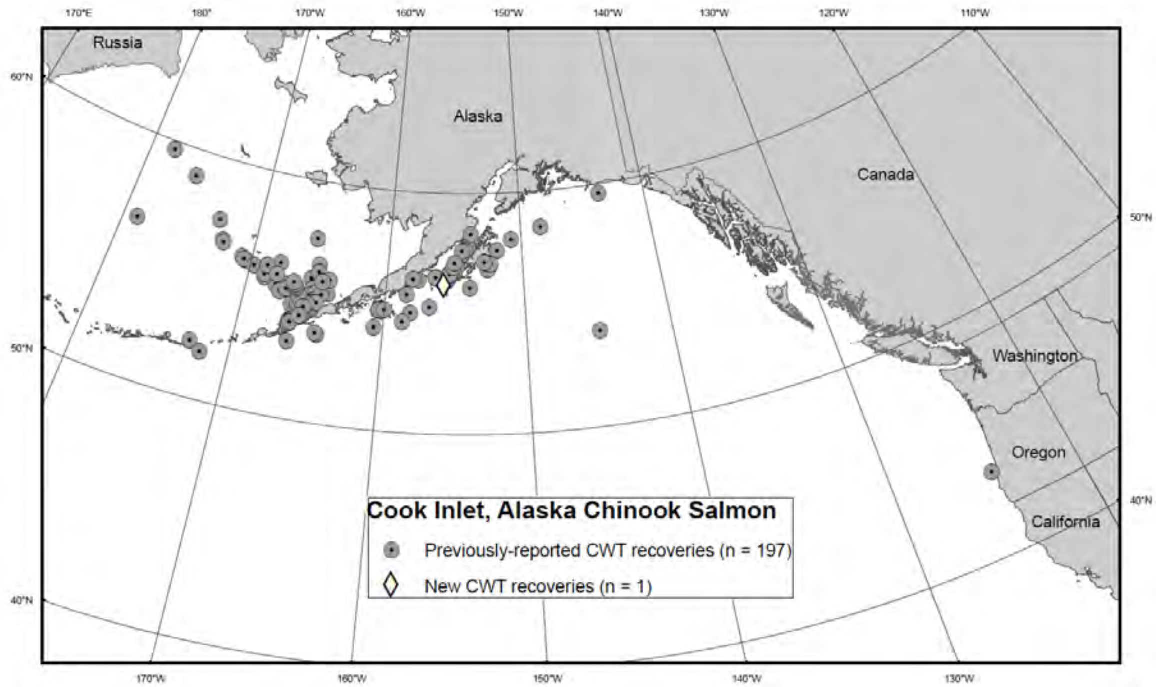

Figure 1. Ocean distribution for Cook Inlet Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary. Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

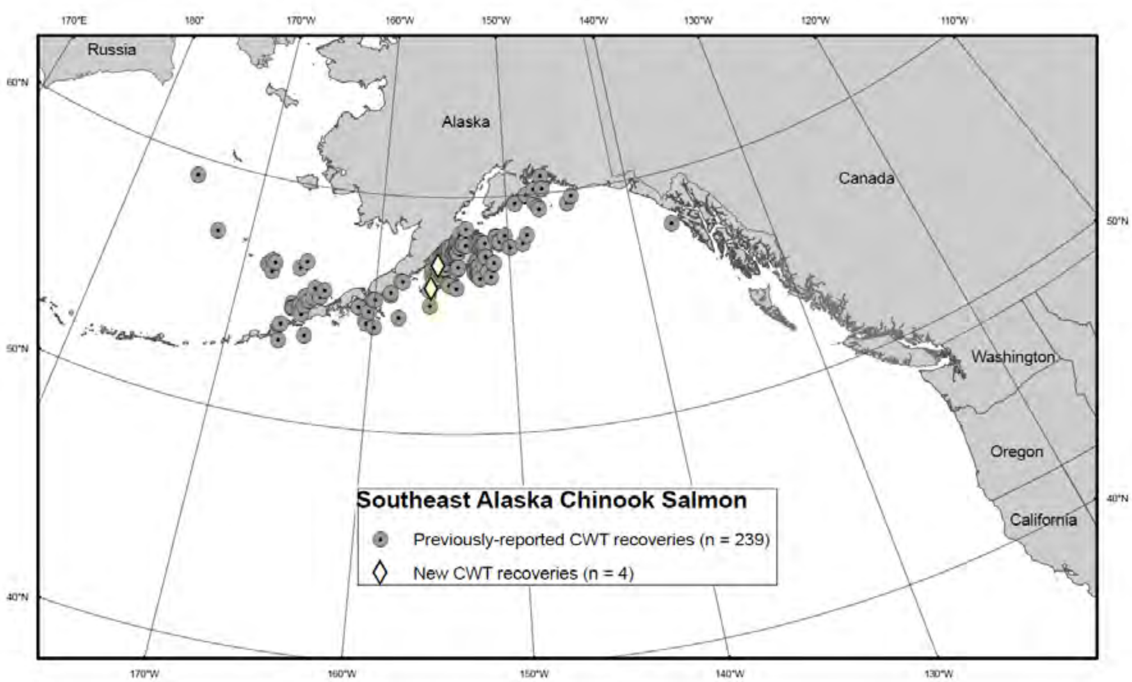

Figure 2. Ocean distribution for Southeast Alaska Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary. Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 8 cont.

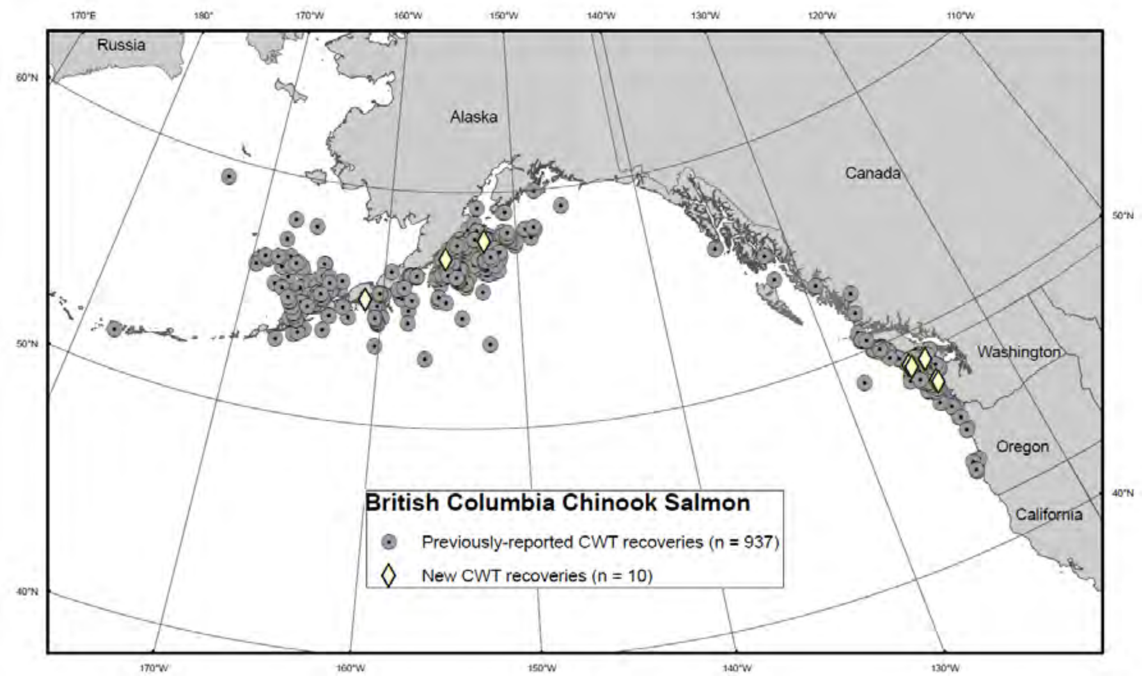

Figure 3. Ocean distribution for British Columbia Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary. Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

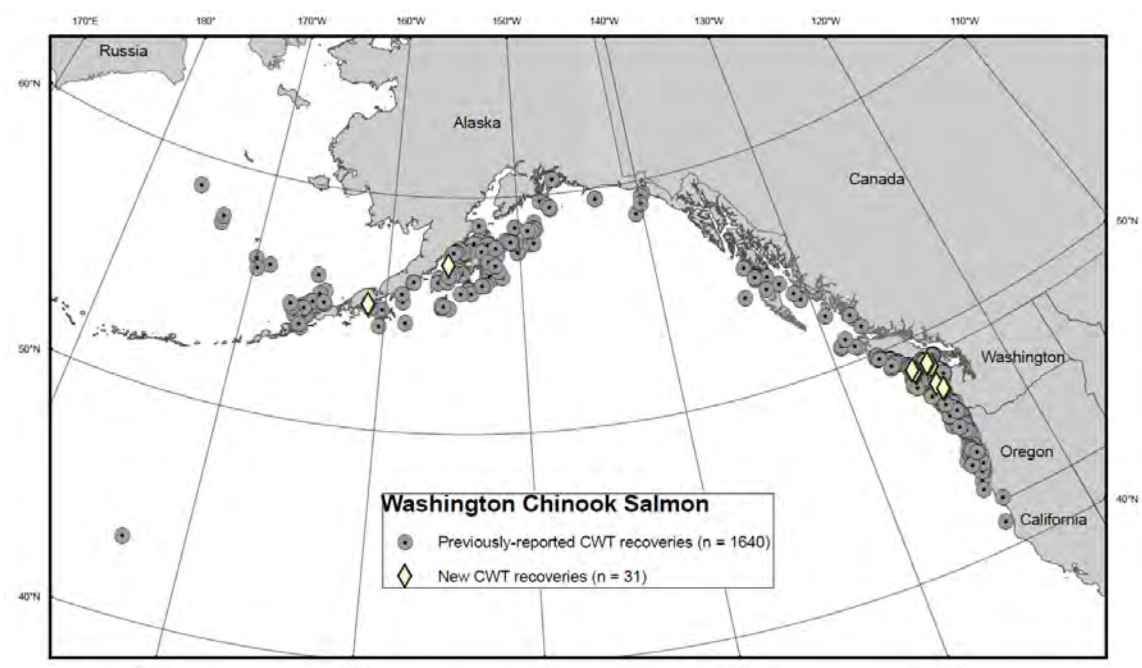

Figure 4. Ocean distribution for Washington Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary. Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 8 cont.

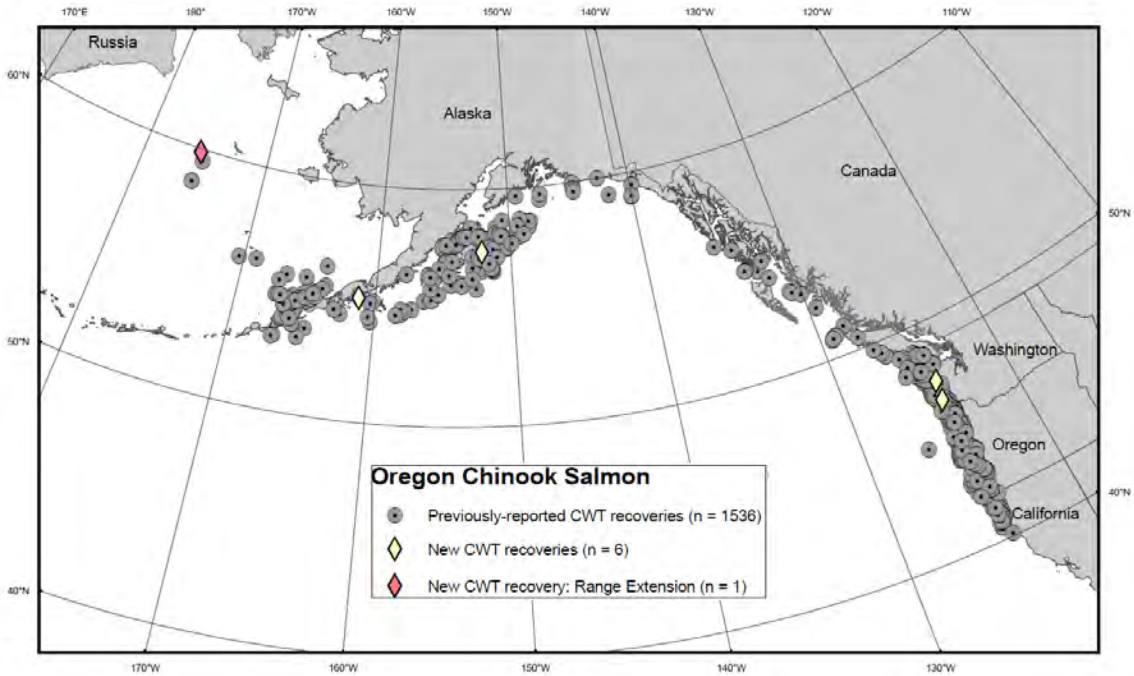

Figure 5. Ocean distribution for Oregon Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary. Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

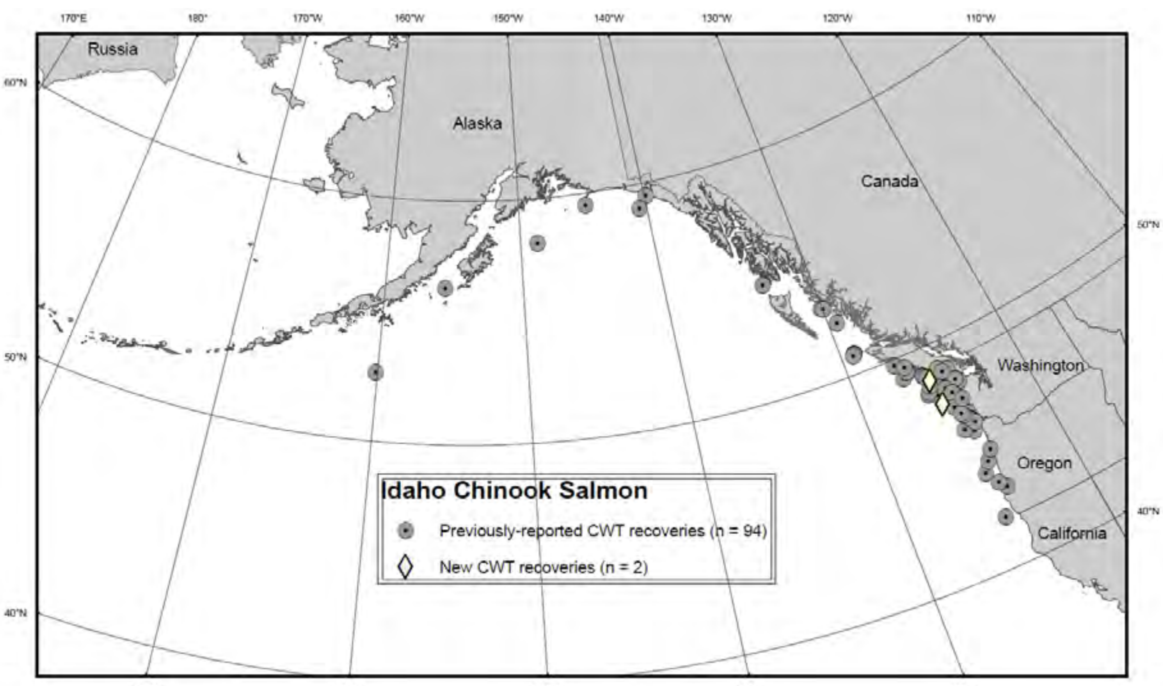

Figure 6. Ocean distribution for Idaho Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary. Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 8 cont.

Figure 7. Ocean distribution for California Chinook salmon from CWT recoveries in high seas commercial fisheries and research surveys, 1981–2010. Data for 2010 are preliminary. Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 2/3/2011

Attachment 9

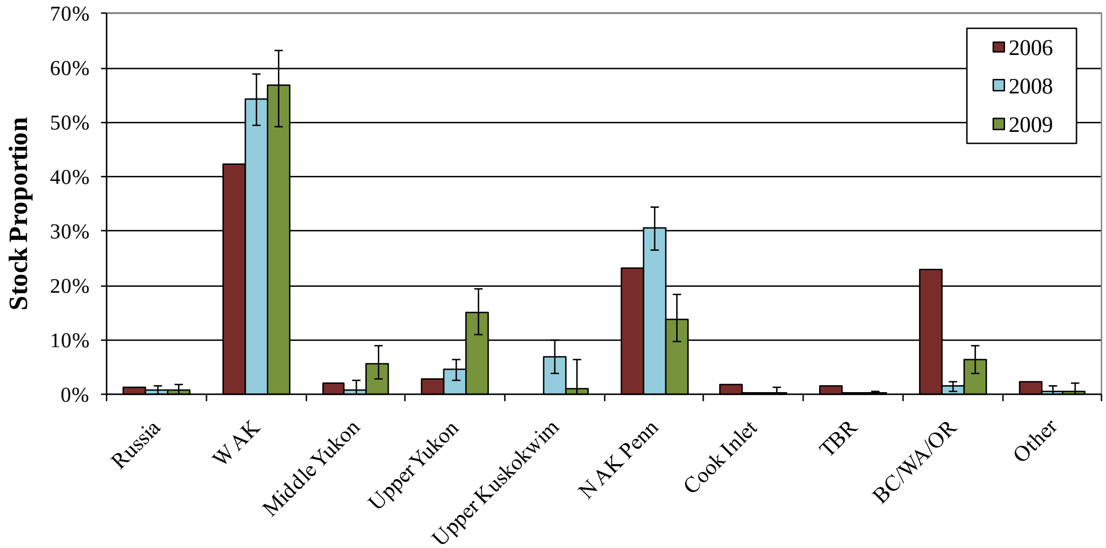

Figure 1. Comparison of yearly stock composition estimates based on available genetic samples from the Bering Sea Chinook salmon bycatch. The same genetic baseline and general regional groupings were used in all analyses. BAYES 95% credible intervals are plotted for available 2008 and 2009 yearly estimates. Source: Guyon et al. 2010b

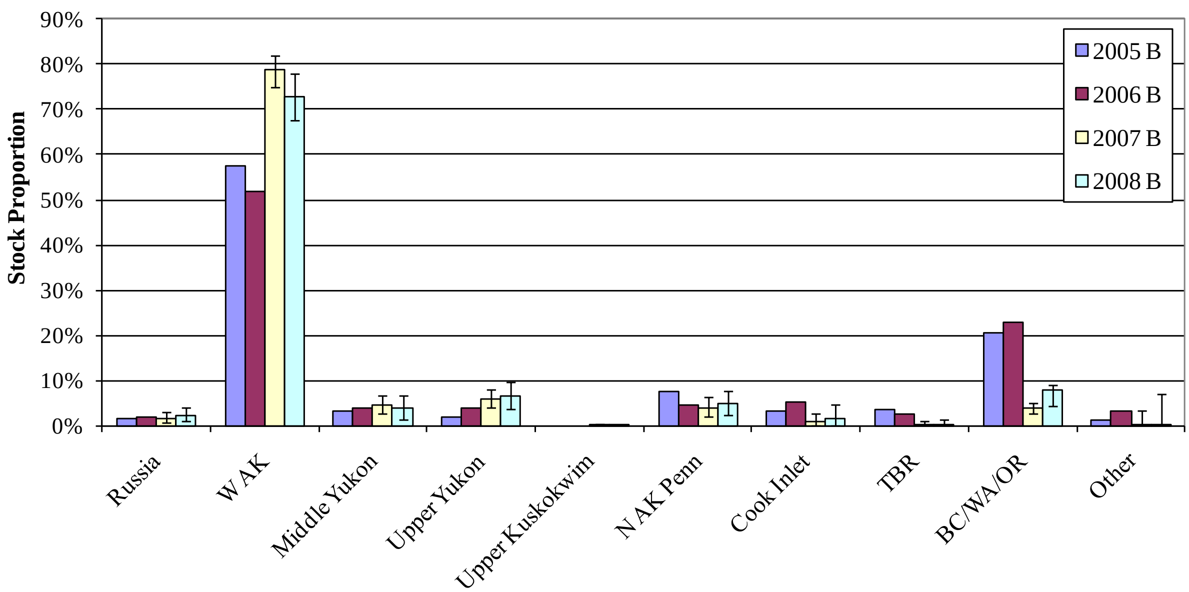

Figure 2. Comparison of “B” season genetic stock composition estimates based on available genetic samples from the Bering Sea Chinook salmon bycatch. The same genetic baseline and general regional groupings were used in all analyses. BAYES 95% credible intervals are plotted for 2007 and 2008 estimates. Source: Guyon et al. 2010b

12 Color figures

Figure 21 Observed Chinook salmon bycatch in the GOA groundfish fishery, summed over 2006-2010

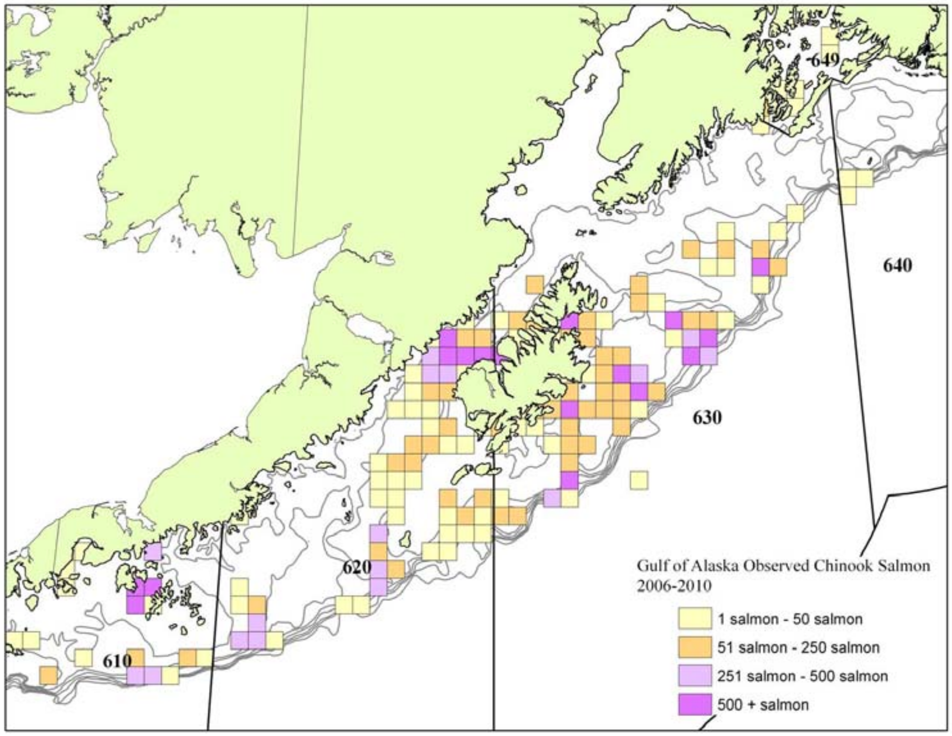

Figure 22 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2006

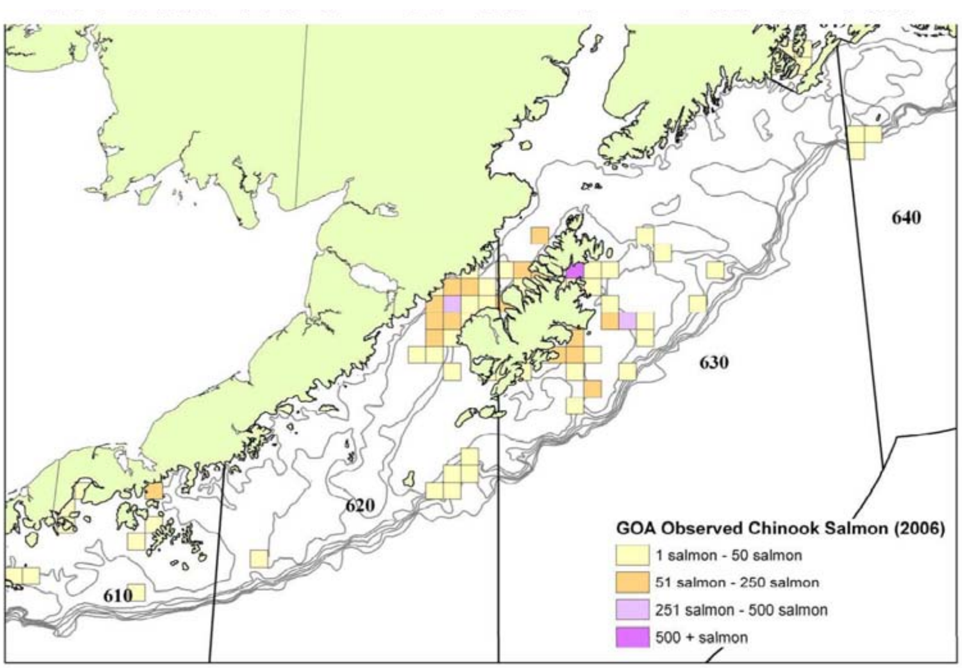

Figure 23 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2007

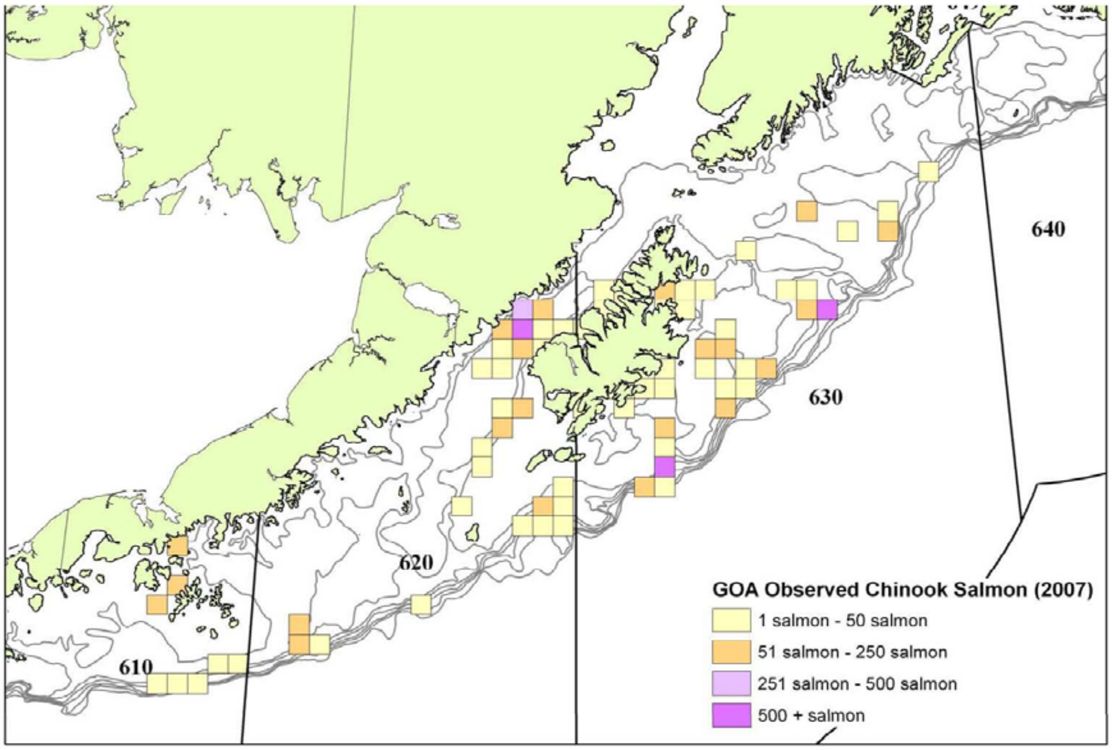

Figure 24 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2008

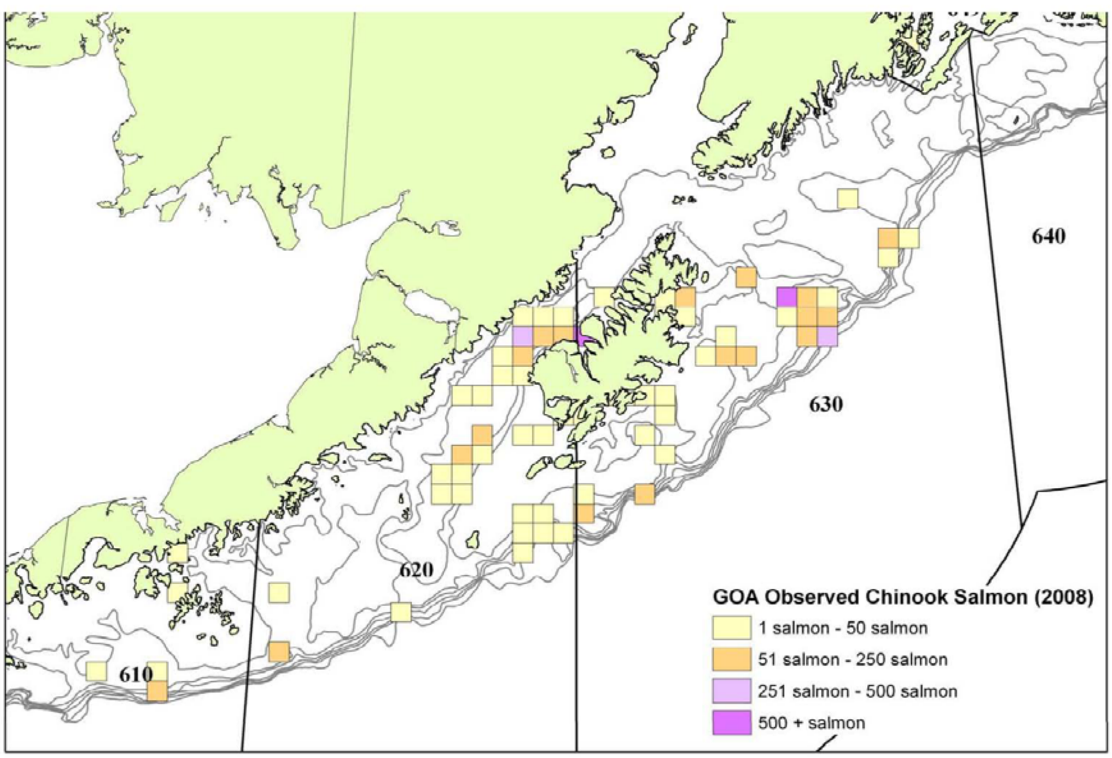

Figure 25 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2009

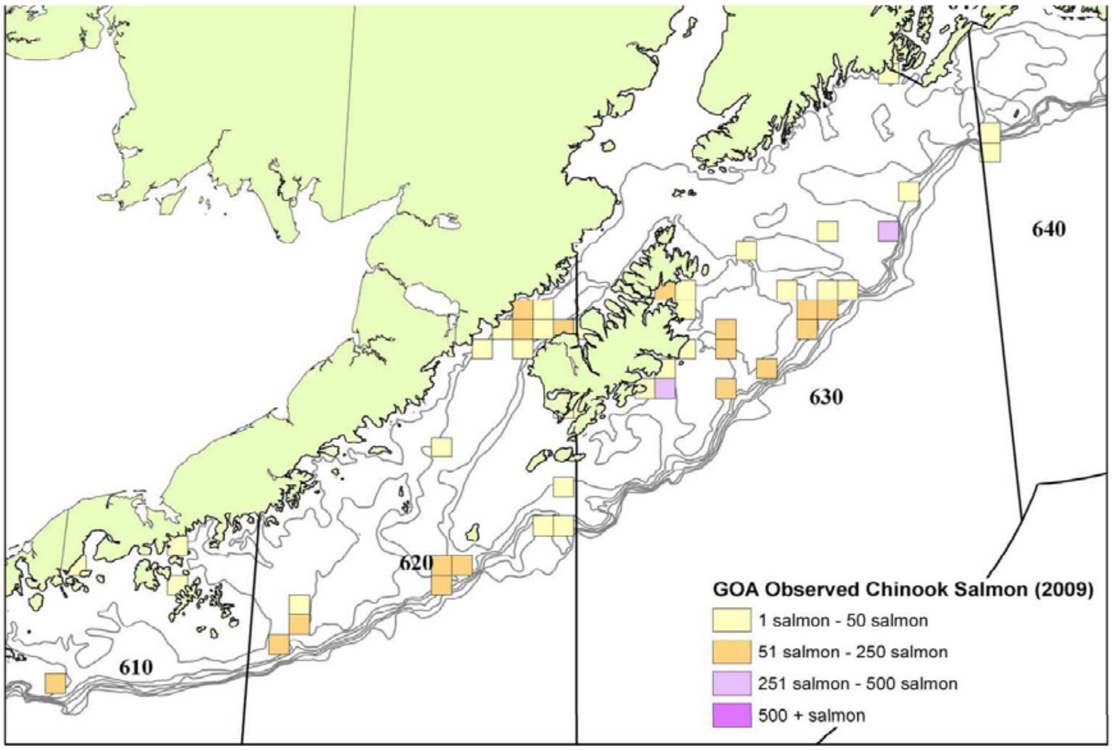

Figure 26 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2010

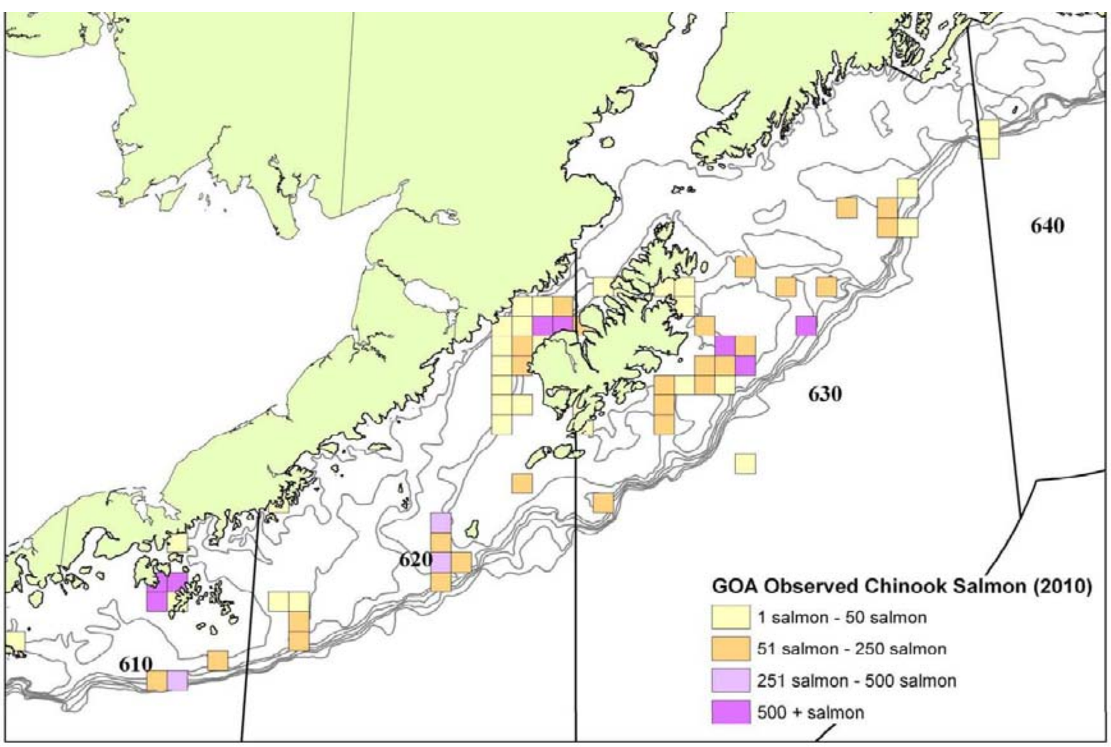

Figure 27 Observed Chinook salmon bycatch in the pelagic trawl fishery, summed over 2001-2008

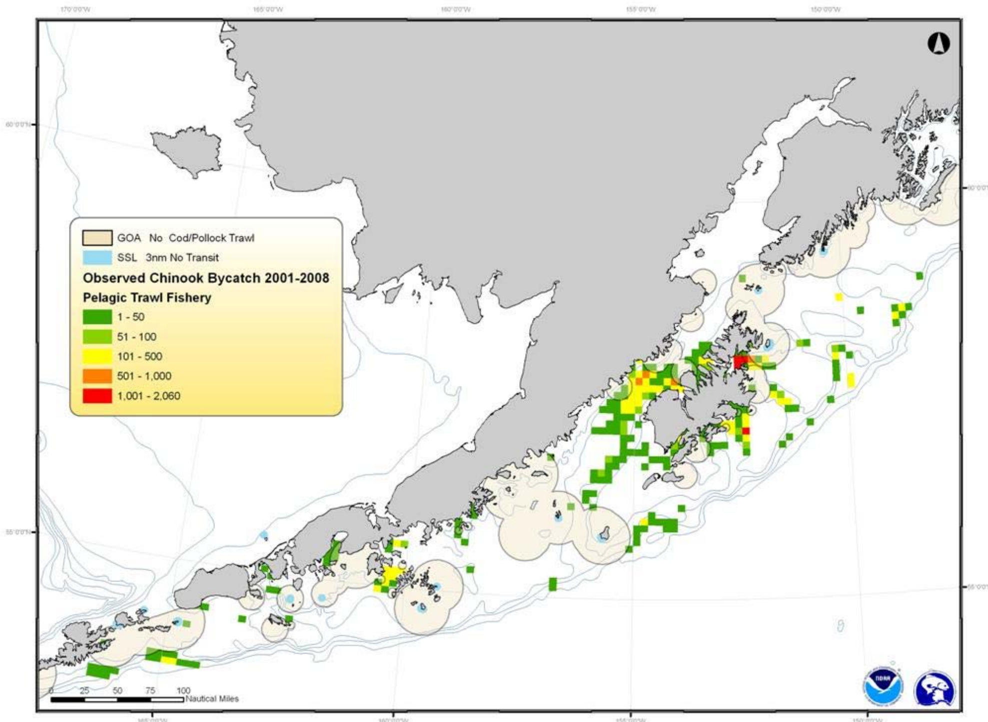

Figure 28 Observed Chinook salmon bycatch rate in the pelagic trawl fishery, summed over 2001-2008, number of salmon per metric ton of total catch