

Chinook Salmon Bycatch in Gulf of Alaska Groundfish Fisheries

November 2010

Staff Discussion Paper

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1 Introduction

Since the implementation of the groundfish fishery management plans for Alaska, the North Pacific Fishery Management Council (Council) has adopted measures intended to control the bycatch of species taken incidentally in groundfish fisheries. Certain species are designated as 'prohibited' in the groundfish fishery management plans, as they are the target of other domestic fisheries. Catch of these species and species groups must be avoided while fishing for groundfish, and when incidentally caught, they must be immediately returned to sea with a minimum of injury¹. These species include Pacific halibut, Pacific herring, Pacific salmon, steelhead trout, king crab, and tanner crab.

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, halibut bycatch limits (which close the groundfish target fisheries after the limits are reached) and bottom trawl seasonal and permanent closure areas to protect red king crab have been established. The Council recently adopted a nonpelagic trawl closure area and areas requiring increased observer coverage off the eastern coast of Kodiak, in order to provide additional conservation for Tanner crab. To date, no bycatch control measures have been implemented 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 salmon and crab bycatch in the GOA groundfish fisheries, and proposed management options that might be considered to regulate such bycatch. During this process, the Council focused the scope of the discussion paper two species and two areas with potentially high bycatch levels: Chinook salmon (*Oncorhynchus tshawytscha*) and *Chionoectes bairdi* Tanner crab, in the central and western GOA. In October 2009, the Council initiated a separate analysis for protection measures for *C. bairdi* crab, which have since been adopted by the Council. This discussion paper now focuses exclusively on Chinook salmon bycatch in the groundfish fisheries, and provides a general overview of the available information on bycatch levels for Chinook (Section 3.4), and species abundance and directed fisheries (Section 8). In previous iterations of this discussion paper, preliminary alternatives were proposed for bycatch management measures, as well as strawman closure areas that may be considered for managing bycatch, which are both included in Section 9.

2 Changes to the discussion paper since April 2010

The Council reviewed a draft of this discussion paper most recently in April 2010. At that time, the Council requested that the paper be expanded with further discussion of the following:

- Requirement for full retention of salmon in the GOA groundfish fisheries
- Data updates showing Chinook salmon bycatch by target fishery, statistical reporting area, statistical week indicating total catch, number of Chinook salmon bycatch, and bycatch rate
- Disaggregated spatial maps of Chinook bycatch by month and year for specific fisheries

The Council also requested that to the extent possible, additional background should be provided on current stock assessment data for the larger GOA Chinook salmon producing streams, information on the known relationships between environmental variables and the abundance of GOA Chinook salmon, stock of origin information for GOA Chinook salmon bycatch, and an expanded discussion on the limitations of the GOA observer data for enforcing PSC limits, MRA caps, and directing inseason management

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

decisions. The Council also wrote a letter to NMFS to request that the agency accelerate the establishment of protocols to identify stock of origin of GOA Chinook salmon bycatch, including analysis of existing GOA Chinook salmon bycatch samples.

To the extent possible in the time available, staff has addressed the Council's main requests. The discussion of full retention is included in Section 3.4 of the discussion paper. Updated bycatch data is included in Section 4. Some additional disaggregated mapping, on an annual basis, is discussed in Section 5, and included in Section 14 at the end of this paper. A complete seasonal and fishery spatial analysis has not been included in this discussion paper, however, for reasons discussed in Section 5.

The items requested for additional background have not yet been addressed in this discussion paper, but will be updated for a future draft. Note, the discussion of management measures and strawman closures in Section 9 has not been updated at all since October 2009, and the strawman closures themselves were developed in December 2008.

The level of GOA Chinook salmon bycatch in 2010 has exceeded the incidental take amount authorized in the Biological Opinion for endangered Chinook salmon stocks, and consequently consultation has been reinitiated between NMFS Alaska Region and the Northwest Region office. A letter reporting on information about the Chinook salmon incidental catch in 2010 has been sent by NMFS to the Northwest Region, and will be available at the December Council meeting. Additionally, the agency is also planning to respond to the Council's letter concerning a stock of origin sampling protocol in time for the December Council meeting.

3 Estimating Chinook salmon bycatch in the GOA groundfish fisheries

NMFS estimates Chinook salmon bycatch based on data from the North Pacific Groundfish Observer Program, Weekly Production Reports (WPR), and Alaska Department of Fish and Game fish tickets. The observer data is used to create bycatch rates, and landings data (observer data, fish tickets or WPRs) are multiplied against the rates to provide bycatch estimates. In the Alaska Region, the source for landings data is observer data for 100% observed vessels, WPR data for catcher/processors with 30% observer coverage, and fish tickets for all shoreside deliveries. The estimation procedures for bycatch are designed to meet two key requirements. First, the estimation procedures are designed to provide a quick turn-around of the data so that inseason managers have useful information as quickly as possible. The system makes maximum use of small amounts of observer data quickly (at coarser aggregation levels) which are updated and refined as more data becomes available. Second, the system is flexible, so that changes to the management structure can be mirrored in the catch accounting structure to allow inseason management to stay current with fisheries regulations and specifications.

3.1 Observer program bycatch sampling

The Fisheries Monitoring and Analysis (FMA) Observer Program (Observer Program) collects catch and incidental catch data used for management and inseason monitoring of groundfish fisheries. 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. 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 salmon are also taken as bycatch in other trawl target fisheries (see Section 4.1). Very few salmon are taken by non-trawl gear fisheries.

Observer sampling for salmon composition in the GOA directed pollock fishery is a labor intensive process, as NMFS strives to obtain a census of all the salmon which are caught when an observer is on board. The census is challenging because salmon are interspersed in the high volume pollock catch and are rarely sorted out at sea. To get a good count of all the salmon in the catch, the entire catch is monitored as it is delivered to shore-side processing plants. This ensures that all salmon in the observed delivery are sorted out, identified, and counted. NMFS extrapolates the salmon bycatch numbers from the observed pollock trips to unobserved trips following the procedures outlined in NOAA Technical Memorandum NMFS -AFSC-205 (Cahalan et al. 2010).

Estimates for non-pollock fisheries are obtained from samples taken at-sea by observers. Vessels which are not fishing for pollock generally sort salmon at-sea. Thus, there is no need to follow the fish into the processing plants.

Observers send their data in to NMFS after each trip and those data are used to make in-season estimates of catch. Observers are deployed in the field for up to three months at a time, and debrief with FMA Division staff following their deployment to ensure the data were collected following NMFS protocols. Changes may occur to the data during the debriefing, and this is a routine and normal process. 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 2010 information is preliminary until the observer data are finalized after the fishing year is completed.**

3.2 Prohibited species bycatch estimation procedure

Management of prohibited species catch (PSC) species, including Chinook salmon, is based solely on estimates derived from independent observer information, rather than from industry reported catch. PSC estimates are based on observer data, and estimates are made using automated procedures within NMFS catch accounting system. The estimation procedures are run daily to incorporate new data or any edits to existing data. It is assumed that unobserved vessels have incidental catch rates, and the bycatch rates are applied to unobserved catch as well.

All available observer data which have been received by NMFS are used in the calculation of PSC estimates. PSC are calculated and managed in numbers of animals for crab and salmon, and in weights for halibut and herring, and are reported to the public on the NMFS website as the fisheries progress throughout the year.

The technical mechanics of how NMFS uses observer sampling ratios to estimate PSC are described in detail in NOAA Technical Memorandum NMFS -AFSC-205 (Cahalan et al. 2010). Detailed instructions on the procedures observers use to collect the data which are inputs into the estimation process can be found in the series of observer manuals available at:

[http://www.afsc.noaa.gov/FMA/Manual_pdfs/MANUAL_pdfs/manual2010.pdf](http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2010.pdf).

In order to continue to improve the NMFS catch accounting processes, the Alaska Fisheries Science Center and Alaska Region contracted with the Pacific States Marine Fisheries Commission to review the current data and data systems used for inseason management and catch accounting in Alaska. The purpose of the multi-year contract is to identify the types of data that are available, their limitations, and to look at the statistical assumptions associated with all estimation procedures. It is intended that the evaluation will

result in recommendations for practical system design changes to improve estimation and to recognize statistical uncertainty in NMFS estimates of catch and bycatch. The first component, documenting the processes, was released as an AFSC publication in February 2010 (Cahalan et al. 2010).

3.3 Proportion of GOA groundfish catch that is observed

The North Pacific Groundfish Observer Program collects catch and bycatch data used for management and inseason monitoring of groundfish fisheries. Under the current Observer Program, the amount of observer coverage is based on vessel length. Since 1990, all vessels larger than 60 ft (length overall) participating in the groundfish fisheries have been required to have observers onboard at least part of the time. No vessels less than 60 ft are required to have observers onboard. Trawl and hook and line vessels that are 60 ft to 125 ft must have an observer onboard for 30% of fishing days, by quarter. Similar gear vessels that are larger than 125 ft must have an observer onboard 100% of the time, and shore-based processing facilities must have an observer present for 100% of the time. All pot vessels greater than 60 ft LOA must have observer coverage while 30% of their pots are pulled for the calendar year.

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 <60' groundfish sector. 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.

There is a greater prevalence of smaller vessels participating in the GOA groundfish fisheries, and over the past 10 years, participation by smaller vessels in the GOA groundfish fisheries has generally increased, particularly catcher vessels less than 60 ft length overall (NPFMC 2003). Because 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. The majority of the GOA fleet is subject to 30% observer coverage. Table 1 illustrates the total groundfish catch in the western and central GOA, the total amount of groundfish that is caught while an observer is onboard the vessel, and the resulting percentage². In the western GOA, the proportion of catch that is caught while an observer is onboard ranges from 25-36% over the years 2004-2007; 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 as to the quality of information. The goal is to have an unbiased estimate that is sufficiently precise to meet the management need for the information. The precision of bycatch estimates depends upon the number of vessels observed and the fraction of hauls sampled (Karp and McElderry 1999). Because of the relatively lower levels of observer coverage in the GOA, estimates of salmon and crab bycatch are less precise in the GOA than in Bering Sea groundfish fisheries. To what degree they are less precise, however, is not known, as current PSC estimates do not include a measure of uncertainty.

² The proportion of hauls, sets, or pots that are sampled while an observer is onboard is approximately 70% for hook and line and pot gear, 75% for nonpelagic trawl gear, and 85% for pelagic trawl gear (pers. comm., J. Mondragon 11/25/08).

Table 1 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 otherwise includes all targets.

Source: http://www.fakr.noaa.gov/sustainablefisheries/inseason/percent_observed.pdf

Detailed information on percent of harvest observed in the GOA groundfish fisheries has been presented to the Council meeting as part of their reports from the Observer Advisory Committee, and in previous iterations of this discussion paper. Table 2 looks specifically at the pollock fishery, and provides information on how much of the fleet's attributed Chinook salmon bycatch is derived directly from observed vessels, and how much is estimated using one of the precedence rate aggregations described in Section 3.2.

Table 2 Sum of Chinook salmon bycatch in the pollock fishery, by year and reporting area, as aggregated using different observed rates

Year	Area	Observer onboard vessel	Rate for unobserved landings calculated using:	Total
2005	610	852	5,099	5,951
	620	1,622	5,148	6,770
	630	3,843	10,728	14,570
	640		474	474
2005 Total		6,317	21,448	27,765
2006	610	564	3,966	4,529
	620	1,105	3,752	4,857
	630	1,750	4,531	6,280
	640		54	54
2006 Total		3,419	12,302	15,721
2007	610	303	3,056	3,359
	620	21,815	6,220	28,035
	630	698	2,878	3,577
	640		34	34
2007 Total		22,816	12,189	35,005
2008	610		2,106	2,106
	620	2,103	4,593	6,696
	630	264	1,012	1,275
	640		340	340
2008 Total		2,367	8,050	10,417
2009	610	23	418	441
	620	367	992	1,359
	630	449	252	701
	640	13	17	31
2009 Total		852	1,680	2,532
2010*	610	3,555	26,283	29,839
	620	1,634	4,371	6,004
	630	2,422	3,533	5,955
	640	19	390	408
2010 Total		7,630	34,576	42,206

* 2010 data through November 12, preliminary.

Source: M. Furuness, NMFS inseason management

3.4 Retention of salmon

Currently, retention of salmon is prohibited in the GOA groundfish fisheries, though the retention of salmon in the pollock fishery is a longstanding practice. This is because of the operational characteristics whereby 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 stability concerns. Several industry members have commented that this practice of retaining salmon should be recognized in the regulations and potentially encouraged to enable observer sampling.

Regulations are currently in place in the Bering Sea pollock fishery requiring full retention of salmon by all participants in the fishery. Regulations require retention of salmon "until the number of salmon has been determined by the observer and the observer's collection of any scientific data or biological samples

from the salmon has been completed,” (50 CFR 679.21(c)(1)). It would be possible for NMFS to implement a similar regulation in the GOA pollock fishery. This would require processors to put salmon aside and count them.

In order to understand how best to implement such a regulation, however, it is important to consider what the full retention is intended to address. There are two policy goals which could be forwarded through full retention: 1) implementing a systematic sampling program to help inform genetic tissue sampling for stock composition of GOA Chinook bycatch; and 2) encouraging donations of bycaught salmon to the salmon food bank program.

Full retention may be a useful step in designing a sampling program for Chinook bycatch in the GOA fisheries. While 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 (see further discussion in Section 7), the potential exists to improve sampling if fish were made available shoreside. NMFS is addressing this issue in a letter to the Council which should be available at the December 2010 meeting.

SeaShare, 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.

4 Chinook Salmon Bycatch in GOA groundfish fisheries

Pacific salmon, including Chinook, chum (*O. keta*), coho (*O. kisutch*), sockeye (*O. nerka*), and pink (*O. gorbuscha*) are taken incidentally in the groundfish fisheries within the Gulf of Alaska. Salmon bycatch is currently grouped as Chinook salmon or ‘other’ salmon, which consists of the other four species combined. Bycatch of Chinook salmon in the last five years (average of 26,732 salmon, 2006–2010) exceeds that of the twenty-year average (average of 20,185 salmon, 1991–2010, Table 3). During the recent time period, there have been two years (2007 and 2010) with particularly high bycatch of Chinook salmon. For the purpose of this discussion paper, it is assumed that salmon caught as bycatch have a 100% mortality rate in the groundfish fisheries.

The following sections provide updated information on Chinook salmon bycatch in the GOA groundfish fisheries. A historical report on salmon bycatch in groundfish fisheries off Alaska as it pertains to the GOA is provided in Witherell et al. (2002). Catch and bycatch data were obtained from the NMFS catch accounting database, and analyzed to represent the amount, species composition, timing, and location of salmon and crab caught incidentally in GOA groundfish fisheries. All NMFS data were screened to ensure confidentiality is maintained. The process that is used to estimate bycatch for GOA groundfish fisheries is described in Section 3. In short bycatch rates from observed vessels are applied to the fleet as a whole. The resulting estimates are used in Sections 4.1 and 4.2.

Table 3 Bycatch of Pacific salmon in Gulf of Alaska groundfish trawl fisheries, by species, 1990-2010

Year	Chinook	'Other' salmon ^a	Chum	Coho	Sockeye	Pink
1990	16,913		2,541	1,482	85	64
1991	38,894		13,713	1,129	51	57
1992	20,462		17,727	86	33	0
1993	24,465		55,268	306	15	799
1994	13,973		40,033	46	103	331
1995	14,647		64,067	668	41	16
1996	15,761		3,969	194	2	11
1997	15,119		3,349	41	7	23
1998	16,941	13,539				
1999	30,600	7,529				
2000	26,705	10,996				
2001	14,946	5,995				
2002	12,921	3,218				
2003	15,172	10,362				
2004	17,596	5,816				
2005	30,724	6,694				
2006	18,726	4,273				
2007	40,320	3,487				
2008	15,299	2,156				
2009	7,767	2,355				
2010 ^c	51,550	1,747				
20-year average 1991-2010	20,185	14,013^b				
5-year average 2006-2010	26,732	2,804				

^a Combines chum, coho, sockeye, and pink salmon.

^b Average combines chum, coho, sockeye, and pink salmon bycatch for 1990-1997.

^c 2010 data preliminary, through November 6, 2010.

Source: NMFS catch reports (<http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm>) for 1990-2002 (all species) and 2003-2010 (non-Chinook species); NMFS PSC database for 2003-2010 (Chinook).

4.1 Bycatch by area, gear type, and target fishery

In the GOA, Chinook salmon bycatch primarily occurs in the western and central regulatory areas, and corresponds to the locations of the trawl fisheries. Table 4 illustrates bycatch for 2003-2010 across western and central regulatory and reporting areas (Figure 1). The eastern regulatory area salmon bycatch is less than 2% of total Chinook bycatch, and since 1998, has been closed to all trawling, with the implementation of Amendment 58 to the GOA groundfish FMP. Prior to 2010, Chinook bycatch in the western regulatory area as a proportion of total GOA Chinook bycatch varied between a 7% and 26%, by year, but averaged to approximately 18%. The remainder of salmon bycatch, in the central GOA, has been on average, divided evenly between reporting areas 620 and 630 (Chignik and Kodiak). In 2010, however, an especially high amount of Chinook salmon were caught as bycatch in the western GOA, amounting to 31,039 salmon, based on preliminary data.

Table 4 Chinook salmon bycatch by reporting area, 2003-2010, in Gulf of Alaska groundfish fisheries

Year	Western		Central				Total
	610		620		630		
	Number of salmon	% of total	Number of salmon	% of total	Number of salmon	% of total	
2003	2,860	19%	3,876	26%	8,437	56%	15,172
2004	4,184	24%	5,320	30%	8,092	46%	17,596
2005	7,567	25%	6,987	23%	16,170	53%	30,724
2006	4,880	26%	5,678	30%	8,169	44%	18,727
2007	3,666	9%	28,942	72%	7,712	19%	40,320
2008	2,398	16%	7,173	47%	5,730	37%	15,300
2009	558	7%	3,041	39%	4,168	54%	7,767
2010*	31,039	61%	8,165	16%	12,054	24%	51,258
Average 2003-2010	7,144	23%	8,648	35%	8,816	41%	24,608

*preliminary data

Source: NMFS Catch Accounting System. Data compiled by AKFIN, November 2010.

Figure 1 Regulatory and reporting areas in the GOA

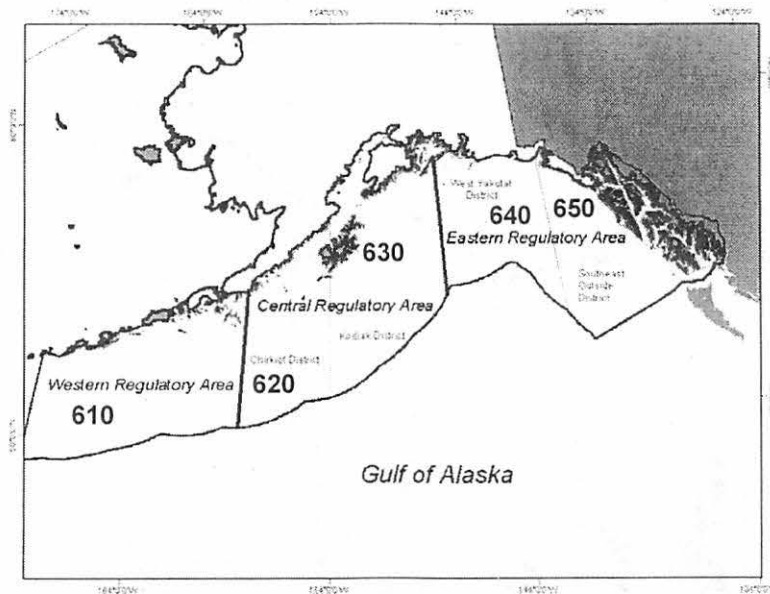


Table 5 identifies Chinook bycatch for 2003-2010, by gear type. Pelagic and non-pelagic trawling are almost entirely responsible for Chinook salmon bycatch. In 2004-2008, pelagic trawl gear accounted for over 70% of Chinook bycatch, however in 2003 and 2009, nonpelagic trawl caught 74% and 67% of the Chinook salmon. The relationship between groundfish catch and pelagic trawl Chinook bycatch is shown in Figure 2 for 2003-2009, and was consistent in all years except 2007. For nonpelagic trawl vessels, the bycatch trend paralleled groundfish catch for 2003-2005, but since then groundfish catch has generally increased, while bycatch has remained relatively constant.

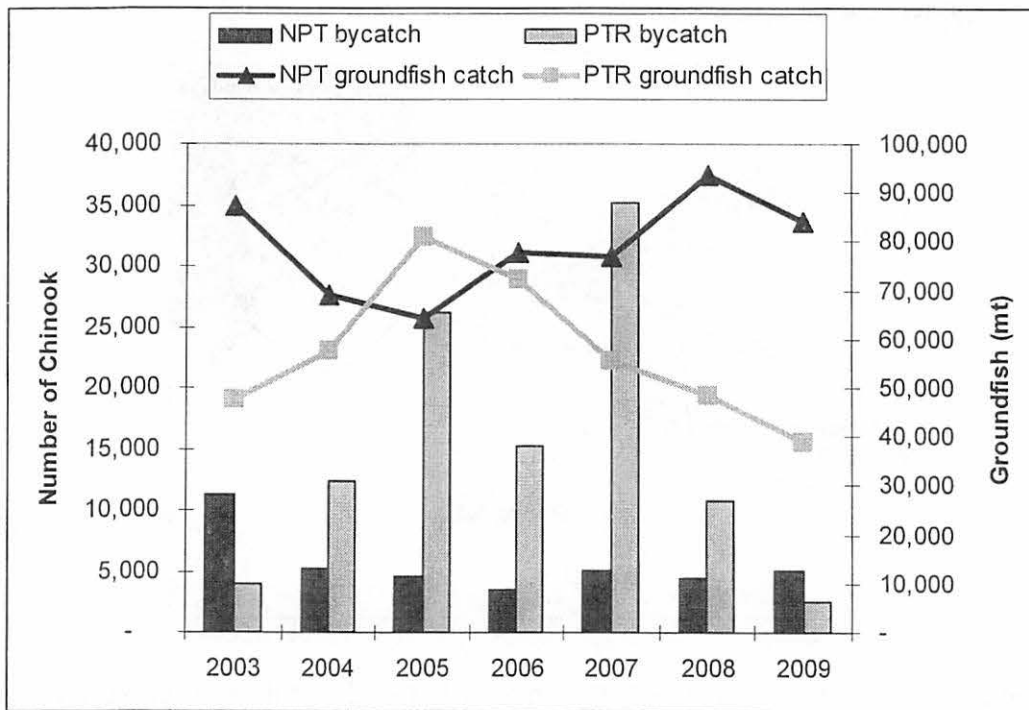
Table 5 Chinook salmon bycatch by gear type, in western and central groundfish fisheries, 2003-2010

Year	Pelagic trawl		Nonpelagic trawl		Hook and line		Pot		Total
	Number of salmon	% of total	% of total	Number of salmon	Number of salmon	% of total	Number of salmon	% of total	
2003	3,903	26%	74%	11,269	-	-	-	-	15,172
2004	12,411	71%	29%	5,164	21	0%	-	-	17,596
2005	26,148	85%	15%	4,576	-	-	-	-	30,724
2006	15,293	82%	18%	3,434	-	-	-	-	18,727
2007	35,249	87%	13%	5,062	8	0%	-	-	40,320
2008	10,803	71%	29%	4,498	-	-	-	-	15,300
2009	2,489	32%	68%	5,278	-	-	-	-	7,767
2010*	40,625	79%	21%	10,633	-	-	-	-	51,258
Average 2003-2010	18,365	67%	33%	6,239	4	0%	-	-	196,864

*preliminary data

Source: NMFS Catch Accounting System. Data compiled by AKFIN, November 2010.

Figure 2 Chinook bycatch and groundfish catch in GOA pelagic and nonpelagic trawl fisheries, 2003-2009



Source: NMFS Catch Accounting System. Data compiled by AKFIN, February 2010.

Chinook bycatch with pelagic trawl gear occurs predominantly in the pollock target fishery (Table 6), and accounts for most of the western and central Chinook bycatch, an average of 72% over 2003-2009, or 14,900 fish. Table 7 illustrates the distribution of bycatch in the pollock pelagic fishery in the western and central GOA. While bycatch in the western GOA prior to 2010 has been generally lower than it is in areas 620 and 630, the proportional bycatch by area within all years 2003-2008 is highly variable. 2010 is the year of highest bycatch, primarily occurring in the western GOA (610). 2007 was also a year of high bycatch, primarily occurring in the Chignik area (620). In the Kodiak area (630), 2005 was the highest

bycatch year with 13,370 Chinook. In 2009, trawl bycatch in the pollock fishery in all areas was considerably lower than in the previous five years.

Table 6 Chinook salmon bycatch by target fishery, in western and central groundfish fisheries, 2003-2010

Gear type	Target fishery	2003	2004	2005	2006	2007	2008	2009	2010*	Average 2003-2010
Pelagic trawl	Pollock	3,872	12,411	26,085	15,287	34,955	10,057	2,285	40,508	18,183
	Rockfish	-		63	-	294	746	203	118	178
Nonpelagic trawl	Arrowtooth Flounder	3,348	359	1,798	408	1,502	2,608	6	4,044	1,759
	Flathead Sole	598	1,446	16	56	-	-	118	149	298
	Pacific Cod	3,167	908	41	882	624	433	111	461	828
	Pollock	423	571	1,296	380	50	30	278	1,287	539
	Rex Sole	2,819	498	982	1,444	714	-	1,907	2,237	1,325
	Rockfish	799	885	387	263	1,733	1,212	1,102	1,443	978
	Shallow Water Flatfish	116	498	56	-	438	213	1,756	1,013	511

*preliminary data

- = data is confidential. If cell is blank, no bycatch was recorded in those months.

Source: NMFS Catch Accounting System. Data compiled by AKFIN, November 2010.

Table 7 Chinook salmon bycatch in the pollock trawl fishery, by reporting area, 2003-2010

Year	Pelagic trawl			Nonpelagic trawl		
	610	620	630	610	620	630
2003	738	1,121	2,044	2,122	2,755	6,393
2004	2,013	4,886	5,513	2,164	430	2,570
2005	5,951	6,764	13,433	1,616	222	2,738
2006	4,529	4,843	5,921	351	835	2,248
2007	3,359	28,036	3,854	304	904	3,853
2008	2,116	6,685	2,001	282	488	3,728
2009	441	1,143	904	117	1,898	3,264
2010*	29,839	5,425	5,362	1,201	2,741	6,692
Average 2003-2010	6,123	7,363	4,879	1,019	1,284	3,936

*preliminary data

Source: NMFS Catch Accounting System. Data compiled by AKFIN, November 2010.

Table 8 also provides overall Chinook bycatch numbers for the trawl sector, by target fishery for 2000-2010, although without distinguishing between pelagic and nonpelagic gear types. The table additionally provides the rate of bycatch, measured as number of Chinook salmon per mt of total groundfish. The bycatch rate averages 0.25 in the GOA pollock fishery, although annually it varies between 0.07 and 0.66 over the time series. (Note, the numbers in Table 8 and Table 9 are slightly different from the numbers reported in the remainder of the tables, as they were queried on different days). Table 9 looks specifically at 2010, and breaks down the Chinook salmon bycatch rate in the pollock target fishery by month and reporting area. From this table, it is evident that the bycatch rate in October was highest in the western GOA, at 3.62 salmon per mt groundfish. Even in 630, the bycatch rate was higher than the average in October, at 0.64. Data is also presented in this table for pollock catch in 640, which has only a small pollock quota and is not subject to the seasonal restrictions of the other GOA reporting areas. The bycatch

rate for September was particularly high, but only a very small amount of pollock was taken in that area during that month.

Table 8 Chinook salmon bycatch (number of salmon) by trawl target fishery, 2000-2010, and bycatch rate (number of salmon per mt of groundfish)

Target		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Ave. 2000-2010
Pollock	Bycatch	9,531	18,413	5,161	4,400	13,152	27,927	15,944	35,040	10,427	2,620	42,206	
	Rate	0.13	0.25	0.10	0.09	0.20	0.33	0.21	0.66	0.21	0.07	0.55	0.25
Pacific Cod	Bycatch	2,747	2,830	4,066	3,167	908	41	888	624	433	111	461	
	Rate	0.11	0.10	0.27	0.20	0.05	0.00	0.08	0.04	0.02	0.01	0.03	0.08
Rockfish	Bycatch	445	1,153	1,250	919	885	450	263	2,038	2,280	1,432	1,627	
	Rate	0.02	0.05	0.05	0.04	0.03	0.02	0.01	0.09	0.09	0.06	0.06	0.05
Flatfish	Bycatch	2,297	2,443	4,392	6,909	2,800	2,853	1,909	2,654	2,822	3,787	7,442	
	Rate	0.06	0.10	0.11	0.15	0.13	0.10	0.05	0.06	0.06	0.07	0.18	0.10

Source: NMFS Catch Accounting System, November 2010.

Table 9 2010 Chinook salmon bycatch rates in the pollock fishery (pelagic and nonpelagic trawl gear combined), by month, all reporting areas

Reporting Area	Month	Total Chinook bycatch (number)	Total pollock catch (weight in MT)	Rate
610	January	329	942	0.35
	February	621	3,939	0.16
	March	384	2,207	0.17
	April	426	2,651	0.16
	August	353	1,631	0.22
	September	1,529	7,187	0.21
	October	26,241	7,251	3.62
620	January	42	42	0.99
	February	3,376	7,464	0.45
	March	198	11,607	0.02
	September	1,530	3,853	0.40
	October	1,010	4,607	0.22
630	January	-	102	0.00
	February	35	347	0.10
	March	1,105	6,206	0.18
	September	1,437	4,757	0.30
	October	3,380	5,274	0.64
640	March	215	1,428	0.15
	September	189	87	2.18

Source: NMFS Catch Accounting System. Data compiled by AKFIN, November 2010.

Chinook bycatch in the rockfish target fishery has increased since the implementation of the rockfish pilot program in 2007, by both nonpelagic and pelagic trawl vessels. The number of vessels employing pelagic trawl gear in the rockfish fishery has increased under the pilot program, likely in an effort to reduce halibut bycatch (Table 6). For non-pelagic trawl gear, bycatch is distributed among several target fisheries. In 2003–2008, the combined flatfish non-pelagic trawl target fisheries accounted for approximately 7–18% of Chinook bycatch in the western and central GOA. In 2003 and 2009, the flatfish

target fisheries accounted for 46% and 48% of Chinook bycatch, respectively. For the nonpelagic trawl fishery, bycatch is consistently highest in area 630.

4.2 Timing of Chinook bycatch

The timing of salmon bycatch follows a predictable pattern in most years. Chinook salmon are caught in high quantities regularly from the start of the trawl fisheries on January 20 through early April, and again during September/October in the pollock fisheries (Table 10). Figure 3 illustrates the difference in seasonal bycatch patterns between the pelagic and non-pelagic trawl fisheries for 2003-2009, with respect to Chinook bycatch. Chinook bycatch in the pelagic trawl fishery pulses in correlation with the seasons of the pollock target fishery. The annual TAC for pollock is divided into four seasons, as a protection measure for Steller sea lions (which prey on pollock). 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. Table 11 provides the bycatch numbers, by month, for the pelagic trawl fishery only. For the nonpelagic trawl fisheries, Figure 3 illustrates that Chinook bycatch is caught consistently throughout the year, although in higher quantities in the spring months. Because of the varied target fisheries in which the non-pelagic trawl vessels participate, Chinook bycatch does not correlate well to groundfish catch by that sector as a whole. The spike in nonpelagic trawl groundfish catch in July is due to participation in the rockfish fisheries, which incurs very low Chinook bycatch.

Table 10 Chinook salmon bycatch by month, 2003-2010, in western and central groundfish fisheries

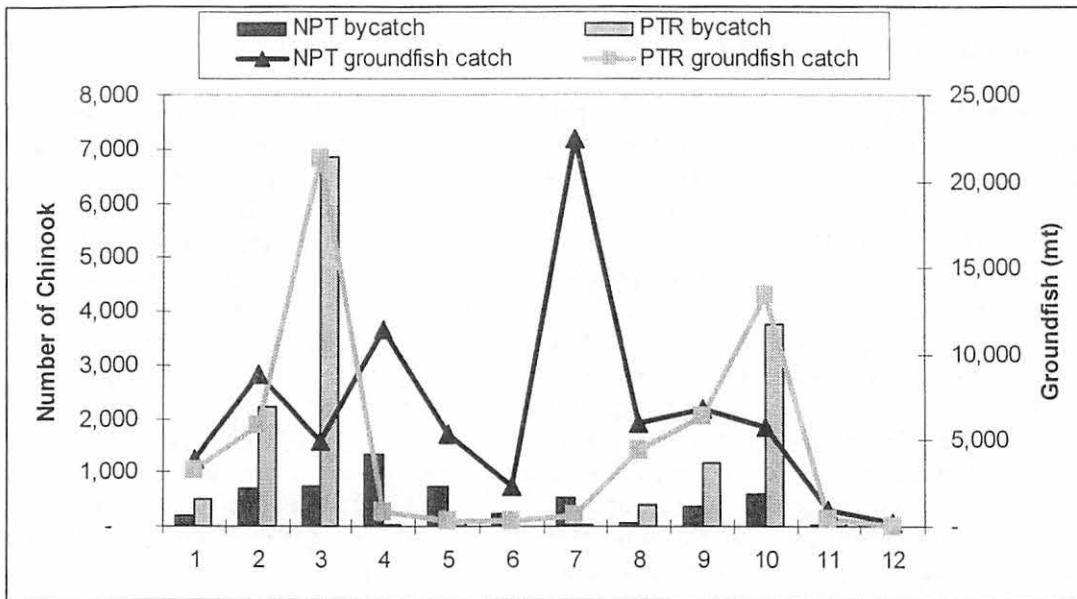
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	1,173	2,311	1,026	2,991	2,608	-	810	1,203	470	2,580	-	
2004	285	3,763	3,552	629	38	35	1,033	1,484	1,639	5,138	-	
2005	924	10,400	6,734	451	56	5	450	121	954	10,629	-	-
2006	1,952	1,816	4,498	1,355	10	-	263	13	4,896	3,786	138	
2007	167	1,265	28,594	202	1,338	1,153	630	150	2,433	3,704	634	50
2008	151	458	7,294	2,727	1,225	368	363	183	224	2,217	91	-
2009	162	411	1,466	1,171	595	157	406	170	233	2,579	233	183
2010*	371	4,363	2,127	4,768	729	594	559	380	5,110	32,256	-	
Average 2003-2010	648	3,098	6,911	1,787	825	289	564	463	1,995	7,861	137	29

*preliminary data

- = data is confidential. If cell is blank, no bycatch was recorded in those months.

Source: NMFS Catch Accounting System. Data compiled by AKFIN, November 2010.

Figure 3 Average Chinook bycatch and groundfish catch by vessels using pelagic and non-pelagic trawl gear, by month, 2003-2009



Source: NMFS Catch Accounting System. Data compiled by AKFIN, February 2010.

Table 11 Chinook salmon bycatch by pelagic trawl gear, by month, 2003-2010

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2003	238	339	263	12		**	**	948	**	2,101		
2004	283	3,275	1,572					1,465	723	5,092		
2005	798	9,717	5,072	**	**		63	121	919	9,458		
2006	1,847	910	4,102				-	13	4,823	3,460	138	
2007	165	1,091	28,483		131	8	82	23	1,341	3,310	615	
2008	77	218	7,157	173	600	65	81	166	223	2,003	41	
2009	16	**	1,264		49	4	4	33	161	928	**	
2010*	329	3,543	1,352	426	111	**	5	347	4,359	30,154		
Average 2003-2010	469	2,387	6,158	76	111	10	29	390	1,569	7,063	99	

*preliminary data

- = data is confidential. If cell is blank, no bycatch was recorded in those months.

Source: NMFS Catch Accounting System. Data compiled by AKFIN, November 2010.

5 Spatial analysis of bycatch patterns

The data presented in Section 4 is from the NMFS catch accounting prohibited species catch data, which applies bycatch rates from observed fishing trips to unobserved groundfish catch within each target, gear type, and reporting area (see Section 3). 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.

There is an important limitation in the observer program data for PSC from the shoreside pollock fishery when it is used for spatial analysis. The limitation is due to a technical database problem, which was corrected by NMFS re-design of the observer database implemented in 2008. The issue is that PSC in the shoreside pollock fishery are sampled at the plant, rather than onboard the vessel. This is because of the particular handling of large volumes of catch in the pollock fishery. Typically, catch is rapidly placed in below deck refrigerated seawater tanks and there is limited opportunity to take large samples. As all hauls are mixed together in the vessel's hold, the entire delivery is monitored for PSC at the shoreside plant upon delivery. Prior to 2008, the Observer Program database did not allow for capturing the delivery level information. Instead, the delivery levels were proportioned back to individual tows made during the trip. This was done to fit the data into the existing system.

We caution that care must be exercised when attempting to interpret PSC rates at the haul level. The spatial distribution currently displayed in the document maps the bycatch data by individual tows. 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. To address this problem, it may be more appropriate, in future iterations of this discussion paper, to look at clusters of tows from deliveries with high bycatch. This analysis of the data will be important if the data are used identify regulatory closure areas, and the impact would need to be investigated at that point.

Two sets of maps are provided in the Section 14, mapping Chinook salmon bycatch. First, Figure 6 through Figure 11, provided by NMFS inseason management, offer an annual illustration of observed GOA Chinook salmon bycatch from 2006 to 2010. Figure 6 provides an overview of bycatch aggregated for all five years, and Figure 7 through Figure 11 present each year's distribution. It is apparent from the annual illustrations that there is considerable interannual variability in the locations of high Chinook bycatch.

Additionally, another set of aggregated maps is included, as presented in previous versions of this discussion paper. Figure 12 and Figure 14, in Section 14 at the end of this document, map the total number of Chinook observed during the aggregated years 2001-2008, in fisheries using pelagic and nonpelagic trawl gear, respectively. Figure 13 and Figure 15 illustrate the total bycatch rate, number of Chinook per metric ton of total catch, for the period 2001 to 2008, for the same gear types.

6 Hatchery releases of Chinook salmon

The United States and Canada account for the highest numbers of hatchery releases of juvenile Chinook salmon, although a limited number are released from Russia. The North Pacific Anadromous Fish Commission compiles reports that summarize these hatchery releases (Table 12). Hatchery releases in each region have decreased in recent years.

The United States has the highest number of annual releases (81% of total in 2006), followed by Canada (18%). Of the US releases, the highest numbers are coming from the State of Washington (61% in 2006), followed by California (16% in 2006), and then Oregon (11% in 2007). Hatcheries in Alaska are located in southcentral and southeast Alaska. Since 2004, the number of hatcheries has ranged from 33 (2004–2005) to 31 (2006), with the majority of hatcheries (18–22) located in southeast Alaska, while 11 hatcheries are in Cook Inlet and 2 in Kodiak (Eggers, 2005a; 2006; Josephson, 2007).

The highest numbers of Canadian releases of Chinook in 2006 occurred 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).

No correlation is discernable between the bycatch of salmon in the GOA and the release from any of these hatchery sites.

Table 12 Hatchery releases of juvenile Chinook salmon, by country, compared to GOA groundfish bycatch, in millions of fish

Year	Russia	Canada	USA	Total	Total GOA groundfish Chinook bycatch
1999	0.6	54.4	208.1	263.1	.031
2000	0.5	53.0	209.5	263.0	.027
2001	0.5	45.5	212.1	258.1	.015
2002	0.3	52.8	222.1	275.2	.013
2003	0.7	50.2	210.6	261.5	.015
2004	1.17	49.8	173.6	224.6	.021
2005	0.84	43.5	184.0	228.3	.031
2006	0.78	41.3	181.2	223.3	.019

Source: North Pacific Anadromous Fisheries Commission reports: Russia (Anon. 2007; TINRO-centre 2006, 2005); Canada (Cook and Irvine 2007); USA (Josephson 2007; Eggers 2006, 2005a; Bartlett 2005, 2006, 2007).

7 River of origin of GOA Chinook salmon bycatch

The direct effects of GOA groundfish bycatch of Chinook salmon on the sustainability of salmon populations are difficult to interpret without specific information on the river of origin of each bycaught salmon. Limited information is available in the GOA groundfish fisheries on the river of origin of salmon species.

Genetic samples (pelvic axillary processes), maturity information, and scales from Chinook salmon were collected by observers in the 2010 GOA pollock fishery. All vessel observers collect a genetic sample, length, sex, and maturity information from every Chinook salmon in the species composition samples. Plant and floating processor observers collect genetic samples, length, sex, and maturity information from randomly selected Chinook salmon using a temporal sampling frame.

In 2011, these sampling procedures will be revised to be consistent with changes occurring in the Bering Sea pollock fishery. In 2011, the genetic samples noted above will be taken systematically from all salmon encountered in observed pollock deliveries. This should provide sample from throughout the observed deliveries in the Gulf of Alaska.

Genetic analysis of Chinook salmon is an ongoing coordinated effort among the Alaska Department of Fish and Game, Alaska Fisheries Science Center Auke Bay Laboratories (Auke Bay Lab), and the University of Washington. Research on stock discrimination for Chinook salmon is being conducted by evaluating DNA variation, specifically single nucleotide polymorphisms (SNPs). A baseline has been developed that identifies the DNA composition of many BSAI and GOA salmon stocks.

The Alaska Fishery Science Center has developed a comprehensive plan for counting all Chinook bycatch (a census) in the Bering Sea pollock fishery, and taking a systematic sample from that bycatch. This census and sample is scheduled for implementation in 2011. Full retention of salmon is currently required in the Bering Sea pollock fishery, and under the implementation of Amendment 91 in 2011, a minimum of 100% observer coverage will also be required on all vessels participating in the pollock fishery, regardless of length. 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. Most recently in April 2010, the Council wrote to NMFS to request that a similar Chinook salmon bycatch sampling protocol be put in place in the GOA groundfish fisheries, and that genetic analysis of samples collected from Chinook salmon in the GOA groundfish fisheries be initiated. NMFS will provide a written response to the Council's request prior to the December 2010 Council meeting.

Currently, coded wire tags (CWTs) are the primary source of information for the stock-specific ocean distribution of those Chinook salmon stocks which are tagged and caught as bycatch in the GOA groundfish fisheries. The High Seas Salmon Research Program of the University of Washington routinely tags and monitors Pacific salmon species. It should be noted that CWT information may not accurately represent the true distribution of hatchery-released salmon. Much of the CWT tagging occurs within the British Columbia hatcheries and thus, most of the tags that are recovered also come from those same hatcheries. CWT tagging does occur in some Alaskan hatcheries, specifically in Cook Inlet, Prince William Sound, other Kenai region hatcheries, as well as in hatcheries in Southeast Alaska (Johnson, 2004). We should note that numerous runs of Chinook salmon do not have coded wire tags.

Chinook salmon tags have been recovered in the area around Kodiak through recovery projects in 1994, 1997, and 1999. The contribution of hatchery-produced Chinook salmon to the sampled harvested in the Kodiak commercial fishery ranged from 16% in 1999 to 34% in 1998; hatchery fish from British Columbia made up the majority of these fish. The study concluded that there was only a low incidental harvest of Cook Inlet Chinook salmon in the Kodiak area (Clark and Nelson 2001, Dinnocenzo and Caldentey 2008).

Other CWT studies have tagged Washington and Oregon salmon, and many of these tagged salmon have been recovered in the GOA (Myers et al. 2004). In 2006, 63 tags were recovered in the eastern Bering Sea and GOA (Celewycz et al. 2006). Of these, 8 CWT Chinook salmon were recovered from the Gulf of Alaska trawl fishery in 2006 and 2007, 8 CWT Chinook salmon were recovered from the Bering Sea-Aleutian Islands trawl fishery in 2006 and 2007, 44 CWT Chinook salmon were recovered from the Pacific hake trawl fishery in the North Pacific Ocean off WA/OR/CA in 2006, and 3 CWT steelhead were recovered from Japanese gillnet research in the central North Pacific Ocean.

Overall, tagging results in the GOA showed the presence of Columbia River Basin Chinook and Oregon Chinook salmon tag recoveries (from 1982–2003). Some CWT recovered by research vessels in this time period also showed the recoveries of coho salmon from the Cook Inlet region and southeast Alaska coho salmon tag recoveries along the southeastern and central GOA (Myers et al 2004).

7.1 Bycatch of ESA-listed Pacific salmon stocks in the GOA groundfish fisheries

Of the larger number of Chinook salmon evolutionarily significant units (ESUs) in the Pacific Northwest that are listed on the Endangered Species Act, three are known to have been caught as bycatch in the Alaska groundfish 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. A biological opinion dated November 30, 2000, and supplemented in January 11, 2007, was issued regarding the authorization of the Alaska groundfish fisheries. An incidental take statement was included in the Biological Opinion, which established a threshold of 40,000 Chinook salmon caught as bycatch in the GOA groundfish fisheries. 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 supplemental Biological Opinion.

Since 1984, CWTs have been recovered from 23 LCR, 98 UWR, and 1 UCR Chinook salmon in the GOA trawl fishery, both pre- and post-listing (Table 13). By applying mark expansion factors (which offer the

closest approximation to the contribution of ESA-listed ESUs in the GOA), the estimated numbers increase to 112 LCR, 282 UWR, and 1 UCR Chinook salmon. Note, the most recent CWT recoveries in this table occurred in February 2010. A single Chinook salmon from the UWR has to date been analyzed and recorded. NMFS Auke Bay Lab is currently analyzing further CWTs that were recovered later in 2010. The results of this analysis may be available by the time of the December 2010 Council meeting.

The numbers provided here should be considered as 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 groundfish fisheries will remain unknown and indeterminable.

Table 13 Observed Number and Mark Expansion of ESA-listed coded wire tagged salmon, by evolutionarily significant unit (ESU), captured in the GOA trawl fishery, pre-listing and post-listing, 1984–2010.

Listing Status	ESU Name	GOA Observed Number	GOA Mark Expansion
Pre-listing	Lower Columbia River Chinook	12	82.1
	Upper Willamette River Chinook	43	143.8
Post-listing	Lower Columbia River Chinook	11	29.7
	Upper Columbia River spring Chinook	1	1.0
	Upper Willamette River Chinook	55	138.1

*2010 data are preliminary. The most recent CWT recoveries occurred in February 2010.
Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 11/8/2010

Because the 2010 GOA groundfish fisheries have exceeded the incidental take statement's threshold of 40,000 Chinook salmon caught as bycatch, NMFS Alaska Region has requested that formal consultation be reinitiated under Section 7 of the ESA. A memorandum to this effect is being sent to NMFS Northwest Region, and an annual report will be prepared in the early part of 2011. A copy of the memorandum will be available by the December 2010 Council meeting.

8 Chinook salmon stocks and directed fisheries

The State of Alaska manages commercial, subsistence and sport fishing of salmon in Alaskan rivers and marine waters and assesses the health and viability of individual salmon stocks accordingly. The catches of Chinook salmon in Southeast Alaska are regulated by quotas set under the Pacific Salmon Treaty. In other regions of Alaska, Chinook salmon fisheries are also closely managed to ensure stocks of Chinook salmon are not overharvested. No gillnet fishing for salmon is permitted in Federal waters (3-200 miles), nor commercial fishing for salmon in offshore waters west of Cape Suckling.

8.1 GOA Chinook salmon stocks

A brief overview of Chinook stocks by area is included in this section. Available information on individual stocks and run strengths varies greatly by river and management area.

Southeast Alaska and Yakutat

Chinook salmon are known to occur in 34 rivers in the Southeast region of Alaska, or draining into the region from British Columbia or Yukon Territory, Canada (known as transboundary rivers). The

southeast Alaska Chinook stocks enter spawning streams during the spring and early summer months. 11 watersheds have been designated to track spawning escapement, and counts of these 11 stocks are used as indicators of relative salmon abundance as part of a coast-wide Chinook model (Pahlke 2007). The Pacific Salmon Commission addresses coordinated management of the transboundary stocks of the Taku, Stikine, and Alsek Rivers. The Taku, Stikine, and Chilkat rivers together make up over 75% of the summed escapement goals in the region.

In 2007, escapements on 8 of the 11 tracked systems were above or within goals, with the Alsek, Taku, Chilkat, and Blossom Rivers being below goal, however Maximum Sustained Yield goals indicated that all Southeast Alaska and Transboundary River stocks were healthy and stable (Lynch and Skannes 2008).

Prince William Sound

The Prince William Sound management area encompasses all coastal waters and inland drainages entering the north central Gulf of Alaska between Cape Suckling and Cape Fairfield. A Sustainable Escapement Goal is established for the Copper River, at 24,000 Chinook, and inriver escapement to the upper Copper River is established for all salmon species combined (Hollowell et al. 2007). In 2007, escapement was 35,957 fish, meeting the escapement goal (Lewis et al 2008).

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. Inseason management of Cook Inlet commercial salmon fisheries is based upon salmon run abundance and timing indicators. Catch data, catch per effort data, test fish data, catch composition data, and escapement information from a variety of sources is used to assess stock strength on an inseason basis. For Chinook salmon, surveys are made to index escapement abundance (Clark et al 2006).

There are three biological escapement goals (Kenai River early and late runs, Deshka River) and 18 sustainable escapement goals in effect for Chinook salmon spawning in Upper Cook Inlet. In 2008 and 2009, Chinook salmon escapement on the Deshka was below the escapement goal (13,000-28,000) for the first time since 1996, at 7,533 fish in 2008 and 11,960 in 2009 (Shields 2009, Eggers et al 2010). From 1999-2006, escapement exceeded the upper end of the escapement range. Kenai River escapement is monitored via sonar by the Division of Sport Fish. The late-run Chinook salmon returns have been relatively stable through 2008, and escapement objectives have been achieved (Shields 2009). The remainder of the northern Cook Inlet salmon escapements are monitored by a single aerial survey, which is the least reliable index method of escapements.

There are 3 sustainable escapement goals in effect for Chinook in the Lower Cook Inlet. Chinook salmon is not normally a commercially important species in the Lower Cook Inlet. Very little escapement information is available for this area.

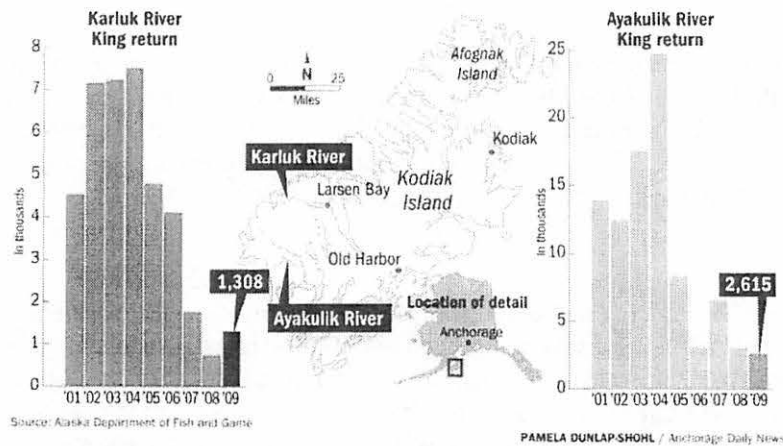
Kodiak

There are three streams that support viable Chinook salmon in the Kodiak management area: Ayakulik River, Karluk River, and Dog Salmon Creek. Commercial harvest occurs during targeted sockeye salmon fisheries. Escapement objectives have been estimated for the Ayakulik and Karluk river systems, and escapement for all three rivers is estimated using fish counting weirs.

The escapement goal range for the Ayakulik is 4,800-9,600 fish; in 2006, 2008, and 2009 escapement has been below the goal range. In 2009, 2,615 Chinook were counted through the weir (Campbell 2010; Figure 4), well below the ten-year average for 1997-2006 of 14,274 salmon (Dinnocenzo and Caldentey

2008). In 2010, the count increased to 5,319 Chinook salmon, which still falls below the ten-year average. For the Karluk, 2007-09 escapement has been below the escapement goal range of 3,600 to 7,300, although between 1998 and 2006, escapements have been within the goal range. Escapement in 2008, especially, was extremely weak, at 752 Chinook, even though retention by seine gear of Chinook salmon greater than 28 inches in length was prohibited in June and July (Dinnocenzo 2010). In 2010, escapement increased to 2,917 fish, which continues to fall below the escapement goal range. Escapements averaged 370 fish for Dog Salmon Creek from 1998 to 2007, however only 90 Chinook were counted through the weir in 2008 (Dinnocenzo 2010). In 2010, 354 Chinook were counted through the weir, which falls slightly below the ten-year average. No escapement goal has been established for this system.

Figure 4 Chinook returns to the Karluk and Ayakulik Rivers, in Kodiak, 2001-2009



Chignik

The Chignik River is the only Chinook salmon producing stream within the Chignik management area, and has an escapement goal range of 1,300-2,700 fish. The 2009 escapement through the weir was 1,680 Chinook (Eggers et al 2010), lower than the 2008 escapement of 1,730 Chinook, and the 5-, 10-, and 20-year averages. Average escapement for 2003-2007 was 5,255 fish, and for 1998-2007 was 4,393 fish (Jackson and Anderson 2009). In 2010, escapement through the weir was 3,679 fish, which represents an increase over the last two years, although still falls below the ten-year average.

South Alaska Peninsula

There are no Chinook spawning streams in the South Alaska Peninsula district.

8.2 Salmon fisheries

Directed commercial Chinook salmon fisheries occur in the Southeast Alaska troll fishery in the GOA, and in the Yukon River, Norton Sound District, Nushagak District, and Copper River. In all other areas, Chinook are taken incidentally, and mainly in the early portions of the sockeye salmon fisheries. Catches in the Southeast Alaska troll fishery have been declining in recent years due to U.S./Canada treaty restrictions and declining abundance of Chinook salmon in British Columbia and the Pacific Northwest. Chinook salmon catches have been moderate to high in most regions over the last 20 years (Eggers 2004).

Forecasts of salmon runs (catch plus escapement) for major salmon fisheries, and projections of statewide commercial harvest are published annually by ADFG. For purposes of evaluating the relative amount of GOA groundfish bycatch as compared to the commercial catch of salmon by area, Table 14 shows the commercial catch of Chinook species by management area between 2003 and 2009.

Table 14 Chinook salmon GOA commercial catch, by area, compared to western and central groundfish bycatch, 2003-2009, in 1000s of fish

Year	Southeast	Prince William Sound	Cook Inlet	Kodiak	Chignik	South Alaska Peninsula	Total	Total GOA groundfish Chinook bycatch
2003	431	49	20	19	3	3	525	15
2004	497	39	29	29	3	7	575	21
2005	462	36	29	14	3	5	549	31
2006	379	32	19	20	2	5	457	19
2007	359	41	18	17	2	5	442	40
2008	241	12	13	17	1	4	288	15
2009	268	11	9	7	3	6	304	8

Source: ADFG (<http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/catchval/blusheet/07exvesl.php>), Volk et al 2009, Eggers et al 2010, Harthill 2009, AKFIN Comprehensive PSC data, February 2010.

Southeast Alaska and Yakutat

Based on current information from age composition, coded wire tagging studies, and general productivity considerations, the majority of Chinook salmon harvested in the Southeast Alaska troll fishery originate from spawning streams and hatcheries in the Pacific Northwest and Canada (Lynch and Skannes 2008). The Pacific Salmon Treaty Agreements determine Chinook allocations for Treaty fish; the fishery also harvests Alaskan hatchery fish. The Chinook salmon all-gear treaty quota for Southeast Alaska was 218,800 fish in 2009, divided among troll, purse seine, drift and set gillnet, and sport fisheries (Eggers et al 2010). In addition, a harvest sharing agreement with Canada under the treaty allows harvest in the Taku River; there was no directed fishery for Chinook salmon on the Stikine River in 2009 due to low forecast returns. The total regional fishery Chinook harvest, including Treaty fish and Alaskan hatchery fish, was 268,500³, which is below the long-term average harvest of 301,000 and the recent 10-year harvest of 339,000 (Eggers et al 2010).

Prince William Sound

Chinook harvest in the Copper River District in 2009 was 9,456 Chinook salmon, below the previous 10-year average of 37,000 fish (Eggers et al 2010). Chinook were harvested in the drift gillnet fishery. In 2007, harvest of Chinook in the Copper River District was 51,768 Chinook, with 76% harvested commercially, 2% through educational and subsistence permits, 12% by upriver personal use and subsistence users, and 8% by sport users (Lewis et al 2008). In 2010, Chinook harvest (through September 15) was 9,353 Chinook, which continues to be below the previous 10-year average.

Harvest of Chinook in commercial fisheries by other gear types or in other Prince William Sound districts totaled 428 fish in 2009, and 360 in 2010 (through September 15). 876 Chinook were harvested in personal use fisheries, and 50 by educational permit (ADFG 2010). Sport and subsistence permit harvests were not yet available.

Cook Inlet

Poor returns in the 2008 and 2009 Deshka River salmon runs resulted in closures for both sport and commercial fisheries. Commercial harvest of Chinook salmon in 2008 was 13,202 fish, lower than the 1998-2007 average of 16,166 fish. 396 Chinook were harvested in 2008 under educational permits, and 1,600 in personal use fisheries (Shields 2009). Approximately 9,000 Chinook were harvested in 2009.

³ The salmon catch accounting year period extends from October 1, 2008 to September 30, 2009.

The 2009 total harvest of 1,266 Chinook in the Northern District was the third lowest harvest since 1986 (Eggers et al 2010). Preliminary catch totals for 2010 through August 30 report 9,631 Chinook salmon harvest.

In 2008, harvest of Chinook salmon in the Lower Cook Inlet (while not normally a commercially important species) totaled just under 200 fish, or less than 20% of the average for the previous 10 years (Hammerstrom and Ford 2009). The 2009 harvest in the Lower Cook Inlet totaled 84 fish, the lowest total since 1971 (Eggers et al 2010). In both years, virtually all catch was taken in the Southern District, primarily the commercial set gillnet fishery, which targets sockeye salmon.

In 2008, personal use catch of Chinook was 2 fish in the Lower Cook Inlet, the lowest since 1974 and much lower than the long term average (1967-2007) of 46 fish. This is attributable to the discontinuation (after 1999) of the Division of Sport Fish program to stock late run juvenile Chinook at the Homer Spit (Hammarstrom and Ford 2009).

Kodiak

There are no directed Chinook commercial fisheries in the Kodiak management area, but Chinook are harvested incidentally in target sockeye salmon fisheries. The 2009 commercial harvest was 7,219 Chinook, considerably lower than the 2008 harvest of 17,176 fish, as well as the previous 10-year average (19,000 Chinook) (Dinnocenzo 2010, Eggers et al 2010). No commercial openings were allowed in the Inner or Outer Karluk or the Inner Ayakulik sections in June and July of 2009, and due to low returns, non-retention of Chinook salmon was implemented during the one fishing period allowed in the Outer Ayakulik, in July 2009. In 2010, the total Chinook harvest through September 13, 2010 was 12,727 Chinook, which remains below the previous 10-year average.

Due to weak Chinook runs on the Ayakulik and Karluk Rivers, subsistence fishing for Chinook was closed by emergency order in June 2008. In 2008, commercial finfish permit holders reported retention of 76 Chinook from their commercial harvest, for personal use (Dinnocenzo 2010).

Chignik

3,319 Chinook were commercially harvested in 2009, which exceeds recent average harvests (Eggers et al 2010). The majority of the harvest occurred from late June through July. Harvest in 2008 was the lowest since 1977, at 970 Chinook (Jackson and Anderson 2009). Average harvest for 2003-2007 was 2,433 fish. In 2010, fishermen have harvested an estimated 10,000 Chinook, a considerable increase from recent years.

15 Chinook were retained in 2008 for personal use, compared to an average from 2003-2007 of 169 fish.

South Alaska Peninsula

In 2009, 3,800 Chinook were caught in the South Unimak and Shumagin Islands June fisheries, 152 in the Southeastern District Mainland fishery, and 1,900 in the South Peninsula post-June fishery (Eggers et al 2010). The 2009 harvest was higher than the 2008 harvest of 4,839 fish, and also higher than the 4,839 fish average 1998-2007 Chinook harvest for the South Peninsula (Harthill 2009).

9 Review of Existing Closures

There are already seasonal and permanent area closures that have been implemented for the GOA groundfish fisheries, many of which were instituted to reduce bycatch or interactions with Steller sea

lions. It is important to consider the development of new spatial controls to reduce bycatch within the context of existing time and area closures. The various State and Federal closures affecting the GOA groundfish fisheries are described below, along with their intended purpose. The year the closure was implemented is noted in parentheses. Figure 16 (in Section 14 at the end of the document) maps the existing closures in the entire GOA management area; Figure 17 and Figure 18 pinpoint the western and central regulatory areas, respectively, which are the focus of this discussion paper.

Kodiak red king crab closures: Type I and Type II (1993). **Nonpelagic trawl closure areas**, designed to protect Kodiak red king crab because of the poor condition of the king crab resource off Kodiak and because trawl bycatch and mortality rates are highest during the spring months when king crab migrate inshore for reproduction. The molting period off Kodiak begins around February 15 and ends by June 15. Type I areas have very high king crab concentrations and, to promote rebuilding of the crab stocks, are closed all year to all trawling except with pelagic gear. Type II areas have lower crab concentrations and are only closed to non-pelagic gear from February 15 through June 15. In a given year, there may also be Type III areas, which are closed only during specified 'recruitment events', and are otherwise opened year-round.

Steller Sea Lion (SSL) 3-nautical mile (nm) no transit zone (2003). **Groundfish fishing closures** related to SSL conservation establish 3-nm no-transit zones surrounding rookeries to protect endangered Steller sea lions.

SSL no-trawl zones for pollock and Pacific cod (2003). **Pollock and Pacific cod trawl fishing closures** related to SSL conservation establish 10- to 20-nm fishing closures surrounding rookeries to protect endangered Steller sea lions. Some hook and line and pot gear closures for Pacific cod fishing are also in effect off Chignik, and around Marmot, Sugarloaf, and Outer Pye Islands in the northeast Kodiak and southeast Kenai peninsula areas.

Scallop closures (1995). **Year-round closure to scallop dredging** to reduce high bycatch of other species (i.e., crabs) and avoid and protect biologically critical areas such as nursery areas for groundfish and shellfish.

Prince William Sound rookeries no fishing zone (2003). **Groundfish fishing closures** related to SSL conservation include two rookeries in the PWS area, Seal Rocks (60° 09.78' N. lat., 146° 50.30' W. long.) and Wooded Island (Fish Island) (59° 52.90' N. lat., 147° 20.65' W. long.). Directed commercial fishing for groundfish is closed to all vessels within 3 nautical miles of each of these rookeries.

Cook Inlet bottom trawl closure (2001). **Prohibits non-pelagic trawling** in Cook Inlet to control crab bycatch mortality and protect crab habitat in an areas with depressed king and Tanner crab stocks.

State Water no bottom trawling (2000). **Prohibit commercial bottom trawling** in all state waters (0-3 nm) to protect nearshore habitats and species. However, specific areas in the Shelikof Straits along the west side of Kodiak Island are open to bottom trawling from January 20 to April 30 and October 1 to November 30, and areas around Shumagin and Sanak Islands are open year round.

Southeast Alaska no trawl closure (1998). **Year-round trawl closure** E. of 140° initiated as part the license limitation program.

10 Management options to reduce Chinook salmon bycatch

In order for the Council to move forward with management options to reduce bycatch, it is important to determine what is the Council's desired objective, as this influences what management options will appropriately address the problem. The Council's purpose in trying to reduce Chinook salmon bycatch is likely to be one of the following factors, or a combination of them: a. groundfish bycatch of this species represents a conservation concern; b. groundfish bycatch of this species is impacting directed fisheries for this species; or c. mortality caused by groundfish bycatch of this species is at a socially unacceptable level (note, this ties into one of the Council's management objectives for the groundfish fisheries).

In all cases, the Council is evaluating whether the groundfish fisheries' bycatch levels cross a threshold at which corrective action is warranted. For various reasons, information is not available to determine, with specificity, to what degree the amount of bycatch taken in groundfish fisheries is likely to affect the sustainability of salmon populations. Section 8 provides limited information on Chinook populations, with which to put in context the bycatch numbers presented in the discussion paper. Based on this information, the Council will decide further action should be considered, and management options to reduce bycatch should be instituted.

The type of management options available to the Council include seasonal and permanent area restrictions to a particular gear type or target fishery; temporal area restrictions, that may be triggered by attainment of a bycatch limit; or creation of industry-level bycatch management entities that can effect real-time communication to avoid 'hotspot' areas of high bycatch. All of these management options have benefits and disadvantages, which cannot be fully analyzed in this discussion paper, but which will be addressed in detail should the Council choose to initiate an analysis. The sections below provide a brief outline of the management options that could be included in an analysis, as well as some preliminary strawman closures to illustrate some of the options.

10.1 Draft alternatives

The following suite of draft alternatives for reducing salmon bycatch in the GOA groundfish fisheries was first proposed by the Council in December 2003, and has been iteratively refined since that time. In June 2008, the Council eliminated alternatives for salmon species other than Chinook salmon, and requested staff to begin to develop strawman closures to pair with the draft alternatives. The following are the draft alternatives:

Chinook Salmon

- Alternative 1: Status quo (no bycatch controls).
- Alternative 2: Trigger bycatch limits for salmon. Specific areas with high bycatch (or high bycatch rates) are closed seasonally (could be for an extended period of time) if or when a trigger limit is reached by the pollock fishery.
- Alternative 3: Seasonal closure to all trawl fishing in areas with high bycatch or high bycatch rates.
- Alternative 4: Voluntary bycatch cooperative for hotspot management.

In June 2005, the Council also provided, in their motion, the following comments on developing trigger limits, and general recommendations for an analysis.

Trigger limits:

- 1- Average numbers are not an appropriate approach to establishing trigger limits. The analysis should instead focus upon the use of biomass-based approaches for establishing appropriate trigger levels.
- 2- Trigger limits under consideration should be separated by gear type (i.e. separate limits for pot gear versus trawl gear)
- 3- Rather than considering an improperly defined duration of a triggered closure, the Council recommends moving in the direction of dynamic revolving closures (hot spots) which reflect the distribution and mobility of the crab population.

General recommendations for the analysis:

- 1- Differential discard mortality rates by gear type should be addressed in the analysis using the most up-to-date and applicable information.
- 2- Additional information must be included with respect to the overall precision of bycatch estimates given the low levels of observer coverage in many of the fisheries under consideration.
- 3- The addition of another alternative (from staff discussion paper) for an exemption from time and area closures if an observer is on board, seems pre-mature at this time.
- 4- Emphasis should be focused on alternatives 3 and 4 rather than focusing attention on trigger limits under alternative 2.
 - a. With respect to alternative 3, additional information may be necessary (in addition to ADFG survey information and bycatch information from the NOAA groundfish observer program) in order to appropriately identify sensitive regions for year-round or seasonal closures.
 - b. Alternative 4 should include the concept of required participation in a contractual agreement for a hot spot management system
- 5- A rate-based approach format should be added as much as possible in all graphs and figures for the analysis.

10.2 Estimating trigger limits

Trigger limits, as proposed under Alternatives 2, would close designated areas to all or specified gear types or target fisheries once a bycatch limit has been reached. PSC limits and associated closures have been used for salmon bycatch in the Bering Sea groundfish fisheries (Witherell and Pautzke 1997). For instance, the pelagic trawl pollock fishery accounts for a high percentage of GOA Chinook bycatch. The Council might set a bycatch limit for Chinook salmon, and once it has been attained (either by the fleet as a whole, or exclusively by the pollock fishery), a designated area might be closed to pollock fishing for the remainder of the year or season.

In the past, the Council has provided direction to staff with respect to establishing trigger limits. Staff were encouraged to look at abundance-based methodologies for developing potential trigger limits. This abundance-based approach has been used in the BSAI groundfish fisheries for crab species. A stair-step procedure of increasing PSC limits corresponding to higher population levels is in place for red king crab; an abundance-based zonal approach is used for *C. bairdi* Tanner crab; and the snow crab PSC limit is based on the percentage of annual biomass estimates. Biomass-based limits, however, require a good understanding of the relative stock status for that species, which may not be available for Chinook salmon in the GOA. Section 8 provide an overview of stock status for Chinook salmon, but a detailed understanding of the health and vulnerability of salmon stocks would be integral to determining the appropriate mechanism for establishing trigger limits, if the Council chooses to include a trigger limit management option in a future analysis.

The proposed alternatives using trigger closures would work similar to other existing PSC management measures. Currently in the GOA, PSC limits are only set for halibut in the flatfish fisheries, so that if the PSC limit for the target fishery (or group of target fisheries) is reached within a given season, the fishery (or fisheries) is closed for the remainder of the season. Establishing trigger bycatch limits for Chinook salmon, as proposed under Alternatives 2, would result in a similar procedure. Inseason management would monitor the accrual of bycatch toward the PSC limit. As most of the GOA groundfish fisheries are subject to less than 100% observer coverage, bycatch rates from observed vessels would be applied to catch on unobserved vessels using the catch accounting database estimation procedure, described in Section 3.

In order to establish PSC limits for Chinook, the Council would first establish what type of bycatch would accrue to the trigger limit (e.g., all bycatch by any gear type, or specific bycatch by gear type, target fishery, and/or regulatory area). Next, the Council would establish what the consequence of arriving at the limit would be (e.g., an area closure for the remainder of the year or season), and to whom the consequence would apply (e.g., a particular gear type and/or target fishery).

It has been suggested that establishing trigger PSC limits for managing Chinook salmon bycatch in the GOA is problematic. The low proportion of observed catch in the GOA means that the reporting of total bycatch numbers involves considerable extrapolation. Inherent in the catch estimation procedure is the fact that a catch of one salmon in a small groundfish haul (resulting in a high bycatch rate) can sometimes be extrapolated to very large amounts of catch, resulting in exceedingly high bycatch totals for the GOA as a whole. The Alaska Fisheries Science Center is looking into the possibility of including estimates of statistical confidence into the bycatch estimation procedure, but for the moment, the current procedure is the best available. It is also the procedure that is currently used to manage the PSC limit for halibut in the GOA.

10.3 Determining appropriate area closures

Year-round and seasonal closures, such as those proposed under Alternatives 3, have also been used in both the GOA and BSAI fisheries to control the bycatch of prohibited species. Currently, in the GOA, trawl closure areas have been implemented around Kodiak Island to protect red king crab. In a separate action, the Council is currently considering establishing area closures around Kodiak Island for protection of *C. bairdi* crab. Area closures can also be associated with PSC trigger limits, as under Alternative 2, so that a particular area is closed once the PSC limit is reached.

For salmon, the highest bycatch is seasonal, and is tied to the timing of the pollock fishery. Seasonal closures of hot spot locations could merit examination, rather than year-round closures. Seasonal salmon closures have been used to control salmon bycatch in the BSAI groundfish fisheries, although in recent years these closures have been problematic, and measures to address salmon bycatch, including revised area closures and PSC limits that would close the pollock fishery when triggered, are currently under review (NMFS 2008). Given that the Council is currently revising bycatch reduction measures for salmon in the BSAI, any measures evaluated in the GOA should consider and build upon lessons learned in the BSAI.

There are various methodologies available for identifying appropriate areas to close in order to reduce bycatch of salmon. One such is to look at areas of high abundance of the species in question, and restrict fishing in those areas, however this methodology is less effective for Chinook salmon. Another methodology that was used by the Council to create habitat closures in the Aleutian Islands and the northern Bering Sea is the footprint approach. For example, in the Aleutian Islands, closures were intended to protect coral (and fish habitat), and little is known about the abundance of coral in those areas.

Closures in this instance were identified to contain fishing within historic limits. The footprint approach is also not necessarily helpful when protecting highly mobile species such as salmon, however.

The default methodology for this preliminary analysis is to use bycatch locations as a proxy for abundance, and identify closure areas based on the locations of hauls with observed bycatch. High incidence of bycatch and high bycatch rates, summed over the years 2003-2007, were used to identify the strawman closures described below. There are many problems with this approach, some of which have already been described above. The observer data is the best available data for designing closures based on where the fishery encounters bycatch. However, the observed fishing trips represent only a relatively small proportion of total fishing trips in the western and central GOA. Also, for vessels that are not 100% observed, the areas where a vessel chooses to fish while it has an observer onboard may be purposefully different than the areas where it fishes without an observer. This might occur if a vessel chooses not to make longer trips with an observer onboard, because it might require paying the observer for a longer duration than is necessary to meet the observer requirement. If this is the case, basing a spatial analysis of where bycatch is occurring on the observer data may not always produce an accurate representation of actual bycatch distribution. Another issue with using the observer data for identifying regulatory closures was discussed in Section 5 with respect to sampling bycatch at the plant in the pollock fishery, and the fact that it effectively averages the bycatch caught on a trip across all the hauls that occurred during that trip.

Additionally, areas with high numbers of bycatch also tend to be the areas where most of the catch is occurring. By prohibiting vessels from fishing in areas of high catch per unit effort, bycatch closures would force vessels to fish longer in other, less productive areas, which may result in higher bycatch rates in the long run. This issue can be addressed by looking at areas with high bycatch rates (e.g. crab/mt groundfish) instead of looking at absolute bycatch numbers. However, bycatch rates are also a problematic methodology, because some of the highest bycatch rates arise from having one salmon or crab caught in a small tow of groundfish, which may not necessarily be representative of a high abundance area that would benefit from a closure.

Bycatch patterns are also highly variable from year to year. The correlation between the location of fishery catch and salmon bycatch has not been fully investigated, but preliminary analysis seems to indicate that the variability is as much a function of salmon life history changes or abundance as it is changes in the fleet's fishing patterns. This complicates the identification of appropriate closure areas to protect Chinook salmon, as a closure that might be appropriate to protect the species in one year may be ineffective in another one. This appears to have been the case with the salmon closure areas for Chinook and chum salmon in the BSAI, which have recently been revised or are under review by the Council. Since the initial evaluation of strawman closures was made, in the version of this discussion paper dated December 2008, staff have mapped and included additional years of observed bycatch history: 2001, 2002, and 2008. Consequently, it is the strawman closures that are described below, based on 2003-2007 bycatch, are often mapped against the 2001-2008 time series, or against 2008 alone. This comparison will allow the Council to see the annual variability in bycatch patterns, and some of the problems with establishing closure areas as a mechanism to reduce Chinook bycatch in the GOA groundfish fisheries.

10.4 Preliminary strawman closures for Chinook salmon (developed in November 2008)

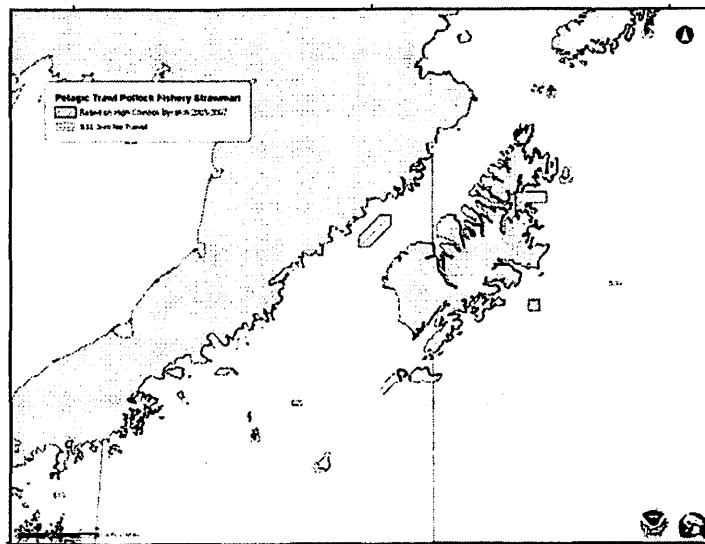
For Chinook salmon, staff tried to look at separate strawman closures for vessels using pelagic and non-pelagic trawl gear. While the majority of salmon overall is taken in the pollock pelagic trawl fishery, the non-pelagic trawl fisheries combined contribute an average of 25% to the total GOA Chinook bycatch. Based on the observer data, however, it was very difficult to identify hotspot bycatch areas that could serve as strawman closure areas for the non-pelagic trawl fleet. For this reason, strawman closures for non-pelagic trawl gear are not included in this discussion paper, although it is possible that further

detailed analysis of the observer data may be able to suggest a different methodology for identifying closures for this gear type in the future.

For pelagic trawl, strawman closures were identified based on high incidence of Chinook salmon in the pelagic pollock trawl fishery during 2003-2007 (Figure 5). The closures were identified by selecting areas with the highest category of observed bycatch during those years, extrapolated to the haul level, and also include any areas of the second highest category that surround it. An attempt was made to include areas of at least two blocks of high or highest catch. The closure areas are overlaid on maps of the observed number of Chinook salmon from 2001-2008 (Figure 19), in Section 14 at the end of the document), and for 2008 only (Figure 20), which provides information on the spatial variability of the catch on an annual basis. Additionally, the strawman closures are compared to the bycatch rate of salmon, from 2001-2008, for the pelagic trawl fishery (Figure 21). This methodology results in three closure areas, all of which occur in the central GOA.

As discussed in Section 5 and above, prohibited species in the pollock fishery are sampled at the plant, and the location of the bycatch is averaged among all hauls in a given trip. **Should the Council proceed with an analysis of closure areas for pelagic trawl gear, a more detailed spatial analysis would need to be conducted to investigate the impact of this averaging on the delineation of appropriate closure areas.**

Figure 5 Chinook salmon strawman closures for pelagic trawl gear, based on high incidence of bycatch summed for 2003-2007



Catch statistics for strawman closures

Table 15 provides a synthesis of the strawman closures identified above. The data, summed for 2001 to 2008, is from the observer database which was used to map the distribution of Chinook bycatch in the western and central GOA. The table provides the overall bycatch rate of Chinook salmon per total catch in the western and central GOA, by gear type, for 2001-2008, and compares it to the bycatch rates in the areas encompassed under the sets of strawman closure areas. Additionally, the total number of tows occurring in each set of closure areas is compared to the total number of hauls that contain Chinook salmon, which gives an idea for the degree to which bycatch is pervasive in the strawman closures. The final columns identify how much of the total observed catch and total observed bycatch come from the strawman closure areas.

Table 15 Total observed catch and Chinook bycatch in strawman closures, by gear type, compared to catch and bycatch of that gear type in the western and central (W/C) GOA, summed over 2001-2008

Area and gear type	Total Chinook bycatch ² (number)	Total fishery catch ² (mt)	Bycatch rate (bycatch/total catch)	Total number of tows in strawman areas	Total tows with Chinook bycatch in strawman areas	% of total W/C GOA bycatch occurring in strawman areas	% of total W/C GOA catch occurring in strawman areas
Pelagic trawl in western and central GOA	24,299	119,638	0.20				
Pelagic trawl strawman closures based on high incidence of Chinook ¹	9,524	32,567	0.29	965	702	39.2%	27.2%

Source: NMFS observer database, March 2009.

¹ The methodology used to identify the strawman closures is described earlier in Section 10.3, and the closures themselves are illustrated in Section 14 at the end of the document).

² These numbers are based on observer data that has been extrapolated to the haul level. Observers do not sample the entire haul from a fishing tow, but rather collect one or several samples. The number of a particular bycatch species collected within the sample(s) is extrapolated by the Observer Program to represent the number of that bycatch species caught in the entire haul.

For the pelagic trawl gear strawman closures for Chinook, the bycatch rate increases from an average of 0.20 GOA-wide to 0.29 in the strawman closure areas as a group. 73% of all observed tows in the strawman closure areas contained Chinook bycatch. The strawman closure areas encompass areas where almost 40% of the observed Chinook bycatch was reportedly caught⁴, but they also represent areas where 27% of the total catch in the pelagic trawl fishery was harvested. Consequently, if these areas were made into regulatory closures, a quarter of the effort in the fishery would be dispersed into other areas. Should the Council choose to pursue an analysis with this as an alternative, the analysis would have to look at the likely areas where the fishery could recoup that effort, and what the bycatch rates would be likely to be in those areas.

10.5 Voluntary bycatch cooperatives

Alternative 4 would establish a bycatch pool or cooperative for hotspot area management. This alternative is designed after the current BSAI bycatch cooperatives, in use by industry to control salmon bycatch in the pollock fishery. Currently in the BSAI, a program of voluntary area closures is in place with selective access to those areas for fleets which demonstrate success in controlling bycatch (Haflinger 2003, NMFS 2008). Voluntary area closures can change on a weekly basis, and depend upon the supply and monitoring of information by fishermen. The sharing of bycatch rates among vessels in the fleet has allowed these bycatch hotspots to be mapped and identified on a real-time basis, so that individual vessels can avoid these areas (Smoker 1996, Haflinger 2003, NMFS 2008). This system relies upon information voluntarily reported to Sea State by the fleet per their cooperative agreements.

One problem with implementing a voluntary cooperative program in the GOA is the fact that the GOA fisheries tend to be of short duration. In the Bering Sea, hotspot areas can be closed on a weekly basis, however this approach would not work in the GOA fisheries. Additionally, the program is more easily

⁴ See Section 5 for discussion of the sampling mechanism for the GOA pollock fishery, and impacts on the averaging of bycatch across multiple haul locations.

implemented in the Bering Sea pollock fishery because the fishery is rationalized, and the agreement is between cooperatives with dedicated pollock allocations. An extensive discussion of the BSAI intercooperative agreement is included in the Final Environmental Impact Statement for Bering Sea Chinook Salmon Bycatch (NMFS 2008).

11 Action by the Council

The decision before the Council is whether to initiate an analysis to examine one or more of the management options proposed in this discussion paper, or others that the Council may wish to include in an analysis. Strawman closures were developed by staff in previous drafts of this paper, in order to provide a starting point for discussion of management options that include spatial or temporal fishery closures. This spatial analysis was, however, prepared in November 2008, and does not incorporate recent data. Additionally, for the pollock fishery, the closures do not account for the averaging of a trip bycatch rate across several hauls which may have occurred in different locations.

If the Council chooses to initiate an analysis, the Council should articulate a problem statement for this action, and a set of alternatives to analyze.

12 References

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14 Color figures

Figure 6 Observed Chinook salmon bycatch in the GOA groundfish fishery, summed over 2006-2010

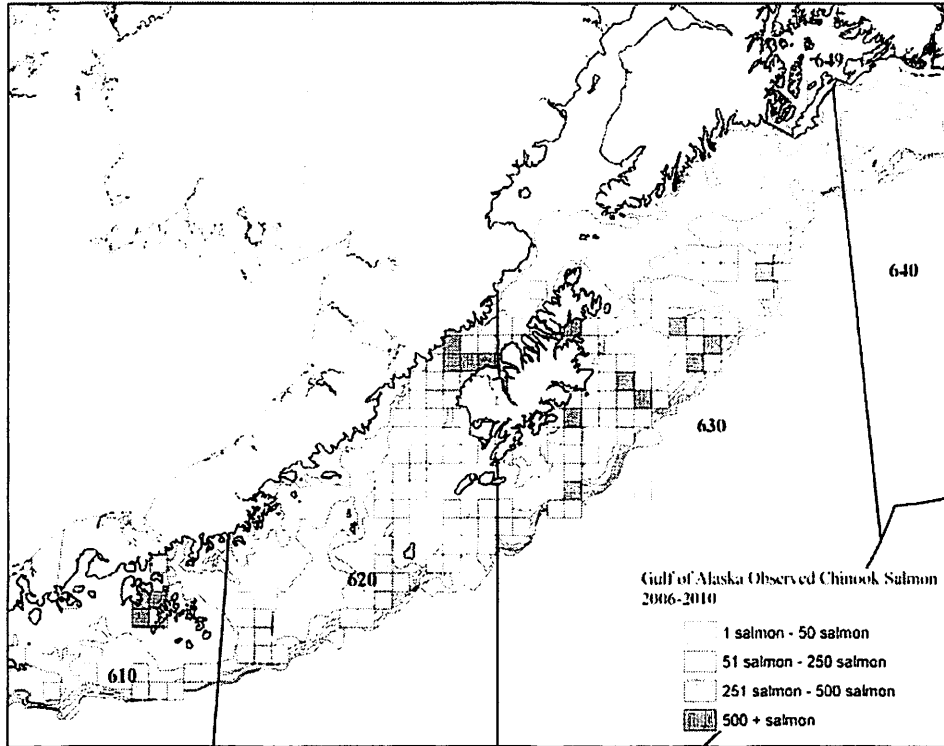


Figure 7 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2006

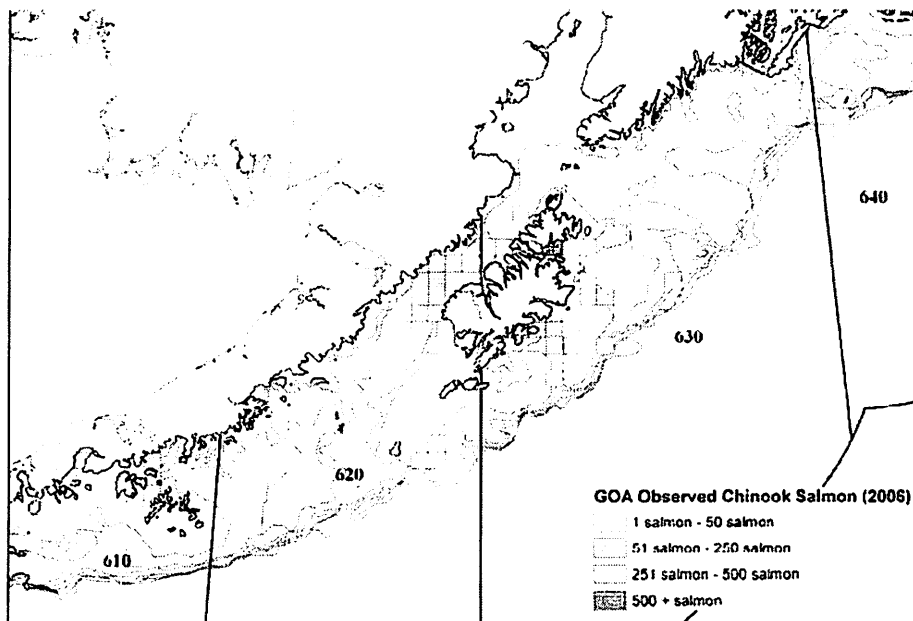


Figure 8 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2007

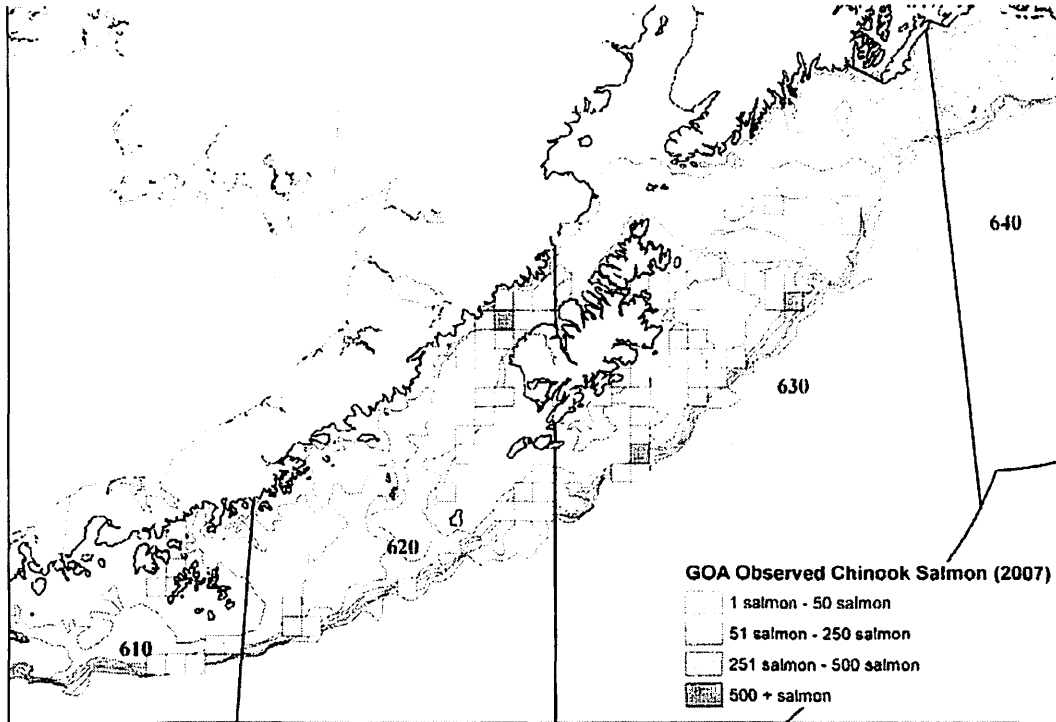


Figure 9 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2008

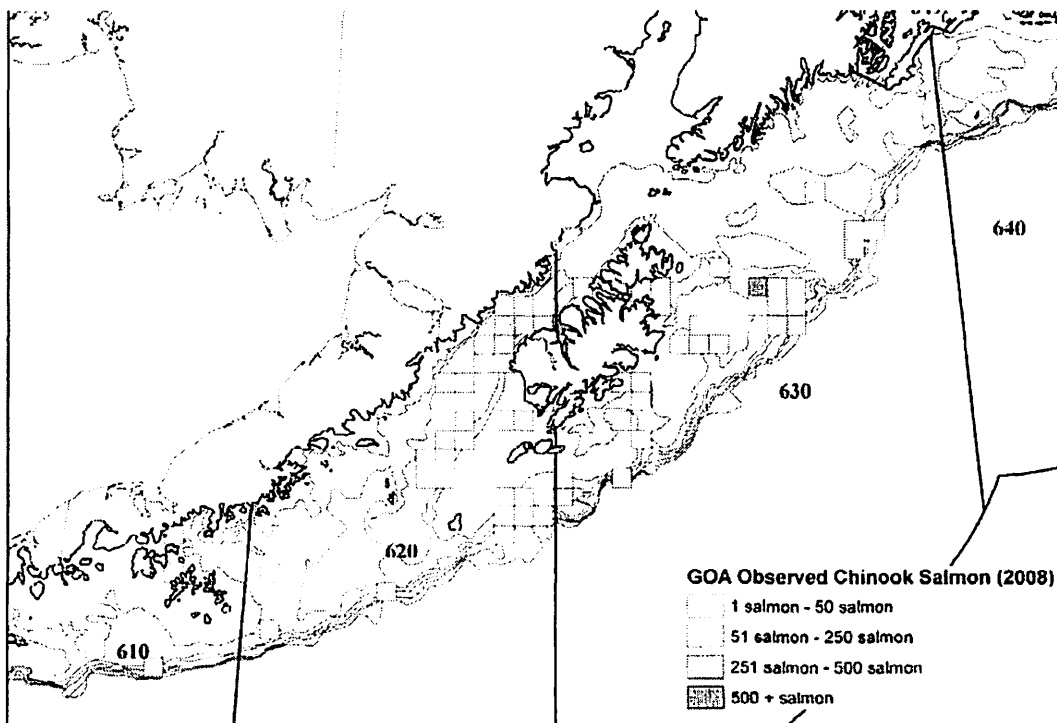


Figure 10 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2009

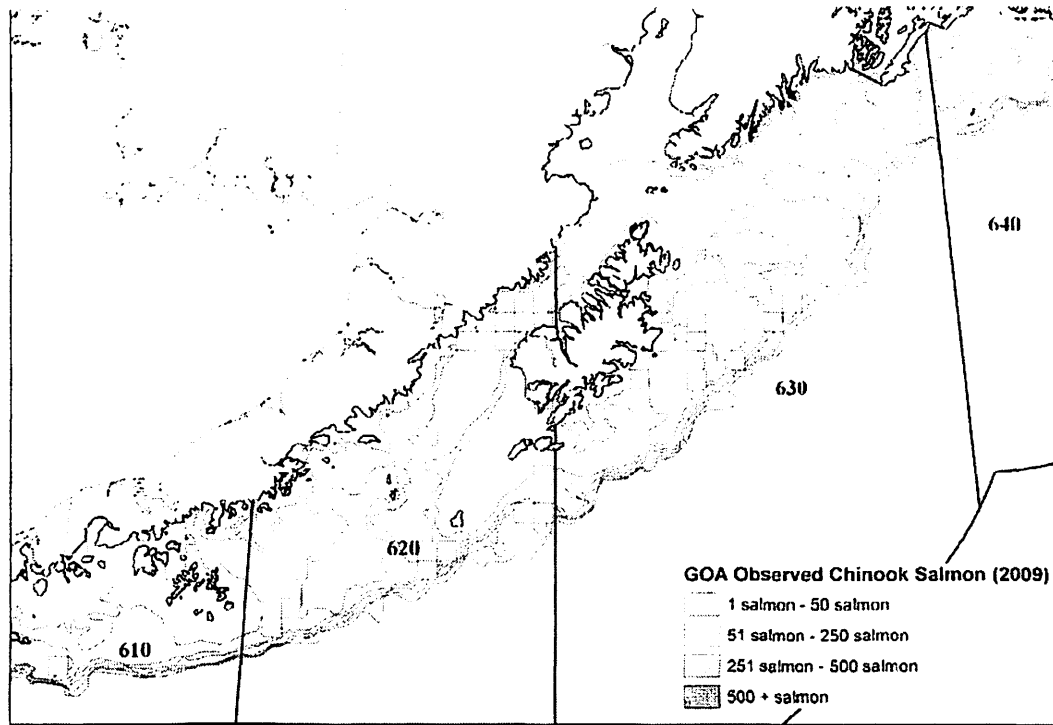


Figure 11 Observed Chinook salmon bycatch in the GOA groundfish fishery, 2010

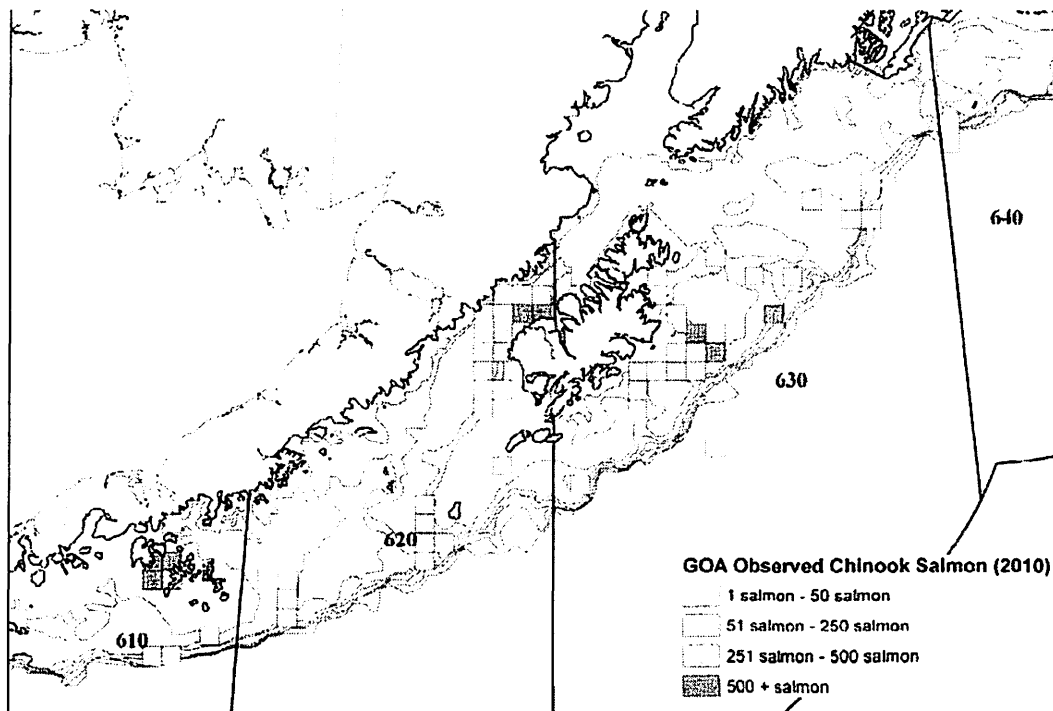


Figure 12 Observed Chinook salmon bycatch in the pelagic trawl fishery, summed over 2001-2008

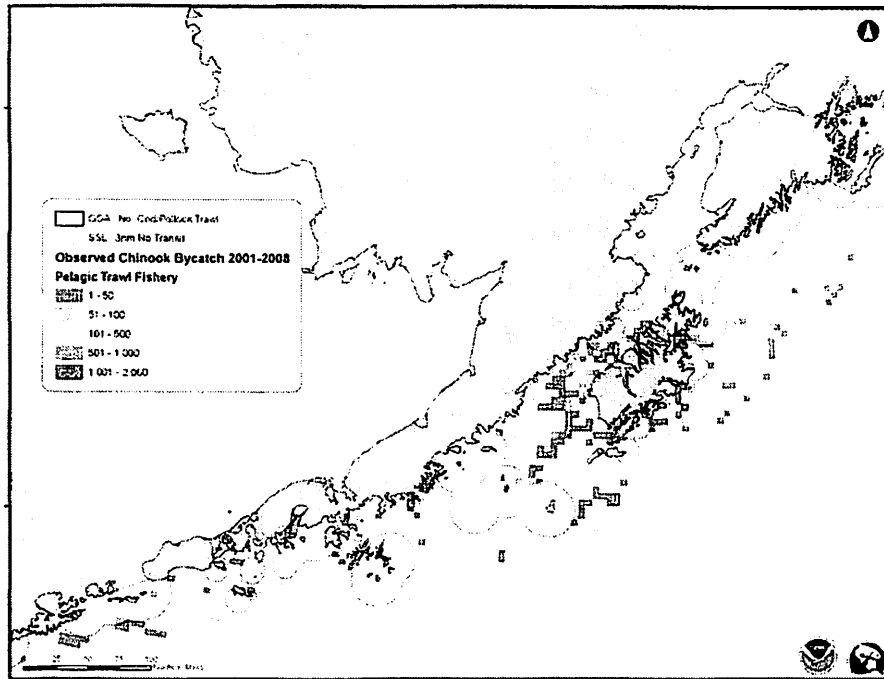


Figure 13 Observed Chinook salmon bycatch rate in the pelagic trawl fishery, summed over 2001-2008, number of salmon per metric ton of total catch

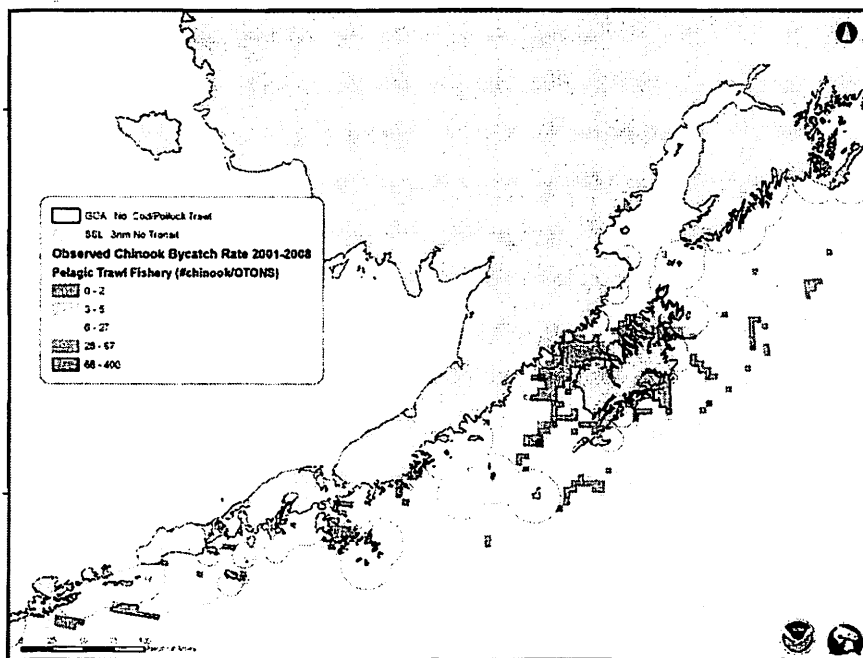


Figure 14 Observed Chinook salmon bycatch in the non-pelagic trawl fishery, summed over 2001-2008

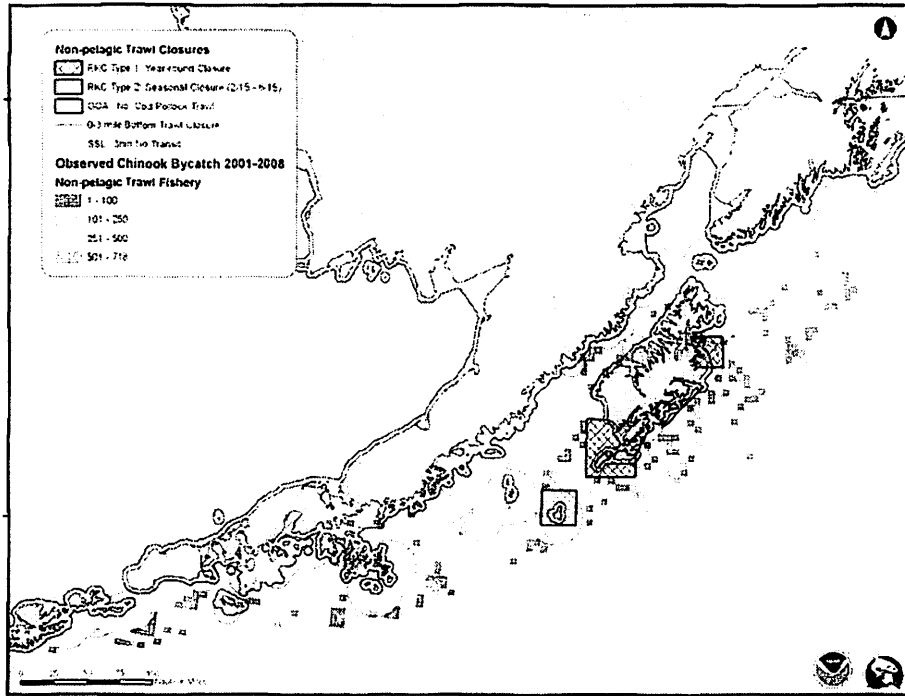


Figure 15 Observed Chinook salmon bycatch rate in the non-pelagic trawl fishery, summed over 2001-2008, number of salmon per metric ton of total catch

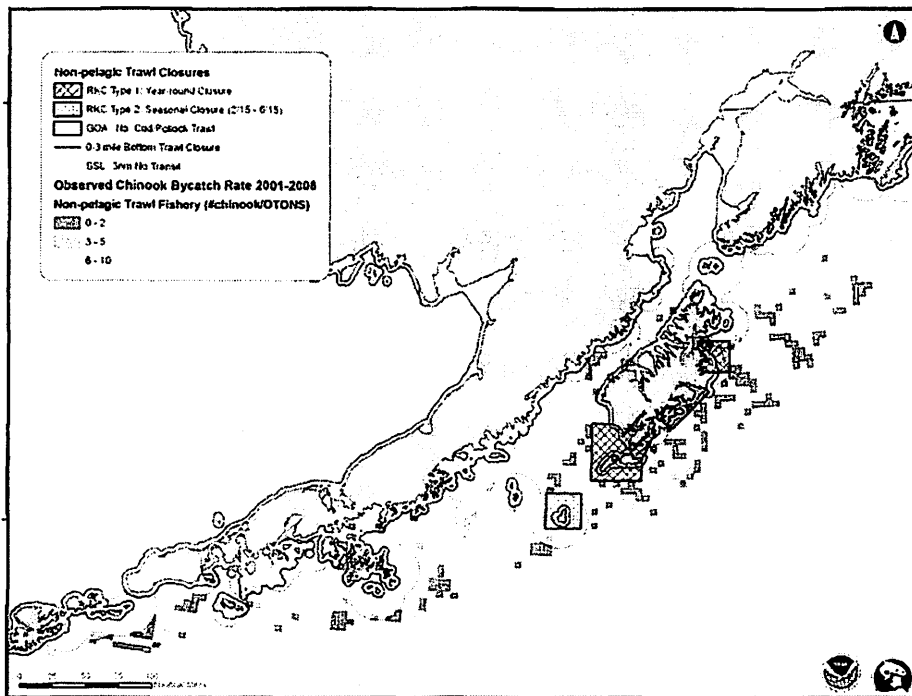


Figure 16 Locations of existing trawl fishery and crab protection closures in the Gulf of Alaska

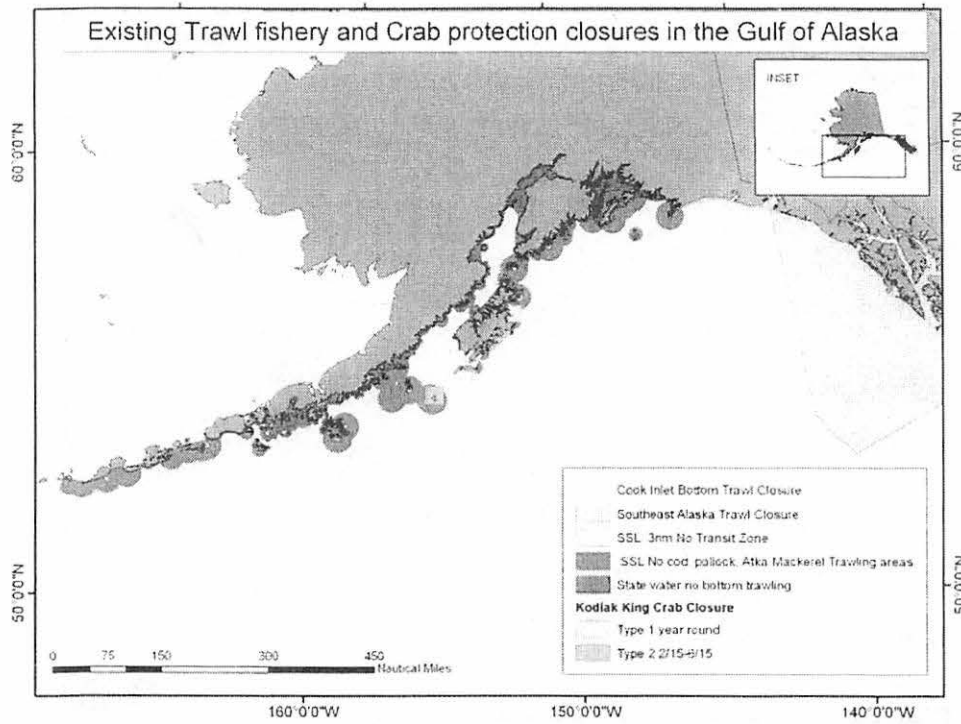


Figure 17 Locations of existing trawl fishery and crab protection closures in the Western Gulf of Alaska

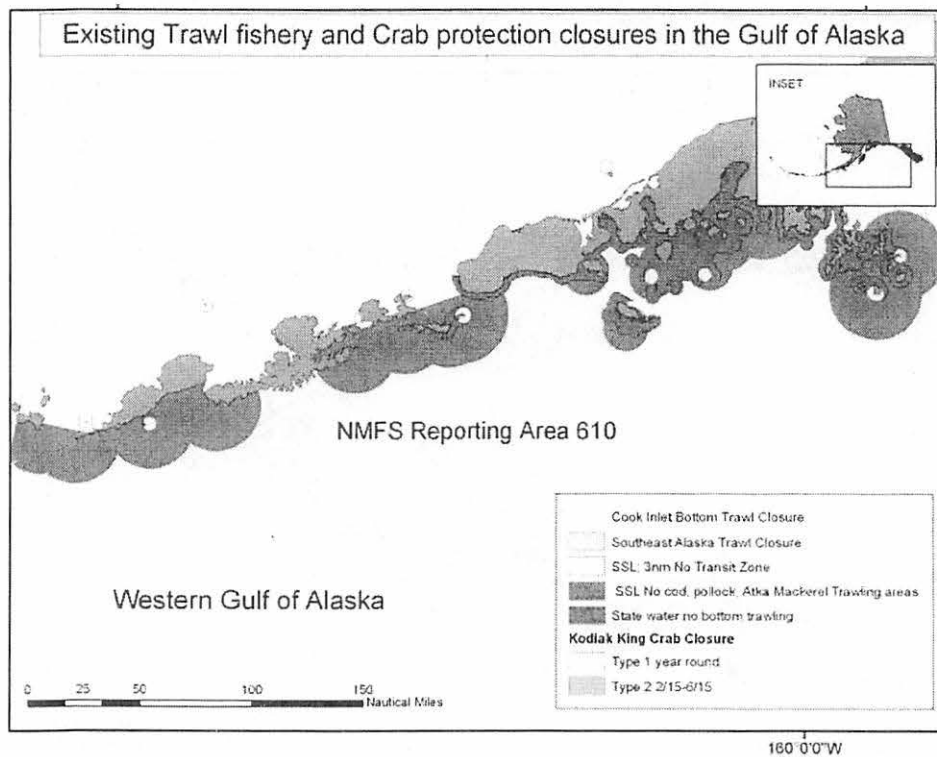


Figure 18 Locations of existing trawl fishery and crab protection closures in the Central Gulf of Alaska

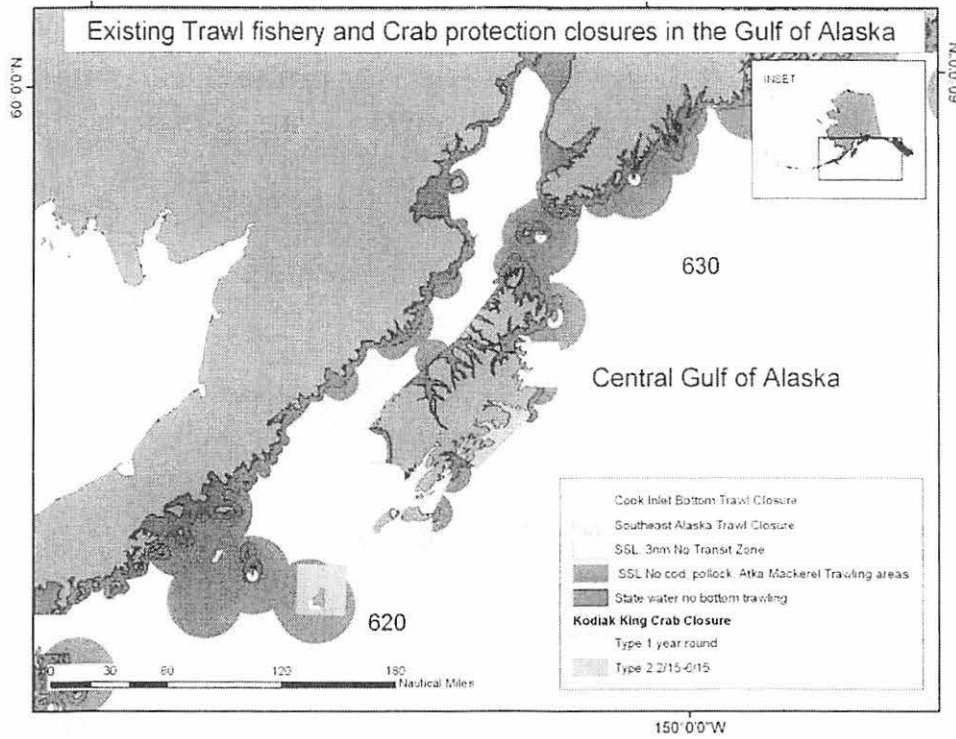


Figure 19 Chinook salmon strawman closures for pelagic trawl gear, based on high incidence of bycatch in 2003-2007, compared to areas with high bycatch incidence in 2001-2008

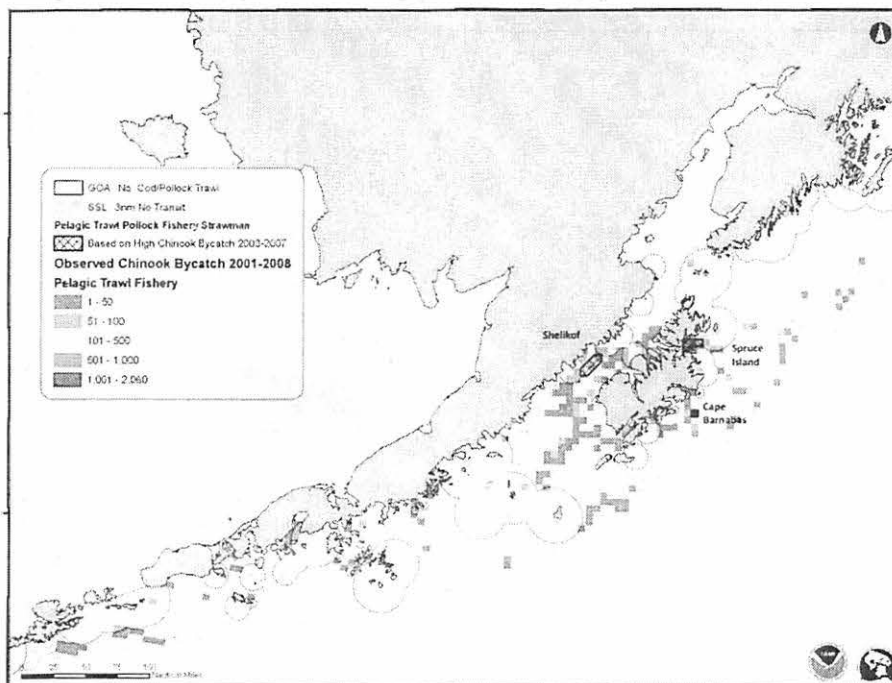


Figure 20 Chinook salmon strawman closures for pelagic trawl gear, based on high incidence of bycatch in 2003-2007, compared to areas with high bycatch incidence in 2008 only

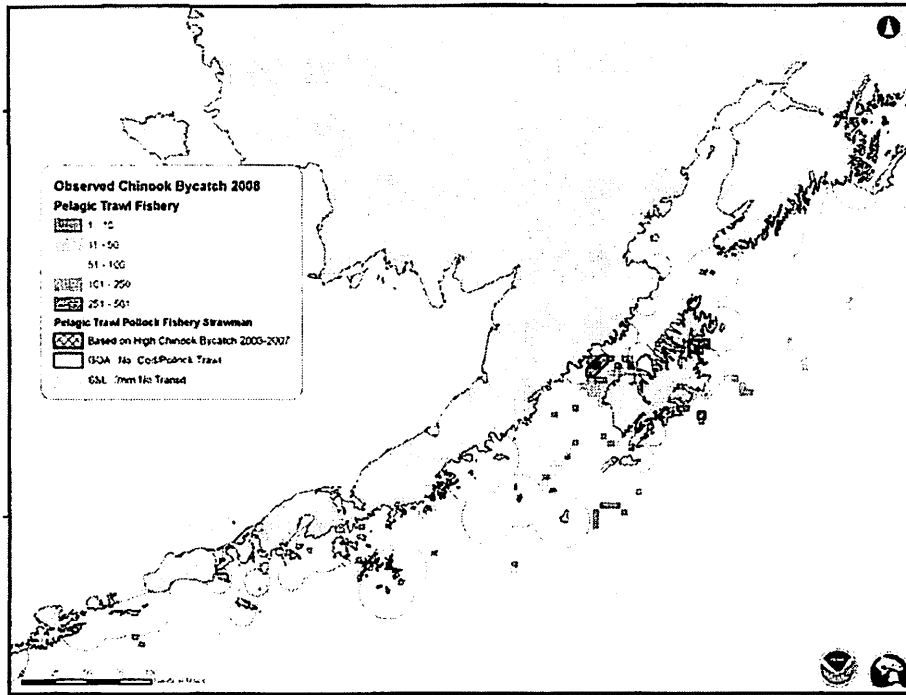
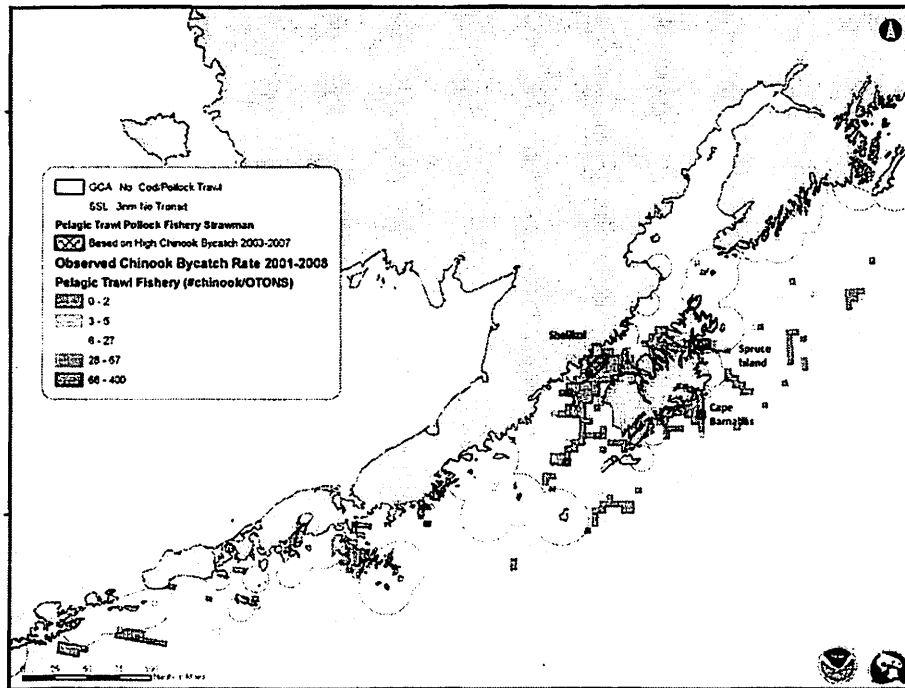


Figure 21 Chinook salmon strawman closures for pelagic trawl gear, based on high incidence of bycatch in 2003-2007, compared to areas with high bycatch rates in 2001-2008





UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

AGENDA C-5(2)
DECEMBER 2010

November 17, 2010

MEMORANDUM FOR: William W. Stelle, Jr.
Administrator, Northwest Region

FROM: James W. Balsiger, Ph.D. *Robert Meeum*
Administrator, Alaska Region

SUBJECT: Reinitiation of Endangered Species Act (ESA) Section 7 Consultation
on Incidental Catches of Chinook Salmon in the Gulf of Alaska
(GOA) Groundfish Fisheries

We are requesting reinitiation of formal consultation pursuant to Section 7 of the Endangered Species Act (ESA) for the Gulf of Alaska (GOA) groundfish fisheries and ESA listed Chinook salmon. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if the amount or extent of incidental take is exceeded. Because the amount of incidental take of Chinook salmon in the 2010 GOA groundfish fisheries exceeded the amount authorized in the incidental take statement in the January 11, 2007, supplement to the November 30, 2000, Biological Opinion regarding the authorization of Bering Sea/Aleutian Islands groundfish fisheries (supplemental BiOp), the Alaska Region requests immediate reinitiation of formal consultation. If, during the course of the groundfish fisheries, the level of take specified in the incidental take statement is exceeded, the additional level of take would represent new information requiring reinitiation of consultation and review of the reasonable and prudent measures (RPMs) identified in the supplemental BiOp. The RPM language specific to the GOA groundfish fisheries is as follows:

1. The NMFS, Alaska Region shall ensure there is sufficient NMFS-certified observer coverage such that the bycatch of Chinook salmon and "other" salmon in the GOA groundfish fisheries can be monitored on an inseason basis. Monitoring will include analysis of all Coded-Wire Tags (CWTs) from salmonids collected in the fisheries.
2. The NMFS, Alaska Region shall monitor bycatch reports in season to evaluate whether the bycatch of Chinook is likely to exceed 40,000 fish per year in the GOA fisheries.

We are providing you the best available information on Chinook salmon incidental catch in the GOA groundfish fisheries.



Chinook Salmon Incidental Catch in the GOA Groundfish Fisheries

In the GOA, Chinook salmon bycatch primarily occurs in the western and central regulatory areas. Figure 1 shows the total number of observed Chinook salmon per 20 km grid in the GOA groundfish fisheries between 2006 and 2010 (Attachment 1). Attachment 2 provides Chinook salmon incidental catch occurrence in the GOA groundfish fisheries. Table 1 provides Chinook salmon incidental catch numbers in the GOA groundfish fisheries for the years 2000 through 2010 (through November 8, 2010). Table 2 provides the rate of Chinook salmon incidental catch in the GOA trawl fisheries during this time period.

As of November 8, 2010, Chinook salmon incidental catch in the GOA groundfish fisheries was 51,736 fish. This number is not final and is likely to change until the observer data are finalized after the fishing year is completed. This is the highest number of Chinook salmon incidentally taken in these fisheries since monitoring began in 1990 and it exceeds the 40,000 Chinook salmon incidental take statement for the GOA groundfish fisheries. The majority of the 2010 Chinook salmon incidental catch occurred between October 1, 2010, and October 18, 2010, with 72% of the fish taken during this time period. Approximately 82% (42,206 Chinook salmon) were caught by vessels using trawl gear in directed pollock fisheries. Of that number 72% (30,560 Chinook salmon) were caught in the final pollock fishery season that opened on October 1. Three pollock fisheries opened on October 1: Area 610, Area 620, and Area 630. Chinook salmon was encountered in every pollock fishery, and observers monitored several trips in each fishery. As of noon on November 1, 2010, all directed fishing for pollock in the GOA was closed for the remainder of the year.

Historically, GOA Chinook salmon incidental catch amounts have been below the amount in the incidental take statement, except for the incidence in 2007 of bycatch as explained in the memorandum to the NMFS Northwest Region dated January 14, 2008. Bycatch of Chinook salmon between 2003 and 2009 (average of 20,723 salmon) is similar to the time series average between 1990 and 2009 (average of 20,395 salmon).

The incidental catch of prohibited species such as salmon are managed in the groundfish fisheries by a variety of measures, which may include prohibited species catch limits and closure areas. To date, no salmon bycatch control measures have been implemented in the GOA groundfish fisheries.

Fisheries Monitoring and Analysis Groundfish Observer Program Bycatch Sampling

The Fisheries Monitoring and Analysis (FMA) Observer Program (Observer Program) collects catch data used for management and inseason monitoring of groundfish fisheries. 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. Chinook salmon are the dominant species taken in the GOA followed by chum salmon. Very small numbers of sockeye salmon, coho salmon, pink salmon, and steelhead are taken in the GOA groundfish fisheries.

Sampling for salmon on observed pollock catcher vessels 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 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. 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.

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.

Sample Collection and Genetic Analysis of Salmon Bycatch

Genetic samples (pelvic axillary processes), maturity information, and scales were collected from Chinook salmon in the 2010 GOA pollock fishery. All vessel observers collect a genetic sample, length, sex, and maturity information from every Chinook salmon in the species composition samples. Plant and floating processor observers collect genetic samples, length, sex, and maturity information from randomly selected Chinook salmon using a temporal sampling frame. These sampling procedures will continue in the 2011 GOA pollock fishery. Genetic analysis of Chinook salmon is an ongoing coordinated effort among the Alaska Department of Fish and Game, Alaska Fisheries Science Center Auke Bay Laboratories (Auke Bay Lab), and the University of Washington. We will continue to coordinate with Auke Bay Lab on the analysis and dissemination of genetic samples collected from Chinook salmon in the GOA groundfish fisheries.

ESA-Listed Chinook Salmon Evolutionarily Significant Units and Coded-Wire Tag Results

The primary source of information for the stock-specific ocean distribution of Chinook salmon incidentally caught in the groundfish fisheries is from CWTs. 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.

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 3 on Recovery Estimation Technique). We are using the mark expansion factor because insufficient data exists on 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 fish sampled is known. Marking expansions can 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. Without being able to calculate total estimated contributions

because of an unknown sampling expansion factors, mark expansions offer the closest approximation to the contribution of ESA-listed Evolutionarily Significant Units (ESUs) in the GOA. Mark expansions should be considered a minimum estimate for the actual total contribution of ESA-listed ESUs in the GOA.

Tables 3 and 4 in Attachment 4 provide the latest actual and estimated CWT recoveries for the GOA groundfish 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, 98 UWR, and 1 UCR Chinook salmon in the GOA trawl fishery, both pre- and post-listing (Attachment 4, Tables 3 and 4). By applying mark expansion factors, the estimated numbers increase to 112 LCR, 282 UWR, and 1 UCR Chinook salmon.

These numbers should be considered as 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 groundfish fisheries will remain unknown and indeterminable. Please note that the most recent CWT recoveries in these tables occurred in February 2010. The Auke Bay Lab recently obtained 90+ snouts from the Observer Program; these tables will be updated when those snouts are processed and the information is entered into the database by next Fall (Adrian Celewycz, NMFS Auke Bay Lab, personal communication, 2010).

NMFS Auke Bay Lab will continue to monitor CWT recoveries for the GOA groundfish fisheries, maintain a historical database of CWT recoveries on the high seas, and provide an updated summary of CWT recoveries from ESA-listed ESUs in the GOA fisheries on an annual basis within ten months after the end of each fishing year.

North Pacific Fishery Management Council Salmon Management Measures

Since the implementation of the groundfish fishery management plans (FMPs) for Alaska, the Council has adopted measures intended to control the bycatch of species taken incidentally in groundfish fisheries. The Council is in the process of evaluating management options to reduce Chinook salmon bycatch in the GOA. These management options include trigger bycatch limits for salmon, seasonal closure to all fishing in areas with high bycatch or high bycatch rates, and a voluntary bycatch cooperative for hotspot management. In December 2010, the Council will review a discussion paper on GOA Chinook salmon bycatch in the GOA groundfish fisheries.

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 <60' groundfish sector. The Council emphasized that under the status quo, NMFS cannot determine when and where to deploy observers in the sectors with less than 100% coverage requirements, coverage levels are fixed in regulation, and data gaps exist for sectors without any coverage. 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 overall data quality.

On November 10, 2010, NMFS issued a final rule to amend regulations implementing the Observer Program, as well as to improve the catch, bycatch, and biological data collected by observers for conservation and management of the North Pacific groundfish fisheries, including those data collected through scientific research activities. This final rule revises the regulatory definition of "fishing day" to clarify that an observer must be on board a vessel for all gear retrievals during the 24-hour period to count as a day of observer coverage. This revision is intended to prevent vessel operators from making fishing trips that do not reflect their normal fishing patterns as this non-representative behavior biases the observer-collected information.

Industry Efforts to Reduce Salmon Bycatch

Based on information from an industry representative, it may be possible to use the salmon excluder device developed for the Bering Sea pollock fishery on GOA pollock trawl vessels. This would require design and testing of the device under GOA pollock fishing conditions, which is a lower catch-per-unit effort fishery compared to the Bering Sea pollock fishery. NMFS has not been approached at this time to issue an Exempted Fishing Permit for this potential work in the GOA.

Annual Report for the Alaska Groundfish Fisheries Salmon Incidental Catch

The conditions of the supplemental BiOp require NMFS' Division of Sustainable Fisheries (Alaska Region) to provide an annual report to the NMFS Division of Sustainable Fisheries (Northwest Region) that details the results of its monitoring of salmon bycatch in the GOA fisheries. This report will be submitted in writing within one month of the new fishing year (February 1, 2011), and will summarize all statistical information based on the January 1 through December 31, 2010, fishing year. This report will also include the latest available information on CWT recoveries of ESA-listed ESUs.

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 Melanie Brown at melanie.brown@noaa.gov or 907-586-7006.

Attachments

Cc: Chris Oliver, NPFMC
Peter Dygert, NMFS NW Region, SF Division

Attachment 1. Observed Chinook Salmon Incidental Catch in the Gulf of Alaska Groundfish Fisheries, 2006–2010

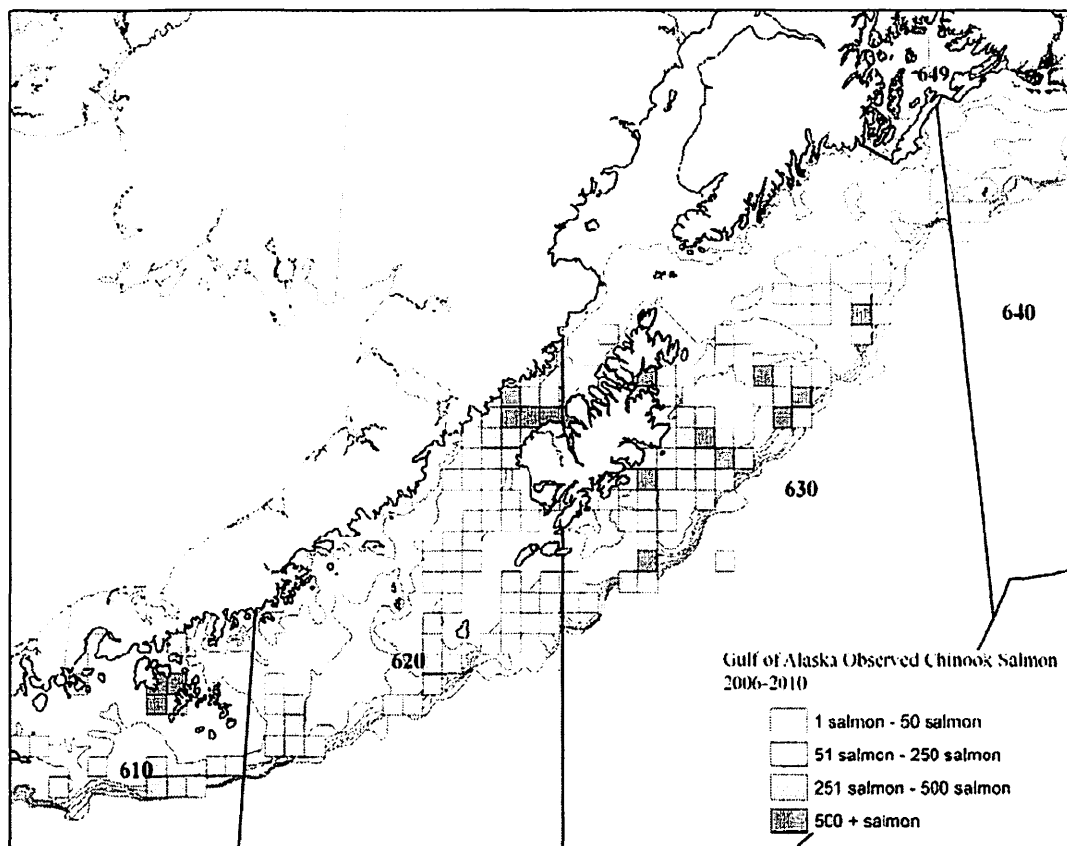


Figure 1. Total number of observed Chinook salmon per 20 km grid in the GOA groundfish fisheries between 2006 and 2010

Source: Observer haul records via NMFS Alaska Region Catch Accounting System, 11/10/2010

Attachment 2. Chinook Salmon Incidental Catch in Gulf of Alaska Groundfish Fisheries

Table 1. Chinook Salmon Incidental Catch in Gulf of Alaska Groundfish Fisheries

	Target	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010*
Trawl Gear	Pollock	9,531	18,413	5,161	4,400	13,152	27,927	15,944	35,040	10,427	2,620	42,206
	Pacific Cod	2,747	2,830	4,066	3,167	908	41	888	624	433	111	461
	Rockfish	445	1,153	1,250	919	885	450	263	2,038	2,280	1,432	1,627
	Flatfish	2,297	2,443	4,392	6,909	2,800	2,853	1,909	2,654	2,822	3,787	7,442
Non-trawl	All	25	0	0	0	32	0	0	39	0	0	0
Total	All	15,045	24,839	14,869	15,396	17,777	31,270	19,004	40,395	15,962	7,951	51,736

*2010 data are preliminary

Source: NMFS Alaska Region Catch Accounting System, 11/8/2010

Table 2. Rate of Chinook Salmon Catch in Gulf of Alaska Trawl Fisheries

Target	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010*	Avg
Pollock	0.13	0.25	0.10	0.09	0.20	0.33	0.21	0.66	0.21	0.07	0.55	0.25
Pacific Cod	0.11	0.10	0.27	0.20	0.05	0.00	0.08	0.04	0.02	0.01	0.03	0.08
Rockfish	0.02	0.05	0.05	0.04	0.03	0.02	0.01	0.09	0.09	0.06	0.06	0.05
Flatfish	0.06	0.10	0.11	0.15	0.13	0.10	0.05	0.06	0.06	0.07	0.18	0.10

*2010 data are preliminary

Source: NMFS Alaska Region Catch Accounting System, 11/8/2010

Attachment 3. Recovery Estimation Technique

The total estimated contributions of ESA-listed salmon ESUs caught in the Gulf of Alaska and Bering Sea-Aleutian Islands 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):

$$a = (\text{total catch of each species by fishery by year}) / (\text{sampled catch of each species by fishery by year}).$$

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:

$$R_{Ti} = aR_{Oi}$$

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;
 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 et al.2010).

For recoveries in high seas research cruises, because the total catch is usually sampled for tags, the sampling expansion factor (a) typically = 1.

References

Johnson, K.J., 2004, Regional overview of coded wire tagging of anadromous salmon and steelhead in Northwest America: Regional Mark Processing Center, Pacific States Marine Fisheries Commission, Portland, Oregon.

Nandor, G.F., Longwill, J.R., Webb, D.L., 2010. Overview of the coded wire tag program in the Greater Pacific Region of North America, *in* Wolf, K.S. and O'Neal, J.S., eds., PNAMP Special Publication: Tagging, Telemetry and Marking Measures for Monitoring Fish Populations—A compendium of new and recent science for use in informing technique and decision modalities: Pacific Northwest Aquatic Monitoring Partnership Special Publication 2010-002, chap. 2, p. 5–46.

Attachment 4. CWT Recoveries for the Gulf of Alaska Groundfish Fisheries

Table 3. Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU captured in the GOA trawl fishery, pre-listing and post-listing, 1984–2010.

Listing Status	ESU Name	GOA Observed Number	GOA Mark Expansion
Pre-listing	Lower Columbia River Chinook	12	82.1
	Upper Willamette River Chinook	43	143.8
Post-listing	Lower Columbia River Chinook	11	29.7
	Upper Columbia River spring Chinook	1	1.0
	Upper Willamette River Chinook	55	138.1

*2010 data are preliminary

Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 11/8/2010

Table 4. Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU by year captured in the GOA trawl fishery, 1984–2010.

A. Lower Columbia River Chinook ESU			GOA Observed Number	GOA Mark Expansion
Listing Status	ESU Name	Run Year		
Pre-listing	Lower Columbia River Chinook	1984	5	14.1
		1985	1	1.0
		1986	0	0.0
		1987	1	1.3
		1988	0	0.0
		1989	0	0.0
		1990	1	1.0
		1991	0	0.0
		1992	1	1.6
		1993	1	60.3
		1994	2	2.8
		1995	0	0.0
		1996	0	0.0
		Post-listing	Lower Columbia River Chinook	1997
1998	2			18.8
1999	4			5.9
2000	2			2.0
2001	2			2.0
2002	0			0.0
2003	0			0.0
2004	1			1.0
2005	0			0.0
2006	0			0.0
	2007	0	0.0	
	2008	0	0.0	
	2009	0	0.0	
	2010*	0	0.0	

Table 4 (continued). Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU by year captured in the GOA trawl fishery, 1984-2010.

B. Upper Willamette River Chinook ESU			GOA Observed Number	GOA Mark Expansion		
Listing Status	ESU Name	Run Year				
Pre-listing	Upper Willamette River Chinook	1984	11	16.9		
		1985	0	0.0		
		1986	0	0.0		
		1987	0	0.0		
		1988	0	0.0		
		1989	0	0.0		
		1990	4	4.0		
		1991	1	13.3		
		1992	4	28.5		
		1993	14	52.1		
		1994	3	8.8		
		1995	2	4.9		
		1996	1	1.3		
		Post-listing	Upper Willamette River Chinook	1997	1	7.5
				1998	4	30.7
				1999	20	49.3
2000	16			16.6		
2001	7			7.1		
2002	1			1.0		
2003	1			5.3		
2004	1			5.8		
2005	0			0.0		
2006	1			1.1		
2007	0			0.0		
2008	1			6.5		
2009	1			1.8		
2010*	1			5.4		

C. Upper Columbia River spring Chinook ESU			GOA Observed Number	GOA Mark Expansion
Listing Status	ESU Name	Run Year		
Pre-listing	Upper Columbia River spring Chinook	1984	0	0.0
		1985	0	0.0
		1986	0	0.0
		1987	0	0.0
		1988	0	0.0
		1989	0	0.0
		1990	0	0.0
		1991	0	0.0
		1992	0	0.0
		1993	0	0.0
		1994	0	0.0
		1995	0	0.0
		1996	0	0.0

Table 4 (continued). Observed Number and Mark Expansion of ESA-listed CWT salmon by ESU by year captured in the GOA trawl fishery, 1984-2010.

C. Upper Columbia River spring Chinook ESU			GOA Observed Number	GOA Mark Expansion
Listing Status	ESU Name	Run Year		
Post-listing	Upper Columbia River spring Chinook	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

*2010 data are preliminary

Source: NMFS Alaska Fisheries Science Center Auke Bay Lab, Adrian Celewycz, 11/8/2010



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

Alaska Fisheries Science Center
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Seattle, Washington 98115-0070

November 19, 2010

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

RECEIVED

NOV 26 2010

Dear Chris,

I am writing in response to your letter of April 19, 2010 regarding the sampling protocol for Chinook salmon caught as bycatch in the GOA groundfish fisheries.

As you are aware, we will initiate a new sampling protocol for Chinook salmon in the Bering Sea pollock fishery at the start of the 2011 fishing year when Amendment 91 is implemented. This protocol was designed to conform with recommendations provided in the report "Sampling Considerations for Estimating the Geographic Origins of Chinook Salmon Bycatch in the Bering Sea pollock Fishery by Jerome J. Pella and Harold J. Geiger. This new protocol will include a complete census of salmon bycatch in the pollock fishery which will then be sampled systematically by observers. Observers will identify and count all salmon in each haul or delivery and then take a tissue sample from every Nth Chinook salmon encountered. The same approach will also be applied to chum salmon in the Bering Sea pollock fishery.

The infrastructure necessary to achieve a systematic sample of a census of salmon bycatch is considerable and is being implemented through the Amendment 91 final rule. This is based on regulations that are already in the Bering Sea pollock fishery such as those requiring full retention of salmon until counted by observers. Additionally, Amendment 91 requires 100 percent coverage of all pollock vessels, 2 observers in all processing plants receiving pollock, and sorting of salmon from catches at the point of delivery so that no salmon enter processing plants. Video cameras will also be required in offshore operations to ensure that sorting is complete and the census is conducted correctly.

A comparable infrastructure to support this intensive salmon sampling does not exist in the GOA. In particular:

- Salmon retention regulations do not exist for fisheries in the GOA.



- Current observer coverage levels for catcher vessels and shoreside processing plants in the GOA are insufficient to enable a census approach to assess the Chinook bycatch magnitude or allow uniform sampling rates of these salmon to obtain tissue samples for mixture analysis
- GOA shoreside processors are not required to have a Catch Monitoring and Control Plan (CMCP), except for those participating in the rockfish pilot program.

Thus, it is not currently possible to implement the protocol developed for salmon sampling in the Bering Sea in the GOA pollock fishery. Nevertheless, we do plan to enhance sampling of salmon taken as bycatch in this fishery in 2011. This will be accomplished by initiating a systematic sampling design to obtain salmon tissue samples from Chinook salmon in the deliveries of pollock which are observed.

When GOA pollock vessels are observed, the primary responsibility of the vessel and plant observers is to monitor the catch at sea and as it is delivered to the shoreside processing plants. All salmon from these observed deliveries are counted under current protocols and we will sub-sample these counted salmon systematically in 2011 (and beyond) to obtain tissue samples for genetic analysis. It will not be possible to collect comparable samples from unobserved deliveries (i.e. from vessels that did not carry observers) because observers are generally not available at the processing plants to monitor to sample these deliveries and NMFS is unable to ensure that discarding does not take place at sea on unobserved vessels. This enhanced salmon bycatch tissue collection protocol will provide additional useful material for genetic analysis, but these collections will not be consistent with the guidance provided by Geiger and Pella.

In addition to sampling, AFSC is also developing protocols for the future genetic analysis of the GOA Chinook salmon bycatch. For example, the AFSC is currently using the ADFG Chinook salmon SNP baseline for the genetic analysis of the Bering Sea Chinook salmon bycatch. This baseline has worked extremely well for the analysis of the Bering Sea samples, but the baseline currently groups all the stocks from the Pacific Northwest (Washington, Oregon, and California) into one reporting region. With regard to the Chinook salmon bycatch from the GOA pollock fishery, the use of the current baseline will enable us to provide highly accurate and important stock composition estimates for all 15 associated regions throughout the north Pacific, but may not provide the expected level of resolution for specific protected stocks within the Pacific Northwest. For increased stock resolution, we are now working with our collaborators exploring the possibility of including additional populations in the current baseline. With an appropriate sampling regime in place, the combination of coded wire tag and genetic stock information data can be expected to provide reliable estimates of Chinook salmon stock composition of the GOA salmon bycatch.

We encourage the Council to consider improvements in the GOA that would enable the Geiger and Pella protocols to be implemented. It is

conceivable that this could be achieved without all of the requirements that have been implemented in the Bering Sea. However, some changes from the status quo would be necessary. Verified full retention of salmon bycatch would likely be required so that census and comprehensive systematic tissue sampling could be carried out at shoreside plants. Compliance with retention requirements could be monitored by observers or video systems and the feasibility of this approach could, perhaps, be evaluated through an EFP.

Our staff will, of course, continue to be available to consult with the Council on this issue and to seek effective solutions for estimating and characterizing bycaught salmon, as well as reducing salmon bycatch in the groundfish fisheries.

Sincerely,



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

cc: James W. Balsiger
Susan Salveson

STATE OF ALASKA

Kenai/Soldotna Fish & Game Advisory Committee

Sean Parnell, Governor

Kenai/Soldotna Advisory
Mike Crawford, Chair
P.O. Box 2067
Soldotna, AK 99669
(907) 260-9210
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December 7, 2010

North Pacific Fishery Management Council
Eric Olson, Chair
605 West 4th, Suite 306
Anchorage, Alaska 99501-2252

The Kenai Soldotna Fish and Game Advisory Committee (KSF&GAC) is an established advisory committee (AC) under AS 16.05.260. The committees are governed under the rules proscribed in; 5 AAC 96, 5 AAC 97, and 5 AAC 99. Original advisory committees were formed in 1959 to provide a local forum to discuss and make recommendations on fish and wildlife issues before the Boards of Fisheries and Game.

At present there are 71 Advisory Committees (AC), 18 which are within the southcentral region.

The KSF&GAC is comprised of 15 board members and 4 alternates. To better insure a wide degree of public representation, our AC functions with designated interests (seats):
3 limited entry salmon permit commercial fishers, 3 commercial fresh water sports guides, 1 personal use user, 1 subsistence user, 1 trapping person, 1 hunting person,
5 at - large representatives and 4 alternates (1 commercial fisher, 1 guided sport and 2 general).
We believe that we fulfill the statute requirement of being, "*well informed on the fish and game resources of the locality.*"

Our community is extremely concerned over the numbers of king salmon caught and dropped overboard in the Gulf of Alaska Pollock fishery, *see news articles.*

With a triennial Upper Cook Inlet Alaska Board of Fisheries regulatory meeting in just two months (February 20 – March 5th, 2011), our AC and other regional citizens committees are reviewing proposals. Many of these submitted ideas request changes in management, but mostly they ask for an increase in opportunity to harvest salmon. Most stocks of salmon especially king salmon are already fully utilized and it is difficult to please all.

The BOF at their October 2010 worksession received a memorandum that summarized results for CI "stocks of concern". Six Chinook salmon and one sockeye stock were recommended for action within the Sustainable Salmon Fisheries Plan. Four of these Chinook stocks were elevated to a "management concern."

A management concern is defined as “a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, OEG, or other specified management objectives for a fishery.” The policy defines “chronic inability” as “the continuing or anticipated inability to meet escapement thresholds over a four to five year period, which is approximately the generation time of most salmon species”.

Another of our worries is centered on our hatchery stocks of king salmon. In sport division’s five year stocking report just released 11.30.10 the Ninilchik River Chinook Enhancement plan will raise 50,000 Chinook smolt. They eventually will be thermally marked and released. An evaluation statement suggests that, “Incidental recoveries may occur in high seas trawl fisheries and other sampled fisheries.” There must be some evidence that these hatchery stocks are being intercepted outside of Cook Inlet.

Many of our community members rely on the return of the Late Run Kenai king salmon. In a late season report dated 08.02.10. the public was informed that the old sonar counter was giving to high of counts. Using the new DIDSON counter numbers, indications led managers to believe that we were having a poor return to the Kenai. The Kenai River produces the most productive runs of wild stocks within Cook Inlet. Post season analysis tells us that this 2010 king return will rank as one of the lowest on record.

We request the council to work with the State of Alaska Department of Fish and & game, and the Alaska Board of Fisheries to minimize the incidental catch of Chinook in the Gulf of Alaska. It has always been our general understanding that the Magnuson Stevens Act was put in place to protect our salmon fisheries. Now we feel like David and instead of the Goliath being foreign trawl and high seas drift nets we are facing Goliath fishing operations at our back door. Please help us to maintain a healthy, viable and sustainable Chinook fishery.

Sincerely,

Kenai/Soldotna Fish & Game Advisory Committee

Submitted by: Paul A. Shadura II, vice-chair

Six enclosures;

ADN - October 25th, 2010

ADN – November 9, 2010

SOA Enhancement Report, CI, November 30th, 2010

ADF&G, Stock of Concern Memo, October 1st, 2010

ADF&G, Kenai River Late Run King Salmon Data Summary, August 2, 2010

ADF&G, Map of Upper CI

Copies submitted to other F&G Advisory committees for comment

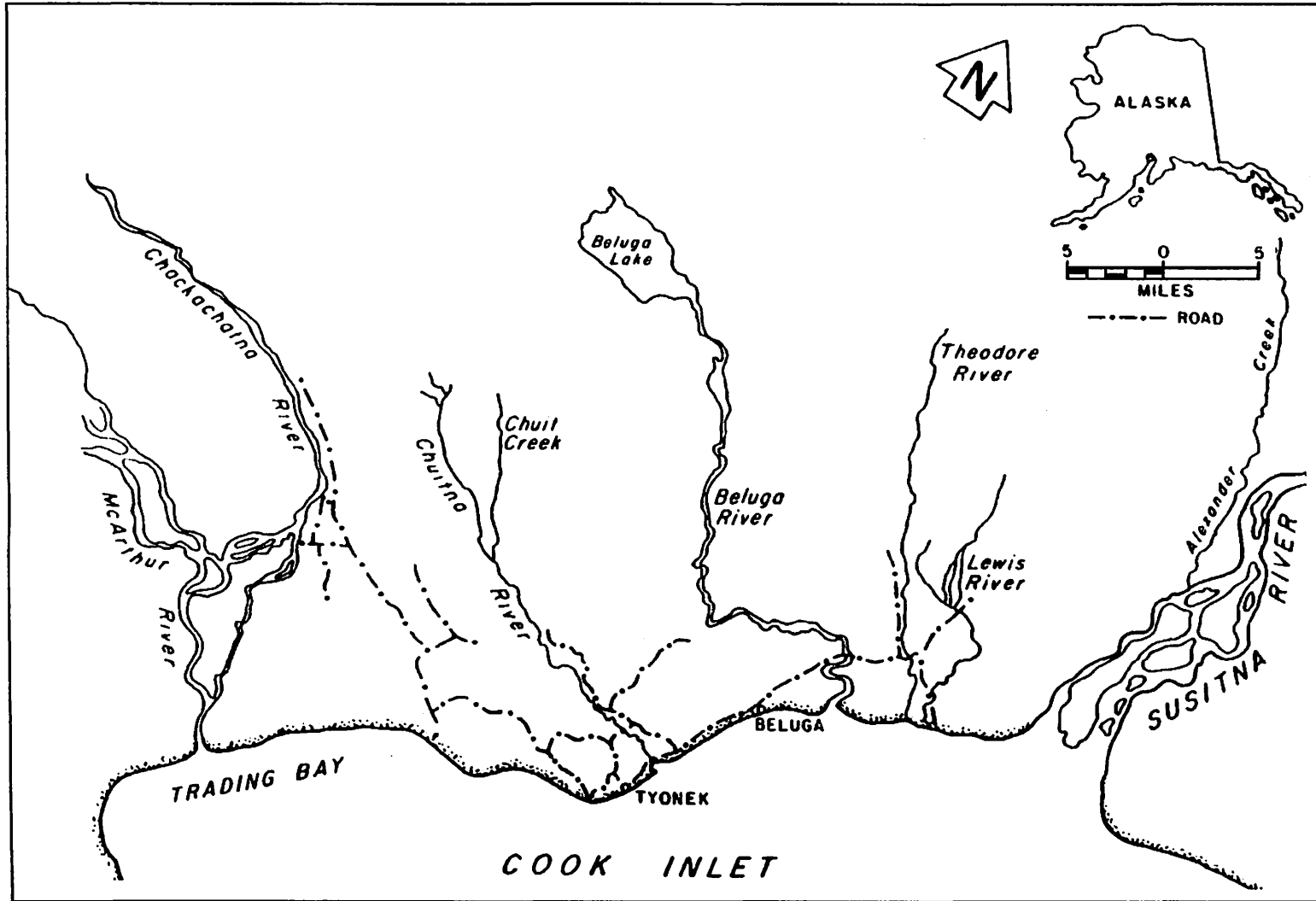


Figure 10.-West Cook Inlet coastal streams.



ALASKA DEPARTMENT OF FISH AND GAME
Denby S. Lloyd, Commissioner

DIVISION OF SPORT FISH
Charles O. Swanton, Director

Robert Begich, Area Management Biologist
(907) 262-9368

Tim McKinley, Area Research Biologist
(907) 262-9368

KENAI RIVER LATE RUN KING SALMON
INSEASON DATA SUMMARY #4
Monday 8/2/10

		Comments															
Latest daily sonar estimate (Sun 8/1)	1,716	Sonar at River Mile 8.5 beginning July 1. This estimate is biased-high because of sockeye passage.															
Cumulative sonar (thru Sun 8/1)	44,505	This estimate is biased-high by sockeye passage. Of the 23 years prior: 3 years were higher, and 20 years were lower thru 8/1.															
Projected total sport harvest in-river	7K	Sport fishery closed by regulation after Saturday July 31.															
Projected end of season in-river run and escapement using 4 different methods	<table border="1"> <thead> <tr> <th>Method</th> <th>Run</th> <th>Escapement</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>50K</td> <td>43K</td> </tr> <tr> <td>B</td> <td>39K</td> <td>32K</td> </tr> <tr> <td>C</td> <td>28K</td> <td>21K</td> </tr> <tr> <td>D</td> <td>25K</td> <td>18K</td> </tr> </tbody> </table>	Method	Run	Escapement	A	50K	43K	B	39K	32K	C	28K	21K	D	25K	18K	Due to sonar indices, catches in the commercial fishery, the Department's inriver netting, and the sport fishery, the regular run projection is biased high and actual run strength is well below average.
Method	Run	Escapement															
A	50K	43K															
B	39K	32K															
C	28K	21K															
D	25K	18K															
Escapement goal range	17,800 - 35,700	Goal range since 1999. If run and fisheries proceed at current rates, it is likely that the escapement will be near the lower end of the goal range.															
Pre-season forecast of in-river run size	~ 32,000	Average run is ~ 43,000															
Sport fishery run total in lower river	<table border="1"> <tbody> <tr> <td>Catch</td> <td>6,041</td> </tr> <tr> <td>Harvest</td> <td>5,376</td> </tr> </tbody> </table>	Catch	6,041	Harvest	5,376	Guided: effort 65%, harvest 39% of average Unguided: effort 57%, harvest 53% of average											
Catch	6,041																
Harvest	5,376																
Average time it takes guided anglers to catch a king in 2010	24 hours	Slow															
Average time it takes unguided anglers to catch a king in 2010	28 hours	Slow															
Commercial Eastside setnet harvest	<table border="1"> <tbody> <tr> <td>Sat 7/31</td> <td>262</td> </tr> <tr> <td>Cum (thru Sat 7/31)</td> <td>5,753</td> </tr> </tbody> </table>	Sat 7/31	262	Cum (thru Sat 7/31)	5,753	Harvest to date ~54% of the average											
Sat 7/31	262																
Cum (thru Sat 7/31)	5,753																
Water clarity	Generally good.																
Water flow/current	Generally typical.																

II-6. Ninilchik River Chinook Salmon Enhancement

The primary purpose of this program is to increase sustainable Chinook salmon fishing opportunities on a at Ninilchik River by supplementing the stream's natural run with hatchery fish, without significantly altering historical Chinook salmon age and sex compositions.

Chinook salmon smolt have been stocked in Ninilchik River since 1988. Initial stocking level was 200,000 smolt, of which only 20% were adipose fin-clipped and fitted with coded wire tags. Due to wild stock concerns, the stocking level was reduced in 1995 to 50,000 smolt of which 100% were clipped and tagged. This reduction in enhancement level was thought to provide additional protection to wild stocks. The 100% marking provided for more accurate assessment of hatchery versus wild-stock production and reduced genetic concerns by allowing the use of naturally spawned fish for hatchery broodstock. Additionally, 100% marking provided a means of increasing exploitation of hatchery fish while protecting wild stocks. Beginning in 2011, smolt stocked in Ninilchik River will no longer receive a coded wire tag but their adipose fin will continue to be clipped. Coded-wire-tagging will be discontinued because the Ninilchik River Chinook releases are already "tagged" with an otolith mark that identifies their Cook Inlet origin. Additionally, the stock is in the department's Chinook salmon SNPs genetic baseline and can be identified in mixed stock fisheries by genetic analyses

A weir is operated during July and early August to accumulate broodstock for taking eggs and to index escapement. During 1999 through 2005, the weir was operated throughout the return. From 1999-2005, the average total return was approximately 3,600 fish per year. Wild escapement averaged 1,500 Chinook salmon during 1999 through 2005. An additional 600 hatchery-produced Chinook salmon escaped the fishery annually during that period.

Wild Chinook salmon escapements, indexed at the egg take weir on the Ninilchik River during July 3-31, have fluctuated between 528 and 1,283 since they were first reliably counted in 1999 but have generally been within the sustainable range. Wild escapements in 2003 of 517, 2007 in 543 and 539 in 2009 were slightly below the sustainable escapement goal (SEG) index range of 550-1,300. The wild run peaks approximately 10 days earlier to the Ninilchik River weir than the hatchery run.

Fishing for wild Chinook salmon at Ninilchik River is restricted by regulation to Saturday through Mondays during three consecutive three-day "weekends" in late May – June because the wild stock cannot sustain daily exploitation.

Various strategies have been employed since 2001 to increase the harvest of hatchery fish while protecting wild fish. Emergency orders have increased fishing time by adding a weekend (2001, 2002), opened the river continuously from either the start of the king salmon fishery (2004, 2007) or some date thereafter (2003, 2006). Effective in 2005, the Board of Fisheries increased the daily bag limit to two king salmon, only one of which could be wild. At their meeting in 2007, the Board of Fisheries opened the Ninilchik River to hatchery king salmon beginning July 1. Liberalization of the fishery coincided with generally lower numbers of Chinook salmon escaping to the egg take weir but the effect of regulatory changes wasn't immediate during the year of the regulatory change. Weir counts of hatchery fish averaged 634 from 1999-2001, 341 from 2002-2006 and 74 from 2007-2010. The weir count of hatchery fish in 2010 was 34, the lowest during the 12-year time series. Relatively low counts of hatchery fish at the weir in 2008-2010 may be the result of poor marine survival in addition to liberalized regulations on hatchery fish.

Objectives

1. Produce additional adult Chinook salmon for harvest that consistently maintain three 3-day weekend fisheries in the Ninilchik River and assure that natural spawning escapement does not fall below the average historical escapement through the weir between July 3 and July 31 of 550 to 1,300 Chinook salmon.
2. Generate 13,000 angler-days of annual weekend and weekday fishing opportunity directed at stocked Chinook salmon in Ninilchik River during June.
3. Harvest all hatchery-produced fish stocked in the Ninilchik River in the sport fishery.

II-6. Ninilchik River Chinook Salmon Enhancement (continued)

Actions

1. Annually stock 50,000 thermally marked Chinook salmon smolt in Ninilchik River of which 100% will be adipose fin-clipped.

Evaluations

1. Sport fishing effort and harvest will be estimated by the SWHS.
2. A weir at Ninilchik River will be used during at least July 3 through July 31 to index total escapement, hatchery contribution to a portion of the escapement, timing of wild and hatchery returns, age, sex, and length composition and to take eggs for future smolt releases.
3. Tagged fish harvested in the Eastside Cook Inlet marine commercial fishery will be sampled in the ongoing recovery program. Hatchery contributions to the commercial fishery will be estimated. Incidental recoveries may occur in high seas trawl fisheries and other sampled fisheries.

For Chinook Salmon stocking refer to Table II-KSI.

Pollock trawlers' king salmon bycatch in Gulf almost triples

GULF TRAWLERS: Numbers may trigger new regulations for boats in pollock fishery.

The Associated Press

Published: October 25th, 2010 09:55 PM

Last Modified: October 25th, 2010 09:55 PM

KODIAK -- Pollock boats and other commercial fishermen in the Gulf of Alaska have accidentally caught an estimated 58,336 king salmon this year, a level of bycatch that could trigger restrictions.

In recent years Gulf of Alaska bycatch numbers have lingered around 20,000 fish.

"By far this is the largest (bycatch) we have ever seen," Josh Keaton, a fisheries manager with the National Marine Fisheries Service, told the Kodiak Daily Mirror. "Hopefully it means a lot of kings are out there to be caught and they ran into a big pack of them."

Most of the bycatch came from the trawl pollock fishery in the last month, especially in the western gulf.

Bycatch is a perennial source of conflict between trawlers and people who prize kings -- commercial salmon vessels, subsistence users and sport fishermen.

The bycatch this year was large enough to attract the attention of fishery managers in the Lower 48 because kings accidentally caught in the Gulf of Alaska might be from endangered stocks from the Lower 48.

About 20 boats from King Cove and Sand Point near the tip of the Alaska Peninsula averaged 3.4 king salmon per metric ton of pollock. They picked up an estimated 24,878 fish in 12 days of fishing between Oct. 1 and Oct. 17.

Pollock boats in two regions around Kodiak took in 11,896 kings in October.

Bycatch numbers are estimated using data collected by fisheries observers.

Bycatch for boats without observers is projected using observed data.

The 2010 numbers could lead to new restrictions or regulations designed to lower bycatch, but not immediately. Bycatch already was on the agenda in December for the North Pacific Fishery Management Council but the group planned only to consider a new research.

Because this year's bycatch exceeded a limit of 40,000 kings, it triggered conversations about the problem with fishery managers in the Lower 48, said NMFS manager Melanie Brown. King salmon tagged from endangered stocks such as the Upper Willamette and lower Columbia rivers have been found before in the Gulf of Alaska.

Salmon bycatch is difficult to control because the fish are always moving around, but the trawl industry does have technologies to reduce it, said Julie Bonney, director of a groundfish industry group, Groundfish Data Bank.

One option is salmon excluder devices -- openings in trawl nets that let salmon escape. Another approach is avoiding salmon hot spots, but detecting salmon and avoiding them during derby-style fishery is difficult, Bonney said.

STATE OF ALASKA

SEAN PARNELL, GOVERNOR

1255 W. 8TH Street
P.O. BOX 115526
JUNEAU, AK 99811-5526

DEPARTMENT OF FISH AND GAME

Division of Commercial Fisheries
Division of Sport FishPHONE: (907) 465-4210
FAX: (907) 465-2604

MEMORANDUM

TO: Members
Alaska Board of Fisheries

DATE: October 1, 2010

FROM:  John Hilsinger, Director
Division of Commercial FisheriesSUBJECT: Upper Cook Inlet Stock of
Concern
Recommendations

and

Charles Swanton, Director 
Division of Sport Fish

This memorandum summarizes results from the stock of concern evaluation for Upper Cook Inlet (Area H) Region salmon for the 2010–2011 Alaska Board of Fisheries (board) regulatory cycle. The evaluation includes input from regional and area staff from the fishery divisions, as well as input from the Division of Subsistence. The memo discusses the existing Susitna River sockeye salmon stock of yield concern, along with six Chinook salmon recommended stocks of concern in three areas of Upper Cook Inlet: West Cook Inlet, Westside Susitna River, and Eastside Susitna River.

The *Policy for the Management of Sustainable Salmon Fisheries* (SSFP; 5 AAC 39.222) directs the Alaska Department of Fish and Game (department) to report to the board on the status of salmon stocks and identify any stocks that present a concern related to yield, management, or conservation during regular board meetings. Both yield and management stocks of concern are discussed in this memorandum. A yield concern is defined (5 AAC 39.222) as “a concern arising from a chronic inability, despite the use of specific management measures, to maintain expected yields, or harvestable surpluses, above a stock’s escapement needs.” A management concern is defined (5 AAC 39.222) as “a concern arising from a chronic inability, despite use of specific management measures, to maintain escapements for a salmon stock within the bounds of the SEG, BEG, OEG, or other specified management objectives for a fishery.” The policy defines “chronic inability” as “the continuing or anticipated inability to meet escapement thresholds over a four to five year period, which is approximately the generation time of most salmon species” (5 AAC 39.222 (f)(5)).

West Cook Inlet Chinook salmon

Chuitna River Chinook salmon

Background

The Chuitna River is the most productive Chinook salmon river flowing into the West Cook Inlet Management Area (WCIMA). This river system is a small- to medium-sized clearwater system initiating in the foothills of the Alaska Range, generally flowing in a southeasterly direction and emptying into WCIMA near the village of Tyonek (Figure 1). This system is pristine with almost no human disturbances or development. Access to the Chuitna River is limited to aircraft and boat since there is no road link to the southcentral Alaska road system.

There is a proposed coal mine development project within the Chuitna River watershed and current plans call for rerouting two of the system's smaller, less productive tributaries. The Chuitna River is the most popular Chinook salmon sport fishery in WCIMA. There are two sport fish lodge operations that target Chuitna River Chinook salmon, as well as several sport fish guide operations.

Stock Status

Chuitna River Chinook salmon are harvested by three user groups: an inriver sport fishery, the Northern District Chinook salmon commercial fishery, and the Tyonek subsistence fishery. The majority of the harvest can likely be attributed to the sport fishery, with the exceptions of 2009 and 2010.

The subsistence fishery occurs in the Tyonek Subdistrict salt waters adjacent to the village of Tyonek on West Cook Inlet; the subdistrict includes the area from one mile south of the mouth of the Chuitna River south to the easternmost part of Granite Point and from the mean point of high tide to the mean point of lower low tide. The season in this subsistence fishery operates in two parts. The first part, which focuses on Chinook salmon, is open Tuesdays, Thursdays, and Fridays from May 15–June 15 or until the Guideline Harvest Level (GHL) of 4,200 Chinook salmon is reached. The second part is open Saturdays from June 16–October 15; however, if the GHL has been reached, the second part does not open until July 1. The board made a positive customary and traditional use finding for salmon in the Tyonek Subdistrict (5 AAC 01.566 (a)(1)(A)), and set an amount necessary for subsistence at 850–3,600 salmon (ADF&G 1995:33).

Prior to 2008, the sport fishery contributed the majority of harvest; although the contribution of this stock to commercial and subsistence fisheries is unknown, it is suspected to be small. The commercial fishery was liberalized from 6 hours per period to 12 hours per period in 2005, and from 3 periods per season to 4 periods per season by the board in 2008. The most productive waters for commercial harvest of Chinook salmon are found from one mile south of the Theodore River to the mouth of the Susitna River; however, this area is open to fishing for the second regular Monday period only. The commercial fishery is limited to a harvest not to exceed 12,500 Chinook salmon, averaging 2,734 over the past five years and about 2,400 since 1993. The department is considering initiating a genetic sampling program to estimate stock-specific harvest in the commercial and subsistence fisheries.

From 1977–2001, this system experienced up to 4,500 angler days of sport fishing effort (Figure 2). In 2009, only 1,350 angler days were expended. Sport angler harvest of Chinook salmon from this system was as high as 1,185 fish (1983); however, in 2009 only 109 fish were harvested (Figure 2) and in 2010, the Chinook salmon fishery was closed preseason by emergency order. Retention of

Chinook salmon in the sport fishery is limited to the area downstream of an old cable crossing. Chinook salmon escapement into the Chuitna River has recently declined. The department has conducted annual single aerial surveys on the Chuitna River since 1979 to index spawning escapement of Chinook salmon. These surveys are conducted from helicopters at slower speeds than traditional fixed-wing aircraft surveys. The average escapement from 1979–2005 was approximately 2,000 fish (Figure 3). A more recent average (2006–2010) is approximately 1,000 fish, nearly one-half the previous 5-year average. The sustainable escapement goal (SEG) for Chinook salmon returning to the Chuitna River is 1,200–2,900 fish. Despite restrictive action since the mid 1990s and closure of the sport fishery in 2010, the lower bound of this goal was not achieved for the past four consecutive years.

Sport Fish Regulatory History

- 1984 Opened to Chinook salmon fishing.
- 1992 Seasonal bag limit of five Chinook salmon was established. Guides could not fish while engaged in guiding activities for Chinook salmon.
- 1993 Chinook salmon fishing in WCIMA reduced from July 13 to June 30. Only unbaited artificial lures could be used in specific sections of the Lewis, Theodore, and Chuitna rivers.
- 1995 Bait prohibited areawide; bag/possession limit of 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.

Stock of Concern Recommendation

Despite the sport fish restrictions already in place and recent commercial fishery restrictions and closures on westside fisheries, the Chuitna River Chinook salmon escapement goal has not been met in four consecutive years. The department recommends that the board consider Chuitna River Chinook salmon for stock of management concern status.

Theodore River Chinook salmon

Background

The Theodore River is a small clearwater system initiating in the foothills of Little Mount Susitna, flowing in a southerly direction and emptying into WCIMA (Figure 1). This system is pristine with almost no human disturbances or development. The Theodore River is remote with access limited to aircraft or boat because there is no road link to the southcentral Alaska road system. Historically, this system was a popular sport fishing destination for Chinook salmon anglers.

Stock Status

Historically, the Theodore River has been the second-most productive Chinook salmon system in WCIMA. Sport fishing effort was relatively high from 1984–1994, with a peak of more than 6,000 angler days of sport fishing effort in 1987 (Figure 2). In recent years estimated effort has been less than 1,000 angler days annually (Figure 2). Sport angler harvest of Chinook salmon from this system was as high as 1,400 fish (1986), and decreased to 183 prior to regulatory changes that closed the sport fishery in 1996 and then restricted sport fishing to catch-and-release in 1999.

Chinook salmon escapement into the Theodore River has recently declined. The department has conducted annual single aerial surveys on the Theodore River via helicopter since 1979 to index spawning escapement of Chinook salmon. The average escapements from 1979–2005 were approximately 1,090 fish (Figure 3). A more recent average (2006–2010) is approximately 470 fish, less than one-half the previous 5-year average. The SEG for Chinook salmon returning to the Theodore River is 500–1,700 fish. The Theodore River has failed to meet the SEG in six of the last 10 years, and for the past four consecutive years despite a catch-and-release sport fishery for Chinook salmon the past 12 years.

Currently, Theodore River Chinook salmon are harvested by two user groups: the Northern District Chinook salmon commercial fishery and the Tyonek subsistence fishery. See “Chuitna River,” above for an explanation of the subsistence and commercial fisheries.

Sport Fish Regulatory History

- 1984 Open to Chinook salmon fishing.
- 1992 Seasonal bag limit of five Chinook salmon was established. Guides could not fish while engaged in guiding activities for Chinook salmon.
- 1993 Chinook fishing in WCIMA was reduced from July 13 to June 30; only unbaited artificial lures could be used in specific sections of the Lewis, Theodore, and Chuitna rivers.
- 1995 Bait prohibited areawide; bag/possession 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.
- 1996 Theodore River closed to Chinook salmon fishing.
- 1999 Opened lower Theodore River to catch-and-release for Chinook salmon.
- 2002 Opened entire Theodore River to catch-and-release for Chinook salmon.

Stock of Concern Recommendation

Despite the sport fish restrictions already in place, including over a decade of no sport harvest and recent commercial fishery restrictions and closures on westside fisheries, the Theodore River escapement goal has not been met in four consecutive years. The department recommends that the board consider Theodore River Chinook salmon for stock of management concern status.

Lewis River Chinook salmon

Background

The Lewis River is a small clearwater system initiating in the foothills of Little Mount Susitna and Mount Susitna, flowing into the WCIMA (Figure 1). This system is pristine with almost no human disturbances or development. Access to the Lewis River is limited to aircraft and boat since there is no road link to the southcentral Alaska road system. Historically, this system was a popular sport fishing destination for Chinook salmon anglers.

Stock Status

Although information on the sport fishery is spotty, this system has experienced as many as 1,300 angler days of sport fishing effort (Figure 2). In recent years estimated effort has been fewer than 500 angler days annually. Sport harvest was greater than 150 fish annually from 1987–1990, but the sport fishery was closed by regulation in 1996 and then restricted to catch-and-release by regulation beginning in 1999.

Chinook salmon production in the Lewis River is currently in a state of decline. The department has conducted single annual aerial surveys on the Lewis River via helicopters since 1979 to index spawning escapement of Chinook salmon. The average escapement from 1979–2005 was approximately 560 fish (Figure 3). A more recent average (2006–2010) is 126 fish, approximately one-fourth the previous period's average. The Lewis River SEG for Chinook salmon is 250–800 fish. The Lewis River has failed to meet the SEG for Chinook salmon the past four consecutive years despite a catch-and-release sport fishery.

Currently Lewis River Chinook salmon are harvested by two user groups: the Northern District Chinook salmon commercial fishery and the Tyonek subsistence fishery. See "Chuitna River," above, for an explanation of the subsistence and commercial fisheries.

Sport Fish Regulatory History

- 1984 Open to Chinook salmon fishing.
- 1992 Seasonal bag limit of five Chinook salmon was established. Guides could not fish while engaged in guiding activities for Chinook salmon.
- 1993 Chinook fishing in WCI was reduced from July 13 to June 30. Only unbaited artificial lures could be used in specific sections of the Lewis, Theodore, and Chuitna rivers.
- 1995 Bait prohibited areawide; bag/possession 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.
- 1996 Lewis River closed to Chinook salmon fishing.
- 2002 Opened entire Lewis River to catch-and-release for Chinook salmon.

Stock of Concern Recommendation

Despite the sport fish restrictions already in place, including over a decade of no sport harvest, and recent commercial fishery restrictions and closures on westside fisheries, the Lewis River escapement goal has not been achieved the past four years. The department recommends that the board consider Lewis River Chinook salmon for stock of management concern status.

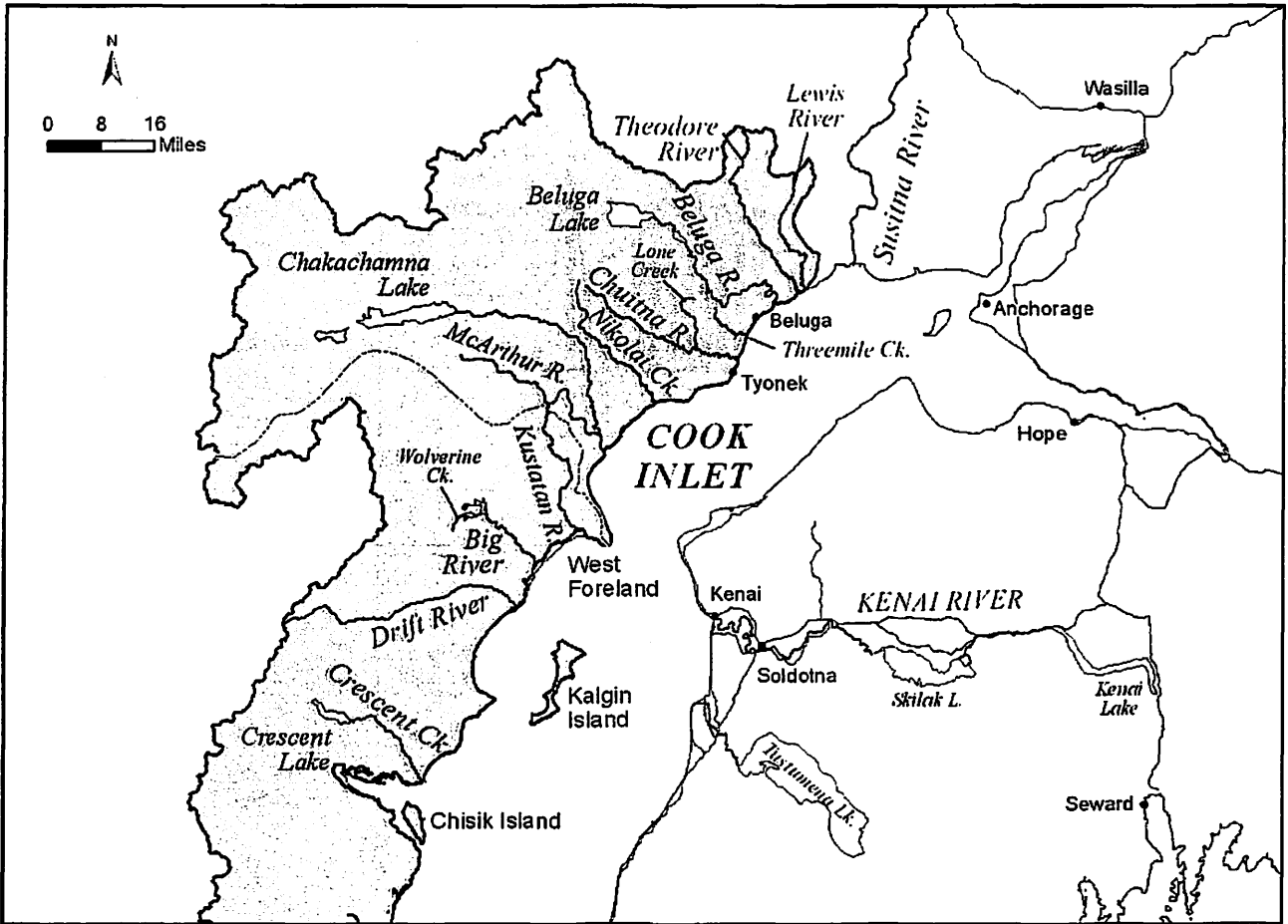


Figure 1. Map depicting West Cook Inlet Chinook salmon streams.

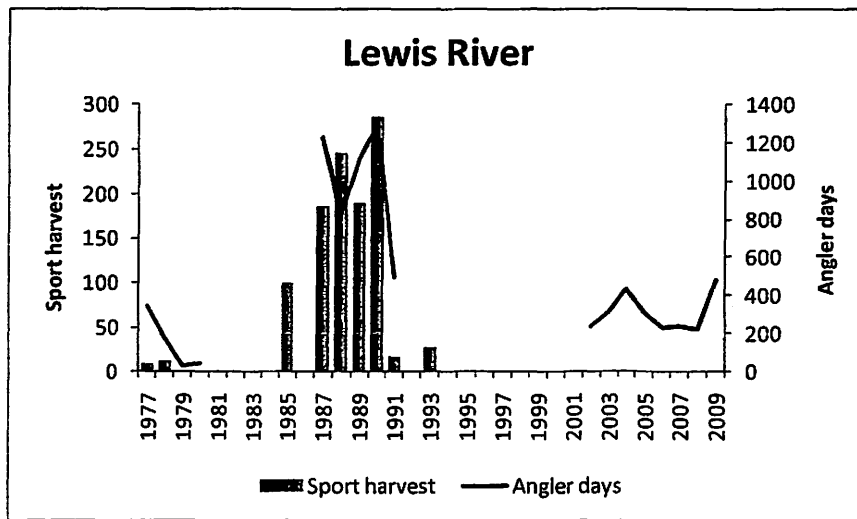
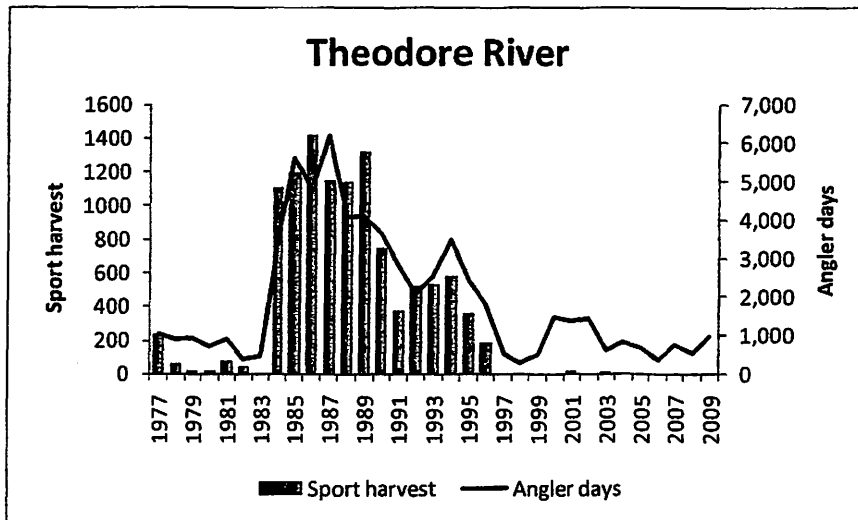
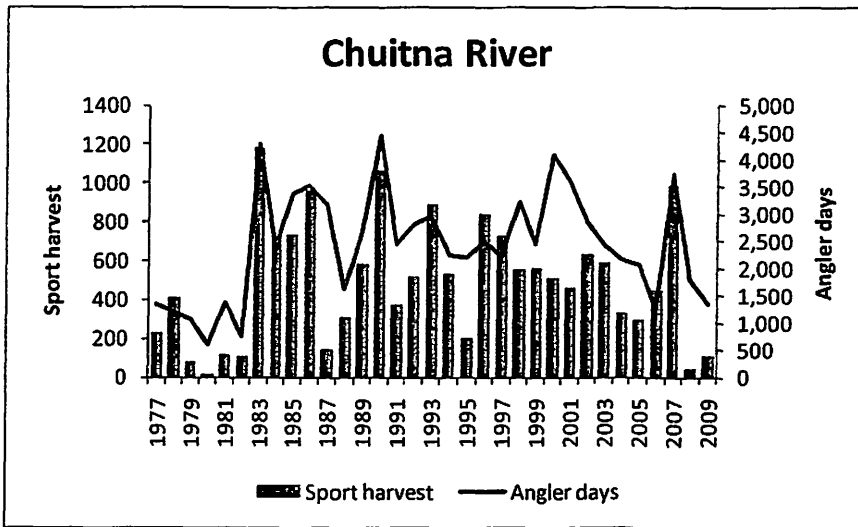


Figure 2. Sport harvest and angler effort estimates for Chuitna, Theodore, and Lewis River Chinook salmon, 1997–2009 (Jennings *et al.* *In prep.*).

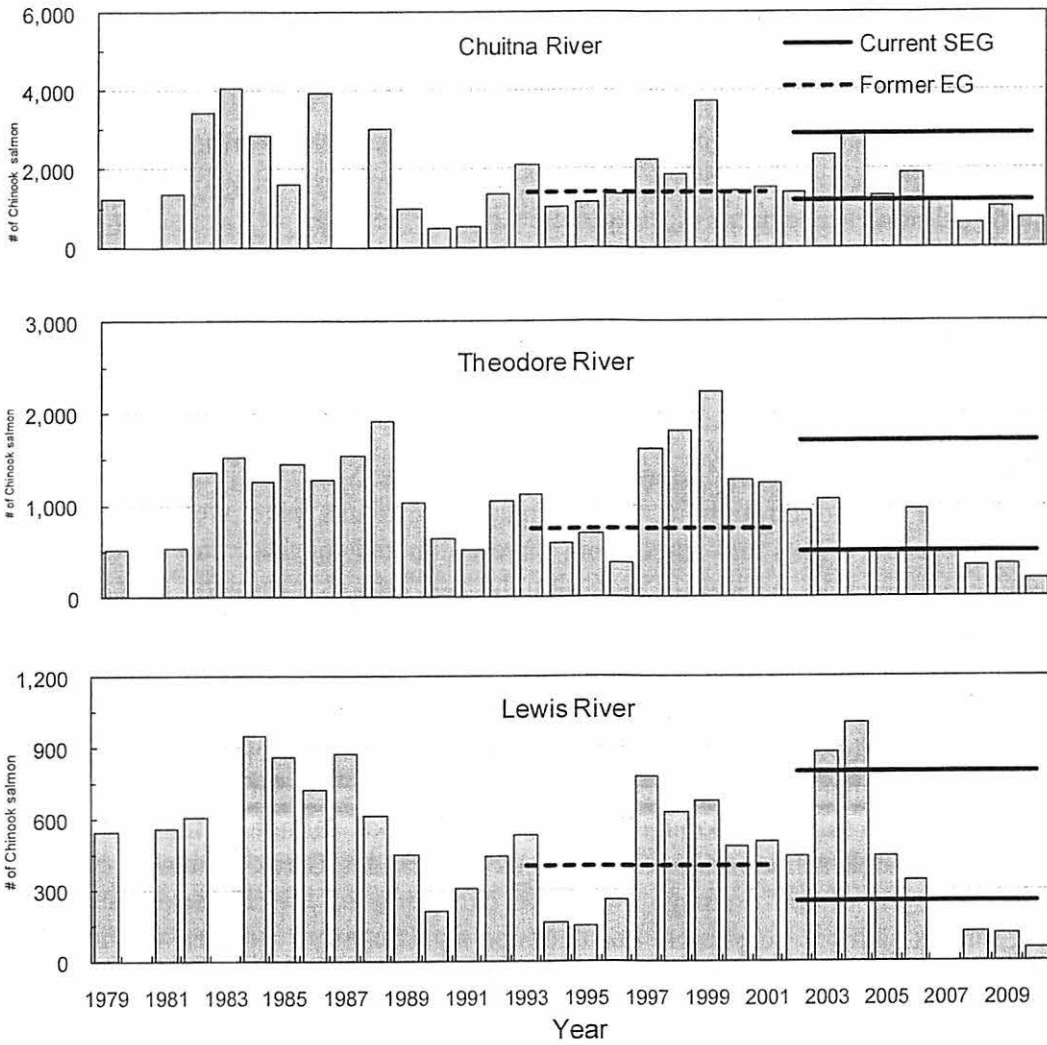


Figure 3. West Cook Inlet Chinook salmon escapement index counts, 1979–2010.

Westside Susitna River Chinook salmon

Alexander Creek Chinook salmon

Background

Alexander Creek (Figure 4) is a remote river accessible via float plane or boat. The creek is a low velocity, winding, clearwater system flowing into the west side of the Susitna River approximately eight river miles upstream from where the Susitna River empties into Cook Inlet. Alexander Creek, once one of the most productive Chinook salmon sport fisheries in the Northern Cook Inlet (NCI) area, was closed to Chinook salmon fishing in 2008 by the board, primarily to address a decade of declining Chinook salmon escapements (see regulatory history below).

Sport fisheries, primarily the Chinook salmon fishery in the Alexander Creek system, once supported nine full time lodges. In addition to the lodge operations, this system also supported several float plane charter operations based at Anchorage's Lake Hood, numerous boat charter/guide operations, and a cabin and boat rental business. Today, few if any, of these operations are still in business.

Northern pike were illegally introduced to at least one lake in the Susitna River drainage during the 1950s and have since spread throughout the drainage. Northern pike were first observed in Alexander Lake in the late 1960s and since then, have colonized the lake and 40 miles of creek. The system contains numerous backwater side-sloughs and oxbow channels, several tributaries, many interconnecting shallow lakes and ponds, and vast expanses of wetlands and marshes, all of which provide for optimum spawning and rearing habitat for northern pike. Unfortunately, juvenile Chinook salmon habitat overlaps with northern pike habitat throughout this river system.

Northern pike are voracious, opportunistic feeders that prey on and prefer salmonids over other available prey. In the absence of refuge areas for juvenile salmon, predation by northern pike can lead to severe reductions in salmonid populations, such as Chinook salmon. This is likely the cause for the decrease of Chinook salmon escapement in the Alexander Creek drainage. Northern pike have colonized nearly all of the drainage (with the exception of lower Sucker and Wolverine creeks), while Chinook salmon escapement has declined significantly. Because of the tremendous overlap of northern pike and juvenile Chinook salmon habitat throughout most of this system, there is little refuge for juvenile Chinook salmon to escape northern pike predation. Therefore, it is unlikely that Alexander Creek Chinook salmon will rebound in this system without significant changes to the northern pike infestation. Other salmon species and resident fish populations have declined in this system as well, the extent of which is currently unknown since the department monitors only Chinook salmon.

Stock Status

Until 2008, Alexander Creek Chinook salmon were harvested by three users groups: a sport fishery, the Northern District Chinook salmon commercial fishery, and the Tyonek subsistence fishery. Prior to 2008, the sport fishery occurred on the lower 12 miles of Alexander Creek and sport fishing was allowed from 6 a.m.–11 p.m., through June 30. The sport fishery was closed in 2008 by the board. See "Chuitna River," above, for an explanation of the subsistence and commercial fisheries.

Prior to 2000, Alexander Creek was one of the most productive Chinook salmon systems in the entire westside Susitna River. From 1986–1994 this system experienced more than 20,000 angler days of sport fishing effort (Figure 5). In 2007, prior to its closure, there was an estimated 2,666 angler days of effort. Historically, sport angler harvest of Chinook salmon from this system was as high as 6,548 fish (1991). In 2007, only 412 fish were harvested (Figure 5).

The department has conducted annual single aerial surveys on Alexander Creek since 1979 to index spawning escapement of Chinook salmon. The average escapements from 1979–1999 were approximately 3,500 fish (Figure 6). The most recent 10-year average (2001 through 2010) was approximately 1,600 fish, less than one-half the previous 10-year average. An SEG of 2,100–6,000 Chinook salmon was established in 2001. Chinook salmon escapements to this system in the past five years have been far below the SEG, averaging 393 fish annually. In seven of the last 10 years the goal was not achieved. At a time (1999–2006) when other Susitna drainage systems were experiencing strong Chinook salmon runs, the Alexander Creek run was either not making or barely meeting the escapement goal.

A change in spawning distribution has also paralleled the decline of Chinook salmon in this drainage. Past escapement surveys on Alexander Creek documented fish spawning throughout the drainage, with a large percentage of fish spawning in tributaries upstream of Alexander Lake. More recent observations indicate no fish spawning in the mainstem between Sucker Creek and the lake, in tributaries upstream of the lake, and few below Sucker Creek (Figure 4). Most of the Chinook salmon escapement to Alexander Creek is now isolated to less productive northern pike habitat in Lower Sucker Creek and the Wolverine Creek fork of Sucker Creek.

Regulatory History for Sport Fish

- 1977 All NCI harvest > 20 inches closed
- 1979 Chinook fishing open; seasonal limit of 5 over 20 inches.
- 1980 Bag changed from 1 to 2 over 20 inches; only 1 over 28 inches
- 1981 Bag/possession returned to 1 daily/2 possession over 20 inches.
Bag/possession changed to 2 per day/4 possession over 16 inches; only 1 daily/2 possession over 28 inches.
- 1986
- 1987 Season extended from July 6 to July 13
- 1990 No seasonal limit.
Seasonal limit of 5 over 16 inches; bag/possession changed to 1 daily/2 possession over 16 inches.
- 1992
- 1995 Bait prohibited; bag/possession 1 over 16 inches; fishing allowed 6 a.m.–11 p.m.; closed upstream of Trail Creek.
- 1996 Season ends June 30; harvest allowed downstream of Granite Creek only.
- 1999 Harvest area extended upstream of Granite Creek to Trail Creek.
- 2008 Fishery closed.

Stock of Concern Recommendations

Chinook salmon escapement has declined both in run size and spatial distribution of adult spawners. Runs to Alexander Creek have declined drastically over the past five years despite closure of the sport fishery in 2008. It is assumed that recent downturns in Chinook salmon runs throughout UCI have added to this decline. Because escapements to this system have been chronically below the escapement goal despite management action taken to eliminate the sport fishery, the department recommends the board consider Alexander Creek Chinook salmon for stock of management concern status.

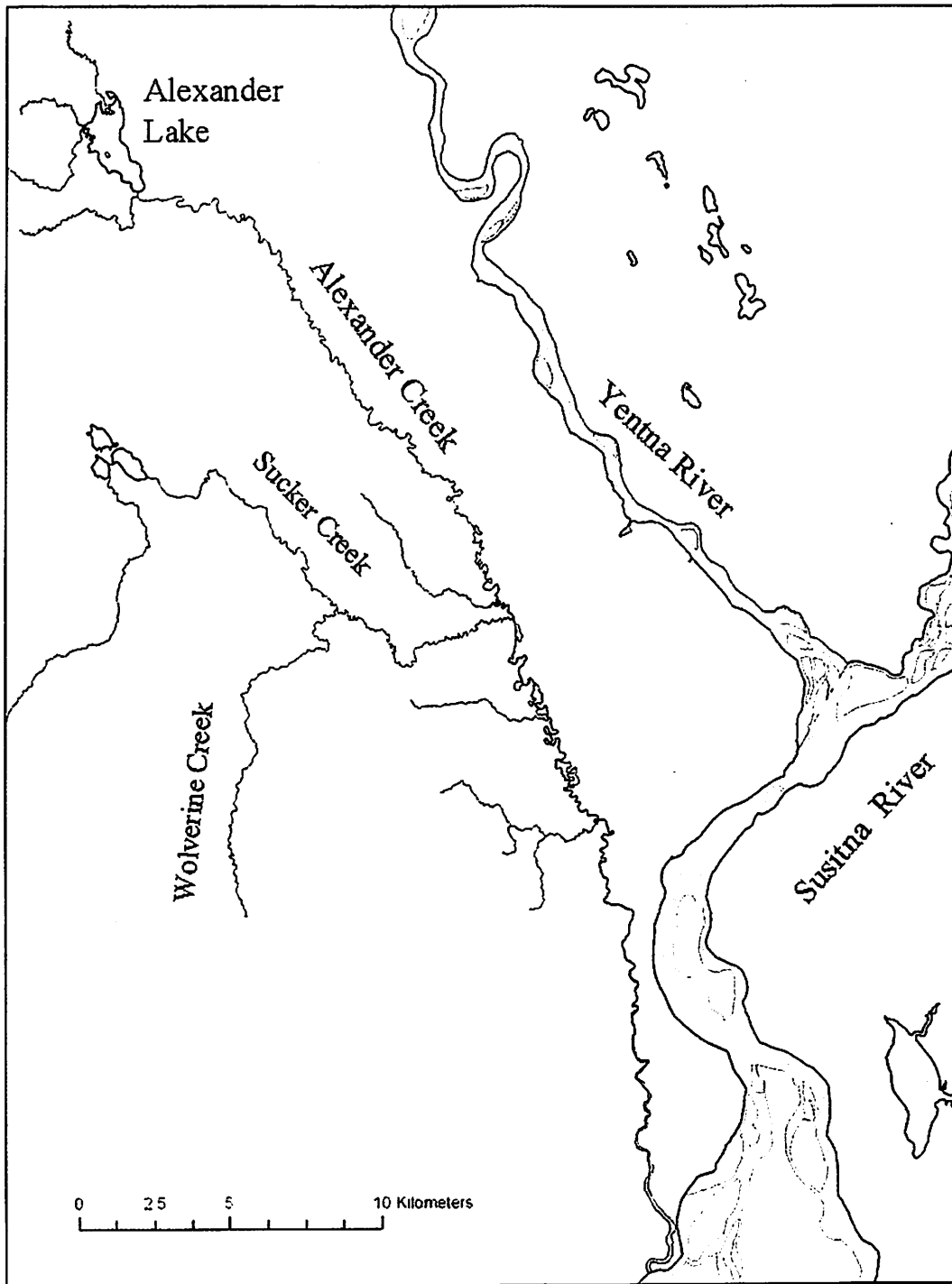


Figure 4. Map depicting the Alexander Creek drainage.

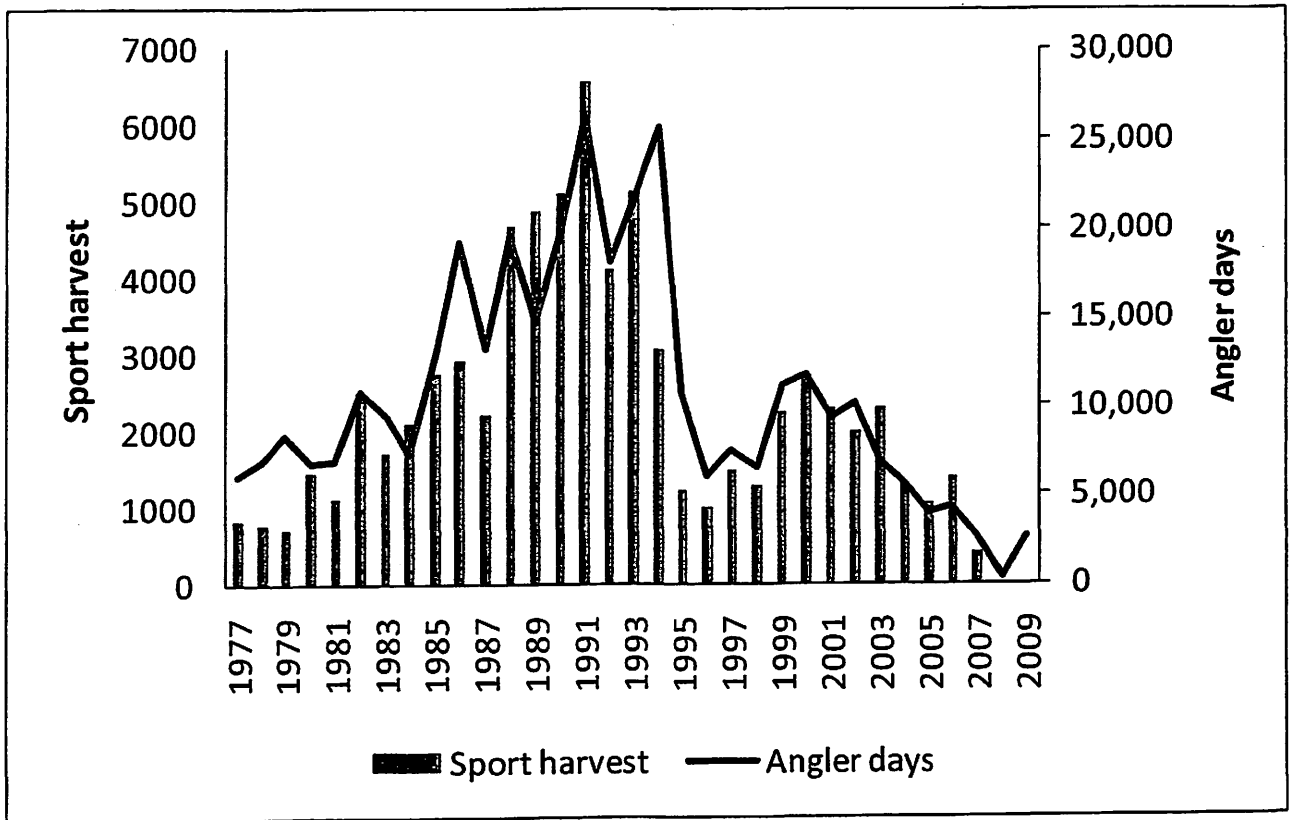


Figure 5. Alexander Creek Chinook salmon sport harvest and fishing effort, 1977–2009 (Jennings *et al.* *In prep.*).

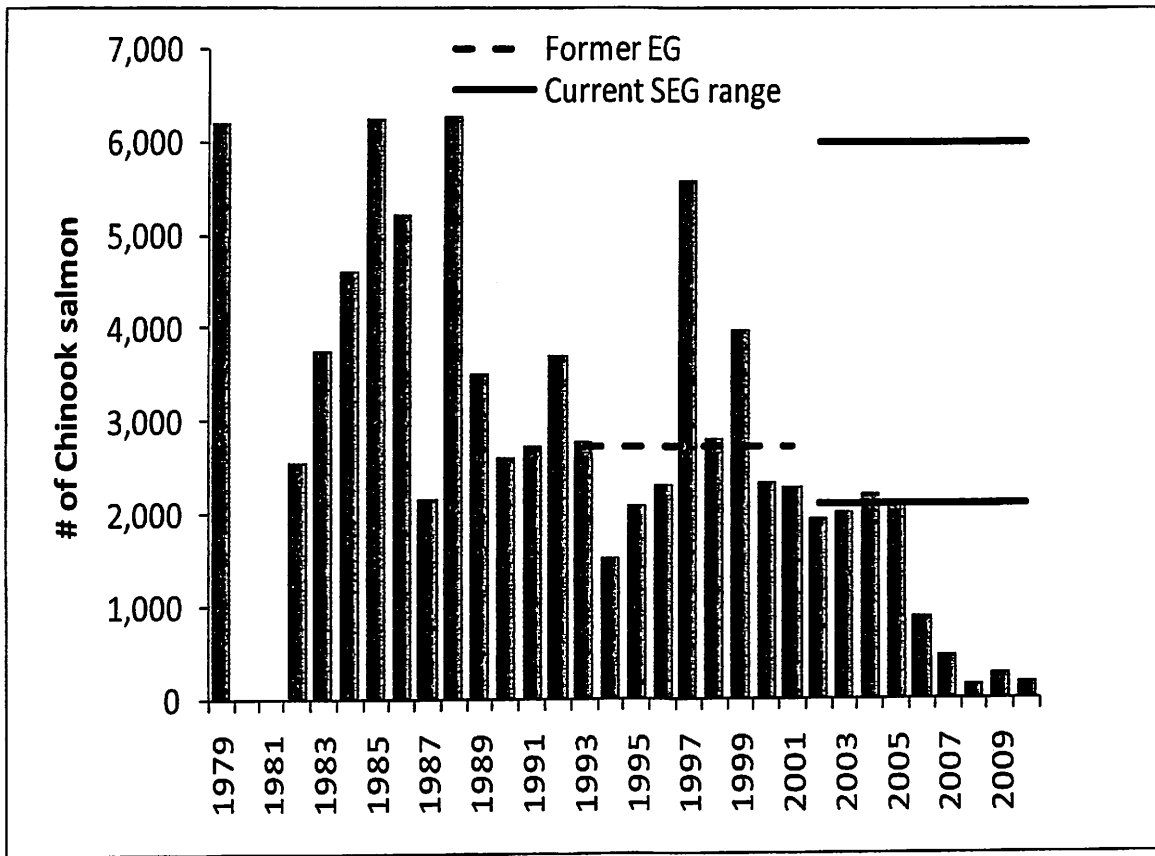


Figure 6. Alexander Creek Chinook salmon escapement index counts as counted by helicopter, 1979–2010.

Eastside Susitna River Chinook salmon

Willow and Goose creeks

Background

Unit 2 of the Susitna River (5 AAC 61.106) includes all tributaries draining the Talkeetna Mountains into the east side of the Susitna River from its confluence with the Deshka River upstream to the Talkeetna River, excluding the Deshka and Talkeetna rivers (Figure 7). Unit 2 streams are also referred to as Parks Highway streams because they cross this highway. Because access to these streams is primarily from the road system, they receive relatively high sport angling effort and are managed conservatively. Popular Chinook salmon sport fisheries within Unit 2 include Willow, Little Willow, Caswell, Sheep, Goose, Greys, and Montana creeks, and the Kashwitna River.

Stock Status

Sport anglers expend an average of 63,000 angler days fishing within Unit 2. The largest Chinook salmon fisheries occur on Willow, Sheep, and Montana creeks. Sport anglers spend an average of 22,600 angler days fishing Willow Creek; 9,400 angler days fishing Sheep Creek; and 18,600 angler days fishing Montana Creek. Average sport harvest of Chinook salmon has been 2,100, 810, and 1,300 Chinook salmon, respectively (Table 1, figures 8 and 9). Willow Creek has been enhanced by stocking hatchery-reared Chinook salmon since 1985. Creel studies estimate that the contribution of hatchery fish to the sport harvest averaged 40% and ranged from 26–51% for 1991–2005, years in which a full complement of stocked fish returned (Ivey *et al.* 2009). Due to the loss of warm water for enhanced fish growth and other water-related issues with rearing hatchery fish in a cold water environment, both the quality and quantity of Chinook salmon stocked into Willow Creek have been below stocking goals since 2006. Therefore, hatchery contributions to the Willow Creek harvest have likely been below 40% since 2009, resulting in additional pressure on wild stocks.

The department has conducted annual single aerial surveys within this area since 1979 to index the spawning escapement of Chinook salmon in Willow, Little Willow, Sheep, Goose, and Montana creeks, and the Kashwitna River. SEGs were developed for all but the Kashwitna River in 2001. Most escapement goals have been achieved on these streams since the mid 1990s. However, since 2007, Chinook salmon escapements in some Unit 2 streams have been insufficient to attain their respective escapement goals (Figure 10). In the past four years escapement goals were not attained in Montana Creek in 2010, and Sheep Creek in 2007 and 2009; however, Sheep Creek was not surveyed in 2008 or 2010 due to poor water visibility. SEGs on Willow Creek (1,600–2,800) and Goose Creek (250–650) have not been achieved in the past four consecutive years. SEGs were not attained in 2009 and 2010 despite a closure of Unit 2 Chinook salmon fisheries inseason by emergency order.

Regulatory History for Sport and Commercial Fisheries

Selected Susitna River streams were reopened to Chinook salmon fishing in 1979 after closing for several years from low stock abundance. Cautious incremental expansion of fishing opportunity has been the management strategy since that time. Beginning in 1979, Willow, Caswell and Montana creeks were open on Saturdays and Sundays for four consecutive weekends commencing on the second Saturday in June. Harvest quotas, ranging from 200 to 7,000 Chinook salmon,

governed these fisheries from 1979 through 1982. In 1986, Little Willow, Goose, Sunshine, Sheep, and Birch creeks were added to the group of weekend-only fisheries. Fishing on Mondays was added to these fisheries in 1987, and the season for all Susitna River streams that formerly closed on July 6 was extended to July 13. In 1989, sport fishing for Chinook salmon was allowed within a one-quarter mile radius of the mouth of the Kashwitna River and fishing was permitted daily at Willow Creek between January 1 and the third Monday in June, and on Saturday through Monday for two consecutive weeks starting the fourth Saturday in June. In 1999, eastside Chinook salmon fisheries were further liberalized by extending daily fishing through the third Monday in June and for the next two consecutive three-day weekends. In 2005, Parks Highway streams were opened for an additional three-day weekend for Chinook salmon fishing. This regulation continues to the present. Bag, seasonal limits, and gear restrictions governing Chinook salmon fisheries within Unit 2 of the Susitna River are summarized below:

- 1977 All NCI harvest > 20 inches closed.
- 1979 Chinook salmon fishing open; seasonal limit of 5 over 20 inches.
- 1980 Bag limit changed from 1 to 2 over 20 inches; only 1 over 28 inches.
- 1981 Bag/possession returned to 1 daily/2 possession over 20 inches.
- 1986 Bag/possession 1 daily/2 possession over 16 inches.
- 1987 Season extended from July 6–July 13.
- 1990 No seasonal limit.
- 1992 Seasonal limit of 5 over 16 inches.
- 1995 Bait prohibited; bag/possession 1 over 16 inches.

The commercial fishery was liberalized from 6 hours per period to 12 hours per period in 2005, and from 3 periods per season to 4 periods per season by the board in 2008. The most productive waters for commercial harvest of Chinook salmon are found from one mile south of the Theodore River to the mouth of the Susitna River; however, this area is open to fishing for the second regular Monday period only. The commercial fishery is limited to a harvest not to exceed 12,500 Chinook salmon, averaging 2,734 over the past five years and about 2,400 since 1993.

Stock of Concern Recommendation

SEGs on Willow Creek and Goose Creek have not been achieved in the past four years. SEGs were not achieved in 2009 and 2010 despite closure of Unit 2 Chinook salmon fisheries by inseason emergency order; the last weekend in the 2009 sport fishing season was eliminated and the last two consecutive weekends were closed in 2010. Because escapements to this system have not been meeting escapement goals despite specific management action taken inseason to reduce harvest, the department recommends the board consider Willow and Goose creeks Chinook salmon for stock of yield concern status.

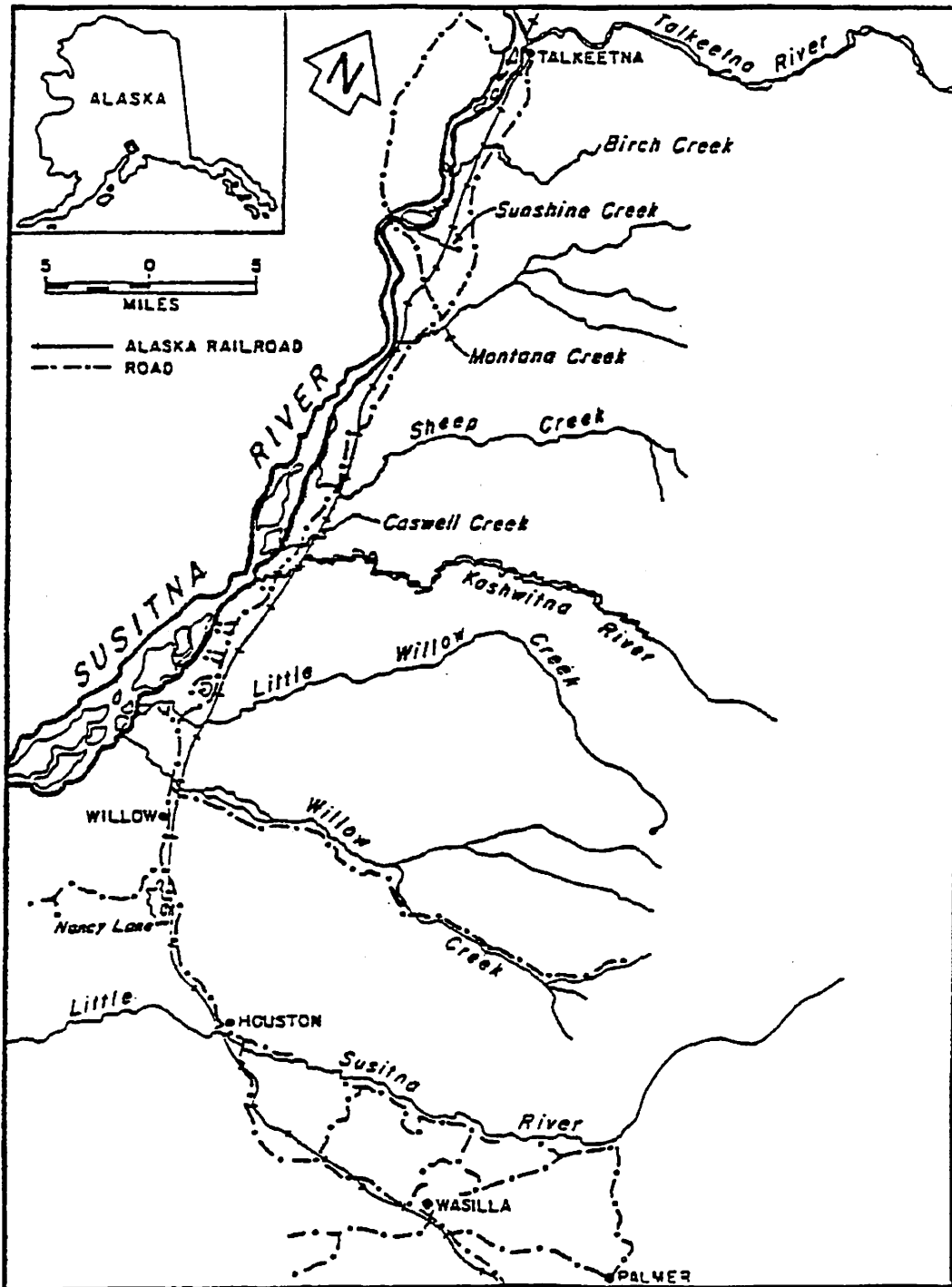


Figure 7. Map depicting Unit 2 of the Susitna River drainage.

Table 1. Unit 2 of the Susitna River drainage Chinook salmon sport harvest and effort (angler days) by fishery, 1977–2009.

Year	Harvest							Effort								
	Willow	Little	Kashwitna	Caswell	Sheep	Goose	Montana	Total	Willow	Little	Kashwitna	Caswell	Sheep	Goose	Montana	Total
	Creek	Willow	River	Creek	Creek	Creek	Creek		Creek	Willow	River	Creek	Creek	Creek	Creek	
1977	137	16			259		415	1,056	14,024	4,583			8,112		14,268	40,987
1978	47	0			256		408	886	22,682	5,687			11,869		25,762	66,000
1979	459	0		156	10		312	937	18,911	5,171		3,710	6,728		22,621	57,141
1980	289	32		215	45		559	1,140	29,011	8,190		4,963	8,014		19,287	69,465
1981	585	0		249	0		661	1,495	14,060	3,845		3,860	6,936		16,657	45,358
1982	629	0		471	0		241	1,341	19,704	5,579		5,101	9,093		23,645	63,122
1983	534	0	231	272	0		504	1,541	13,405	2,791	1,344	5,048	6,237		17,109	45,934
1984	774	37	0	586	0	0	1,522	2,919	21,649	5,872	2,995	4,952	6,106	1,305	19,239	62,118
1985	1,063	25		527	0		979	2,594	16,282	5,705		5,289	2,844		20,028	50,148
1986	1,017	872	73	327	1,778	145	2,796	7,008	10,733	4,490	2,908	4,362	10,091	1,993	20,268	54,845
1987	1,987	711	116	88	1,610	334	1,726	6,572	13,583	5,850	2,717	3,332	9,019	1,865	13,745	50,111
1988	2,349	937	0	578	1,847	218	1,070	6,999	27,758	10,768	1,454	4,529	18,699	2,947	16,498	82,653
1989	2,846	507	11	357	1,116	385	1,708	6,930	23,811	5,285	6,320	4,029	13,010	3,058	16,179	71,692
1990	3,237	387	6	330	1,537	504	478	6,479	32,200	6,505	2,313	6,103	11,392	3,714	11,284	73,511
1991	3,208	684	41	305	1,519	288	575	6,620	32,520	7,792	1,981	7,816	14,872	2,811	10,745	78,537
1992	8,884	1,023	16	592	2,663	1,033	3,078	17,289	50,958	9,240	2,177	6,391	17,509	4,908	18,437	109,620
1993	8,626	1,200	38	531	2,300	633	4,054	17,382	41,218	6,422	1,600	5,033	12,636	3,423	21,615	91,947
1994	5,980	745	78	562	1,349	361	3,111	12,186	34,362	6,744	1,957	5,842	11,526	3,300	16,220	79,951
1995	2,742	436	18	397	746	226	1,004	5,569	29,392	6,386	1,460	3,912	9,758	1,993	16,303	69,204
1996	2,690	896	21	128	1,397	437	1,612	7,181	23,508	5,890	1,140	1,473	8,112	1,796	13,485	55,404
1997	3,135	699	10	30	550	298	2,181	6,903	21,511	5,829	1,916	1,317	9,172	3,151	14,111	57,007
1998	2,793	546	15	226	700	348	1,471	6,099	23,920	4,987	1,663	2,983	9,716	2,510	14,952	60,731
1999	4,988	1,344	83	142	2,558	371	3,279	12,765	37,384	8,596	2,004	2,764	17,188	3,561	22,382	93,879
2000	3,782	578	160	561	851	258	1,728	7,918	44,648	9,028	2,331	4,385	12,660	3,266	26,070	102,388
2001	4,573	941	74	238	1,420	160	2,646	10,052	34,979	7,059	2,320	2,637	11,742	2,339	22,454	83,530
2002	3,591	580	217	115	928	403	2,026	7,860	31,997	7,189	2,648	2,562	12,853	2,845	22,008	82,102
2003	3,922	510	373	26	1,284	350	1,242	7,707	29,668	4,815	5,028	3,018	12,878	2,965	20,794	79,166
2004	2,818	445	125	23	914	335	1,071	5,731	26,722	5,031	1,906	902	10,310	2,645	22,860	70,376
2005	2,466	621	112	394	878	150	1,328	5,949	24,181	6,566	1,626	2,395	8,521	2,039	16,083	61,411
2006	2,141	449	210	264	707	27	1,672	5,470	21,927	4,536	2,489	1,767	9,437	2,593	19,657	62,406
2007	2,258	870	223	190	964	31	1,294	5,830	22,139	7,126	1,099	1,260	10,156	621	18,111	60,512
2008	1,101	505	237	30	589	134	1,188	3,784	17,953	8,213	5,634	1,524	8,574	1,895	16,174	59,967
2004–2008																
Mean	2,157	578	181	180	810	135	1,311	5,353	22,584	6,294	2,551	1,570	9,400	1,959	18,577	62,934
2009	499	885	212	17	393	0	257	2,263	19,019	4,105	3,896	1,859	9,248	1,640	14,084	53,851

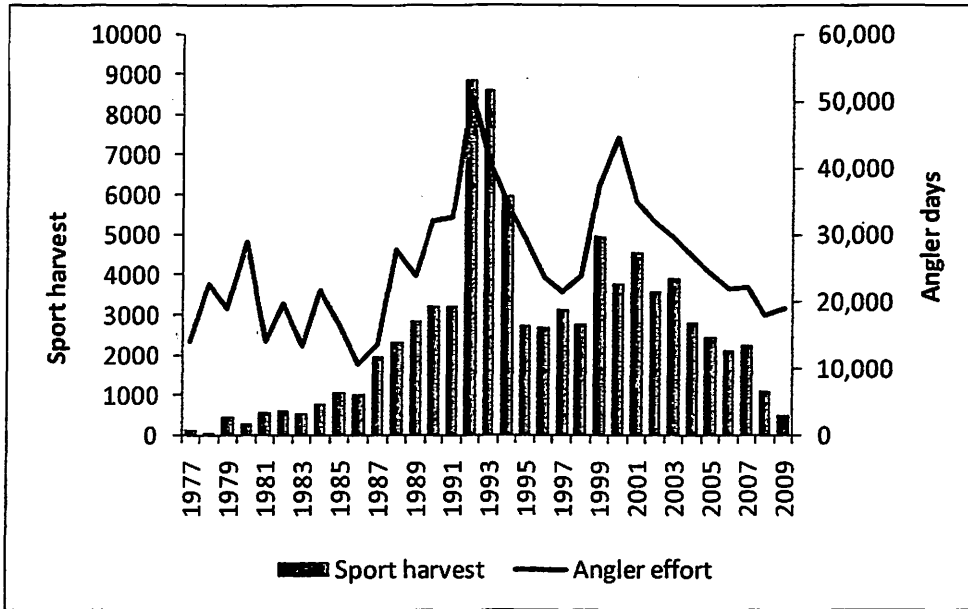


Figure 8. Willow Creek Chinook salmon harvest and effort, 1977–2009 (Jennings *et al.* *In prep.*).

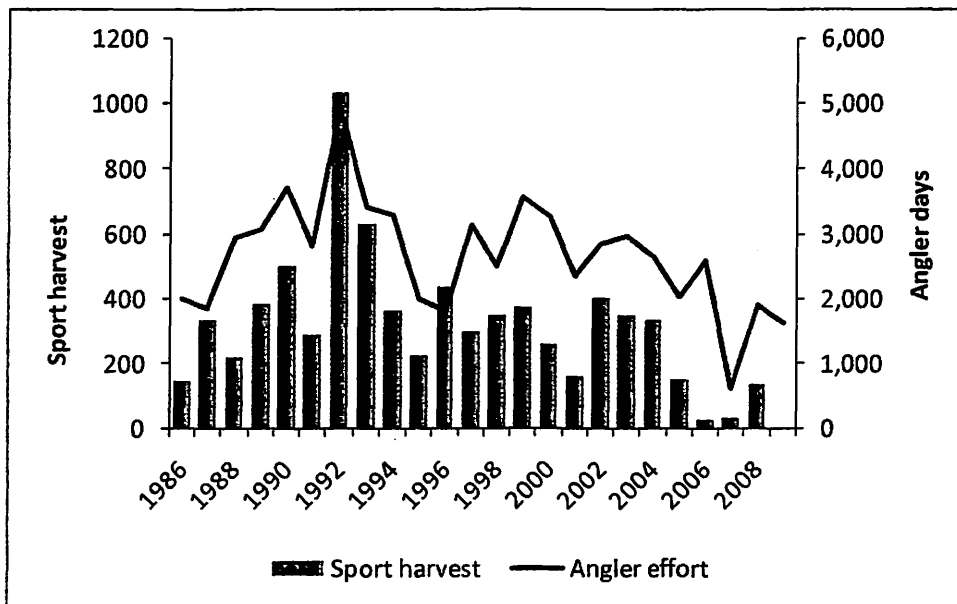


Figure 9. Goose Creek Chinook salmon harvest and effort, 1986–2009 (Jennings *et al.* *In prep.*).

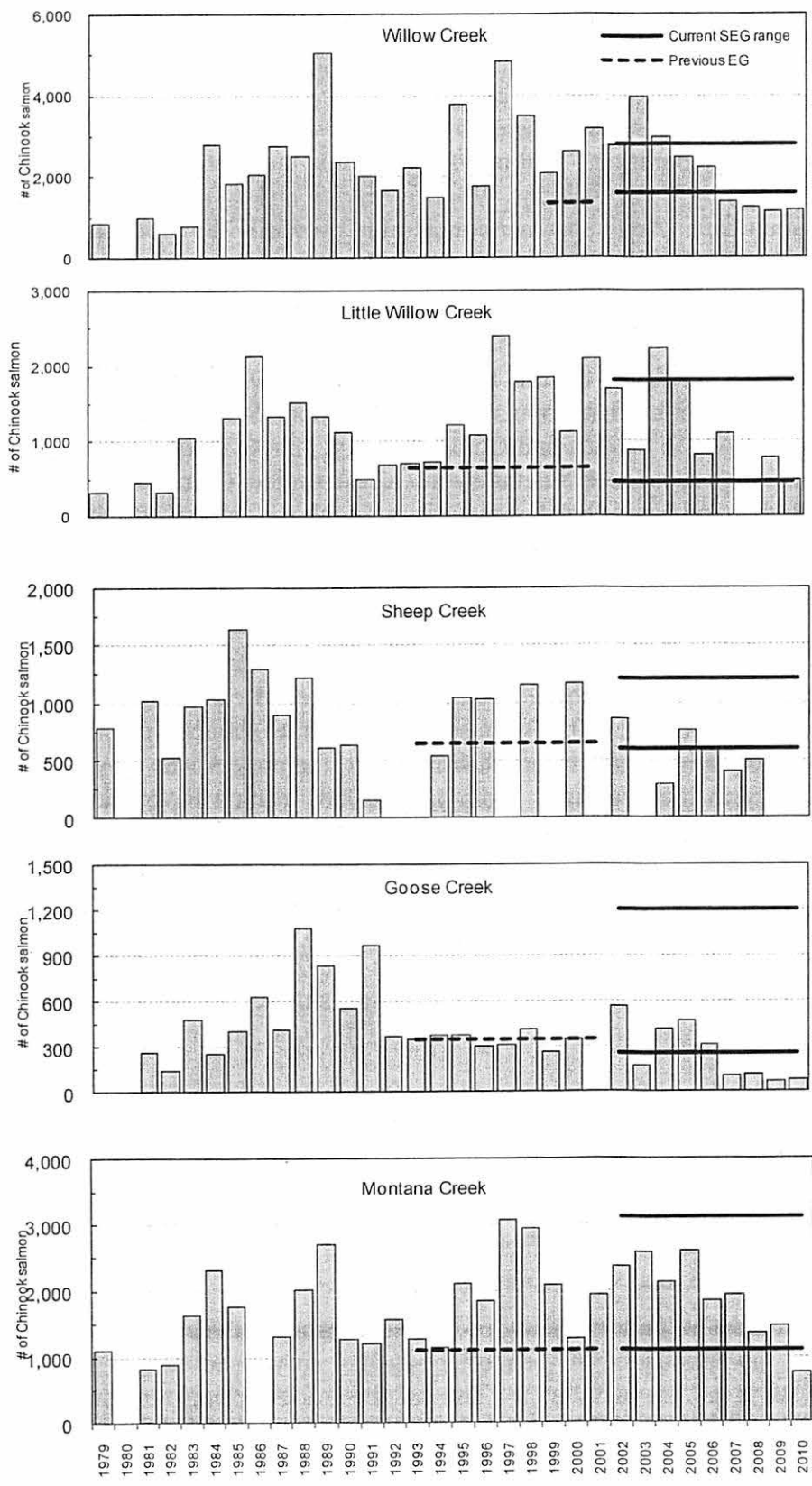


Figure 10. Unit 2 Chinook salmon escapement index counts, 1979–2010.

Susitna River Sockeye Salmon

Background and Stock Status

Early efforts to estimate the number of sockeye salmon spawning and rearing in the Susitna watershed were limited in scope and duration. Various lakes within the drainage were visited sporadically in the 1950s and 1960s by U. S. Fish and Wildlife Service and ADF&G personnel to collect salmonid juvenile and adult data. Adult spawner counts were primarily the product of aerial surveys (King and Walker 1997). At various times since the early 1970s, weirs were utilized to monitor sockeye salmon entering selected tributaries to spawn (e.g., at Chelatna, Fish, Judd, and Larson lakes, Shell Creek, and Talachulitna River (King and Walker 1997)).

Mark-recapture projects were conducted on the Susitna River in 1974 and 1975 as part of an effort to estimate juvenile and adult anadromous fish populations in the upper Susitna River between Devil's Canyon and the confluence of the Susitna and Chulitna rivers. These studies were part of the pre-authorization investigation for a proposed Susitna hydroelectric project (Barrett 1974; Friese 1975). The results of these studies indicated that the majority of sockeye salmon in the Susitna basin were produced in the Yentna and Skwentna river drainages (Namtvedt et al. 1978). Mark-recapture projects were also conducted on the Susitna River during 1982–1985 to estimate the inriver run of sockeye salmon (Barrett et al. 1985; Thompson et al. 1986).

Adult salmon escapements into the Susitna River were monitored with sonar at Susitna Station (river kilometer (rkm) 52) from 1976–1980. However, changes in riverbed characteristics at that sonar location precluded the project after 1980. Because no other site suitable for the sonar equipment then in existence was found in the mainstem Susitna River, the project was moved to the Yentna River, the largest tributary in the drainage. From 1981–2008, Yentna River daily sonar estimates were used as an indicator of sockeye salmon escapement into the Susitna River drainage. Yentna River sockeye escapement was thought to be approximately one-half the total Susitna River sockeye salmon escapement. This assumption was based on the combination of 1981–1985 mark-recapture abundance estimates of fish passing Sunshine (Susitna River rkm 116) and sonar abundance estimates of fish passing the communities of Yentna (at rkm 7 of the Yentna River) and Susitna Station (Westerman and Willette 2006). Mark-recapture studies in 2007 and 2008, however, suggest that Yentna River escapement is about 20–30% of the total Susitna River drainage escapement (Fair et al. 2009).

Prior to 2009, the Yentna River sockeye salmon escapement goal of 90,000–160,000 was an SEG adopted in 2002 (Bue and Hasbrouck *Unpublished*). Based on Bendix sonar estimates since 1981, the number of Yentna River spawners ranged from approximately 37,000 to 181,000 sockeye salmon. The Yentna River is a large, dynamic, glacial river that poses difficulties for sonar assessment of salmon escapement. In addition, significant runs of other salmon species occur; thus, fish wheels are required to apportion the total sonar count by species.

The sustained yield principle requires an understanding of the relationship between the abundance of a stock's spawning fish and the abundance of their offspring that survive to adulthood (often written by department scientists in a "brood table"). The number of offspring that survive to adulthood is calculated by adding the number of spawning fish and the number of fish harvested for each parent generation.

Accurately estimating the composition of a mixed-stock harvest is critical to determining the total run of each stock. Age composition has historically been used to facilitate estimation of stock composition. The department has used age composition estimates from the harvest and escapement, as well as run timing to allocate the harvest to each stock (Bernard 1983). This method assumes that stocks present in a district are equally exploited. This untested assumption can greatly affect estimated stock compositions. The age composition method probably underestimates the productivity of some stocks and overestimates the productivity of other stocks. Stock- and age-specific harvest and escapement data have been the basis for development of long-term brood tables used for both preseason forecasting and for scientific estimation of escapement goals.

In recent years (2005 to present), the department has supported a genetics program for sockeye salmon in UCI. The primary goal of the program is to develop and apply genetic methods to identify stock composition of mixtures. The first comprehensive baseline using genetic markers in UCI employed microsatellites (Habicht et al. 2007). The need to differentiate among all the stocks led to development of methods to screen single nucleotide polymorphism (SNP) loci under selection. In a recent study of UCI sockeye salmon genetic diversity, simulations indicated that eight regional groups (Kenai, Kasilof, and Crescent rivers; Fish Creek; West Cook Inlet; Knik/Turnagain/Northeast Cook Inlet, Judd/Chelatna/Larson lakes; and remaining Susitna/Yentna stocks) could be identified in mixtures at high levels of precision and accuracy (Barclay et al. 2010).

Given the potential errors outlined above for estimating the harvest of Susitna sockeye salmon stocks in UCI using harvest and escapement age composition information, we are hesitant to estimate the historical yield for Yentna sockeye salmon stocks. There are many unsubstantiated assumptions involved in the estimation procedure. Nonetheless, in the context of “stock of concern” we examined the historical estimates of Yentna River sockeye salmon yield in both the Central and Northern districts.

Regulatory History

Commercial Fisheries

There are currently no actions in the Central District Upper Subdistrict (Eastside) set gillnet fishery for conservation of northern bound salmon stocks. However, in the Northern District set gillnet fishery, the department’s primary tools to reduce exploitation on Susitna stocks is to reduce gear from three nets to two or one from July 20–July 31, or to close the commercial fishery. In practice, the department has done both concurrently, but most commonly the fishery has been closed. Furthermore, from July 16–31 the drift gillnet fishery is restricted for two regular fishing periods to Drift Area 1 when Kenai River sockeye salmon runs are less than two million fish, or drift areas 1 and 2 when Kenai runs are between two and four million sockeye salmon. These restrictions are for conservation of both sockeye and coho salmon.

Sport Fisheries

The commissioner may, by emergency order, change bag and possession limits, and annual limits, and alter methods and means in sport fisheries. These changes may not reduce the allocation of harvest among other user groups. An emergency order may not supersede provisions for increasing or decreasing bag and possession limits or changing methods and means established in regulatory management plans established by the board.

Stock of Concern Recommendation

The Susitna River sockeye salmon stock was found to be a stock of yield concern during the February 2008 Upper Cook Inlet board meeting. In response to the stock of yield concern designation, the board designed an action plan within the framework of 5 AAC 21.358 *Northern District Salmon Management Plan* to do the following:

(a) From July 20 through August 7, the Northern District set gillnet fishery will fish regular 12-hour Monday and Thursday fishing periods, but will be limited to no more than one 35-fathom set gillnet per permit. If it is determined by the department that the Yentna River sockeye salmon [SEG or OEG] will be achieved during this time frame, the department may increase the allowable fishing gear from one 35-fathom set gillnet per permit to two 35-fathom set gillnets per permit or the full complement of 3 set gillnets that are not more than 105 fathoms in aggregate length per permit.

(b) On the first regular fishing period after August 7, and thereafter, the Northern District set gillnet fishery will again return to a full complement of fishing gear of 3 set gillnets that are not more than 105 fathoms in aggregate length per permit, unless restricted or closed by emergency order.

Other management plans affecting Susitna River sockeye salmon and their conservation remained unchanged. Additionally, the department initiated a suite of research projects to better understand the errors associated with sonar enumeration and catchability of different species in fish wheels, lake productivity, and historical harvested stock compositions.

Since establishment of the Susitna River sockeye salmon stock of concern status, the sonar-based Yentna River sustainable escapement goal was eliminated and replaced with three Susitna River weir-based sustainable escapement goals, for Chelatna Lake (Yentna River), Judd Lake (Yentna River), and Larson Lake (Susitna mainstem) (Fair et al. 2009). The new escapement goals were in effect during the 2009 and 2010 salmon runs. The Chelatna Lake escapement goal is 20,000–60,000; escapement in 2009 was below the goal range, but within the range in 2010. The Judd Lake escapement goal is 25,000–55,000; escapement in 2009 was within the goal range, but below it in 2010. The Larson Lake escapement goal is 15,000–50,000; 2009 and 2010 escapements were within the goal range.

In the Central District drift fishery, Susitna median yield estimates in 2008–2010 were 82% of those from 2003–2007, and about one-half of those from 1983–2002 and 1993–2002, the two time periods to which recent (2003–2007) yields were compared to when determining the stock of “yield” concern in February 2008. In the Northern District salmon fishery, the 2008–2010 median yield estimates were about two times larger than the periods 1993–2002 and 2003–2007, but only 32% of yields from 1983–2002.

Given that 1) the new Susitna River escapement goals have only been active for two years, 2) two of the escapements have been below the minimum goal, 3) harvests in Central and Northern districts in 2009 and 2010 were generally less than long-term averages, and that 4) many research studies are ongoing, we recommend that Susitna River sockeye salmon maintain their classification as a stock of yield concern.

**C-5 GOA Chinook salmon bycatch
Council motion**

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

Problem statement:

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

Alternatives for expedited review and rule making:

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

Alternative 1: Status quo.

Alternative 2: Chinook salmon PSC limit and increased monitoring.

Component 1: 30,000 Chinook salmon PSC limit (hard cap).

Option: Apportion limit between Central and Western GOA

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

Component 2: Expanded observer coverage.

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

Alternative 3: Mandatory salmon bycatch control cooperative membership.

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

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

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

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

- Minimum number of licenses required to promote meaningful exchange of information and cooperation to avoid bycatch under the current directed fishery management structure. (Minimum threshold for cooperative formation should be set to ensure all eligible licenses have a reasonable opportunity to participate).
- Options to ensure participants outside of a bycatch control cooperative would be subject to regulatory bycatch controls if it is determined mandatory cooperative membership is not possible.
- Appropriate contract elements and reporting requirements.

Alternatives for regular review and rule making track:

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

Alternative 1: Status quo.

Alternative 2: 10,000 Chinook salmon PSC limit (hard cap).

Option 1: Apportion limit between Central and Western GOA.

Option 2: Apportion limit by directed fishery.

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

Alternative 3: Mandatory salmon bycatch control cooperative membership.

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

Cooperative contractual agreements would include measures to control Chinook salmon bycatch, promote gear innovation, salmon hotspot reporting, and monitoring individual vessel bycatch

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

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

Alternative 4: Full retention of salmon.

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

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

The Council also requests staff to provide the following:

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

Bycatch kings upset sport fishermen

CONTROVERSY: 59,000 were caught unintentionally by pollock trawlers.

By MIKE CAMPBELL
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(11/09/10 10:30:44)

Some sport fishermen are seething after a report last month showed more than 59,000 king salmon in the Gulf of Alaska were taken by pollock boats and other commercial fishermen this year.

"There's a feeling of frustration among most recreational anglers," said Chris Fiala, owner of Kodiak Island Charters and a Kodiak resident since 1985. "The king salmon is huge because it's our wonder fish. It's our, marlin; it's the fish that really signifies Alaska.

"You can't have too many king salmon. The fact that they're diminishing fast is really frightening to our state."

How many kings is 59,000? Nearly as many kings as returned all last year to the Kenai River, the biggest return in Southcentral Alaska.

Exactly where those fish were headed before trawlers scooped them from the sea is unclear. By law, the dead kings must be thrown back.

That prevents pollock fishermen from profiting from the bycatch. But it also prevents fisheries managers from determining exactly where the fish were headed, something that genetic sampling could help decipher.

"That could open up a huge Pandora's box, if the fish come from, say, the Columbia River or the Sacramento River," said Kodiak commercial fisherman Pete Thompson, referring to two endangered Lower 48 populations.

What is known is that many Alaska king salmon sport fisheries are suffering these days. Among them:

- The early Kenai River run is down 43 percent since 2006.
- The Deshka River return, while on the rebound, is still down 51 percent from a robust 2005 run.
- Both the Karluk (down 61 percent) and Ayakulik (down 80 percent) rivers on Kodiak Island have dropped precipitously and were shuttered to anglers last summer in an effort to rebuild them.
- Alaska's biggest king run, to the Nushagak River in southwest Alaska, cratered last year, down 80 percent in just five years.

Josh Keaton, a fisheries manager with the National Marine Fisheries Service, said 59,000 is the highest bycatch number since monitoring began in 1992. Federal observers work on only about a third of the commercial vessels. Projections are used for boats without observers.

"This is something the (NMFS Management) Council has been looking toward addressing," Keaton said. "The council needs to decide what it's going to do."

The council is an 11-member group, with six members from Alaska, three from Washington, one from Oregon and one federal representative. It has jurisdiction over 900,000 square miles of ocean from 3 to 200 miles off Alaska's shoreline, with responsibility for managing cod, pollock, flatfish, mackerel, sablefish and rockfish species harvested by commercial trawlers, longliners and pot fishermen.

On Dec. 6, the council will meet at the Hilton Anchorage Hotel. Gulf of Alaska king salmon bycatch is on the agenda.

A month later, the state fish board plans to meet in Kodiak.

"I expect that (king salmon bycatch) will get a little bit of air time," said Matt Miller, regional sport fish management biologist for Fish and Game.

"That (59,000) looks like a big number, but you have to look at the bigger picture. One year just taken on its own doesn't necessarily paint a full picture."

From a bycatch of 40,320 Gulf of Alaska kings caught in 2007, the number had declined sharply to 15,299 in 2008 and just 7,714 last year.

Of the 34 commercial pollock boats reporting king salmon to the National Marine Fisheries Service this season, only three -- Sea Storm, Sea Mac and Michelle Renee -- tallied more than 1,000 kings.

The latter had the most, 3,419-- with 2,606 coming on Oct. 9.

Much of this year's bycatch was caught at the end of the season in the western Gulf of Alaska.

"Hopefully," Keaton told the Kodiak Daily Mirror, "it means a lot of kings are out there to be caught, and they ran into a big pack of them."

Kodiak commercial fisherman Oliver Holm said the most effective remedy would be to not fish pollock during the fall.

"Apparently," he said, "kings are mixed in more with the pollock then."

And the pollock fishery is huge, with millions of fish taken in the Gulf of Alaska compared to just tens of thousands of kings during a good year.

Complicating the management challenges is the fact kings appear to roam widely up and down the Pacific Coast.

"They're highly migratory," said Fiala, 60, a member of the Kodiak Fisheries Advisory Committee. "They wander all around the ocean and nobody really knows what their life is like out there."

Most often, juvenile kings are the ones mixed in with pollock.

"They're right out there with pollock, feeding on sand lance. It's really hard to predict where and when they'll show up. It's a crap shoot."

Kevin Delaney, the former director of sport fishing at the Alaska Department of Fish and Game who

now works for Kenai River Sportfishing, expects a clamor for action as the December meeting approaches.

"I'm convinced there's going to be a loud cry for a thorough assessment of those high-sea catches, and I'd expect some pretty severe restrictions," he said. "Times like this bring out the best in Alaska fisheries management."

Perhaps it's no wonder that concern about kings is growing. Even though king salmon population numbers pale beside pollock, each fish is worth far more.

"I made \$1,000 for every king salmon I caught last year," Fiala said. "It's a big lure to visitors, so if I lose that lure, I'm in trouble. I live here, and that money stays in Kodiak."

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