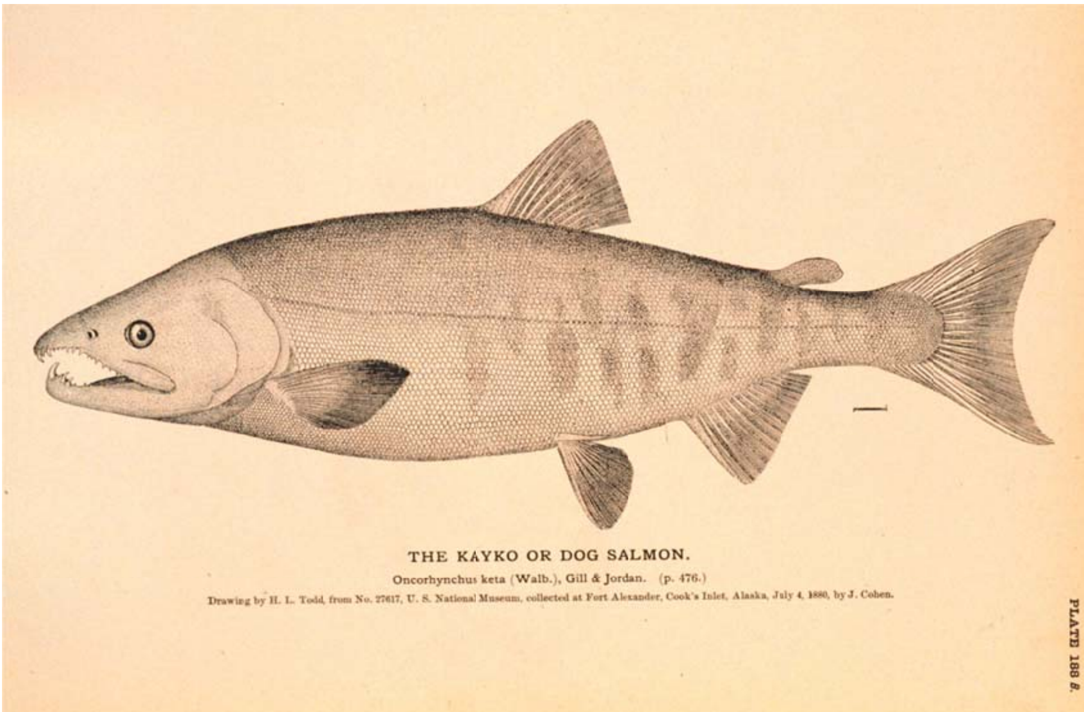
Bering Sea Non-Chinook Salmon Bycatch Management

Preliminary Draft Environmental Assessment



North Pacific Fishery Management Council

United States Department of Commerce
National Oceanic and Atmospheric Administration
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1 Introduction

This Environmental Assessment (EA) provides decision-makers and the public with an evaluation of the predicted environmental effects of alternative measures to minimize chum salmon bycatch in the Bering Sea pollock fishery. The Regulatory Impact Review (RIR), provides decision-makers and the public with an evaluation of the social and economic effects of these alternatives to addresses the requirements of Executive Order 12866, Executive Order 12898, and other applicable federal law. The EA/RIR served as the central decision-making document for the Council to recommend changes in management via an Amendment to the Bering Sea Groundfish FMP to the Secretary of Commerce. The EA and RIR are intended to serve as the central decision-making documents for the Secretary of Commerce to approve, disapprove, or partially approve an amendment, and for the National Marine Fisheries Service (NMFS or NOAA Fisheries) to implement this amendment through federal regulations. This EA complies with the National Environmental Policy Act (NEPA). The RIR addresses the requirements of Executive Order 12866 and Executive Order 12898.

The Council has not yet developed a problem statement specifically for the chum bycatch management measures. The following problem statement was developed for the action on Bering Sea Chinook salmon bycatch management:

> *An effective approach to salmon prohibited species bycatch reduction in the Bering Sea pollock trawl fishery is needed. Current information suggests these harvests include stocks from Asia, Alaska, Yukon, British Columbia, and lower-48 origin. Chinook salmon are a high-value species extremely important to western Alaskan village commercial and subsistence fishermen and also provide remote trophy sport fishing opportunities. Other salmon (primarily made up of chum salmon) harvested as bycatch in the Bering Sea pollock trawl fishery also serve an important role in Alaska subsistence fisheries. However, in response to low salmon runs, the State of Alaska has been forced to close or greatly reduce some commercial, subsistence and sport fisheries in western Alaska. Reasons for reductions in the number of Chinook salmon returning to spawn in western Alaska rivers and the Canadian portion of the Yukon River drainage are uncertain, but recent increases in Bering Sea bycatch may be a contributing factor.*
>
> *Conservation concerns acknowledged by the Council during the development of the Salmon Savings Areas have not been resolved. Continually increasing Chinook salmon bycatch indicates the VRHS [Voluntary Rolling Hotspot System] under the salmon bycatch intercooperative agreement approach is not yet sufficient on its own to stabilize, much less, reduce the total bycatch. Hard caps, area closures, and/or other measures may be needed to reduce salmon bycatch to the extent practicable under National Standard 9 of the MSA [Magnuson-Stevens Act]. We recognize the MSA requires use of the best scientific information available. The Council intends to develop an adaptive management approach which incorporates new and better information as it becomes available. Salmon bycatch must be reduced to address the Council's concerns for those living in rural areas who depend on local fisheries for their sustenance and livelihood and to contribute towards efforts to reduce bycatch of Yukon River salmon under the U.S./Canada Yukon River Agreement obligations. The Council is also aware of the contribution that the pollock fishery makes in the way of food production and economic activity for the country as well as for the State of Alaska and the coastal communities that participate in the CDQ [Community Development Quota] program; and the need to balance tensions between National Standard 1 to achieve optimum yield from the fishery and National Standard 9 to reduce bycatch.*

1.1 What is this Action?

The proposed action is to implement new management measures to minimize chum salmon bycatch in the Bering Sea pollock fishery. This EA analyzes alternative ways to manage chum salmon bycatch, including replacing the current Chum Salmon Savings Areas and voluntary rolling hotspot system intercooperative agreement (VHRS ICA) in the Bering Sea with salmon bycatch limits or new regulatory closures based on current salmon bycatch information. The alternatives represent a range of bycatch management measures for analysis that assist the decision-makers and the public in determining the best alternative to meet the purpose and need for the action. The alternatives meet the purpose and need by presenting different ways to minimize chum salmon bycatch in the Bering Sea pollock fishery to the extent practicable while achieving optimum yield.

1.2 Purpose and Need for this Action

The purpose of chum salmon bycatch management in the Bering Sea pollock fishery is to minimize chum salmon bycatch to the extent practicable, while achieving optimum yield. Minimizing chum salmon bycatch while achieving optimum yield is necessary to maintain a healthy marine ecosystem, ensure long-term conservation and abundance of chum salmon, provide maximum benefit to fishermen and communities that depend on chum salmon and pollock resources, and comply with the Magnuson-Stevens Act and other applicable federal law. National Standard 9 of the Magnuson-Stevens Act requires that conservation and management measures shall, to the extent practicable, minimize bycatch.

National Standard 1 of the Magnuson-Stevens Act requires that conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry. Section 3(33) of the MSA defines optimum yield to mean “the amount of fish which . . . (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; [and] (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor . . . .” NMFS has established in regulations at 50 C.F.R. § 679.20(a)(1)(i) that the optimum yield for the Bering Sea Aleutian Island Management area is a range from 1.4 to 2.0 million metric tons (mt).

The BSAI FMP defines total allowable catch is the annual harvest limit for a stock or stock complex, derived from the acceptable biological catch by considering social and economic factors. NMFS’s regulations at 50 C.F.R. § 679.20(a)(2) provide that the sum of the TACs so specified must be within the optimum yield range. The BSAI FMP provides further elaboration of the differences among optimum yield (OY), acceptable biological catch (ABC) and total allowable catch (TAC):

> In addition to definitional differences, OY differs from ABC and TAC in two practical respects. First, ABC and TAC are specified for each stock or stock complex within the “target species” and “other species” categories, whereas OY is specified for the groundfish fishery (comprising target species and other species categories) as a whole. Second, ABCs and TACs are specified annually whereas the OY range is constant. The sum of the stock-specific ABCs may fall within or outside of the OY range. If the sum of annual TACs falls outside the OY range, TACs must be adjusted or the FMP amended (BSAI FMP at 13).

Recognizing that salmon bycatch management measures precluding the pollock fishery from harvesting its entire TAC for any given year are not determinative of whether the BSAI groundfish fishery achieves optimum yield, providing the opportunity for the fleet to harvest the TAC in any given year is one aspect of achieving optimum yield in the long term.

For catch accounting and PSC limits 4 species of salmon (Sockeye, Coho, Pink and Chum) are aggregated into an ‘other salmon’ or non-Chinook salmon species category. Chum salmon comprises over 99.6% of the total catch in this category (Table 1-1).

Table 1-1. Composition of non-Chinook salmon by species from 2001-2007.

Year	sockeye	coho	pink	chum	Total	% chum
2001	12	173	9	51,001	51,195	99.6%
2002	2	80	43	66,244	66,369	99.8%
2003	29	24	72	138,772	138,897	99.9%
2004	13	139	107	352,780	353,039	99.9%
2005	11	28	134	505,801	505,974	100.0%
2006	11	34	235	221,965	222,245	99.9%
2007	3	139	39	75,249	75,430	99.8%

*source NMFS catch accounting, extrapolated from sampled hauls only

The majority of non-Chinook bycatch in the Bering Sea occurs in the pollock fishery. Historically, the contribution of non-Chinook bycatch from the pollock trawl fishery has ranged from a low of 88% of all bycatch to a high of >99.5% in 1993. Since 2002 bycatch of non-Chinook salmon in the pollock fishery has comprised over 95% of the total. Total catch of non-Chinook salmon in the pollock fishery reached an historic high in 2005 at 704,586 fish (Table 1-2). Bycatch of non-Chinook salmon in this fishery occurs almost exclusively in the B season. Previously the historic high was 242,000 in 1993 (prompting previous Council action to enact the Chum SSA). In recent years bycatch levels for chum salmon have been much lower than levels seen between 2003-2006, and in 2010 bycatch was approximately 13,000 fish.

Table 1-2. Non-Chinook (chum) salmon mortality in BSAI pollock directed fisheries 1991-2010. Note 2010 updated 1/14/11.

Year	Annual with CDQ	Annual without CDQ	Annual CDQ only	A season with CDQ	B season with CDQ	A season without CDQ	B season without CDQ	A season CDQ only	B season CDQ only
1991	Na	28,951	na	na	na	2,850	26,101	na	na
1992	Na	40,274	na	na	na	1,951	38,324	na	na
1993	Na	242,191	na	na	na	1,594	240,597	na	na
1994	92,672	81,508	11,165	3,991	88,681	3,682	77,825	309	10,856
1995	19,264	18,678	585	1,708	17,556	1,578	17,100	130	456
1996	77,236	74,977	2,259	222	77,014	177	74,800	45	2,214
1997	65,988	61,759	4,229	2,083	63,904	1,991	59,767	92	4,137
1998	64,042	63,127	915	4,002	60,040	3,914	59,213	88	827
1999	45,172	44,610	562	362	44,810	349	44,261	13	549
2000	58,571	56,867	1,704	213	58,358	148	56,719	65	1,639
2001	57,007	53,904	3,103	2,386	54,621	2,213	51,691	173	2,930
2002	80,782	77,178	3,604	1,377	79,404	1,356	75,821	21	3,583
2003	189,185	180,783	8,402	3,834	185,351	3,597	177,186	237	8,165
2004	440,459	430,271	10,188	422	440,037	395	429,876	27	10,161
2005	704,586	696,876	7,710	595	703,991	563	696,313	32	7,678
2006	309,644	308,430	1,214	1,326	308,318	1,260	307,170	66	1,148
2007	93,786	87,317	6,469	8,523	85,263	7,368	79,949	1,155	5,314
2008	15,142	14,717	425	319	14,823	246	14,471	73	352
2009	46,129	45,179	950	48	46,081	48	45,131	0	950
2010	13,306	12,789	517	48	13,258	48	12,741	0	517

Non-CDQ data for 1991-2002 from bsahalx.dbf Non-CDQ data for 2003-2009 from akfish_v_gg_pscnq_estimate CDQ data for 1992-1997 from bsahalx.dbf
CDQ data for 1998 from boatrate.dbf
CDQ data for 1999-2007 from akfish_v_cdq_catch_report_total_catch
CDQ data for 2008-2009 from akfish_v_gg_pscnq_estimate_cdq
A season - January 1 to June 10
B season - June 11 to December 31

Several management measures are currently used to reduce chum salmon bycatch in the Bering Sea pollock fishery. Chum salmon taken incidentally in groundfish fisheries are classified as prohibited species and, as such, must be either discarded or donated through the Prohibited Species Donation Program. In the mid-1990s, NMFS implemented regulations recommended by the Council to control the bycatch of chum salmon taken in the Bering Sea pollock fishery. These regulations established the chum Salmon Savings Areas and mandated year-round accounting of chum salmon bycatch in the trawl fisheries. The savings area was adopted based on historic observed salmon bycatch rates and was designed to avoid areas with high levels of chum salmon bycatch.

The Chum Salmon Savings Area in the Bering Sea is a time-area closure designed to reduce overall non-Chinook salmon bycatch in the federal groundfish trawl fisheries. This time-area closure was adopted based on historically observed salmon bycatch rates and was designed to avoid areas and times of high non-Chinook salmon bycatch. The Chum Salmon Savings Area is closed to pollock fishing from August 1 through August 31 of each year. Additionally, if the prohibited species catch limit of 42,000 non-Chinook salmon are caught by vessels using trawl gear in the Catcher Vessel Operational Area during the period August 15 through October 14, the Chum Salmon Savings Area remains closed to directed fishing for pollock for the remainder of the calendar year.

The Council started considering revisions to salmon bycatch management in 2004, when information from the fishing fleet indicated that it was experiencing increases in Chinook and chum salmon bycatch following the regulatory closure of the Chinook Salmon Savings Areas. This indicated that, contrary to the original intent of the savings area closures, Chinook and chum salmon bycatch rates appeared to be higher outside of the savings area than inside the area. While, upon closure, the non-CDQ fleet could no longer fish inside the Chinook and Chum Salmon Savings Area, vessels fishing on behalf of the CDQ groups were still able to fish inside the area because the CDQ groups had not yet reached their portion of the Chinook salmon prohibited species catch limit. Much higher salmon bycatch rates were reportedly encountered outside of the closure areas by the non-CDQ fleet than experienced by the CDQ vessels fishing inside. Further, the closure areas increased costs to the pollock fleet and processors.

To address this problem, the Council examined other means that were more flexible and adaptive to minimize salmon bycatch. The Council developed and recommended Amendment 84 to the BSAI FMP to implement in federal regulations the VRHS ICA and an exemption to the Chinook and Chum Salmon Savings Areas for vessels that participated in the VRHS ICA. In 2002, participants in the pollock fleet started the VRHS ICA for Chinook and Chum salmon. The exemption to area closures for the VRHS ICA was first implemented through an exempted fishing permit in 2006 and 2007 subsequently, in 2008, through Amendment 84 to the BSAI FMP. The VRHS ICA was intended to increase the ability of pollock fishery participants to minimize salmon bycatch by giving them more flexibility to move fishing operations to avoid areas where they experience high rates of salmon bycatch.

The Council took separate action to minimize Chinook salmon bycatch in the Bering Sea pollock fishery under Amendment 91 to the BSAI Groundfish FMP. This management program implements sector and seasonal caps on the pollock fishery. The fishery will operate under the regulations to implement Amendment 91 beginning in January 2011. Additional information on Amendment 91 and management and monitoring modifications as a result of this program are contained in Chapter 2.

The Council is now considering separate management actions to minimize bycatch of chum salmon in the Bering Sea pollock fishery.

1.3 The Action Area

The action area effectively covers the Bering Sea management area in the exclusive economic zone (EEZ), an area extending from 3 nm from the State of Alaska’s coastline seaward to 200 nm (4.8 km to 320 km). The Bering Sea EEZ has a southern boundary at 55° N. latitude from 170° W. longitude to the U.S.-Russian Convention line of 1867, a western boundary of the U.S.-Russian Convention Line of 1867, and a northern boundary at the Bering Strait, defined as a straight line from Cape Prince of Wales to Cape Dezhneva, Russia.

Impacts of the action may also occur outside the action area in the freshwater origins of the chum salmon caught as bycatch and in the chum salmon migration routes between their streams of origin and the Bering Sea. Chum salmon caught as bycatch in the Bering Sea pollock fishery may originate from Asia, Alaska, Canada, or the western United States.

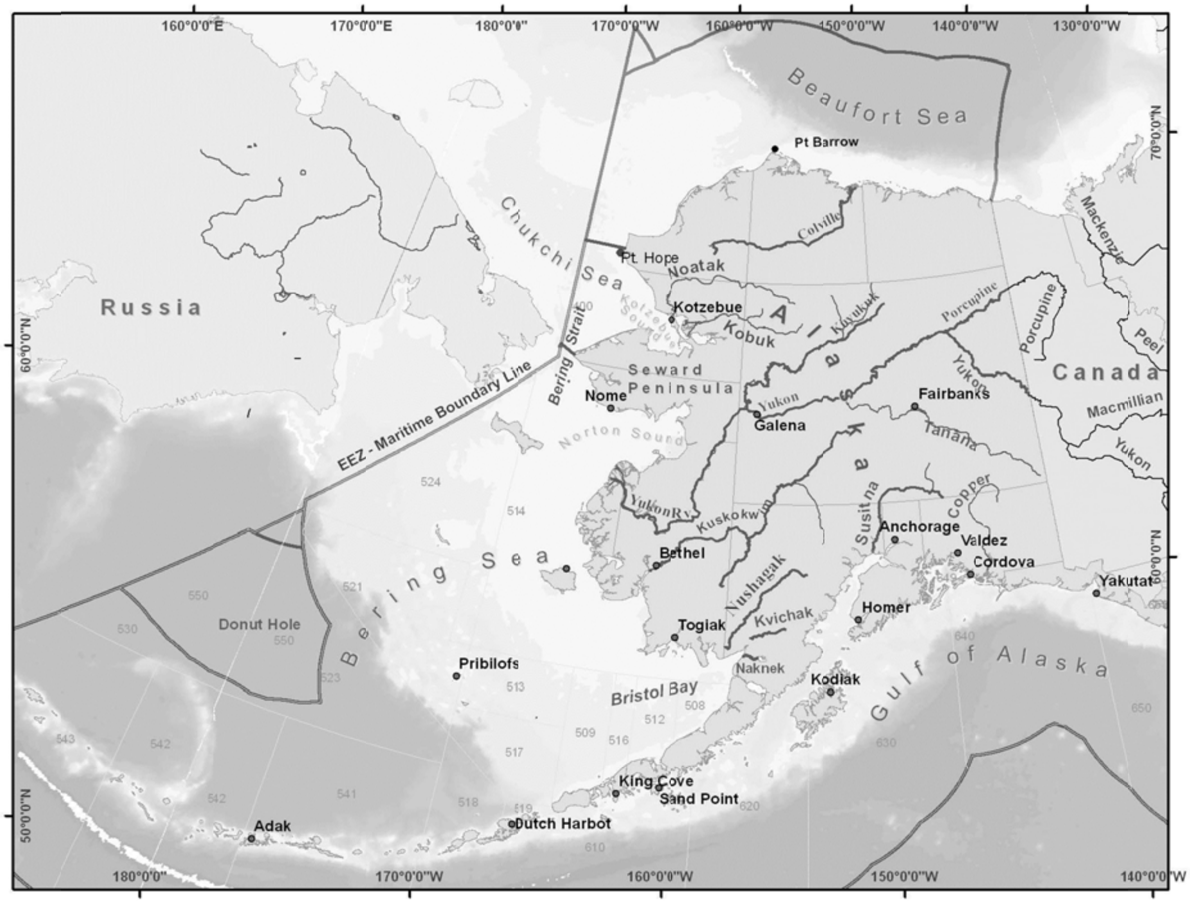


Figure 1-1 Map of the Bering Sea and major connected salmon producing rivers in Alaska and Northwest Canada

A comprehensive description of the action area is contained in previous EISs prepared for North Pacific fishery management actions. The description of the affected environment is incorporated by reference from Chapter 3 of the Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries (PSEIS, NMFS 2004) and Chapter 3 of the Final Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska (EFH EIS, NMFS 2005a). These documents contain extensive information on the fishery management areas, marine resources, habitat, ecosystem, social, and economic parameters of the pollock fishery. Both of these public documents are available on the NMFS Alaska Region website.[1]

A large body of information exists on the life histories and general distribution of salmon in Alaska. The locations of many freshwater habitats used by salmon are described in documents organized and maintained

[1] http://alaskafisheries.noaa.gov/

by the Alaska Department of Fish & Game (ADF&G). Alaska Statute 16.05.871 requires ADF&G to specify the various streams that are important for spawning, rearing, or migration of anadromous fishes. This is accomplished through the *Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes* (ADF&G 1998a) which lists water bodies documented to be used by anadromous fish, and the *Atlas to the Catalog of Waters Important for Spawning, Returning or Migration of Anadromous Fishes* (ADF&G 1998b), which shows locations of these waters and the species and life stages that use them. Additional information on salmon streams is available from the ADF&G website.[2]

1.4 The Bering Sea pollock fishery

Pollock is a commercially targeted species distributed in the North Pacific from Central California to the southern Sea of Japan. Currently, this species comprises a major portion of the BSAI finfish biomass and supports the largest single species fishery in the U.S. EEZ. The economic character of the fishery centers on the products produced from pollock: roe (eggs), surimi, and fillet products. In 2007, the total first wholesale gross value of retained pollock was estimated to be $1.248 billion. In 2008, the total value of pollock increased to an estimated $1.415 billion.

Within the BSAI management area, pollock is managed as three separate stocks: the Eastern Bering Sea, the Aleutian Islands region stock, and the Aleutian Basin or Bogoslof stock. The largest of these stocks, the Eastern Bering Sea stock, is the primary target of the pollock fishery. Since 1977, average annual catch of pollock in the Bering Sea has been 1.2 million tons while reaching a peak of catch of nearly 1.5 million tons in 2006.

Until 1998, the Bering Sea pollock fishery was managed as an open access fishery, commonly characterized as a “race for fish.” In 1998, however, Congress enacted the American Fisheries Act (AFA) to rationalize the fishery by limiting participation and allocating specific percentages of the Bering Sea directed pollock fishery total allowable catch (TAC) among the competing sectors of the fishery.

Sections 206(a) and (b) of the AFA establish the allocation of the Bering Sea pollock TAC among four AFA sectors. First, 10% of the Bering Sea pollock TAC is allocated to the CDQ Program. Then, NMFS reduces the remainder of the TAC by an amount of pollock that will be harvested as incidental catch in the non-pollock fisheries. In 2009, the incidental catch allowance for Bering Sea pollock was 29,340 mt. The remaining amount, after subtraction of the CDQ allocation and the incidental catch allowance, is called the directed fishing allowance. As required under the AFA, NMFS then allocates the directed fishing allowance among the three remaining AFA sectors (the “non-CDQ sectors”): 50% to the inshore catcher vessel (CV), 40% to the offshore catcher processor (CP), and 10% to the mothership sector (MS). Because the percentage of the TAC allocated to each of the four AFA sectors is specified in the AFA, transfer of pollock among the sectors is not allowed.

Pollock allocations to the AFA sectors are further divided into two seasons – 40% to the A season (January 20 to June 10) and the 60% to the B season (June 10 to November 1). NMFS may add any under harvest of a sector’s A season pollock allowance to the subsequent B season allowance. Typically, the fleet targets roe – bearing females in the A season and harvests the A season TAC by early April. The B season fishery focuses on pollock for filet and surimi markets and the fleet harvests most the B season TAC in September and October.

In addition to the required sector level allocations of pollock, the AFA allowed for the development of pollock industry cooperatives. Ten such cooperatives were developed as a result of the AFA: seven inshore cooperatives, two offshore cooperatives, and one mothership cooperative. These cooperatives are described below in more detail. All cooperatives are required to submit preliminary and final annual written reports on

[2] http://www.state.ak.us/adfg/habitat

fishing activity including prohibited species catch (PSC) on an area-by-area and vessel by vessel basis. NMFS and the Council are required by the AFA to release this information to the public.

1.4.1 Community Development Quota Program

The CDQ Program was established by the Council in 1992 to improve the social and economic conditions in western Alaska communities by facilitating their economic participation in the BSAI fisheries. The CDQ Program was developed to redistribute some of the BSAI fisheries' economic benefits to adjacent communities by allocating a portion of commercially important BSAI species including pollock to such communities. Their initial 7.5% allocation of pollock was expanded to 10% with the enactment of the AFA. These allocations are further allocated among the 6 CDQ groups: the Aleutian Pribilof Island Community Development Association (APICDA), the Bristol Bay Economic Development Corporation (BBEDC), the Central Bering Sea Fishermen's Association (CBSFA), the Coastal Villages Region Fund (CVRF), the Norton Sound Economic Development Corporation (NSEDC), and the Yukon Delta Fisheries Development Association (YDFDA). The percentage allocations of pollock among the six CDQ groups were approved by NMFS in 2005 based on recommendations from the State of Alaska. These percentage allocations are now the required allocations of pollock among the CDQ groups under section 305(i)(1)(B) of the Magnuson-Stevens Act. CDQ groups typically sell or lease their Bering Sea pollock allocations to various harvesting partners. The vessels harvesting CDQ pollock are the same vessels conducting AFA non-CDQ pollock harvesting. More detailed information on the CDQ Program is contained in the RIR.

1.4.2 Inshore catcher vessel sector

Each year, catcher vessels eligible to deliver pollock to the seven eligible AFA inshore processors may form cooperatives associated with a particular inshore processor. These catcher vessels are not required to join a cooperative and those that do not join a cooperative are managed by NMFS under the "inshore open access fishery." In recent years, all inshore catcher vessels have joined one of seven inshore cooperatives. Annually, NMFS allocates the inshore sector's allocation of pollock among the inshore cooperatives and, if necessary, the inshore open access fishery. NMFS permits the inshore cooperatives, allocates pollock to them, and manages these allocations through a regulatory prohibition against an inshore cooperative exceeding its pollock allocation.

The inshore CV cooperatives are required to submit copies of their contracts to NMFS annually. These contracts must contain the information required in NMFS regulations, including information about the cooperative structure, vessels that are parties in the contract, and the primary inshore processor that will receive at least 90 percent of the pollock deliveries from these catcher vessels. Each catcher vessel in a cooperative must have an AFA permit with an inshore endorsement, a license limitation program permit authorizing the vessel to engage in trawl fishing for pollock in the Bering Sea, and no sanctions on the AFA or license limitation program permits. Although the contract requirements are governed by NMFS regulations, compliance with the provisions of the contract (primarily the 90 percent processor delivery requirements) are not enforced by NMFS, but are enforced through the private contractual arrangement of the cooperative.

Once an inshore cooperative's contract is approved by NMFS, the cooperative receives an annual pollock allocation based on the catch history of vessels listed in a cooperative contract. The annual pollock allocation for the inshore CV sector is divided up by applying a formula in the regulations which allocates catch to a cooperative or the inshore open access fishery according to the specific sum of the catch history for the vessels in the cooperative or the limited access fishery. Under § 679.62(a)(1), the individual catch history of each vessel is equal to the sum of inshore pollock landings from the vessel's best 2 of the 3 years 1995 through 1997, and includes landings to catcher/processors for vessels that made landings of 500 mt or more to catcher/processors from 1995 through 1997. Each year, fishing permits are issued to the inshore cooperative, with the permit application listing the vessels added or subtracted.

An inshore CV open access fishery could exist if vessels choose not to join a cooperative in a given year. In this case, the inshore CV pollock allocation would be partitioned to allow for an allocation to the limited access fishery. The TAC for the inshore open access fishery is based on the portion of total sector pollock catch associated with the vessels not participating in one of the inshore CV cooperatives.

1.4.3 Offshore catcher/processor cooperatives and mothership cooperatives

Separate allocations of the Bering Sea pollock TAC are made annually to the offshore CP sector and the mothership sector. These sector allocations of pollock are not further subdivided by NMFS among the vessels or companies participating in these sectors. However, through formation of cooperatives and under private contractual arrangement, participants in the offshore CP sector and the mothership sector further subdivide their respective pollock allocations among the participants in their sector. The purpose of these cooperatives is to manage the allocations made under the cooperative agreements to ensure that individual vessels and companies do not harvest more than their agreed upon share. The cooperatives also facilitate transfers of pollock among the cooperative members, enforcement of contract provisions, and participation in the VRHS ICA.

Two fishery cooperatives are authorized by the AFA to form in the offshore CP sector and the offshore catcher vessels sector. A single cooperative may form that includes both CPs and named offshore catcher vessels delivering to CPs, or the CP and CV may form separate cooperatives and enter into an inter-cooperative agreement to govern fishing for pollock in the offshore CP sector. The offshore CP sector elected to form two cooperatives. The Pollock Conservation Cooperative (PCC) was formed in 1999 and is made up of nineteen CPs that divide the sector's overall pollock allocation. The AFA listed 20 eligible CPs by name and also allowed eligibility for any other CP that had harvested more than 2,000 metric tons of pollock in 1997 and was eligible for the license limitation program. One CP, the Ocean Peace, met the requirements for an "unlisted catcher/processor" under the AFA and is part of the offshore CP sector. The Ocean Peace fished for pollock from 1999 through 2001 and again in 2008. Under the requirements of the AFA, unlisted CPs may harvest up to 0.5% of the offshore CP sector's allocation of pollock. The Ocean Peace is not part of the PCC.

The High Seas Catcher Cooperative (HSCC) consists of seven catcher vessels that formerly delivered pollock to CPs. These catcher vessels must either deliver to the PCC or lease their allocation to the PCC. The HSCC has elected to lease its pollock allocation to the PCC.

Mothership catcher vessels have formed a cooperative called the Mothership Fleet Cooperative (MFC). Under the AFA, fishery cooperatives are authorized to form in the mothership sector if at least 80 percent of the mothership sector catcher vessels enter into a fishery cooperative. The three motherships also are eligible to join the cooperative and retain a limited anti-trust exemption under the Fisherman's Collective Marketing Act. The three motherships in this sector have not formed a separate cooperative and are not members of the MFC.

1.5 Public Participation

The EA and RIR are being developed with several opportunities for public participation. This section describes these avenues for public participation.

1.5.1 Scoping

Scoping is an early and open process for determining the scope of issues to be addressed in an EA or EIS and for identifying the significant issues related to the proposed action. A principal objective of scoping and public involvement process is to identify a range of reasonable of management alternatives that will delineate critical issues and provide a clear basis for distinguishing among those alternatives and selecting a preferred alternative. Through the notice of intent, we notified the public that a NEPA analysis and decision-making process for this proposed action has been initiated so that interested or affected people may participate and contribute to the final decision.

Scoping is the term used for involving the public in the NEPA process at its initial stages. Scoping is designed to provide an opportunity for the public, agencies, and other interest groups to provide input on potential issues associated with the proposed action. Scoping is used to identify the environmental issues related to the proposed action and identify alternatives to be considered in the analysis. Scoping is accomplished through written communications and consultations with agency officials, interested members of the public and organizations, Alaska Native representatives, and State and local governments.

The formal scoping period began with the publication of a Notice of Intent in the *Federal Register* on January 8, 2009 (74 FR 798). Public comments were due to NMFS by March 23, 2009. In the Notice of Intent, NMFS requested written comments from the public on the range of alternatives to be analyzed and on the environmental, social, and economic issues to be considered in the analysis. This scoping report summarizes issues and alternatives raised in public comments submitted during this scoping period.

Additionally, members of the public have the opportunity to comment during the Council process. The Council has noticed the public when it is scheduled to discuss non-Chinook salmon bycatch issues. The Council process, which involves regularly scheduled and noticed public Council meetings, ad-hoc industry meetings, and Council committee meetings, started before this formal scoping process and will continue after this formal scoping process is completed.

1.5.2 Summary of Alternatives and Issues Identified During Scoping

NMFS received 4 written comments from the public and interested parties.

1.5.2.1 Alternative management measures identified during scoping

The Council and NMFS will consider the alternatives identified during scoping in the analysis. The Council and NMFS will determine the range of alternatives to be analyzed that best accomplish the proposed action's purpose and need. The analysis describes the alternatives raised during scoping that were considered but not carried forward, and discuss the reasons for their elimination from further detailed study. Comments identified the following alternatives for consideration:

- Analyze a range of hard caps from 50,000 non-Chinook salmon to 400,000 non-Chinook salmon and their likely impacts to Western Alaska.
- The hard cap should be from 70,000 non-Chinook to 77,000 non-Chinook salmon.
- The hard cap should be less than or equal to 70,000 non-Chinook salmon because this amount appears to allow in-river escapement, subsistence harvest consistent with ANILCA, and Canadian border passage goals to be achieved, while providing for traditional in-river commercial fishing opportunities.
- Any pollock fishery management actions aimed at reducing salmon bycatch by altering time, area, and/or fishing methods must be used in conjunction with a hard cap threshold beyond which additional bycatch is prohibited.
- Develop a research and monitoring plan to identify information needed to establish an optimal bycatch level based on improved genetic stock-specific information.

1.5.2.2 Issues identified during scoping

The comments received through the scoping process identified the following issues. To the extent practicable and appropriate, the analysis will take these issues into account.

- NEPA mandates the preparation of an EIS because the proposed chum salmon bycatch measures would be a significant action because they are likely to be controversial and to have substantial environmental, social, and economic impacts.

- The purpose of the proposed action should be to reduce BSAI salmon bycatch to levels which facilitate and provide for healthy returns of in-river fish both in Alaska and the Yukon River in Canada. Healthy returns mean adequate escapement and sufficient opportunity to meet subsistence harvest needs. Healthy returns also would allow for the taking of additional fish for historical non-subsistence harvest and would allow the U.S. to meet its international treaty obligations to Canada.
- Evaluate the impacts of anticipate climate change and how changes to ocean temperatures are impacting oceanic circulation and nutrient flow, and how these changes affect salmon diet, competition, predation, and migration.
- Identifying salmon bycatch stock of origin and age at maturity would assist significantly in understanding the impact of pollock fishery bycatch to in-river salmon returns not only in Alaska but for Pacific Northwest threatened and endangered salmon stocks as well. Collecting samples of salmon from the pollock fishery bycatch could inform non-Chinook salmon management decisions in both marine and in-river fisheries.
- Relying on inaccurate data could make NMFS think there are more fish in the sea than there actually are

1.6 Tribal governments and Alaska Native Claims Settlement Act regional and village corporations

NMFS is obligated to consult and coordinate with Federally recognized tribal governments and Alaska Native Claims Settlement Act (ANCSA) regional and village corporations on a government-to-government basis pursuant to Executive Order 13175, the Executive Memorandum of April 29, 1994, on "Government-to-Government Relations with Native American Tribal Governments," and Section 161 of the Consolidated Appropriations Act of 2004 (P.L. 108-199, 188 Stat. 452), as amended by Section 518 of the Consolidated Appropriations Act of 2005 (P.L. 108-447, 118 Stat. 3267).

As a first step in the consultation process, on January 16, 2009, NMFS mailed letters to approximately 660 Alaska tribal governments, ANCSA corporations, and related organizations providing information about the proposed action and analysis and soliciting consultation and coordination with interested tribal governments and ANCSA corporations. NMFS received 1 comment from a tribal government.

1.7 Cooperating Agencies

The Council for Environmental Quality (CEQ) regulations for implementing the procedural provisions of NEPA emphasize agency cooperation early in the NEPA process. The State of Alaska Department of Fish and Game (ADF&G) is a cooperating agency and has agreed to participate in the development of this analysis and provide data, staff, and review for this analysis. ADF&G has an integral role in the development of this analysis because it manages the commercial salmon fisheries, collects and analyzes salmon biological information, and represents people who live in Western and Interior Alaska.

1.8 Community outreach

One of the Council's policy priorities is to improve communication with and participation by Alaska Native and rural communities in the federal fisheries management process. The Council developed an outreach plan to solicit and obtain input on the proposed action from Alaska Natives, communities, and other affected stakeholders. This outreach effort, specific to chum salmon bycatch management, dovetails with the Council's overall community and Native stakeholder participation policy.

The Council's Rural Community Outreach Committee identified this action as an important project for outreach efforts to rural communities. An outreach plan was developed in late 2009 and is continually refined. The updated version is available here:
http://www.fakr.noaa.gov/npfmc/current_issues/bycatch/ChumOutreach1010.pdf. The outreach plan includes attending several regional meetings in rural Alaska, as well as other meetings, in order to explain the

proposed action, provide preliminary analysis, and receive direct feedback from rural communities prior to the final analysis. The majority of these meetings will occur in early 2011. A summary of verbal comments received during outreach meetings will be provided to the Council in the initial review draft analysis in June 2011.

1.9 Statutory Authority for this Action

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

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

1.10 Relationship of this Action to Federal Laws, Policies, and Treaties

While NEPA is the primary law directing the preparation of this EA, a variety of other federal laws and policies require environmental, economic, and socioeconomic analyses of proposed federal actions. This section addresses the CEQ regulations, at 40 CFR 1502.2(d), that require an EA to state how alternatives considered in it and decisions based on it will or will not achieve the requirements of sections 101 and 102(1) of NEPA and other environmental laws and policies. This EA and RIR contain the required analysis of the proposed federal action and its alternatives to ensure that the action complies with these additional federal laws and executive orders:

- National Environmental Policy Act (NEPA)
- Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act)
- Endangered Species Act (ESA)
- Marine Mammal Protection Act (MMPA)
- Administrative Procedure Act (APA)
- Regulatory Flexibility Act (RFA)
- Information Quality Act (IQA)
- Coastal Zone Management Act (CZMA)
- Alaska National Interest Lands Conservation Act (ANILCA)
- American Fisheries Act (AFA)
- Executive Order 12866: Regulatory planning and review
- Executive Order 13175: Consultation and Coordination with Indian Tribal Governments
- Executive Order 12898: Environmental Justice
- Pacific Salmon Treaty and the Yukon River Agreement

The following provides details on the laws and executive orders directing this analysis. None of the alternatives under consideration threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

1.10.1 National Environmental Policy Act

NEPA establishes our national environmental policy, provides an interdisciplinary framework for environmental planning by federal agencies, and contains action-forcing procedures to ensure that federal decision-makers take environmental factors into account. NEPA does not require that the most environmentally desirable alternative be chosen, but does require that the environmental effects of all the alternatives be analyzed equally for the benefit of decision-makers and the public.

NEPA has two principal purposes:

1. To require federal agencies to evaluate the potential environmental effects of any major planned federal action, ensuring that public officials make well-informed decisions about the potential impacts.

2. To promote public awareness of potential impacts at the earliest planning stages of major federal actions by requiring federal agencies to prepare a detailed environmental evaluation for any major federal action significantly affecting the quality of the human environment.

NEPA requires an assessment of the biological, social, and economic consequences of fisheries management alternatives and provides that members of the public have an opportunity to participate in the decision-making process. In short, NEPA ensures that environmental information is available to government officials and the public before decisions are made and actions are taken.

Title II, Section 202 of NEPA (42 U.S.C. 4342) created the CEQ. The CEQ is responsible for, among other things, the development and oversight of regulations and procedures implementing NEPA. The CEQ regulations provide guidance for federal agencies regarding NEPA's requirements (40 CFR Part 1500) and require agencies to identify processes for issue scoping, for the consideration of alternatives, for developing evaluation procedures, for involving the public and reviewing public input, and for coordinating with other agencies—all of which are applicable to the Council's development of FMPs.

NOAA Administrative Order 216-6 describes NOAA's policies, requirements, and procedures for complying with NEPA and the implementing regulations issued by the CEQ. This Administrative Order provides comprehensive and specific procedural guidance to NMFS and the Council for preparing and adopting FMPs.

Federal fishery management actions subject to NEPA requirements include the approval of FMPs, FMP amendments, and regulations implementing FMPs. Such approval requires preparation of the appropriate NEPA analysis (Categorical Exclusion, Environmental Assessment, or EIS).

1.10.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Act authorizes the U.S. to manage its fishery resources in the EEZ. The management of these marine resources is vested in the Secretary and in regional fishery management councils. In the Alaska Region, the Council is responsible for preparing FMPs for marine fishery resources requiring conservation and management. NMFS is charged with carrying out the federal mandates with regard to marine fish. The NMFS Alaska Region and Alaska Fisheries Science Center research, draft, and review the management actions recommended by the Council. The Magnuson-Stevens Act established the required and discretionary provisions of an FMP and created ten National Standards to ensure that any FMP or FMP amendment is consistent with the Act

The Magnuson-Stevens Act emphasizes the need to protect fish habitat. Under the law, the Council has amended its FMPs to identify essential fish habitat (EFH). For any actions that may adversely impact EFH, the Magnuson-Stevens Act requires NMFS to provide recommendations to federal and state agencies for conserving and enhancing EFH. In line with NMFS policy of blending EFH assessments into existing environmental reviews, NMFS intends the analysis contained in Chapter 8 of this EIS to also serve as an EFH assessment.

The actions under examination in the EA and RIR are chum salmon bycatch minimization measures for the Bering Sea pollock fishery. While each FMP amendment must be comply with all ten national standards, National Standards 1 and 9 are directly guide the proposed action. National Standard 9 of the Magnuson-Stevens Act requires that conservation and management measures shall, to the extent practicable, minimize bycatch. National Standard 1 of the Magnuson-Stevens Act requires that conservation and management measures prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

1.10.3 Endangered Species Act (ESA)

The ESA is designed to conserve endangered and threatened species of fish, wildlife, and plants. The ESA is administered jointly by NMFS and the USFWS. With some exceptions, NMFS oversees cetaceans, seals and sea lions, marine and anadromous fish species, and marine plant species. USFWS oversees walrus, sea otter, seabird species, and terrestrial and freshwater wildlife and plant species.

The listing of a species as threatened or endangered is based on the biological health of that species. Threatened species are those likely to become endangered in the foreseeable future (16 U.S.C. 1532(20)). Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range (16 U.S.C. 1532(6)). Species can be listed as endangered without first being listed as threatened.

Currently, with the listing of a species under the ESA, the critical habitat of the species must be designated to the maximum extent prudent and determinable (16 U.S.C. 1533(b)(6)(C)). The ESA defines critical habitat as those specific areas that are essential to the conservation of a listed species and that may be in need of special consideration. Federal agencies are prohibited from undertaking actions that destroy or adversely modify designated critical habitat.

Federal agencies have a mandate to conserve listed species and federal actions, activities or authorizations (hereafter referred to as federal actions) must be in compliance with the provisions of the ESA. Section 7 of the ESA provides a mechanism for consultation by the federal action agency with the appropriate expert agency (NMFS or USFWS). Informal consultations are conducted for federal actions that have no adverse affects on the listed species. The action agency can prepare a biological assessment to determine if the proposed action would adversely affect listed species or modify critical habitat. The biological assessment contains an analysis based on biological studies of the likely effects of the proposed action on the species or habitat.

Formal consultations, resulting in biological opinions, are conducted for federal actions that may have an adverse affect on the listed species. Through the biological opinion, a determination is made about whether the proposed action poses “jeopardy” or “no jeopardy” of extinction or adverse modification or destruction of designated critical habitat for the listed species. If the determination is that the proposed or on-going action will cause jeopardy or adverse modification of critical habitat, reasonable and prudent alternatives may be suggested which, if implemented, would modify the action to no longer pose the jeopardy of extinction or adverse modification to critical habitat for the listed species. These reasonable and prudent alternatives must be incorporated into the federal action if it is to proceed. A biological opinion with the conclusion of no jeopardy or adverse modification of critical habitat may contain conservation recommendations intended to further reduce the negative impacts to the listed species. These recommendations are advisory to the action agency (50 CFR 402.14(j)). If the likelihood exists of any take[3] occurring during promulgation of the action, an incidental take statement may be appended to a biological opinion to provide for the amount of take that is expected to occur from normal promulgation of the action. An incidental take statement is not the equivalent of a permit to take a listed species.

[3] The term “take” under the ESA means “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct” (16 U.S.C. § 1532(19)).

This EA contains pertinent information on the ESA-listed species that occur in the action area and that have been identified in previous consultations as potentially impacted by the Bering Sea pollock fishery. Analysis of the impacts of the alternatives is in the chapters addressing those resource components.

1.10.4 Marine Mammal Protection Act (MMPA)

Under the MMPA, NMFS has a responsibility to conserve marine mammals, specifically cetaceans and pinnipeds (other than walrus). The USFWS is responsible for sea otter, walrus, and polar bear. Congress found that certain species and stocks of marine mammals are or may be in danger of extinction or depletion due to human activities. Congress also declared that marine mammals are resources of great international significance.

The primary management objective of the MMPA is to maintain the health and stability of the marine ecosystem, with a goal of obtaining an optimum sustainable population of marine mammals within the carrying capacity of the habitat. The MMPA is intended to work in concert with the provisions of the ESA. The Secretary is required to give full consideration to all factors regarding regulations applicable to the "take" of marine mammals, including the conservation, development, and utilization of fishery resources, and the economic and technological feasibility of implementing the regulations. If a fishery affects a marine mammal population, the Council or NMFS may be requested to consider measures to mitigate adverse impacts. This EA analyzes the potential impacts of the pollock fishery and changes to the fishery under the alternatives on marine mammals.

1.10.5 Administrative Procedure Act (APA)

The APA requires federal agencies to notify the public before rule making and provide an opportunity to comment on proposed rules. General notice of proposed rule making must be published in the *Federal Register*, unless persons subject to the rule have actual notice of the rule. Proposed rules published in the *Federal Register* must include reference to the legal authority under which the rule is proposed and explain the nature of the proposal including a description of the proposed action, why it is being proposed, its intended effect, and any relevant regulatory history that provides the public with a well-informed basis for understanding and commenting on the proposal. The APA does not specify how much time the public must be given for prior notice and opportunity to comment; however, Section 304 (b) of the Magnuson-Stevens Act provides that proposed regulations that implement an FMP or FMP amendment, or that modify existing regulations, must have a public comment period of 15 to 60 days.

After the end of a comment period, the APA requires that comments received be summarized and responded to in the final rule notice. Further, the APA requires that the effective date of a final rule is no less than 30 days after its publication in the *Federal Register*. This delayed effectiveness, or "cooling off" period, is intended to give the affected public time to become aware of, and prepared to comply with the requirements of the rule. For fishery management regulations, the primary effect of the APA, in combination with the Magnuson-Stevens Act, NEPA, and other statutes, is to allow for public participation and input into the development of FMPs, FMP amendments, and regulations implementing FMPs. Regulations implementing the proposed salmon bycatch reduction measures will be published in the *Federal Register* in accordance with the APA and the Magnuson-Stevens Act.

1.10.6 Regulatory Flexibility Act (RFA)

The RFA requires federal agencies to consider the economic impact of their regulatory proposals on directly regulated small entities, analyze alternatives that minimize adverse economic impacts on this class of small entities, and make their analyses available for public comment. The RFA applies to a wide range of small entities, including small businesses, not-for-profit organizations, and small governmental jurisdictions. The Small Business Administration has established size criteria for all major industry sectors in the United States, including fish harvesting and fish processing businesses.

The RFA applies to any regulatory actions for which prior notice and comment is required under the APA. After an agency begins regulatory development and determines that the RFA applies, unless an agency can certify that an action subject to the RFA will not have a significant economic impact on a substantial number of small entities, the agency must prepare an initial regulatory flexibility analysis (IRFA) to accompany a proposed rule. Based upon the IRFA, and received public comment, assuming it is still not possible to certify, the agency must prepare a final regulatory flexibility analysis (FRFA) to accompany the final rule. NMFS has published revised guidelines, dated August 16, 2000, for RFA analyses; they include criteria for determining if the action would have a significant impact on a substantial number of small entities.

The Analysis contains a draft IRFA that identifies the small entities directly regulated by the proposed action. The preamble to the proposed regulations that will be published in the *Federal Register* will contain the IRFA that evaluates the adverse impacts of this action on directly regulated small entities, in compliance with the RFA.

1.10.7 Information Quality Act (IQA)

The IQA directs the OMB to issue government-wide policy and procedural guidance to all federal agencies to ensure and maximize the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by federal agencies. The OMB's guidelines require agencies to develop their own guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information disseminated by the agency. NOAA published its guidelines in September 2002.[4] Pursuant to the IQA and the NOAA guidelines, this information product has undergone a pre-dissemination review by NMFS, completed on November 30, 2009.

1.10.8 Coastal Zone Management Act (CZMA)

The CZMA is designed to encourage and assist states in developing coastal management programs, to coordinate State activities, and to safeguard regional and national interests in the coastal zone. Section 307(C) of the CZMA requires that any federal activity affecting the land or water or uses natural resources of a state's coastal zone be consistent with the state's approved coastal management program, to the maximum extent practicable.

A proposed fishery management action that requires an FMP amendment or implementing regulations must be assessed to determine whether it directly affects the coastal zone of a state with an approved coastal zone management program. If so, NMFS must provide the state agency having coastal zone management responsibility with a consistency determination for review at least 90 days before final action. Prior to implementation of the proposed action, NMFS will determine whether this action is consistent to the maximum extent practicable with the enforceable policies of the approved coastal management program of the State of Alaska and submit this determination for review by the responsible state agency.

1.10.9 Alaska National Interest Lands Conservation Act (ANILCA)

Among other things, Title VIII of the Alaska National Interest Lands Conservation Act (ANILCA) creates a priority for "subsistence uses" over the taking of fish and wildlife for other purposes on public lands (16 U.S.C. 3114). ANILCA also imposes obligations on federal agencies with respect to decisions affecting the use of public lands, including a requirement that they analyze the effects of those decisions on subsistence uses and needs (16 U.S.C. 3120).

ANILCA defines "public lands" as lands situated "in Alaska" which, after December 2, 1980, are federal lands, except those lands selected by or granted to the State of Alaska, lands selected by an Alaska Native Corporation under the Alaska Native Claims Settlement Act (ANCSA), and lands referred to in section 19(b) of ANCSA (16 U.S.C. 3102(3)).

[4] http://www.noaanews.noaa.gov/stories/iq.htm

The U.S. Supreme Court has ruled that ANILCA's use of "in Alaska" refers to the boundaries of the State of Alaska and concluded that ANILCA does not apply to the outer continental shelf (OCS) region (*Amoco Prod. Co. v. Village of Gambell*, 480 U.S. 531, 546-47 (1987)). The action area for Chinook salmon bycatch management is in the Bering Sea EEZ, which is in the OCS region.

Although ANILCA does not directly apply to the OCS region, NMFS aims to protect such uses pursuant to other laws, such as NEPA and the Magnuson-Stevens Act. The RIR evaluates the consequences of the proposed actions on subsistence uses. Thus NMFS and the Council remain committed to ensuring that federal fishery management actions consider the importance of subsistence uses of salmon and protecting such uses from any adverse consequences. One of the reasons NMFS and the Council have proposed implementing salmon bycatch reduction measures is to protect the interests of salmon subsistence users.

1.10.10 American Fisheries Act (AFA)

The AFA established a cooperative management program for the Bering Sea pollock fisheries. Among the purposes of the AFA was to tighten U.S. vessel ownership standards and to provide the pollock fleet the opportunity to conduct its fishery in a more economically rational manner while protecting non-AFA participants in other fisheries. Since the passage of the AFA, the Council has taken an active role in the development of management measures to implement the various provisions of the AFA. The AFA EIS was prepared to evaluate sweeping changes to the conservation and management program for the Bering Sea pollock fishery and to a lesser extent, the management programs for the other groundfish fisheries of the GOA and BSAI, the king and Tanner crab fisheries of the BSAI, and the scallop fishery off Alaska (NMFS 2002). Under the Magnuson-Stevens Act, the Council prepared Amendments 61/61/13/8 to implement the provisions of the AFA in the groundfish, crab, and scallop fisheries. Amendments 61/61/13/8 incorporated the relevant provisions of the AFA into the FMPs and established a comprehensive management program to implement the AFA. The EIS evaluated the environmental and economic effects of the management program that was implemented under these amendments, and developed scenarios of alternative management programs for comparative use. The AFA EIS is available on the NMFS Alaska Region website.[5]

NMFS published the final rule implementing the AFA on December 30, 2002 (67 FR 79692). The structure and provisions of the AFA constrain the types of measures that can be implemented to reduce salmon bycatch in the pollock fishery. The RIR contains a detailed discussion of the pollock fishery under the AFA and the relationship between the chum salmon bycatch management and the AFA.

1.10.11 Executive Order 12866: Regulatory planning and review

The purpose of Executive Order 12866, among other things, is to enhance planning and coordination with respect to new and existing regulations, and to make the regulatory process more accessible and open to the public. In addition, Executive Order 12866 requires agencies to take a deliberative, analytical approach to rule making, including assessment of costs and benefits of the intended regulations. For fisheries management purposes, it requires NMFS to (1) prepare a regulatory impact review (RIR) for all regulatory actions; (2) prepare a unified regulatory agenda twice a year to inform the public of the agency's expected regulatory actions; and (3) conduct a periodic review of existing regulations.

The purpose of an RIR is to assess the potential economic impacts of a proposed regulatory action. As such, it can be used to satisfy NEPA requirements and serve as a basis for determining whether a proposed rule will have a significant impact on a substantial number of small entities under the RFA. The RIR is frequently combined with an EA and an IRFA in a single document that addresses the analytical requirements of NEPA, RFA, and Executive Order 12866. Criteria for determining "significance" for Executive Order 12866 purposes, however, are different than those for determining "significance" for NEPA or RFA purposes. A "significant" rule under Executive Order 12866 is one that is likely to:

[5] http://www.fakr.noaa.gov/sustainablefisheries/afa/eis2002.pdf

- Have an annual effect on the economy (of the nation) of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal governments or communities;
- Create serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in Executive Order 12866.

Although fisheries management actions rarely have an annual effect on the national economy of $100 million or more or trigger any of the other criteria, the Secretary of Commerce with the Office of Management and Budget (OMB), makes the final determination of significance under this Executive Order, based in large measure on the analysis in the RIR. An action determined to be significant is subject to OMB review and clearance before its publication and implementation.

The RIR identifies economic impacts and assesses of costs and benefits of the proposed salmon bycatch reduction measures.

1.10.12 Executive Order 13175: Consultation and coordination with Indian tribal governments

Executive Order 13175 on consultation and coordination with Indian tribal governments establishes the requirement for regular and meaningful consultation and collaboration with Indian tribal governments in the development of federal regulatory practices that significantly or uniquely affect their communities; to reduce the imposition on unfunded mandates on Indian tribal governments; and to streamline the application process for and increase the availability of waivers to Indian tribal governments. This Executive Order requires federal agencies to have an effective process to involve and consult with representatives of Indian tribal governments in developing regulatory policies and prohibits regulations that impose substantial, direct compliance costs on Indian tribal communities.

Additionally, Congress extended the consultation requirements of Executive Order 13175 to Alaska Native corporations in Division H, Section 161 of the Consolidated Appropriations Act of 2004 (Public Law 108-199; 188 Stat. 452), as amended by Division H, Section 518 of the Consolidated Appropriations Act of 2005 (Public Law 108-447, 118 Stat. 3267). Public Law 108-199 states in Section 161 that "The Director of the Office of Management and Budget shall hereafter consult with Alaska Native corporations on the same basis as Indian tribes under Executive Order No. 13175." Public Law 108-447, in Section 518, amends Division H, Section 161 of Public Law 108-199 to replace Office of Management and Budget with all federal agencies.

1.10.13 Executive Order 12898: Environmental Justice

Executive Order 12898 requires that federal agencies make achieving environmental justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low income populations in the United States. Salmon bycatch in the pollock fisheries impacts the in-river users of salmon in western and Interior Alaska, many of whom are Alaska Native. Additionally, a growing number of Alaska Natives participate in the pollock fisheries through the federal CDQ Program and, as a result, coastal native communities participating in the CDQ Program derive substantial economic benefits from the pollock fishery.

1.10.14 Pacific Salmon Treaty and the Yukon River Agreement

In 2002, the United States and Canada signed the Yukon River Agreement to the Pacific Salmon Treaty. The Yukon River Agreement states that the "Parties shall maintain efforts to increase the in-river run of Yukon River origin salmon by reducing marine catches and by-catches of Yukon River salmon. They shall further identify, quantify and undertake efforts to reduce these catches and by-catches" (Art. XV, Annex IV, Ch. 8, Cl. 12). The Yukon River Agreement also established the Yukon River Panel as an international advisory body to address the conservation, management, and harvest sharing of Canadian-origin salmon between the U.S. and Canada. This proposed action is an element of the Council's efforts to reduce bycatch of salmon in the pollock fishery and ensure compliance with the Agreement. Additionally, in developing the alternatives under consideration, NMFS and the Council have considered the recommendations of the Yukon River Panel. This EA and RIR address the substantive issues involving the portion of chum salmon taken as bycatch in the Bering Sea pollock fishery that originated from the Yukon River and the impacts of salmon bycatch in the pollock fishery on returns of Chinook salmon to the Canadian portion of the Yukon River.

2 Description of Alternatives

This analysis is focused on alternative measures to minimize Chum (non-Chinook) salmon bycatch in the Bering Sea pollock fishery. This chapter provides a detailed description of the following three alternatives:

Alternative 1: Status Quo (No Action)

Alternative 2: Hard cap

Alternative 3: Triggered closures

The alternatives analyzed in this EA and the RIR represent a complex suite of components, options, and suboptions. However, each of the alternatives involves a limit or "cap" on the number of Chinook salmon that may be caught in the Bering Sea pollock fishery and closure of all or a part of the Bering Sea to pollock fishing once the cap is reached. These closures would occur when a Chum salmon bycatch cap was reached even if a portion of the pollock total allowable catch (TAC) has not yet been harvested. Alternatives 2 and 3 represent a change in management of the pollock fishery because if the Chum salmon bycatch allocations are reached before the full harvest of the pollock quota, then pollock fishing must stop either BS-wide or in a specified area. Under Alternative 3, like Alternative 1, reaching the cap closes specific areas important to pollock fishing.

To best present the alternatives in comparative form, this chapter is organized into sections that describe in detail each alternative's components, options, and suboptions. To avoid unnecessary repetition, many aspects of the alternatives are presented in this chapter only, and cross-referenced later in the document as applicable.

This chapter also describes how management of the pollock fishery would change under each of the alternatives and how Chum salmon bycatch would be monitored. Estimated costs and the impacts of these changes on the pollock fishery are discussed in the RIR.

2.1 Alternative 1: Status Quo (No Action)

Alternative 1 retains the current program of Chum Salmon Savings Area (SSA) closures in the BS triggered by separate non-CDQ and CDQ Chum salmon prohibited species catch limits (PSC), along with the exemption to these closures by pollock vessels participating in the Voluntary Rolling Hot Spot intercooperative agreement (VRHS ICA). The VRHS ICA regulations were implemented in 2007 through Amendment 84 to the BSAI FMP. Closure of the SSAs is designed to reduce the total amount of Chum incidentally caught by closing areas with historically high levels of salmon bycatch. The VRHS ICA operates in lieu of regulatory closures of the SSA and requires industry to identify and close areas of high salmon bycatch and move to other areas. Only vessels directed fishing for pollock are subject to the SSA closures and ICA regulations. The ICA for 2011 and the list of vessels participating in it are appended to this chapter (Chapter 2, appendix 1).

2.1.1 Chum Salmon Savings Area

Alternative 1 would keep the existing Chum SSA closures in effect (Figure 1-1). This area is closed to all trawling from August 1 through August 31. Additionally, if 42,000[6] 'other" salmon are caught in the Catcher Vessel Operational Area (CVOA) during the period August 15-October 14, the area remains closed. As catcher processors are prohibited from fishing in the CVOA during the "B" season, unless they are participating in a CDQ fishery, only catcher vessels and CDQ fisheries are affected by the PSC limit.
This PSC limit is allocated among the non-CDQ pollock fisheries (89.3% or 37,506 salmon in 2011) and the CDQ Program (10.7% or 4,494 salmon). In the absence of an approved VRHS ICA described in Section 1.1.2, NMFS closes the Chum SSAs to directed fishing for pollock from August 1-31 and additionally if

[6] This number is inclusive of the allocation to CDQ groups. Non-CDQ 'other salmon' limit is 38,850.

either the non-CDQ or CDQ portions of the Chum salmon PSC limit is triggered by vessels directed fishing for pollock in the Bering Sea. The Chum Salmon Savings Area was established in 1994 by emergency rule, and then formalized in the BSAI Groundfish FMP in 1995 under Amendment 35 (ADF&G 1995) (Figure 2-1).

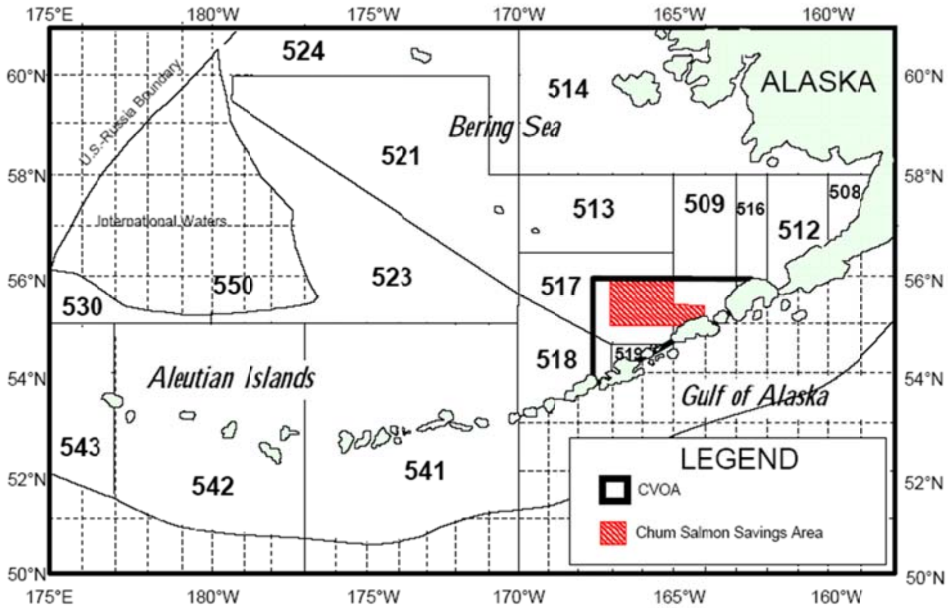


Figure 2-1 Chum Salmon Savings Area and Catcher Vessel Operational Area (CVOA)

2.1.1.1 PSC limits for the CDQ Program

Under the status quo, the CDQ Program receives allocations of 10.7 % of the BS and AI Chum salmon PSC limits as prohibited species quota (PSQ) reserves. A portion of the PSC limit (10.7%, or 4,494 chum salmon) is allocated to the CDQ Program as a PSQ reserve[7], while the remaining 37,506 chum salmon are available to the non-CDQ pollock fishery. NMFS further allocates the PSQ reserves among the six CDQ groups based on percentage allocations approved by NMFS on August 8, 2005. For chum salmon, the percentage allocations of the PSQ reserve among the CDQ groups are as follows:

- Aleutian Pribilof Island Community Development Association (APICDA) 14%
- Bristol Bay Economic Development Corporation (BBEDC) 21%
- Central Bering Sea Fishermen's Association (CBSFA) 5%
- Coastal Villages Region Fund (CVRF) 24%
- Norton Sound Economic Development Corporation (NSEDC) 22%
- Yukon Delta Fishery Development Corporation (YDFDC) 14%

Unless exempted because of participation in the VRHS ICA, a CDQ group is prohibited from directed fishing for pollock in the Chinook salmon savings areas when that group's Chinook salmon PSQ is reached. NMFS does not issue fishery closures through rulemaking for the CDQ groups. All CDQ groups are participating in the VRHS ICA approved in 2010, so they currently are exempt from closure of the Chinook salmon savings area.

2.1.2 Voluntary Rolling Hotspot System Intercooperative Agreement

Regulations implemented under Amendment 84 to the BSAI FMP exempt vessels directed fishing for pollock from closures of both the Chum and Chinook salmon savings areas if they participate in a VRHS

[7] See 50 CFR 679.21(e)(3)(i)(A)(3)(i) .

ICA approved by NMFS (NPFMC 2005). The fleet voluntarily started the VRHS program in 2001 for chum salmon and in 2002 for Chinook salmon. The exemption to regulatory area closures for vessels that participated in the VRHS was implemented in 2006 and 2007 through an exempted fishing permit. The Council developed Amendment 84 to attempt to resolve the bycatch problem through the AFA pollock cooperatives. These regulations were implemented in 2007. A VRHS ICA was approved by NMFS in January 2010 for the 2011 fishing year (see Chapter 2, Appendix 2). All vessels and CDQ groups that are participating in the BS pollock fishery in 2011, except one vessel, participate in this ICA.

The VHRS provides real-time salmon bycatch information so that the fleet can avoid areas of high chum or Chinook salmon bycatch rates. Using a system of base bycatch rates, the ICA assigns vessels to certain tiers, based on bycatch rates relative to the base rate, and implements area closures for vessels in certain tiers. Monitoring and enforcement are carried out through private contractual arrangements.

Parties to the current VRHS ICA include the AFA cooperatives, the CDQ groups, a third-party salmon bycatch data manager, and other entities with interests in Bering Sea salmon bycatch reduction. Inshore cooperatives choose to participate in the ICA, rather than offering this election to individual vessels within a cooperative. Thus, a single vessel in an inshore cooperative cannot elect to opt out of the ICA. Doing so would mean that the cooperative to which they were affiliated would be charged with a contractual violation each time the single vessel fished in a closed area (Karl Haflinger, Sea State, personal communication, April 14, 2008).

Federal regulations require the ICA to describe measures that parties to the agreement will take to monitor salmon bycatch and redirect fishing effort away from areas in which salmon bycatch rates are relatively high. It also must include intra-cooperative enforcement measures and various other regulatory conditions. The ICA data manager monitors salmon bycatch in the pollock fisheries and announces area closures for areas with relatively high salmon bycatch rates. The efficacy of voluntary closures and bycatch reduction measures must be reported to the Council annually.

2.1.3 Amendment 91

The Council took final action on Amendment 91, Chinook salmon bycatch management measures in the Bering Sea pollock fishery in April 2009. The fishery will operate under rules to implement this program beginning in January 2011. The final rule to implement Amendment 91 establishes two Chinook salmon PSC limits (60,000 Chinook salmon and 47,591 Chinook salmon) for the Bering Sea pollock fishery. For each PSC limit, NMFS will issue A season and B season Chinook salmon PSC allocations to the catcher/processor sector, the mothership sector, the inshore cooperatives, and the CDQ groups. Chinook salmon allocations remaining from the A season can be used in the B season (‘‘rollover’’). Entities can transfer PSC allocations within a season and can also receive transfers of Chinook salmon PSC to cover overages (‘‘post-delivery transfers’’). NMFS will issue transferable allocations of the 60,000 Chinook salmon PSC limit to those sectors that participate in an incentive plan agreement (IPA) and remain in compliance with the performance standard. Sector and cooperative allocations would be reduced if members of the sector or cooperative decided not to participate in an IPA. Vessels and CDQ groups that do not participate in an IPA would fish under a restricted opt-out allocation of Chinook salmon. If a whole sector does not participate in an IPA, all members of that sector would fish under the optout allocation. NMFS changed the final rule to subtract a vessel’s opt-out allocation from a sector’s annual threshold amount in a method similar to the Council’s recommended method for determining the sector allocation under the 60,000

The IPA component is an innovative approach for fishery participants to design industry agreements with incentives for each vessel to avoid Chinook salmon bycatch at all times and thus reduce bycatch below the PSC limits. The rule establishes performance-based requirements for the IPAs. To ensure participants develop effective IPAs, this final rule requires that participants submit annual reports to the Council that evaluate whether the IPA is effective at providing incentives for vessels to avoid Chinook salmon at all times while fishing for pollock. The sector-level performance standard ensures that the IPA is effective and that sectors cannot fully harvest the Chinook salmon PSC allocations under the 60,000 Chinook salmon PSC limit in most years. Each year, each sector will be issued an annual threshold amount that represents that sector's portion of 47,591 Chinook salmon. For a sector to continue to receive Chinook salmon PSC allocations under the 60,000 Chinook salmon PSC limit, that sector must not exceed its annual threshold amount 3 times within 7 consecutive years. If a sector fails this performance standard, it will permanently be allocated a portion of the 47,591 Chinook salmon PSC limit.

To improve the implementation of sector entities, NMFS modified the final rule to clarify that: (1) NMFS will authorize only one entity to represent the catcher/processor sector and only one entity to represent mothership sector; (2) under the 60,000 Chinook salmon PSC limit, the entity for each sector has to represent all IPA participating vessel owners in that sector; and (3) vessel owners in the catcher/processor sector and mothership sector must be a member of the sector entity to join an IPA.

NMFS will issue transferable allocations of the 47,591 Chinook salmon PSC limit to all sectors, cooperatives, and CDQ groups if no IPA is approved, or to the sectors that exceed the performance standard. Transferability of PSC allocations is expected to mitigate the variation in the encounter rates of Chinook salmon bycatch among sectors, CDQ groups, and cooperatives in a given season by allowing eligible participants to obtain a larger portion of the PSC limit in order to harvest their pollock allocation or to transfer surplus allocation to other entities. When a PSC allocation is reached, the affected sector, inshore cooperative, or CDQ group would have to stop fishing for pollock for the remainder of the season even if its pollock allocation had not been fully harvested.

The rule removes from regulations the 29,000 Chinook salmon PSC limit in the Bering Sea, the Chinook Salmon Savings Areas in the Bering Sea, exemption from Chinook Salmon Savings Area closures for participants in the VRHS ICA, and Chinook salmon as a component of the VRHS ICA. This final rule does not change any regulations affecting the management of Chinook salmon in the Aleutian Islands or non-Chinook salmon in the BSAI.

IPAs were submitted and approved for all sectors for the 2011 fishing year. Thus NMFS will allocate sector and seasonal proportions of the 60,000 Chinook cap in 2011. Observer coverage and monitoring changes as a result of implementation of Amendment 91 will be implemented in 2011. These changes are summarized in Section 2.1.4.1.

2.1.4 Managing and Monitoring Alternative 1

NMFS monitors numerous annual catch limits, seasonal limits, sector allocations, and quotas for many different BSAI groundfish fisheries. NMFS currently uses a combination of vessel monitoring system (VMS) data, industry reported catch information, and observer data to monitor vessel activities in the Chinook Salmon Savings Areas. These data sources are used by NMFS on a daily basis to monitor fishery limits. Information from VMS is useful for determining vessel location in relation to closure areas, but it may not conclusively indicate whether a vessel is fishing, transiting through a closed area, or targeting a particular species.

As part of this monitoring effort, NMFS may detect what appear to be regulatory violations, such as quota overages or closed area incursions. Such incidents are forwarded to the NOAA Office for Law Enforcement (OLE) for subsequent investigation. Depending on its findings for each particular case, NOAA OLE may forward cases to NOAA General Counsel (GC) for prosecution. The investigation and disposition of regulatory infractions requires considerable staff time from the Alaska Fishery Science Center's (AFSC's) Fisheries Monitoring and Analysis Division, NOAA GC and NOAA OLE.

NMFS's Catch Accounting System (CAS) was developed to receive catch reports from multiple sources, evaluate data for duplication or errors, estimate the total catch by species or species category, and determine the appropriate "bin" or account to attribute the catch. The AFSC's Fisheries Monitoring and Analysis

Division provides observer data about groundfish catch and salmon bycatch, including expanded information to NMFS. NMFS estimates salmon bycatch for unobserved catcher vessels using algorithms implemented in its CAS. The haul-specific observer information is used by the CAS to create salmon bycatch rates from observed vessels that are applied to total groundfish catch in each delivery (trip level) by an unobserved vessel. The rate is calculated using the observed salmon bycatch divided by the groundfish weight, which results in a measure of salmon per metric ton of groundfish caught. Salmon bycatch rates are calculated separately for Chinook salmon and non-Chinook salmon. Additional information about observer sampling methods and the CAS is in Section 3.1.

On-board observers monitor catch of pollock and bycatch in the pollock fishery. Observer requirements differ based on the type of vessel and its operation. Catcher/processors and motherships are required to carry two NMFS-certified observers during each fishing day. These vessels must also have an observer sampling station and a motion-compensated flow scale, which is used to weigh all catch in each haul. The observer sampling station is required to include a table, motion compensated platform scale, and other monitoring tools to assist observers in sampling. Each observer covers a 12 hour shift and all hauls are observed unless an observer is unable to sample (*e.g.,* due to illness or injury).

Catcher vessels deliver unsorted catch to the three motherships that participate in the AFA pollock fisheries. NMFS does not require these catcher vessels to carry observers because catch is not removed from the trawl's codend (the detachable end of the trawl net where catch accumulates) prior to it being transferred to the mothership. Observer sampling occurs on the mothership following the same estimation processes and monitoring protocols that are described above for catcher/processors.

Catcher vessels in the inshore sector are required to carry observers based on vessel length.

> Catcher vessels 125 feet in length or greater are required to carry an observer during all of their fishing days (100 percent coverage).
>
> Catcher vessels greater than 60 feet in length and up to 125 feet in length are required to carry an observer at least 30 percent of their fishing days in each calendar quarter, and during at least one fishing trip in each target fishery category (30 percent coverage).
>
> Catcher vessels less than 60 feet in length are not required to carry an observer. One AFA permitted vessel is less than 60 feet, however, currently this vessel does not actively participate in the pollock fishery.

AFA inshore processors are required to provide an observer for each 12 consecutive hour period of each calendar day during which the processor takes delivery of, or processes, groundfish harvested by a vessel directed fishing for pollock in the Bering Sea. NMFS regulates plant monitoring through a permitting process. Each plant that receives AFA pollock is required to develop and operate under a NMFS-approved catch monitoring and control plan (CMCP). Monitoring standards for CMCP are described in regulation at 50 CFR 679.28(g). Additional information about monitoring for salmon bycatch at the shoreside processing plants is in Section 3.1.

2.1.4.1 Changes resulting from Amendment 91

Amendment 91 would place constraints on the Bering Sea pollock fishery that currently do not exist. The only regulatory measure that currently prevents the full harvest of a pollock allocation is the end of a fishing season. Under current regulations, no prohibited species catch limits prevents pollock fishermen from full harvest of their allocations. Amendment 91 would implement Chinook salmon bycatch limits that, if reached, could prevent the full harvest of a pollock allocation to the AFA sectors, inshore cooperatives, or CDQ entities. Each entity (a sector, an inshore cooperative, or a CDQ entity) receiving a transferable Chinook salmon bycatch allocation would be prohibited from exceeding that allocation.

Amendment 91 will significantly increase the economic incentives to under report or misreport the amount of Chinook salmon bycatch or to discard or hide Chinook salmon before they can be counted by an observer. Because of the economic incentives created by transferable Chinook salmon bycatch allocations, current methods of estimating Chinook salmon bycatch in the BS pollock fishery are not adequate to support monitoring and enforcement of the Chinook salmon PSC limits under Amendment 91.

The current methods of estimating the number of Chinook salmon harvested by catcher/processors or delivered to motherships based on observers' species composition samples has been adequate to estimate Chinook salmon bycatch for management of the current trigger cap that applies at the fleet level. However, the uncertainty associated with extrapolating from species composition samples to estimates of the total number of salmon caught in each haul will not support the level of accuracy and reliability that both the vessel owners and NMFS will require to monitor and enforce transferable Chinook salmon bycatch allocations.

The following descriptions of changes to monitoring requirements to address these issues are excerpted from the Proposed and Final rules to implement Amendment 91. More information can be found at 50 CFR 600 and 679, and 75 FR 53026 and 75 FR 14016 available at http://alaskafisheries.noaa.gov/frules.

2.1.4.1.1 Monitoring requirements

NMFS believes that to accurately count salmon for Chinook salmon PSC allocations, the following requirements must be implemented: (1) Observer coverage for all vessels and processing plants, (2) retention requirements, (3) specific areas to store and count all salmon, (4) video monitoring on at-sea processors, and (5) electronic reporting of salmon by species by haul or delivery. Prohibitions against the discard of salmon in the BS pollock fishery would be added to prohibitions for the CDQ Program (at § 679.7(d)(8)(ii)(A)) and for the AFA (§ 679.7(k)(8)(i)).

Catcher Vessels Delivering to Inshore Processors

Currently, the Chinook salmon bycatch rates from observed vessels are used to estimate Chinook salmon bycatch by the unobserved vessels delivering pollock to inshore processors. This method of accounting for Chinook salmon bycatch would not be adequate for monitoring and enforcement of transferable PSC allocations under Amendment 91. Under this rule, catcher vessels delivering pollock, including pollock CDQ, to inshore processors would be required to retain all salmon of any species caught while directed fishing for pollock in the BS, and to deliver that salmon together with its pollock catch to an inshore processor with an approved catch monitoring and control plan (CMCP). Full retention of all salmon regardless of species would be required because it is difficult to differentiate Chinook salmon from other species of salmon without direct identification. Identification of and counting of salmon would occur at the shoreside processing plant or on the floating processor where conditions for identification and counting of salmon can be better monitored and controlled. In addition, catcher vessels delivering to inshore processors would be required to carry an observer at all times while directed fishing for pollock in the BS. Currently, observer coverage for these catcher vessels is based on vessel length with one observer required at all times for vessels greater than 125 feet length overall (LOA) and an observer required for 30 percent of the fishing days for vessels between 60 feet and 125 feet LOA (see § 679.50(c)(1)(v)).

An observer would be required on every catcher vessel, primarily to monitor compliance with the requirement to retain all salmon to ensure that all salmon bycatch is counted at the processing plant. These duties would not require an observer with prior experience or a ''level 2'' endorsement as defined at § 679.50(j)(1)(v)(D). The observer on a catcher vessel is responsible for identifying and counting salmon, and collecting scientific data or biological samples from a delivery. These duties must be completed as soon as possible after the delivery so that information about salmon bycatch from each delivery is available to NMFS, the vessel operator, and the entity responsible for the Chinook salmon bycatch by this vessel. In the final rule NMFS modified the proposed rule to (1) allow a catcher vessel to begin a new trip before the salmon census and sampling are complete from the vessel's prior trip and (2) clarify that a shoreside or stationary processor must give the observer the opportunity to complete the count of salmon and collect biological samples before sorting a new pollock offload. In 2011, NMFS' observer sampling policy and observer duties for the Bering Sea pollock fishery will be modified for monitoring offloads at shoreside processors and stationary floating processors. The plant observer on duty will be tasked with monitoring each offload for proper salmon sorting, verifying the count of salmon, and collecting biological samples and scientific data.

Inshore Processors

Under current regulations, each inshore processor that receives AFA pollock is required to develop and operate under a NMFS-approved CMCP. The procedures established under the AFA for the CMCPs were designed to monitor the weighing of pollock at the inshore processing plants. Proper weighing of large volumes of a target species such as pollock require different conditions than does the proper sorting, identification, and counting of a more infrequently occurring bycatch species such as salmon. Salmon can be difficult to see, identify, and count amid the large volume of pollock. The factory areas of processing plants are large and complex. Preventing observers from seeing salmon that enter the factory area of the processing plant would not be difficult. In addition, observers must examine each salmon to verify the species identification. Therefore, NMFS proposes that the following additions to requirements for the inshore processors are needed to ensure that observers have access to all salmon bycatch prior to the fish being conveyed into the processing area of the plant: (1) Processors would be prohibited from allowing salmon to pass from the area where catch is sorted and into the factory area of the processing plant; (2) The observer work station currently described in regulations at § 679.28(g) would be required to be located within the observation area identified in the CMCP; (3) A location must be designated within the observation area for the storage of salmon; and (4) All salmon of any species must be stored in the observation area and within view of the observer at all times during the offload. NMFS modified the final rule to clarify that the observation area and the observer work station may be located in separate areas, while also requiring the observer work station be adjacent to the location where the observer counts all salmon and collects scientific data or biological information. NMFS also modified the final rule to require that all salmon be stored in a ‘‘salmon storage container.’’ The observation area must now provide a clear, unobstructed view of the salmon storage container to ensure no salmon of any species are removed without the observer's knowledge. NMFS made these changes to the final rule to give processors more flexibility to achieve the goals of allowing an observer to monitor all the sorting of salmon as well as verify the count of the salmon.

Because these requirements would be effective for the 2011 fishing year, inshore processors would have to modify their plants to meet these requirements and have these modifications reflected in CMCPs approved by NMFS prior to January 20, 2011. Observers would identify the species of each salmon, count each salmon, record the number of salmon by species on their data form, and transmit that information electronically to NMFS. Data submitted by the observer would be used by NMFS to accrue Chinook salmon bycatch against an entity's allocation. The manager of the inshore processor would be provided notice by the observer when he or she will be conducting the salmon count and would be provided an opportunity to witness the count. Information from the observer's salmon count would be made available to the manager of the inshore processor for their use in submitting this information to NMFS on electronic logbooks or landings reports. Requirements to deliver pollock to inshore processors that have approved CMCPs currently apply only to AFA catcher vessels delivering non-CDQ pollock to inshore processors. These requirements do not apply to catcher vessels directed fishing for pollock on behalf of a CDQ group. With few exceptions, pollock allocated to the CDQ Program since 1992 has been processed at sea on catcher/processors or motherships. Therefore, this requirement would not require any of the CDQ groups to stop delivering pollock CDQ to a currently-contracted processing partner. In the future, if they chose to have pollock CDQ delivered to a shoreside processing plant, the catcher vessel used to harvest the pollock CDQ would be required to comply with the retention and observer coverage requirements described above and the pollock would have to be delivered to a processor with an approved CMCP. This requirement is necessary to ensure that salmon bycatch from the pollock CDQ fisheries are properly counted and reported.

Catcher/Processors and Motherships

Current methods for estimating salmon bycatch by catcher/processors and catcher vessels delivering to motherships rely on requirements for two observers on each catcher/processor and mothership and using observers' species composition sample data to estimate the number of salmon in each haul. This method has been adequate to estimate Chinook salmon bycatch for management of the current trigger cap that applies to the BS pollock fishery as a whole.

NMFS proposes to use a census or a full count of Chinook salmon bycatch in each haul by a catcher/processor and delivery by a catcher vessel to a mothership or catcher/processor as a basis for monitoring and enforcing the Chinook salmon PSC allocations under Amendment 91. This would eliminate the uncertainty associated with extrapolating from species composition samples to estimates of the total number of salmon caught in each haul and support the level of precision and reliability that both the vessel owners and NMFS require to monitor and enforce Chinook salmon PSC limits. NMFS supports the use of a census on catcher/processors and motherships, as long as conditions exist to properly monitor that all of the salmon bycatch is retained and to provide the observer with the tools needed to identify, count, and report salmon bycatch by haul or delivery by catcher vessels. Current regulations require the retention of salmon ''until the number of salmon has been determined by an observer.'' Observers report the count of salmon for each haul in data submitted to NMFS and vessel operators separately report the count of salmon bycatch each day on their daily production reports.

To ensure accurate counts of salmon on catcher/processors and motherships, NMFS proposes the following requirements: (1) No salmon of any species would be allowed to pass from the observer sample collection point and into the factory area of the catcher/processor or mothership; (2) All salmon bycatch of any species must be retained until it is counted by an observer; (3) Vessel crew must transport all salmon bycatch from each haul to an approved storage location adjacent to the observer sampling station so that the observer has free and unobstructed access to the salmon, and the salmon must remain within view of the observer from the observer sampling station at all times; (4) The observer must be given the opportunity to count the salmon and take biological samples, even if this requires the vessel crew to stop sorting or processing catch until the counting and sampling is complete;(5) The vessel owner must install a video system with a monitor in the observer sample station that provides views of all areas where salmon could be sorted from the catch and the secure location where salmon are stored; and (6) The counts of salmon by species must be reported by the operator of a catcher/processor for each haul, using an electronic logbook that will be provided by NMFS as part of the current eLandings software. The operator of the catcher/processor or mothership would be provided notice by the observer when he or she will be conducting the count of salmon and would be provided an opportunity to witness the count. Information from the observer's count of salmon would be made available to the vessel operator for their use in submitting this information to NMFS on electronic logbooks or landings reports. The video requirements would be similar to those currently in place for monitoring fish bins on non-AFA trawl catcher/processors. An owner of a catcher/processor would be required to provide and maintain cameras, a monitor, and a digital video recording system for all areas where sorting and storage of salmon, prior to being counted by an observer, could occur. The video data must be maintained and made available to NMFS upon request for 120-days after the date the video is recorded. The video systems would also be subject to approval by NMFS at the time of the observer sample station inspection. In order for the video system to be effective and ensure the observer has access to all salmon prior to entering the factory area, no salmon of any species would be allowed to pass the last point where sorting could occur. These requirements would be effective for the 2011 fishing year so catcher/processors and motherships would have to modify their vessels to meet these requirements and have these modifications approved by NMFS prior to January 20, 2011.

Operators of catcher/processors participating in the BS pollock fishery would be required to report the salmon bycatch counts by species for each haul rather than the daily total currently required. This count would be required to be submitted to NMFS using an electronic logbook so that the data are readily available to NMFS in an electronic format. Reporting the count of all salmon by species for each haul would not change or increase the amount of information that is required to be gathered by vessel operators because, to report the number of salmon by species each day, as they currently are required to do, vessel operators must obtain a count and identification of salmon in each haul and sum that information to get the daily totals. The electronic logbooks would replace the paper logbooks currently required to be submitted by the operators of catcher/processors under § 679.5(c)(4). Current regulations require recording the following information in paper logbooks: Vessel identifying information and catch-by-haul information including haul number; date, time, and location of gear deployment and retrieval; average sea depth and average gear depth for each haul, target species of the haul, estimate weight of the haul, and information about retention of certain species. All of this information would now be submitted using the electronic logbook. The electronic logbooks would be an additional component to ''eLandings,'' the program through which the operators of catcher/processors currently submit their daily production reports. The requirement to maintain and submit daily logbook information electronically instead of maintaining and submitting a paper logbook is not expected to increase costs for the catcher/processors.

The electronic logbook software would be developed by NMFS and provided to the vessel operator as part of the eLandings software that is updated annually by NMFS. Data entry for the electronic logbooks would be done on the same computer as already is required on the vessel to submit the electronic daily production reports. The same communications hardware and software currently used for eLandings could be used for the electronic logbooks. The vessel operators would be required to print out a copy of the electronic logbook and maintain it onboard the vessel. The additional cost of data entry of information into the electronic logbook should be offset by the reduction in cost associated with maintaining the paper logbook. AFA catcher/processors required to use an electronic logbook for their participation in the BS pollock fisheries also would be required to use this electronic logbook for the entire year for any other fishery in which they participate. Use of the electronic logbook all year for all fisheries is necessary to provide logbook information from a vessel to NMFS in a consistent format throughout the year for all fisheries in which that vessel participates. In 2008, 13 of the 17 catcher/processors that fished in the BS pollock fishery also participated in other fisheries, primarily yellowfin sole and Pacific cod. The days fishing in non-pollock fisheries represented 20 percent of the total fishing days for these vessels in 2008. Electronic logbooks would not be required for the AFA motherships or catcher vessels. Motherships already are required under § 679.5(e)(6) to submit daily an electronic landings report that includes a report of the number of salmon by species in each delivery by a catcher vessel. When NMFS develops the electronic logbook component of eLandings for the AFA catcher/ processors, it likely also will develop an electronic logbook for the motherships, which could be used voluntarily in place of the paper logbook. Electronic logbooks also would not be required for catcher vessels delivering to inshore processors because the counting and reporting of the number of salmon by species in each delivery would be done at the processing plant and reported in the inshore processor's electronic logbook.

Release of Information about Chinook Salmon Prohibited Species Catch Allocations and Catch
Under this rule, the NMFS Alaska Region would post on its Web site (http://alaskafisheries.noaa.gov/) (1) The Chinook salmon PSC allocations for each entity receiving a transferable allocation, (2) each entity's Chinook salmon bycatch, and (3) the vessels fishing on behalf of that entity for that year. NMFS would update the Web site to reflect any transfers of Chinook salmon PSC allocations. For non-transferable allocations, the NMFS Alaska Region would also post on its Web site (1) the amount of each non-transferable allocation, (2) the Chinook salmon bycatch that accrued towards that non-transferable allocation, and (3) the vessels fishing under each non-transferable allocation. NMFS would update the website to reflect any changes to the B season non-transferable allocations from rollovers or deductions for overages in the A season. Information about Chinook salmon bycatch is based on data collected by observers and data submitted by processors. Section 402(b)(2) of the Magnuson-Stevens Act provides that any observer

information is confidential and shall not be disclosed. As a result of this requirement, NMFS may not release information collected by observers from vessels or processing plants unless it is provided to the public in aggregate or summary form. However, section 210(a)(1)(B) of the AFA requires NMFS ‘‘to make available to the public in such manner as the North Pacific Council and Secretary deem appropriate information about the harvest by vessels under a fishery cooperative of all species (including bycatch) in the directed pollock fishery on a vessel-by-vessel basis.’’ Public release of Chinook salmon bycatch information for each entity and vessel fishing on behalf of that entity would provide information valuable to the pollock industry and the public in assessing the efficacy of Amendment 91. It would also reduce the amount of time NMFS staff would need to spend responding to information requests about Chinook salmon bycatch in the BS pollock fishery.

Removal of Salmon Bycatch Retention Requirements in the Bering Sea Aleutian Islands Trawl Fisheries
NMFS proposes to revise the requirements at § 679.21(c), which currently require the operators of all vessels using trawl gear in the BSAI groundfish fisheries, and all processors taking deliveries from these vessels, to retain all salmon until the salmon have been counted by an observer and the observer has collected biological samples. This allows discard of salmon from a vessel with an observer onboard, after the observer has counted and sampled the salmon. It also requires retention of salmon by vessels without an observer onboard until those salmon are delivered to a processing plant, where an observer is provided the opportunity to count and sample the salmon. Once salmon are counted and sampled at the processing plant, they may either be donated to the PSD Program or they must be put back onboard a catcher vessel and discarded at sea. This proposed rule would apply these regulations only to catcher vessels and processors participating in the BS pollock fishery, because these requirements are needed to obtain an accurate count of all salmon bycatch for Chinook salmon PSC allocations. NMFS is proposing to remove the retention requirements in § 679.21(c) from participants in other BSAI trawl fisheries and the AI pollock fishery because it is not necessary to count each salmon in these other fisheries. Estimates of salmon bycatch for the other BSAI trawl fisheries, including the AI pollock fishery, would continue to be based on data collected by observers and extrapolation of bycatch rates derived from observer data to unobserved vessels. Moreover, all vessels and processors would continue to be required to report the number of discarded salmon by species in their landings or production reports. Current methods are adequate to estimate salmon bycatch in these other BSAI fisheries because, under current regulations, the salmon caught in these other fisheries (except AI pollock) does not accrue against the Chinook or non- Chinook PSC limits. Chinook salmon bycatch in the AI pollock fishery would continue to be managed with a trigger cap that closes the AI Chinook Salmon Savings Area. Current methods of estimating Chinook salmon bycatch are adequate to manage this area closure, if it is triggered during any AI pollock fishery in the future. Because the retention requirement would be removed from § 697.21(c), this proposed rule would also remove the prohibition at § 679.7(c)(1) that prohibits the discard of any salmon taken with trawl gear in a BSAI groundfish fishery. The proposed rule also would standardize language related to the discard of salmon. Current regulations at § 679.21(b) require that, with several exceptions, prohibited species be returned to the sea immediately, with a minimum of injury, regardless of condition. A similar regulation at § 679.21(c)(5) requires that salmon bycatch, with the exception of those donated to the PSD program, be returned to Federal waters (Federal waters are defined in § 679.2 as waters within the EEZ off Alaska). The requirements for discard of salmon bycatch in Federal waters were implemented under the final rule for Amendment 25 to the FMP (59 FR 9492; April 20, 1994). Neither the proposed nor the final rule provided an explanation about why the term ‘‘to Federal waters’’ was applied to the discard of salmon and NMFS cannot identify a reason to have this different language for PSC in general versus salmon bycatch. NMFS proposes to standardize the language so that salmon not required to be retained by other regulations would be required to be returned to the sea and to remove reference to requiring discard of salmon specifically in Federal waters.

2.1.5 2009 and 2010 pollock catch and non-Chinook (chum) salmon bycatch by vessel category

Vessel-specific salmon bycatch information currently exists for catcher/processors, motherships, and observed catcher vessels in the inshore sector. However, vessels in the 30 percent observer coverage category are a significant component of the inshore sector, in 2011 per observer coverage changes implemented under amendment 91 this sector will be covered at 100%. However through 2010, when these vessels are not observed, salmon bycatch rates from other observed vessels are used to estimate the salmon bycatch associated with the pollock catch by the unobserved vessels (as discussed in Section 2.1.4).

Table 2-1 shows the estimated pollock catch and salmon bycatch in the AFA pollock fisheries in the Bering Sea in 2009, by fishery sector and vessel length class. Fifty-three of the vessels participating in the inshore sector in 2009 were in the 30 percent observer coverage category. These vessels caught approximately 22 percent of the pollock catch and an estimated 38 percent of the non-Chinook (chum) salmon bycatch.

Table 2-1 Number of vessels that participated in the 2009 AFA pollock fisheries, pollock catch, and estimated non-Chinook salmon bycatch, by vessel category

Vessel category	Number of Vessels	Pollock (mt)	Percent of Pollock Catch	Number of non-Chinook salmon	Percent of non-Chinook Salmon
Catcher/processor	15	281,603	40%	3,901	9%
Motherships	3	70,308	10%	1,733	4%
CV 60 ft.-125 ft.	53	152,649	22%	22,465	38%
CV ≥ 125 ft.	26	197,718	28%	17,070	38%
Total	97	702,278	100%	45,169	100%

Table 2-2 shows the estimated pollock catch and salmon bycatch in the AFA pollock fisheries in the Bering Sea in 2010, by fishery sector and vessel length class. Fifty-five of the vessels participating in the inshore sector in 2010 were in the 30 percent observer coverage category. These vessels caught approximately 22 percent of the pollock catch and an estimated 44 percent of the non-Chinook (chum) salmon bycatch.

Table 2-2 Number of vessels that participated in the 2010 AFA pollock fisheries, pollock catch, and estimated non-Chinook salmon bycatch, by vessel category

Vessel category	Number of Vessels	Pollock (mt)	Percent of Pollock Catch	Number of non-Chinook salmon	Percent of non-Chinook Salmon
Catcher/processor	15	353,326	50%	3,181	25%
Motherships*	2				
CV 60 ft.-125 ft.	55	153,322	22%	5,584	44%
CV ≥ 125 ft.	26	198,363	28%	4,024	31%
Total	100	705,010	100%	12,788	100%

*CPs and mothership sector harvests are combined for confidentiality reasons.

2.2 Alternative 2: Hard Cap

Alternative 2 would establish a hard cap to limit chum salmon bycatch in the pollock fishery. When the hard cap is reached all directed pollock fishing must cease. Only those Chum salmon caught by vessels participating in the directed pollock fishery would accrue towards the cap, and fishery closures upon attainment of the cap would apply only to directed fishing for pollock. Several different options as to the scale of management for the hard cap are provided under this alternative: at the fishery level (separate hard caps for the CDQ Program and the remaining three AFA sectors combined); at the sector level (each of the 4 sectors including the CDQ sector receive a sector level cap with the CDQ sector level cap allocated to the individual CDQ groups); and at the cooperative level (the inshore CV sector level cap is further subdivided and managed at the individual cooperative level; Section 2.2.4).

Under this alternative, Component 1 requires selecting the hard cap. If the hard cap is apportioned by sector (under Component 2), options are provided for the subdivision. Options for sector transfer or rollovers are included in Component 3. Further subdivision of an inshore sector cap to individual inshore cooperatives is discussed under Component 4 (cooperative provisions).

If none of the options under the Components 2-4 are selected, the Alternative 2 hard cap would apply at the fishery level and would be divided between the CDQ and non-CDQ fisheries. The CDQ sector would receive an allocation of 10.7% of a fishery level hard cap. The CDQ allocation would be further allocated among the six CDQ groups based on percentage allocations currently in effect. Each CDQ group would be prohibited from exceeding its Chum salmon allocation. This prohibition would require the CDQ group to stop directed fishing for pollock once its cap was reached because further directed fishing for pollock would likely result in exceeding the cap.

The remaining 89.3% of a fishery level hard cap would be apportioned to the non-CDQ sectors (inshore CV sector, offshore CP sector, and mothership sector) combined. The inshore CV sector contains up to seven cooperatives, each composed of multiple fishing vessels associated with a specific inshore processor. There also is a possibility than an inshore open access sector could form, if one or more catcher vessels do not join an inshore cooperative. All bycatch of Chum salmon by any vessel in any of these three AFA sectors would accrue against the fishery level hard cap, and once the cap was reached, NMFS would simultaneously prohibit directed fishing for pollock by all three of these sectors.

Under Alternative 2, existing regulations related to the Chum salmon prohibited species catch limit of 42,000 salmon and triggered closures of the Chum salmon savings areas in the Bering Sea would be removed from 50 CFR part 679.21.

Per Council direction (June 2010), the impact of implementing specific cap levels for Alternative 2 was analyzed based on a subset of the range of cap levels, as indicated in the tables under each component and option.

2.2.1 Component 1: Setting the Hard Cap

Component 1 would establish the annual hard cap number based upon a range of values as shown below. Component 1 sets the overall cap; this could be either applied at the pollock fishery level to the CDQ and non-CDQ fisheries (not allocated by sector within the non-CDQ sectors), or may be subdivided by sector (Component 2) and the inshore sector allocation further allocated among the inshore cooperatives (Component 4).

2.2.1.1 Range of numbers for a hard cap

Table 2-3 lists the range of numbers considered for the overall chum salmon hard caps, in numerical order, lowest to highest. As listed here, the CDQ allocation of the fishery level cap would be 10.7%, with the remainder apportioned to the combined non-CDQ fishery.

Table 2-3 Range of suboptions for hard cap for non-Chinook with breakout for CDQ allocation (10.7%) and remainder for non-CDQ fleet (89.3 %)

	Non-Chinook	CDQ	Non-CDQ
i)	**50,000**	5,350	44,650
ii)	75,000	8,025	66,975
iii)	125,000	13,375	111,625
iv)	**200,000**	21,400	178,600
v)	300,000	32,100	267,900
vi)	**353,000**	37,771	315,229

For analytical purposes only, a subset of the cap numbers included in the six suboptions were used in this document to assess the impacts of operating under a given hard cap. This subset approximates the upper and lower endpoints of the suboption range, and a midpoint (**bolded**).

The cap numbers initially represented a range of rounded historical averages over different 3-, 5- and 10-year time periods ranging from 1997-2006. The Council chose to modify these averages based both on more recent year averages as well as downward adjustments that the Council made in their December 2009 motion (for complete Council motions from December 2009 and June 2010 see Appendix 1 to Chapter 2). For comparison, Table 2-4 shows the resulting change in these time periods for historical averaging by using the most recent time frame as opposed to averaging only from time frames 2006 and earlier.

Table 2-4 Comparison of historical averages using previous time frame (1997-2006) time periods with more recent (1997-2009) 3-, 5-, and 10-yr averages

Period (current alternative set)	Average (# of salmon)	Period	Average (# of salmon)
2004-2006	484,895	2007-2009	51,629
2002-2006	344,898	2005-2009	233,820
1997-2006	201,195	2000-2009	199,489
1997-2001	57,493		

2.2.2 Component 2: Sector Allocation

If this component is selected, the hard cap would be apportioned to the sector level. This would result in separate sector level caps for the CDQ sector, the inshore catcher vessel (CV) sector, the mothership sector, and the offshore catcher processor (CP) sector.

The bycatch of chum salmon would be tabulated on a sector level basis. If the total salmon bycatch in a non-CDQ sector reaches the cap specified for that sector, NMFS would close directed fishing for pollock by that sector for the remainder of the season. The remaining sectors may continue to fish until they reach their specific sector level cap. The CDQ allocations would continue to be managed as they are under the status quo, with further allocation of the CDQ salmon bycatch cap among the six CDQ groups, transferable allocations within the CDQ Program, and a prohibition against a CDQ group exceeding its salmon bycatch allocation.

For analytical purposes, a subset of the sector allocation options which provides the greatest contrast will be used for detailed analysis.

2.2.2.1 Option 1: Sector allocation based on pollock allocation under AFA

Option 1) 10% of the cap to the CDQ sector, and the remaining allocated as follows: 50% inshore CV fleet; 10% for the mothership fleet; and 40% for the offshore CP fleet. This results in allocations of 45% inshore CV, 9% mothership and 36% offshore CP.

This option would set the sector level hard caps based the percentage allocations established for pollock allocations under the AFA. Application of these percentages results in the following range of sector level caps, based upon the range of caps in Component 1, Option 1 (Table 2-5).

2.2.2.2 Options 2-6: Historical average of Chum salmon bycatch by sector and blended adjustment of historical and pro-rata

Under Option 2, sector level caps would be set for each sector based on a range of sector allocation percentages. Table 2-5 summarizes the range of sector allocations resulting from options 1-6 and suboptions under each.

Option 2) Historical average of percent bycatch by sector, based on:

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 3) Allocation based on 75% pro-rata and 25% historical

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 4) Allocation based on 50% pro-rata and 50% historical

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 5) Allocation based on 25% pro-rata and 75% historical

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 6) Allocate 10.7% to CDQ, remainder divided 44.77% to Inshore CV, 8.77% to Mothership and 35.76% to Catcher Processors.

Table 2-5 Sector split percentage allocations resulting from options 1-3. Note that percentage allocations under Option 6 for the remaining sections are not included at this time. The allocation included for analytical purposes are shown in **bold**.

Time Period for Average	Option	% historical: pro-rata	CDQ	Inshore CV	Mothership	Offshore CPs
NA (AFA)	1	0:100	10.0%	45.0%	9.0%	36.0%
2007-2009	2i	100:0	4.4%	75.6%	5.6%	14.4%
	3i	75:25	5.8%	67.9%	6.5%	19.8%
	4i	50:50	7.2%	60.3%	7.3%	25.2%
	5i	25:75	8.6%	52.6%	8.2%	30.6%
2005-2009	**2ii**	**100:0**	**3.4%**	**81.5%**	**4.0%**	**11.1%**
	3ii	75:25	5.0%	72.4%	5.3%	17.3%
	4ii	**50:50**	**6.7%**	**63.3%**	**6.5%**	**23.6%**
	5ii	25:75	8.3%	54.1%	7.8%	29.8%
2000-2009	2iii	100:0	4.4%	76.0%	6.2%	13.4%
	3iii	75:25	5.8%	68.3%	6.9%	19.1%
	4iii	50:50	7.2%	60.5%	7.6%	24.7%
	5iii	25:75	8.6%	52.8%	8.3%	30.4%
1997-2009	2iv	100:0	4.4%	74.2%	7.3%	14.1%
	3iv	75:25	5.8%	66.9%	7.8%	19.5%
	4iv	50:50	7.2%	59.6%	8.2%	25.0%
	5iv	25:75	8.6%	52.3%	8.6%	30.5%
suboption(10.7% to CDQ)	**6**	**NA**	**10.7%**	**44.77%**	**8.77%**	**35.76%**

For analysis the following range of sector allocations will be examined:

Option	CDQ	Inshore CV	Mothership	CP
2ii (sector allocation 1)	3.4%	81.5%	4.0%	11.1%
4ii (sector allocation 2)	6.7%	63.3%	6.5%	23.6%
Suboption (sector allocation 3)	10.7%	44.77%	8.77%	35.76%

Based on the cap levels noted under component 1 for analysis, the sector allocations under component 2 and the cooperative provisions under component 3 to be analyzed, the following shows the specific caps by sector to be evaluated in this analysis (Table 2-6). Note that cooperative level allocations to the inshore CV sector will be analyzed qualitatively (see Section 2.2.4 for cooperative provisions and allocations).

Table 2-6 Alternative 2 chum salmon bycatch limits by sector for analysis (note sector allocation numbers refer to options as listed in Table 2-5 above)

Hard cap	Sector allocation	CDQ	CV	MS	CP
50,000	1	1,700	40,750	2,000	5,550
	2	3,350	31,650	3,250	11,800
	3	5,350	22,385	4,385	17,880
200,000	1	6,800	163,000	8,000	22,200
	2	13,400	126,600	13,000	47,200
	3	21,400	89,540	17,540	71,520
353,000	1	12,002	287,695	14,120	39,183
	2	23,651	223,449	22,945	83,308
	3	37,771	158,038	30,958	126,233

2.2.3 Component 3: Sector Transfer

The two options under this component may be selected only if the hard cap is apportioned among the sectors under Component 2. Options 1 and 2 are mutually exclusive, which means that either Option 1 to allow sector level transferable allocations or Option 2 to require NMFS to reapportion salmon bycatch from one sector to the other sectors in a season could be selected.

If sector level caps under Component 2 are selected, but not select Option 1 (transfers) or Option 2 (rollovers) under Component 3, the sector level cap would not change during the year and NMFS would close directed fishing for pollock once each sector reached its sector level cap. Because the CDQ sector level cap would allocated to the CDQ groups, the CDQ allocations would continue to be managed as they are under status quo, with further allocation of the salmon bycatch cap among the six CDQ groups, transferable allocations within the CDQ Program, and a prohibition against a CDQ group exceeding is salmon bycatch allocation.

2.2.3.1 Option 1: Transferable salmon bycatch caps

Option 1) Allocate salmon bycatch caps to each sector and allow the entity representing each non-CDQ sector and the CDQ groups to transfer salmon bycatch among the sectors and CDQ groups.

To provide sectors and cooperatives more opportunity to fully use their pollock allocations, the ability to transfer sector allocations could be implemented as part of Alternative 2. If sector are issued transferable allocations, then these entities could request NMFS to move a specific amount of a salmon bycatch allocation from one entity's account to another entity's account during a fishing season. Transferable allocations would not constitute a "use privilege" and, under the suboptions, only a portion of the residual salmon bycatch may be transferred.

Suboption: Limit transfers to the following: a) 50%, b) 70%, or c) 90% of available salmon.

If a transferring entity had harvested all of its pollock without attaining it Chum salmon bycatch allocation, it could only transfer up to a specified percent of that salmon bycatch allocation to another entity with pollock still remaining for harvest in that season. Under this circumstance, this transfer provision would mean that not all salmon bycatch allocated would be available for use by entities other than the original recipient of the allocation.

Transfers are voluntary requests to NMFS, initiated by the entity receiving a salmon bycatch cap, for NMFS to move a specific amount of a salmon bycatch allocation from one entity's account to another entity's account.

Option 1 would require that each sector receiving a transferable salmon bycatch cap be represented by an entity that could:

- represent all vessels eligible to participate in the particular AFA sector and receive allocations for a specific amount of chum salmon bycatch on behalf of those vessels,
- be authorized by all members of the sector to transfer all or a portion of the sector's chum salmon bycatch cap to another sector or to receive a chum salmon bycatch transfer from another sector on behalf of the members of the sector,
- be responsible for any penalties assessed for exceeding the sector's chum salmon bycatch cap (i.e., have an agent for service of process with respect to all owners and operators of vessels that are members of the entity).

More information about the entities necessary to receive transferable chum salmon bycatch allocations is in Section 1.2.5.3.

Once sector level salmon bycatch hard caps are allocated to an entity representing an AFA sector or to a CDQ group, each entity receiving a transferable allocation would be prohibited from exceeding that allocation. NMFS would report any overages of the allocation to NOAA OLE for enforcement action.

2.2.3.2 Option 2: Rollover unused salmon bycatch to other sectors

Option 2) NMFS manages the sector level caps for the non-CDQ sectors and would rollover unused salmon bycatch to other sectors still fishing in a fishing season based on the proportion of pollock remaining for harvest.

A “rollover” is a management action taken by NMFS to “reapportion” or move salmon bycatch from one sector to the remaining sectors through a notice in the *Federal Register*. Rollovers are an alternative to transferable allocations that allow one sector to voluntarily transfer unused salmon bycatch allocation to another sector.

Under this option, if a non-CDQ AFA sector has completed harvest of its pollock allocation without attaining its sector level cap, and sufficient salmon bycatch remains to be reapportioned, NMFS would reapportion the unused amount of salmon bycatch to other AFA sectors, including CDQ groups. Any reapportionment of salmon bycatch by NMFS would be based on the proportion each sector represented of the total amount of pollock remaining for harvest by all sectors through the end of the season. Successive reapportionment actions would occur as each non-CDQ sector completes harvest of its pollock allocation.

The CDQ groups could receive rollovers of salmon bycatch from other sectors. However, because the CDQ groups will each receive a specific, transferable allocation of salmon bycatch (as occurs under status quo), unused salmon bycatch would not be reapportioned from an individual CDQ group to other CDQ groups or other AFA sectors. CDQ groups with unused salmon bycatch could transfer it to another CDQ group, as is currently allowed in the CDQ Program.

2.2.4 Component 4: Cooperative provisions

Options under this component may be selected only if sector level caps are set under Component 2. Component 4 would further subdivide the inshore CV sector level cap to the inshore cooperatives and the inshore open access fishery (if the inshore open access fishery exists in a particular year). Each inshore cooperative would manage its allocation and would be required to stop fishing for pollock once the cooperative allocation is reached. NMFS would close the inshore open access fishery once that fishery’s cap is reached.

The allocation of salmon to a cooperative within the inshore CV fleet or to the inshore open access fishery would be based upon the proportion of total sector pollock catch associated with the vessels in the cooperative or inshore open access fishery, respectively. The annual pollock quota for this sector is allocated by applying a formula which allocates catch to a cooperative, or the inshore open access fishery, according to the specific sum of the catch history for the vessels in the cooperative or the inshore open access fishery, respectively. Under 50 CFR 679.62(e)(1), the individual catch history of each vessel is equal to the sum of inshore pollock landings from the vessel’s best 2 out of 3 years from 1995 through 1997, and includes landings to catcher/processors for vessels that made landings of 500 mt or more in 1995, 1996, or 1997.

Each year, NMFS issues fishing permits to cooperatives based on the cooperative’s permit application which lists the vessels added or subtracted. Fishing in the inshore open access fishery is possible should a vessel leave its cooperative, and the inshore CV quota allocation is partitioned to allow for an allocation to an inshore open access fishery under these circumstances.

The range of cooperative level allocations in this analysis is based upon the 2010 pollock quota allocations, and the options for the range of sector splits for the inshore CV fleet based upon Alternative 2 caps for analysis. All inshore sector catcher vessels have been part of a cooperative since 2005. However, if this component is selected, regulations would accommodate allocations of an appropriate portion of the salmon bycatch cap to the inshore open access fishery, if, in the future, a vessel or vessels did not join a cooperative.

Table 2-7 Alternative 2 shore-based catcher vessel sector chum salmon bycatch limits by co-op based on 2010 pollock allocations

Hard cap	Sector Allocation	Akutan CV Assoc	Arctic Enterprise	Northern Victor Fleet	Peter Pan Fleet	Unalaska	Unisea Fleet	Westward Fleet	Open access AFA
2010 pollock allocation		32.02%	0.00%	9.38%	2.88%	10.49%	25.95%	18.49%	0.00%
50,000	1	13,050	0	3,822	1,172	4,276	10,576	7,534	0
	2	10,136	0	2,968	910	3,321	8,214	5,851	0
	3	7,169	0	2,099	644	2,349	5,810	4,139	0
200,000	1	52,199	0	15,286	4,688	17,104	42,305	30,135	0
	2	40,542	0	11,873	3,641	13,284	32,858	23,406	0
	3	28,674	0	8,397	2,575	9,395	23,239	16,554	0
353,000	1	92,131	0	26,980	8,274	30,188	74,668	53,189	0
	2	71,557	0	20,955	6,426	23,447	57,994	41,311	0
	3	50,610	0	14,821	4,545	16,583	41,017	29,218	0

2.2.4.1 Cooperative transfer options

These options would only apply if the sector level caps under Component 2 and the inshore CV sector level cap is further allocated among the cooperatives and the inshore open access fishery (if the inshore open access fishery existed in a particular year) under Component 4. Option 1 or Option 2 or both could be selected.

When a salmon cooperative cap is reached, the cooperative must stop fishing for pollock and may:

Option 1) Transfer (lease) its remaining pollock to another inshore cooperative for the remainder of the season or year. Allow inter-cooperative transfers of pollock to the degree currently authorized by the AFA.

Option 2) Transfer salmon bycatch from other inshore cooperatives (industry initiated)

Suboption: Limit transfers to the following: a) 50%, b) 70%, or c) 90% of available salmon

2.2.5 Managing and Monitoring Alternative 2

Under Alternative 2, the term “hard cap” refers to an amount of chum salmon that, once caught, would require entities regulated under the cap to stop directed fishing for pollock in the Bering Sea. Regulatory changes including changes to monitoring requirements, inseason management, and enforcement responsibilities have been implemented in conjunction with amendment 91. Some information is contained in this section based upon the issues raised in the Chinook salmon bycatch management measures EIS. Additional information on potential changes necessary to implement a hard cap for chum salmon in addition to Chinook salmon will be included in the initial review draft.

This action proposes several levels of salmon bycatch hard caps, applied to different fishing industry sectors:

- **Component 1.** Separate hard cap allocations could be made to the CDQ and the non-CDQ fisheries. The CDQ sector level cap would be further allocated among the CDQ groups.

- **Component 2.** The hard cap allocations to the non-CDQ sector could be further subdivided, by sector, into sector level caps or transferable allocations for motherships, catcher/processors, and the inshore sector.
- **Component 4.** The inshore sector cap could be further subdivided among inshore cooperatives and, potentially, to an inshore open access fishery for catcher vessels not participating in an inshore cooperative.

Note: Component 3 is omitted from this list because it is associated with transfers of salmon cap allocations, not allocations to, and among, sectors.

2.2.5.1 Sector Allocations

Under Alternative 2, Component 2, the non-CDQ salmon hard cap would be apportioned among the three non-CDQ AFA sectors as sector level caps. These sector level caps would not be transferable allocations, unless Component 3, option 1, is chosen. Sector Transfers

Component 3 includes options to allow sector level caps either to be transferred from one sector to another (Option 1) or rolled over (Option 2) from one sector to another. If Option 1 is chosen, the sector level caps would be issued to entities representing each sector as transferable allocations. Chum salmon transfers would be industry-initiated, whereas for rollovers NMFS would move a quantity of a sector level cap from the sector that has stopped fishing to the sectors still fishing in a season. Both of these options have associated management implications; each of them are discussed below. Option 1 would put more of the burden of managing and accounting for Chum salmon bycatch on the recipients of the transferable allocation. Option1 would require each sector to have an entity to receive the allocation and make the transfers and it would require changes to monitoring requirements for inshore catcher vessels and shoreside processors. Option 2 would increase NMFS's monitoring and management role associated with salmon bycatch caps (see Section 1.2.5.5). The transfer and/or rollover options considered under Component 3 would require NMFS to administer the movement of salmon among sectors in a season.

If neither Option 1 or Option 2 were selected, *i.e.*, if Component 3 was not selected, each sector would have to stop directed fishing for pollock once its seasonal sector level cap was reached. There could be no movement of salmon bycatch between the catcher/processor, mothership, inshore sector, or the CDQ sectors. Without transfers or rollovers, prior to each sector's specific cap being reached, NMFS would close fishing for that sector with an inseason closure notice. The short delay associated with inseason closures would require NMFS to closely monitor pollock catch and salmon bycatch in order to project when a sector might reach its salmon hard cap. NMFS would rely on existing observer coverage levels and monitoring requirements to determine the amount of salmon bycatch made by each sector. Thus, as with Component 1, bycatch information from observed fishing vessels would be applied to non-observed fishing vessels.

Under Option 1, transfers of Chum salmon bycatch allocations could occur between the catcher/processor sector, mothership sector, inshore sector, and CDQ groups. Chum salmon could be transferred between any of these sectors or the CDQ groups. Participants would need to apply to NMFS to formally transfer all or a portion of their Chum salmon bycatch allocation. Selection of this option would require NMFS to process and approve Chum salmon bycatch allocation transfer applications. The burden on the agency would increase proportionally with the number of inter-sector transfers that industry chose to request during a given season. Participants in the pollock fishery would face additional costs associated with preparing and submitting Chum salmon bycatch allocation transfer applications to NMFS.

Option 1 contains a suboption to limit transfers to 50 percent, 70 percent, or 90 percent of the amount of salmon available to a sector at the time of transfer. If such a level were adopted, NMFS would implement it by incorporating the appropriate limit into the business rules that would be developed to modify the CAS changes.

2.2.5.2 Entities necessary to receive transferable allocations

Transferable allocations must be issued to an entity that represents all members of the group eligible to receive the transferable allocation. The entity performs the following functions with NMFS:

- receives an allocation of a specific amount of salmon bycatch on behalf of all members of the entity,
- is authorized to transfer all or a portion of the entity's salmon bycatch allocation to another entity or receive a transfer from another entity (authorized to sign transfer request forms), and
- is responsible for any penalties assessed for exceeding the entity's salmon bycatch allocation (i.e., the entity must have an agent for service of process with respect to all owners and operators of vessels that are members of the entity).

The entity would have to be created by a contract among the group of eligible AFA participants in that sector who are receiving the transferable salmon bycatch allocation.

Some pollock fishery participants already are recognized as entities by NMFS:

- Inshore cooperatives are entities recognized by NMFS through the pollock permitting process. They file contracts with NMFS and are issued permits for specific amounts of pollock. 50 CFR 679.7(k)(5)(ii) prohibits an inshore cooperative from exceeding its annual allocation of pollock.
- CDQ groups are entities recognized by NMFS to receive groundfish, halibut, crab, and PSQ reserves. 50 CFR 679.7(d)(5) prohibits a CDQ group from exceeding its groundfish, crab, and halibut PSC allocations. If a CDQ group receives a transferable salmon bycatch allocation, that allocation would be added to this list of prohibitions.

AFA sectors are not recognized as entities by NMFS in the same sense as inshore cooperatives or CDQ groups because there has been no reason to require these groups to be entities to receive pollock allocations. These include the:

- <u>AFA catcher/processor sector</u> (which includes all members of the Pollock Conservation Cooperative (PCC), the seven catcher vessels named in the AFA, and the catcher/processor Ocean Peace). Non-transferable allocations of pollock are made to this sector are required by the AFA and are made by NMFS through the annual groundfish specifications process. This fishery can be closed by NMFS through a *Federal Register* notice if the sector exceeds its pollock allocation. In practice, the sector manages its pollock catch within allocations and NMFS has not had to issue pollock fishery closures.
- <u>AFA mothership sector</u>. This includes the three motherships named in the AFA: Excellence, Ocean Phoenix, and Golden Alaska and the catcher vessels permitted to deliver to these motherships. Non-transferable allocations of pollock are made to this sector as required by the AFA and made by NMFS through the annual groundfish specifications process. This fishery can be closed by NMFS through a *Federal Register* notice if the sector exceeds its pollock allocation. In practice, the sector manages its pollock catch within allocations and NMFS has not had to issue pollock fishery closures.
- <u>Inshore CV sector</u>. While NMFS recognizes cooperatives as entities, the sector as whole does not have an entity. Chum salmon bycatch allocations would not be issued to the inshore cooperatives under Component 3 alone, so the inshore cooperatives and any catcher vessels not in a cooperative would have to create an umbrella entity that represented all participants in the inshore sector, if Component 4, cooperative allocations, is not chosen.

Existing contracts forming the PCC, the High Seas Catcher Vessel Cooperative, and the Mothership Cooperative could be modified to create the entities required to receive transferable bycatch allocations from NMFS or new entities (contracts) could be formed by the owners of these same vessels to address only NMFS's requirements to receive and transfer Chum salmon bycatch allocations.

Each of the three sectors in the non-CDQ pollock fishery would incur some costs associated with establishing and maintaining the entity necessary for the sector as a whole to conduct salmon transfers, although this cost cannot be estimated at this time. Entities have been formulated in conjunction with Amendment 91 for 2011 for these sectors.

If members of the catcher/processor, mothership, or inshore sectors are unable to form their respective entities to accept their share of the transferable salmon bycatch allocations, then these sectors would fish under a sector level cap. NMFS would manage the sector level caps with directed fishery closures that would apply to all members of the sector once the sector's Chum salmon sector level cap was reached.

2.2.5.3 Conducting transfers

A Chum salmon bycatch allocation transfer between different entities in the pollock fishery would require NMFS approval before the transaction could be completed. Per existing agency practice with other fishery programs with transferrable allocations, NMFS would review the transferring entities catch record to ensure sufficient salmon was available to transfer. The time required to complete a Chum salmon bycatch allocation transfer would depend on a variety of factors, including staff workload, the number of transfers being requested, and the accounting system developed to oversee the transfer process (i.e., electronic and/or paper).

The Chum salmon cap that is allocated to the CDQ sector would continue to be subdivided into CDQ group allocations. Each CDQ group allocation may be transferred between CDQ groups as well as between the other three AFA sectors under Component 3. NMFS regulations describe the process to transfer allocations between CDQ groups. This process requires each group involved in the transfer to complete a transfer request and submit it to NMFS for review. If the remaining salmon cap is sufficient, NMFS debits the transferring CDQ group's salmon account and credits the receiving group's salmon account, per the amount requested.

Option 1 increases the complexity of the changes that would be required to be made to NMFS's CAS, since it involves both sector level caps and transferable allocations. Transfer provisions would require accounts to be established for entities that receive salmon allocations, including designing accounts that enable NMFS to track and archive transfers and changes in cooperative structure. Transfers between entities would require receipt of transfer information and readjustment of accounts for the transferor and transferee. These management structures have been put into place in conjunction with Amendment 91.

NMFS has developed the internal processes that allow quota share and allocation holders in various Alaska fisheries to conduct transfers through the internet. Such a process would be extended to transferable Chum salmon bycatch allocations. The transfer process would be automated through an online system that allows entities to log onto a secure NMFS website and make a salmon bycatch allocation transfer. Online transfers probably would reduce the amount of oversight required by NMFS. The costs for an online system would depend on the system developed, but could be shared with other fishery management programs. Another advantage to the online system is that transfers are almost instantaneous. By contrast, paper-based transfers take up to 3 business days to process. The cost of preparing transfer requests could be shared by the transferring entities, since each party to a transfer would have some cost associated with a transfer transaction.

2.2.5.4 NMFS rollovers of sector level caps

Rollovers under Option 2 would be selected if a hard cap or a trigger cap for salmon bycatch is allocated among the AFA sectors, but either:

- salmon bycatch caps are not transferable among the sectors, or
- the non-CDQ sectors cannot form the entity necessary to allow transferability of salmon bycatch among the sectors.

Under Component 3 (sector transfers), either Option 1 (to allow transferable salmon bycatch caps) or Option 2 (to have NMFS manage reapportionments or rollovers of unused salmon bycatch among the sectors, inshore cooperatives, or CDQ groups) could be selected.

Rollovers refer to an action that NMFS would take to reapportion salmon bycatch that remained in a season after a sector had reached its pollock allocation to another AFA sector, the CDQ Program, or the inshore open access fishery. For example, if the catcher/processor sector harvested its entire pollock allocation, but still had some remaining salmon bycatch, and if the mothership sector, inshore sector, and CDQ sector had remaining pollock, NMFS would rollover the catcher/processor sector's remaining salmon bycatch to the other pollock sectors. This is portrayed in the following table, in which there are 1,000 salmon remaining in the catcher/processor sector level cap.

Table 2-8 Example of a salmon bycatch sector level cap rollover to remaining sectors from catcher/processor sector level cap

Sector	Pollock remaining	Percent of total pollock remaining	Reallocation of 1,000 salmon
Inshore	20,000 mt	77	770
Mothership	5,000 mt	20	200
CDQ Program	1,000 mt	3	30
Total	26,000 mt	100	1,000

Rollovers of salmon caps among AFA sectors could include the CDQ sector as a recipient of rollovers. Any salmon bycatch reapportioned to the CDQ sector during a year would be further allocated among the CDQ groups, based on each group's percentage allocation of salmon bycatch. However, rollovers from the CDQ sector to other AFA sectors are not practicable under the current allocative structure of CDQ Program. A percentage of the current salmon PSC limits currently are allocated to the CDQ Program. These PSC allocations are then further allocated among the six CDQ groups as transferable salmon PSQ. Therefore, once allocated among the CDQ groups, NMFS could not reallocate salmon bycatch away from one or more CDQ groups through a rollover.

Regulatory guidelines would be needed to allow NMFS to conduct salmon bycatch rollovers. For example, the following process could be used for guiding the rollover process:

> *If, during a fishing season, the Regional Administrator determines that a non-CDQ AFA sector has completed harvest of its pollock allocation without reaching its sector level cap and sufficient salmon bycatch remains to be reapportioned, the Regional Administrator would reapportion the projected unused amount of salmon bycatch to other AFA sectors (including CDQ), through notification in the Federal Register. Any reapportionment of salmon bycatch by the Regional Administrator would be based on the proportion each sector represents of the total amount of pollock remaining for harvest by all sectors through the end of the season. Successive reapportionments actions would occur as each sector completes harvest of its pollock allocation.*

2.3 Alternative 3: Triggered closures

Triggered closures are regulatory time and area closures that are invoked when specified cap levels are reached. Once specified areas are closed, pollock fishing could continue outside of the closure areas until either the pollock allocation is reached or the pollock fishery reaches an annual (November 1) closure date.

If the trigger cap is not further allocated among the non-CDQ sectors under Component 3, sector allocation, the CDQ Program would receive an allocation of 10.7 percent of the Chum salmon trigger cap. This CDQ allocation would be further allocated among the six CDQ groups based on percentage allocations currently in effect. Each CDQ group would be prohibited from directed fishing for pollock inside the closure area(s) when that group's trigger cap is reached.

Under Alternative 3, existing regulations related to the Chum salmon prohibited species catch limit of 42,000 salmon and triggered closures of the Chum salmon savings area in the Bering Sea would be removed from 50 CFR part 679.21 as well as regulations associated with the non-Chinook salmon elements of the VRHS ICA.

2.3.1 Component 1: Trigger cap formulation

Component 1 defines both how the overall cap level associated with the triggered area is defined (component 1A) as well as how the monthly proportion or within-monthly limit is formulated (Component 1B).

2.3.1.1 Component 1A: Trigger cap limits:

Table 2-8 lists the range of numbers considered for the overall Chum salmon hard caps, in numerical order, lowest to highest. As listed here, the CDQ allocation of the fishery level cap would be 10.7%, with the remainder apportioned to the combined non-CDQ fishery.

Table 2-9 Range of suboptions for hard cap for non-Chinook with breakout for CDQ allocation (10.7%) and remainder for non-CDQ fleet

	Non-Chinook	CDQ	Non-CDQ
i)	**25,000**	2,675	22,325
ii)	50,000	5,350	44,650
iii)	**75,000**	8,025	66,975
iv)	125,000	13,375	111,625
v)	**200,000**	21,400	178,600

For analytical purposes only, a subset of the cap numbers included in the six suboptions were used in this document to assess the impacts of operating under a given hard cap. This subset approximates the upper and lower endpoints of the suboption range, and a midpoint (**bolded**).

2.3.1.2 Component 1B: Trigger limit application:

Two options are considered for application of trigger caps (component 1B) for area closure options

Option 1: Apply trigger to all chum bycatch (monthly proportion of cap)

Option 1 is to apply trigger to all chum bycatch, and to use the calculated cumulative monthly proportion of the cap to establish monthly threshold limits. Here the cumulative monthly proportion (as noted in Table 2-10 below) is used to establish threshold limits by month for the overall cap as selected under Component 1A. The cumulative monthly proportion was calculated by estimating the average per month over the years 2003-2010.

Table 2-10 Monthly proportion of chum salmon limit

Month	**Option 1** : monthly threshold Cumulative proportion
June	11.1%
July	35.4%
August	66.5%
September	92.8%
October	100.0%

Option 2: Apply chum bycatch between specific dates (minimum of monthly proportion and 150% monthly historical proportion)

Under this option of component 1B, "apply chum bycatch between specific dates", the intent would be to specify a within monthly limit defined as the minimum of the monthly cumulative and 150% of monthly historical proportion[8]. The minimum of these two levels defines the within-month cap. . Under this option of component 1B, the monthly limit would also be shown in Table 2-11 would be in effect.

Table 2-11 Monthly proportion of chum salmon limit and within monthly proportion

	Option 2: monthly threshold and within monthly limit	
Month	Cumulative Proportion	Monthly proportion (if < cumulative)
June	11.1%	11.1%
July	35.4%	24.4%
August	66.5%	31.1%
September	92.8%	26.3%
October	100.0%	7.2%

Option 3: single cap, no monthly limit[9]

Component 1B option 3 would indicate that a single (overall or sector-split) cap would be specified and bycatch would accrue toward it cumulatively over the season. When that cap was reached, the closure system as specified in component 4 would be enacted. There would be no additional monthly cap limit constraints as specified under components 1A and 1B. The areas to be closed would depend upon the timing of when the overall cap (or sector-specific proportion) was reached and would then continue monthly as specified under the closure system selected under component 4.

2.3.2 Component 2: Sector allocation

If this component is selected, the trigger cap would be apportioned to the sector level. This would result in separate sector level caps for the CDQ sector, the inshore catcher vessel (CV) sector, the mothership sector, and the offshore catcher processor (CP) sector.

The bycatch of Chum salmon would be tabulated on a sector level basis. If the total salmon bycatch in a non-CDQ sector reaches the cap specified for that sector, NMFS would close directed fishing for pollock by that sector in the specified areas (selected under Component 4) for the remainder of the season. The remaining sectors may continue to fish outside the closures until they reach their specific sector level cap. The CDQ allocations would continue to be managed as they are under the status quo, with further allocation of the CDQ salmon bycatch cap among the six CDQ groups, transferable allocations within the CDQ Program, and a prohibition against a CDQ group exceeding its salmon bycatch allocation.

For analytical purposes, a subset of the sector allocation options which provides the greatest contrast will be used for detailed analysis.

[8] Note monthly limit should evaluate +/- 25% of monthly limit distribution

[9] Note this option was previously contained under Component 5 of June 2010 Council motion and has been merged for simplicity with the other timing and cap components under component 1. Previously this component read the following: *Component 5: Timing Option – Dates of Area Closure:*

a) Trigger closure when the overall cap level specified under Component 1(a) was attained

b) Discrete small closures would close when a cap was attained and would close for the time period corresponding to periods of high historical bycatch.

The remaining component 'b' of the previous "Component 5" are contained already in Components 1A and 1B.

2.3.2.1 Option 1: Sector allocation based on pollock allocation under AFA

Option 1) 10% of the cap to the CDQ sector, and the remaining allocated as follows: 50% inshore CV fleet; 10% for the mothership fleet; and 40% for the offshore CP fleet. This results in allocations of 45% inshore CV, 9% mothership and 36% offshore CP.

This option would set the sector level trigger caps based the percentage allocations established for pollock allocations under the AFA. Application of these percentages results in the following range of sector level caps, based upon the range of caps in Component 1, Option 1 (Table 2-12).

2.3.2.2 Option 2-6: Historical average of Chum salmon bycatch by sector and blended adjustment of historical and pro-rata

Under Option 2, sector level trigger caps would be set for each sector based on a range of sector allocation percentages.

Option 2) Historical average of percent bycatch by sector, based on:

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 3) Allocation based on 75% pro-rata and 25% historical

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 4) Allocation based on 50% pro-rata and 50% historical

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 5) Allocation based on 25% pro-rata and 75% historical

i. 3-year (2007-2009)
ii. 5-year (2005-2009)
iii. 10-year (2000-2009)
iv. 14-year (1997-2009)

Option 6) **Allocate 10.7% to CDQ, remainder divided 44.77% to Inshore CV, 8.77% to Mothership and 35.76% to Catcher Processors.**.

Table 2-12 summarizes the range of sector allocations resulting from options 1-5 and suboptions under each.

Table 2-12 Sector split percentage allocations resulting from options 1-6

Time Period for Average	Option	% historical: pro-rata	CDQ	Inshore CV	Mothership	Offshore CPs
NA (AFA)	1	0:100	10.0%	45.0%	9.0%	36.0%
2007-2009	2i	100:0	4.4%	75.6%	5.6%	14.4%
	3i	75:25	5.8%	67.9%	6.5%	19.8%
	4i	50:50	7.2%	60.3%	7.3%	25.2%
	5i	25:75	8.6%	52.6%	8.2%	30.6%
2005-2009	2ii	100:0	3.4%	81.5%	4.0%	11.1%
	3ii	75:25	5.0%	72.4%	5.3%	17.3%
	4ii	50:50	6.7%	63.3%	6.5%	23.6%
	5ii	25:75	8.3%	54.1%	7.8%	29.8%
2000-2009	2iii	100:0	4.4%	76.0%	6.2%	13.4%
	3iii	75:25	5.8%	68.3%	6.9%	19.1%
	4iii	50:50	7.2%	60.5%	7.6%	24.7%
	5iii	25:75	8.6%	52.8%	8.3%	30.4%
1997-2009	2iv	100:0	4.4%	74.2%	7.3%	14.1%
	3iv	75:25	5.8%	66.9%	7.8%	19.5%
	4iv	50:50	7.2%	59.6%	8.2%	25.0%
	5iv	25:75	8.6%	52.3%	8.6%	30.5%
Option 6(10.7% to CDQ)	6	NA	10.7%	44.77%	8.77%	35.76%

For analysis the following range of sector allocations will be examined:

Option	CDQ	Inshore CV	Mothership	CP
2ii (sector allocation 1)	3.4%	81.5%	4.0%	11.1%
4ii (sector allocation 2)	6.7%	63.3%	6.5%	23.6%
6(sector allocation 3)	10.7%	44.77%	8.77%	35.76%

Based on the cap levels noted under component 1 for analysis, and the sector allocations under component 2 to be analyzed, the following shows the specific caps by sector to be evaluated in this analysis (Table 2-13 and Table 2-14).

Table 2-13 Chum salmon bycatch limits that would trigger monthly closures by sector under options 1-2. Optional monthly limits (option 2) are given in parenthesis. Note sector allocation numbers correspond to options listed in Table 2-14.

Sector Allocation	25,000 cap	CDQ	CV	MS	CP
	June	90 (90)	2,250 (2,250)	110 (110)	310 (310)
	July	300 (300)	7,210 (7,210)	350 (350)	980 (980)
1	August	570 (400)	13,560 (9,510)	670 (470)	1,850 (1,300)
	September	790 (340)	18,910 (8,030)	930 (390)	2,580 (1,090)
	October	850 (90)	20,380 (2,190)	1,000 (110)	2,780 (300)
	June	180 (180)	1,710 (1,710)	180 (180)	640 (640)
	July	530 (520)	4,990 (4,920)	510 (510)	1,860 (1,830)
2	August	1,070 (810)	10,070 (7,620)	1,030 (780)	3,760 (2,840)
	September	1,550 (720)	14,600 (6,790)	1,500 (700)	5,440 (2,530)
	October	1,680 (190)	15,830 (1,830)	1,630 (190)	5,900 (680)
	June	290 (290)	1,210 (1,210)	240 (240)	970 (970)
	July	840 (830)	3,530 (3,480)	690 (680)	2,820 (2,780)
3	August	1,700 (1,290)	7,130 (5,390)	1,400 (1,060)	5,690 (4,310)
	September	2,470 (1,150)	10,330 (4,800)	2,020 (940)	8,250 (3,840)
	October	2,680 (310)	11,190 (1,300)	2,190 (250)	8,940 (1,040)

Table 2-14 Chum salmon sector allocations of different trigger cap levels under option 3

Trigger cap	Sector allocation	CDQ	CV	MS	CP
	1	850	20,375	1,000	2,775
25,000	2	1,675	15,825	1,625	5,900
	3	2,675	11,192	2,193	8,940
	1	1,700	40,750	2,000	5,550
50,000	2	3,350	31,650	3,250	11,800
	3	5,350	22,385	4,385	17,880
	1	6,800	163,000	8,000	22,200
200,000	2	13,400	126,600	13,000	47,200
	3	21,400	89,540	17,540	71,520
	1	12,002	287,695	14,120	39,183
353,000	2	23,651	223,449	22,945	83,308
	3	37,771	158,038	30,958	126,233

2.3.2.3 Comparison of monthly limits under options 1, 2 and 3

Options 1-3 describe the mechanism by which the specified trigger limit (as selected under Component 1) is applied, which if reached enacts a series of closures, as described under Component 4. Under all three options, the closure system would be enacted for the remainder of the season should the cumulative total trigger by sector be reached. The distinction between the options is the progressively more restrictive within monthly limits imposed on either option 1 or 2 in addition to the cumulative cap. This section uses a specified cap and sector allocation example to demonstrate how the options differ in their application. For all options the area closure system example employed is the same. Component 4 describes the range of area closures under consideration based upon average historical bycatch percentages. Here Component 4B (50% historical bycatch) is selected for this example. The areas shown in Table 2-15 correspond to the closures indicated in Figure 2-3.

Table 2-15 Closure descriptions under Alternative 3, component 4b (50% historical bycatch closure system) for all three trigger application options. Note that within each month the closures are indicated by the CSSA number corresponding to the month and number of closure areas as indicated in Figure 2-3.

Month	Chum salmon savings area	Number of closure boxes
June	CSSA1	2
July	CSSA2	4
August	CSSA3	6
September	CSSA4	5
October	CSSA5	3

Option 1: Using the example of a 25,000 trigger cap limit sector allocation (1), the following tables indicate what the within monthly limit would be and which areas would close upon reaching that limit.

Table 2-16 Option 1 monthly proportion of cumulative total limits. If cumulative bycatch by a sector reaches the specified limit, during the specified month, then the area as indicated for that month will close for the remainder of the month. CSSA area numbers correspond to those listed in Table 2-15.

CDQ	CV	M	CP	Month	Area
90	2,250	110	310	June	CSSA1
300	7,210	350	980	July	CSSA2
570	13,560	670	1,850	August	CSSA3
790	18,910	930	2,580	September	CSSA4
85	**20,380**	**1,000**	**2,780**	October	CSSA5

Here the listed area will close for the month within which the sector-specific cap is reached. Those areas would then reopen at the end of the month. The next areas would remain open unless the cumulative bycatch by sector reaches the within monthly limit. If bycatch reaches the within monthly limit then the areas listed for that month will close for the remainder of the month. If in any month the cumulative total amount (listed in bold) is reached, then the CSSAs listed for each month would close according to their monthly schedule for the remainder of the season. In all cases there may be additional bycatch by sector outside of the listed CSSAs, however the sector whose limit has been reached will be prohibited from fishing in the CSSAs in each month in which the closure applies.

Option2: Using the same example, Table 2-17 shows the within monthly limit that would close the CSSA prior to reaching the limits as shown in Table 2-16.

Here the limits as shown in Table 2-17 are in addition to the monthly cumulative limits shown in Table 2-16. For all sectors the within monthly and cumulative amounts for June are equivalent (and for this sector allocation example they are equivalent in July as well). Should the within-monthly limit (Table 2-17) by sector be reached, regardless of the cumulative monthly not being reached, the listed CSSA would close for the remainder of the month. The following month, the listed CSSA would only close if the within monthly limit for that month was reached or if the cumulative bycatch reached the cumulative totals. As with option 1, if at any time the annual cumulative total (in bold) were reached, then the CSSAs would be enacted monthly for the remainder of the season and the sector or sectors reaching their limits would be prohibited from fishing within those areas in each month. As with option 1, bycatch by sector may continue to accrue outside of the CSSAs.

Table 2-17 Option 2 monthly proportion and within monthly limit. If prior to reaching the monthly amounts listed in Table 2-16 above, non-Chinook bycatch by sector in a given month reaches the following amount then the following areas close for the remainder of the month:

CDQ	CV	M	CP	MONTH	AREA
90	2,250	110	310	June	CSSA1
300	7,210	350	980	July	CSSA2
400	9,510	470	1,300	August	CSSA3
340	8,030	390	1,090	September	CSSA4
90	2,190	110	300	October	CSSA5

Option 3: For option 3 there is no within monthly limit. Instead the bycatch accrues cumulatively against the cumulative by sector limit only. Annual sector specific limits under the same cap (25,000) and sector allocation example as shown for options 1 and 2 are as follows:

Table 2-18 Option 3 Seasonal cumulative limit. Sector specific cumulative trigger limits

CDQ	CV	M	CP
85	**20,380**	**1,000**	**2,780**

Here when the cumulative amount by sector is reached, the CSSA in the month in which the cap was reached will close for the remainder of the month and the CSSAs for all subsequent months through the end of the season will close as scheduled. No within monthly limit is applied in addition to the cumulative bycatch limit under this option. As with option 1 and 2, bycatch by sector may continue to accrue outside of the CSSAs.

2.3.3 Component 3: Cooperative Provisions

The two options under this component may be selected only if the trigger cap is apportioned among the sectors under Component 2. Options 1 and 2 are mutually exclusive, which means that either Option 1 to allow sector level transferable allocations or Option 2 to require NMFS to reapportion salmon bycatch from one sector to the other sectors could be selected.

If sector level caps under Component 2 are selected, but not select Option 1 (transfers) or Option 2 (rollovers) under Component 3, the sector level cap would not change during the year and NMFS would close directed fishing for pollock in the specified area once each sector reached its sector level cap. Because the CDQ sector level cap would be allocated to the CDQ groups, the CDQ allocations would continue to be managed as they are under status quo, with further allocation of the salmon bycatch cap among the six CDQ groups, transferable allocations within the CDQ Program, and a prohibition against a CDQ group exceeding is salmon bycatch allocation.

a) Allow allocation at the co-op level for the inshore sector, and apply transfer rules (Component 3) at the co-op level for the inshore sector.
    Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:
    1) 50%
    2) 70%
    3) 90%

b) Allow NMFS to roll-over unused bycatch allocation to cooperatives that are still fishing

2.3.4 Component 4: Area and Timing Options

Component 4 includes 3 options for a system of closure areas which change by month. Here options represent the overall estimated bycatch percentage represented historically by these regions on a monthly basis over the years 2003-2010.

a) Area closure groupings by month that represent 40% of historical bycatch

b) Area closure groupings by month that represent 50%[10] of historical bycatch

c) Area closure groupings by month that represent 60% of historical bycatch.

The following steps were used to determine which areas to be included in the area closures by size for each month.

1) Use criterion for ranking top 20 areas for each month (out of global top 20 areas)
2) Given the monthly ranking, compute the percentage of total chum
3) Use that to find the level amount of areas to close

Results area shown in Figure 2-2 to Figure 2-4 for each month associated with options a-c of Component 4.

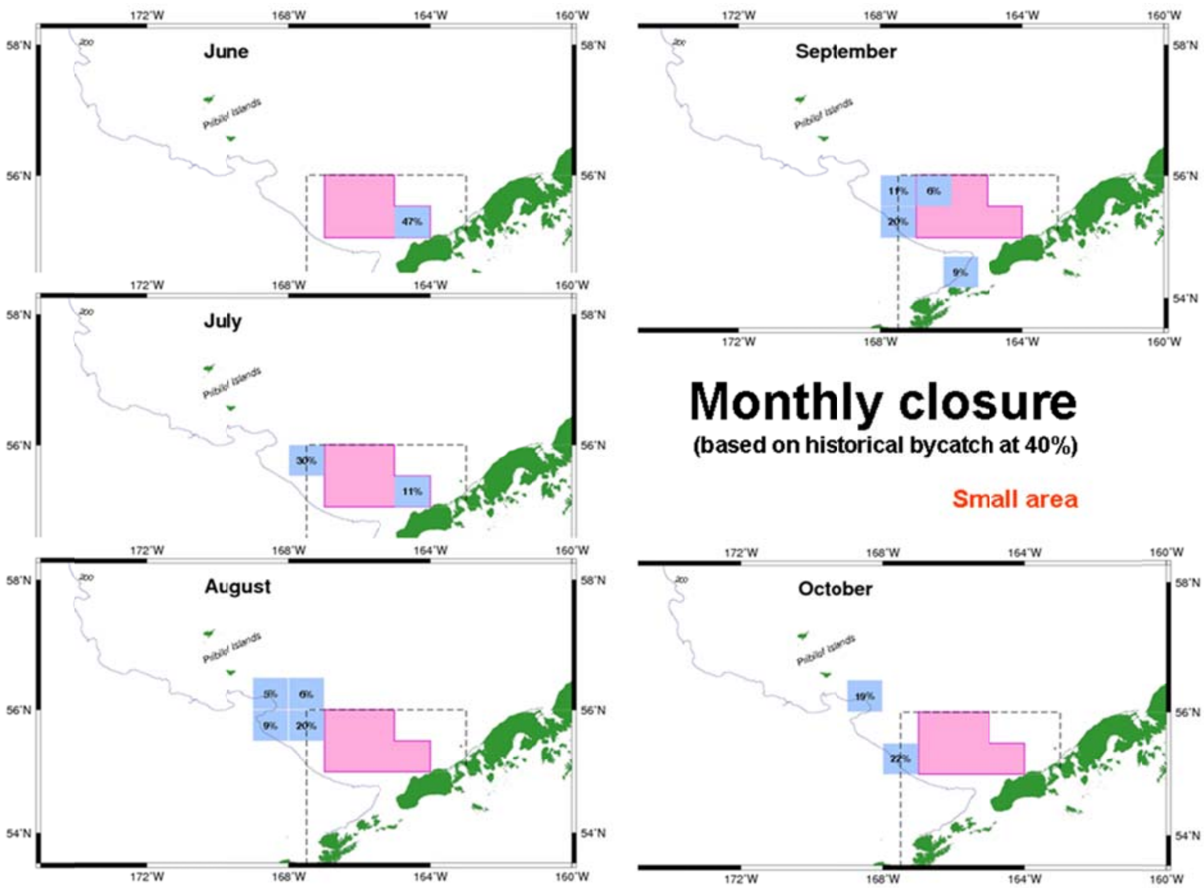


Figure 2-2 Monthly area closures based on ADFG areas that represented 60% of the historical chum bycatch (within each month)

[10] The Council noted that the analysis should include quantitative analysis of the 50% closure options and qualitative analysis of the 40% and 60% closure options.

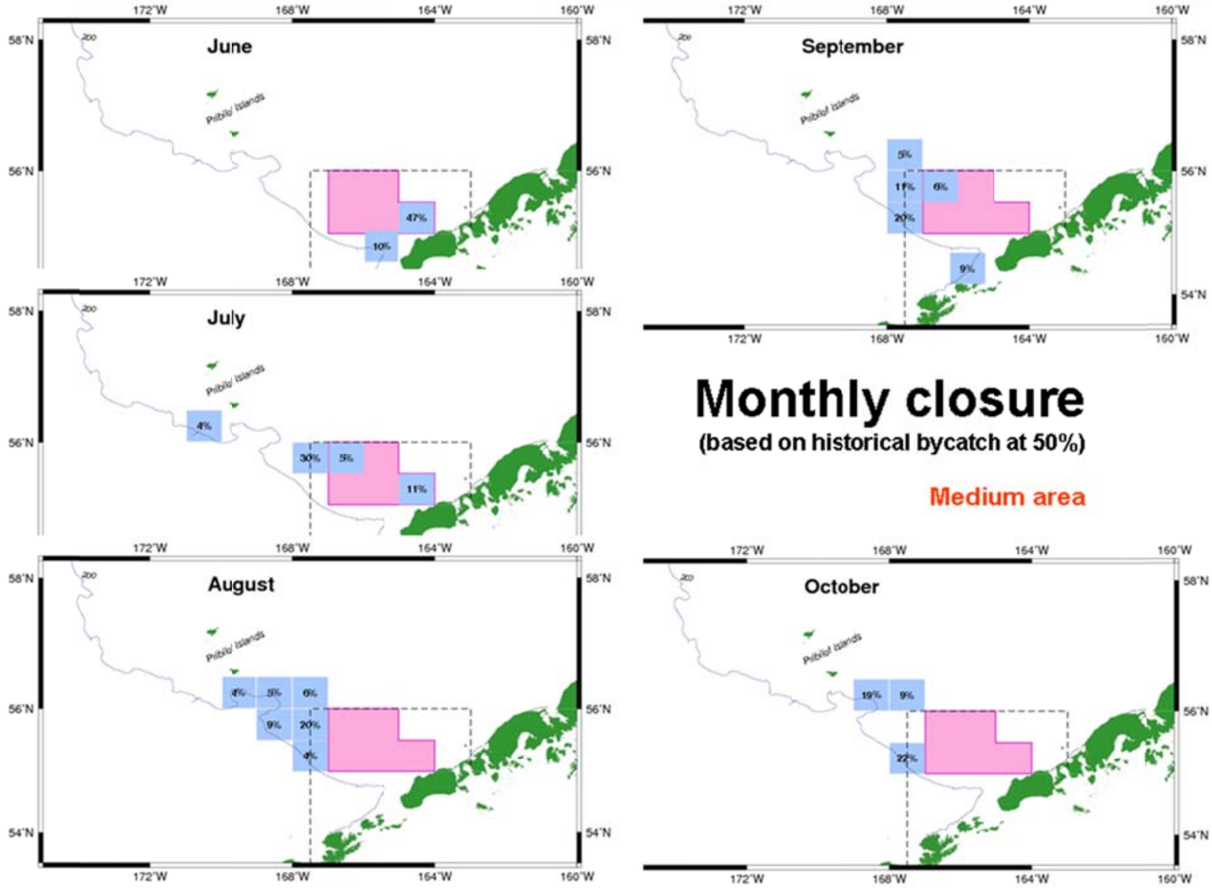


Figure 2-3 Monthly area closures based on ADFG areas that represented 50% of the historical chum bycatch (within each month)

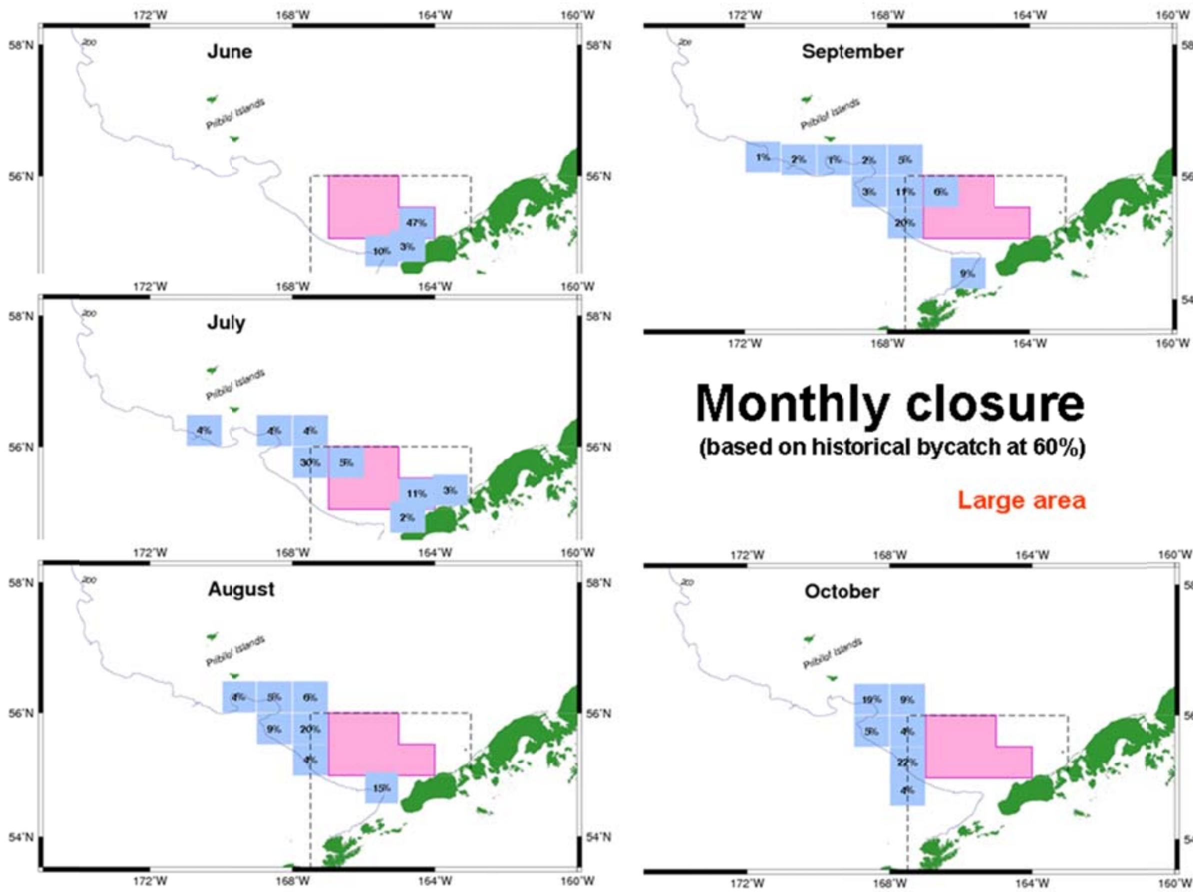


Figure 2-4 Monthly area closures based on ADFG areas that represented 60% of the historical chum bycatch (within each month)

2.3.5 Component 5: Rolling Hot Spot (RHS) system

Similar to status quo (with RHS system in regulation), participants in a vessel-level (platform level for Mothership) RHS would be exempt from regulatory closure system below. This closure represents a large area trigger closure encompassing 80% of historical bycatch (Figure 2-5).

Sub-option: RHS regulations would contain an ICA provision that the regulatory trigger closure (as adopted in Component 4) apply to participants with a rate in excess of 200% of the Base Rate
In constructing an ICA under this component, consideration should be given to closures that would address timing and location of bycatch of Western AK chum stocks.

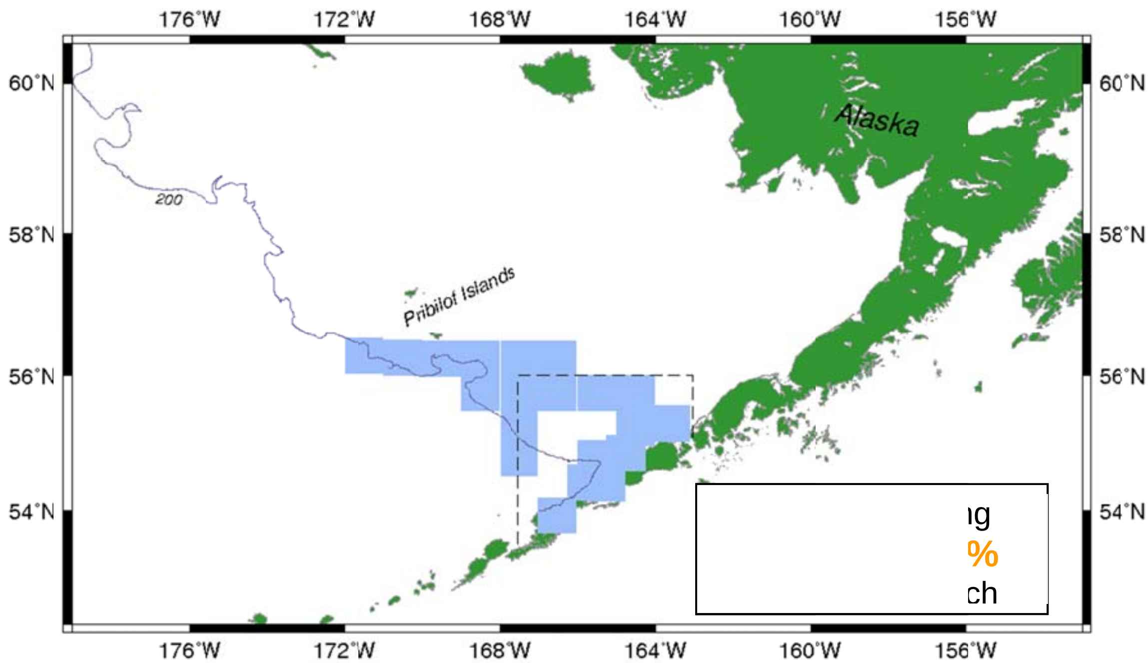


Figure 2-5 Large area closure based on ADFG areas that represented about 80% of the historical chum bycatch

2.4 Alternatives considered and eliminated from further analysis

The alternatives in this analysis were developed through a public Council and stakeholder process. Many issues were aired and other possible management options, or points within the range of the options, were considered. Through an iterative process, the Council arrived at an draft suite of management options that best suit the problem statement, that represent a reasonable range of alternatives and options, and also represent a reasonable combination of management measures that can be analyzed and used for decision-making. These alternatives may still be modified by the Council in iterative reviews of this analysis. Currently the analysis is scheduled for preliminary review in February, initial review in June and final action in October or December of 2011. It is anticipated that some modification of the suite of alternatives will occur both at preliminary review and initial review. The Council may select a preliminary preferred alternative (PPA) at initial review in June and will select a preferred alternative (PA) at final action that may or may not comport with the PPA.

The Council and NMFS also concurrently held a formal scoping period which provided another forum for the public to provide input to the development of alternatives. A scoping report was provided which summarized the comments for the Council. Chapter 1 includes a detailed discussion of the issues raised in scoping, which is referenced but not repeated here.

This section discusses the Council's process for developing alternatives, and those alternatives that were originally discussed at the Council level and through the Council's Salmon Bycatch Workgroup, but which, for the reasons noted below, were not analyzed in detail.

The Council, in February 2007, established a Salmon Bycatch Workgroup (SBW) committee, comprising of members representing the interests of western Alaska (4 members) and of the pollock industry (4 members). This committee had two Chairs**, one from each of the major interest groups represented in its membership. The Council later (June 2007**) appointed an additional member from the Alaska Board of Fisheries (BOF). The Council requested that the SBW provide recommendations to the Council regarding appropriate salmon cap levels, by species (Chinook and chum or 'other' salmon), to be considered for the pollock fishery, as well as to work with staff to provide additional review of and recommendations for the development of alternatives for analysis.

The SBW met 5 times, in March 2007, May 2007, August 2007, November 2007 and January 2009. These meetings were open to the public and noticed in the Federal Register accordingly. Following each meeting, a report was compiled representing the recommendations and discussions by the committee, and provided to the Council at its subsequent meeting (April 2007, June 2007, October 2007, December 2007, February 2009). In the spring of 2009 the Council bifurcated the analyses of chum and Chinook management measures and prioritized the analysis of Chinook management measures. Final action on Chinook management measures was taken by the Council in April 2009 (Amendment 91). The fishery is operating under the Amendment 91 regulations beginning in January 2011.

The Council refined alternatives for chum salmon management measures in December 2009 and June 2010 (see Council motions in Appendix 1 to this Chapter). Modifications included changing the range of numbers for cap considerations and adopting the area closures under consideration in Alternative 3. Further modification of alternatives may occur iteratively in the course of finalizing the analysis prior to final action.

Appendix 1:
Council motions June 2010 and December 2009 to refine Chum bycatch management alternatives

Council motion June 2010
The Council moves the following suite of alternatives for preliminary analysis of chum salmon bycatch management measures. Note bolded items are additions while strike-outs represent deletions from previous suite of alternatives.

C-1(b) Bering Sea Chum Salmon Bycatch

Alternative 1 – Status Quo
Alternative 1 retains the current program of the Chum Salmon Savings Area (SSA) closures triggered by separate non-CDQ and CDQ caps with the fleet's exemption to these closures per regulations for Amendment 84 and as modified by the Amendment 91 Chinook bycatch action.

Alternative 2 – Hard Cap
Component 1: Hard Cap Formulation (with CDQ allocation of 10.7%)

a) 50,000
b) 75,000
c) 125,000
d) 200,000
e) 300,000
f) 353,000

Component 2: Sector Allocation

Use blend of CDQ/CDQ partner bycatch numbers for historical average calculations.

a) No sector allocation
b) Allocations to Inshore, Catcher Processor, Mothership, and CDQ
    1) Pro-rata to pollock AFA pollock sector allocation
    2) Historical average
        i. 2007-2009
        ii. 2005-2009
        iii. 2000-2009
        iv. 1997-2009
    3) Allocation based on 75% pro-rata and 25% historical
    4) Allocation based on 50% pro-rata and 50% historical
    5) Allocation based on 25% pro-rata and 75% historical

For Analysis:

CDQ	Inshore CV	Mothership	Offshore CPS
3.4%	81.5%	4.0%	11.1%
6.7%	63.3%	6.5%	23.6%11
10.7%	44.77%	8.77%	35.76%

Suboption: Allocate 10.7% to CDQ, remainder divided among other sectors (**see table**).

Component 3: Sector Transfer

a) No transfers or rollovers

[11] Note the actual midpoint is CDQ = 7.05%, CV 63.14%, Mothership 6.39%, CP 23.43% . However as noted by staff during Council deliberation numbers reflected in the table are an existing option as the historical average from 2005-2009 allocated 50:50 pro-rata AFA to historical average by section.

b) Allow NMFS-approved transfers between sectors
Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:
1) 50%
2) 70%
3) 90%

c) Allow NMFS to roll-over unused bycatch allocation to sectors that are still fishing

Component 4: Cooperative Provision

a) Allow allocation at the co-op level for the inshore sector, and apply transfer rules (Component 3) at the co-op level for the inshore sector.
Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:
1) 50%
2) 70%
3) 90%

b) Allow NMFS to rollover unused bycatch allocation to inshore cooperatives that are still fishing.

Alternative 3 – Trigger Closure

Component 1: Trigger Cap Formulation

Cap level
a) 25,000
b) 50,000
c) 75,000
d) 125,000
e) 200,000

Application of Trigger Caps
a) Apply trigger to all chum bycatch
b) Apply trigger to all chum bycatch between specific dates
~~c) Apply trigger to all chum bycatch in a specific area.~~

Trigger limit application:

Two options for application of trigger caps for area closure options (applied to caps under consideration)

1- **Cumulative monthly proportion of cap (left-side of table below)**
2- **Cumulative monthly proportion AND monthly limit (left and right sides of table together. Note monthly limit should evaluate +/- 25% of distribution below)**

Option of cumulative versus monthly limit for trigger area closures (assuming a trigger cap of 100,000 fish). Monthly limit based on minimum of monthly cumulative value and 150% of monthly historical proportion. *NOTE: these cumulative proportions have changed slightly using updated data through 2010*

	Cumulative		Monthly limit	
Month	Cumulative Proportion	Monthly Cumulative	Monthly proportion	Monthly limit
June	10.8%	10,800	10.8%	10,800
July	31.5%	31,500	20.7%	31,050
August	63.6%	63,600	32.1%	48,150
September	92.3%	92,300	28.6%	42,900
October	100.0%	100,000	7.7%	11,550

Component 2: Sector allocation

Use blend of CDQ/CDQ partner bycatch numbers for historical average calculations.

a) No sector allocation

b) Allocations to Inshore, Catcher Processor, Mothership, and CDQ

1) Pro-rata to pollock AFA pollock sector allocation
2) Historical average
   i. 2007-2009
   ii. 2005-2009
   iii. 2000-2009
   iv. 1997-2009
3) Allocation based on 75% pro-rata and 25% historical
4) Allocation based on 50% pro-rata and 50% historical
5) Allocation based on 25% pro-rata and 75% historical

For Analysis:

CDQ	Inshore CV	Mothership	Offshore CPS
3.4%	81.5%	4.0%	11.1%
6.7%	63.3%	6.5%	23.6%[12]
10.7%	44.77%	8.77%	35.76%

Suboption: Allocate 10.7% to CDQ, remainder divided among other sectors.

~~Component 3: Sector Transfer~~

~~a) No transfers or rollovers~~

~~b) Allow NMFS-approved transfers between sectors~~

~~Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:~~

~~1) 50%~~
~~2) 70%~~
~~3) 90%~~

~~c) Allow NMFS to roll-over unused bycatch allocation to sectors that are still fishing~~

~~Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:~~

~~1) 50%~~
~~2) 70%~~
~~3) 90%~~

Component **3**~~Component 4~~ : Cooperative Provisions

a) Allow allocation at the co-op level for the inshore sector, and apply transfer rules (Component 3) at the co-op level for the inshore sector.

Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:

4) 50%
5) 70%
6) 90%

b) Allow NMFS to roll-over unused bycatch allocation to cooperatives that are still fishing

Component **4** ~~Component 5~~: Area and Timing Options

~~a. Large area closure~~

[12] Note the actual midpoint is CDQ = 7.05%, CV 63.14%, Mothership 6.39%, CP 23.43% . However as noted by staff during Council deliberation numbers reflected in the table are an existing option as the historical average from 2005-2009 allocated 50:50 pro-rata AFA to historical average by section.

b. ~~Discrete, small area closures identified by staff in February Discussion paper (20 ADF&G statistical areas, identified in Table 4)~~

c. **Groupings of ADFG area closures by month that represent 40%, 50%, 60% of historical bycatch.** ~~the small area closures (as presented) (described in Option b above) into 3 zones that could be triggered independently with subarea, rather than statistical area, level closures~~

The analysis should include quantitative analysis of the 50% closure options and qualitative analysis of the 40% and 60% closure options.

Component **5**~~Component 6:~~ Timing Option – Dates of Area Closure

a) Trigger closure ~~of Component 5 areas~~ when the overall cap level specified under Component 1(a) was attained

b) ~~Under Component 5(b)~~ discrete small closures would close when a ~~an overall~~ cap was attained and would close for the time period corresponding to periods of high historical bycatch.~~, considering both number of salmon. a (i.e. Table 11 in February Discussion Paper) Under Component 5(c) Subareas within a zone would close for the time period corresponding to periods of high historical bycatch within the subarea when a zone level cap was attained.~~

c) ~~Under Component 5, Areas close when bycatch cap is attained within that area (i.e. Table 12 in February Discussion Paper)~~
   - ~~a. for the remainder of year~~
   - ~~b. for specific date range~~

Component **6** ~~Component 6~~: Rolling Hot Spot (RHS) **system** ~~Exemption~~ – Similar to status quo (**with RHS system in regulation**), participants in a vessel-level (platform level for Mothership fleet) RHS would be exempt from regulatory triggered closure below.

1. A large area trigger closure (encompassing 80% of historical bycatch).
   - ~~a)~~ Sub-option: RHS regulations would contain an ICA provision that the regulatory trigger closure (as adopted in Component **4** ~~5~~) **apply to participants with a rate in excess of 200% of the Base Rate.** ~~that do not maintain a certain level of rate-based chum salmon bycatch performance.~~

In constructing an ICA under this component, the following aspects should be considered:

- **Closures that would address timing & location of bycatch of Western AK chum stocks.**

In addition, include the following items in the initial review analysis:

1. Analyze discrete area approach normalized across years (i.e. proportion of salmon caught in an area in a year rather than numbers of salmon);
2. Discuss how Component **6**~~7 and suboption~~ would be applied;
3. In depth description of the rolling hot spot regulations (Amendment 84), focusing on parameters that could be adjusted if the Council found a need to refine the program to meet objectives under Component 7. **Specifically analyze:**
   - **a. the base rate within the RHS program;**
   - **b. the options for revising the tier system within the RHS program;**
   - **c. the Council's options for revising the fine structure within the RHS program. Analysis should include a discussion of the meaningfulness of fines, including histograms of number and magnitude of fines over time as well as a comparison of penalties under the RHS program to agency penalties and enforcement actions for violating area closures.**
4. Discussion from NMFS of catch accounting for specific caps for discrete areas, and area aggregations described in Component 5 and for areas within those footprints that may have other shapes that could be defined by geographic coordinates [Component 6(c)] Discussion from NMFS on the ability to trigger a regulatory closure based on relative bycatch within a season (with respect to catch accounting system and enforcement limitations) considering changes in bycatch monitoring under Amendment 91.

5. Contrast a regulatory closure system (Components 5 and 6) to the ICA closure system (Component 7) including data limitations, enforcement, potential level of accountability (i.e., fleet-wide, sector, cooperative, or vessel level).
6. Examine differences between high bycatch years (i.e. 2005) and other years to see what contributes to high rates (i.e. timing/location, including fleet behavior and environmental conditions).
7. Examine past area closures and potential impacts of those closures on historical distribution of bycatch and on bycatch rates (qualitative); include 2008 and 2009 data and contrast bycatch distribution under VRHS versus the Chum Salmon Savings Area.

Council motion December 2009
C-4(b) Bering Sea Salmon Bycatch
Council motion: strike-outs and underlines to indicate additions and deletions from original alternative set

Alternative 1 – Status Quo
Alternative 1 retains the current program of the Chum Salmon Savings Area (SSA) closures triggered by separate non-CDQ and CDQ caps with the fleet's exemption to these closures per regulations for Amendment 84 and as modified by the Amendment 91 Chinook bycatch action.

Alternative 2 – Hard Cap
Component 1: Hard Cap Formulation (with CDQ allocation of 10.7%)

- a) ~~58,000~~ 50,000
- b) ~~206,000~~ 75,000
- c) ~~353,000~~ 125,000
- d) ~~488,000~~ 200,000
- e) 300,000
- f) 353,000

Component 2: Sector Allocation

Use blend of CDQ/CDQ partner bycatch numbers for historical average calculations.

- a) No sector allocation
- b) Allocations to Inshore, Catcher Processor, Mothership, and CDQ
  1) Pro-rata to pollock AFA pollock sector allocation
  2) Historical average
     - i. ~~2004-2006~~ 2007-2009
     - ii. ~~2002-2006~~ 2005-2009
     - iii. ~~1997-2006~~ 2000-2009
     - iv. 1997–2009
  3) Allocation based on 75% pro-rata and 25% historical
  4) Allocation based on 50% pro-rata and 50% historical
  5) Allocation based on 25% pro-rata and 75% historical
- c) Allocate 10.7% to CDQ, remainder divided among other sectors

Component 3: Sector Transfer

- a) No transfers or rollovers
- b) Allow NMFS-approved transfers between sectors

  Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:
  1) 50%
  2) 70%
  3) 90%
- c) Allow NMFS to roll-over unused bycatch allocation to sectors that are still fishing

Component 4: Cooperative Provision

a) Allow allocation at the co-op level for the inshore sector, and apply transfer rules (Component 3) at the co-op level for the inshore sector.

Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:

1) 50%
2) 70%
3) 90%

b) Allow NMFS to rollover unused bycatch allocation to inshore cooperatives that are still fishing.

Alternative 3 – Trigger Closure

Component 1: Trigger Cap Formulation

Cap level

a) ~~45,000~~ 25,000
b) ~~58,000~~ 50,000
c) ~~206,000~~ 75,000
d) ~~353,000~~ 125,000
e) ~~488,000~~ 200,000

Application of Trigger Caps

a) Apply trigger to all chum bycatch
~~b) Apply trigger to all chum bycatch in the CVOA~~
~~c)~~ b) Apply trigger to all chum bycatch between specific dates
~~d)~~ c) Apply trigger to all chum bycatch in a specific area.

Component 2: Sector allocation

Use blend of CDQ/CDQ partner bycatch numbers for historical average calculations.

a) No sector allocation
b) Allocations to Inshore, Catcher Processor, Mothership, and CDQ
   1) Pro-rata to pollock AFA pollock sector allocation
   2) Historical average
      i. ~~2004-2006~~ 2007-2009
      ii. ~~2002-2006~~ 2005-2009
      iii. ~~1997-2006~~ 2000-2009
      iv. 1997-2009
   3) Allocation based on 75% pro-rata and 25% historical
   4) Allocation based on 50% pro-rata and 50% historical
   5) Allocation based on 25% pro-rata and 75% historical
c) Allocate 10.7% to CDQ, remainder divided among other sectors

Component 3: Sector Transfer

a) No transfers or rollovers
b) Allow NMFS-approved transfers between sectors

Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:

1) 50%
2) 70%
3) 90%

c) Allow NMFS to roll-over unused bycatch allocation to sectors that are still fishing

Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:

1) 50%
2) 70%

3) 90%

Components 4: Cooperative Provisions

a) Allow allocation at the co-op level for the inshore sector, and apply transfer rules (Component 3) at the co-op level for the inshore sector.
   Suboption: Limit transfers to the following percentage of salmon that is available to the transferring entity at the time of transfer:
   1) 50%
   2) 70%
   3) 90%
b) Allow NMFS to roll-over unused bycatch allocation to cooperatives that are still fishing

Component 5: Area Option

a) Area identified in October, 2008 discussion paper (B-season chum bycatch rate-based closure described on pages 14-15 of December 2009 discussion paper)
b) ~~Existing Chum Salmon Savings Area (differs from status quo with application of other components)~~
b) New areas [to be identified by staff] which are small, discrete closure areas, each with its own separate cap whereby bycatch in that area only accrues towards the cap

Component 6: Timing Option – Dates of Area Closure

a) ~~Existing closure dates (August 1 – August 31 and September 1 through October 14 if trigger is reached.)~~
b) New closure dates [to be developed from staff analysis of seasonal proportions of pollock and chum salmon by period across additional ranges of years]

Component 7: Rolling Hot Spot (RHS) Exemption – Similar to status quo, participants in a vessel-level (platform level for Mothership fleet) RHS would be exempt from regulatory triggered closure(s).

a) Sub-option: RHS regulations would contain an ICA provision that the regulatory trigger closure (as adopted in Component 5) apply to participants that do not maintain a certain level of rate-based chum salmon bycatch performance.

Appendix 2: Non-Chinook ICA agreement for 2011 and list of vessels under ICA

[Note this section collated separately]

3 Methodology for Impact Analysis

This chapter provides a discussion of the methodology used to conduct the quantitative analysis to understand the impacts of alternatives on pollock catch (Chapter 4), Chum salmon (Chapter 5), and the economic impacts (RIR). For the remaining resource categories considered in this analysis, marine mammals, seabirds, other groundfish, EFH, ecosystem relationships, and environmental justice, impacts of the alternatives were evaluated largely qualitatively based on results and trends from the quantitative analysis.

The following description of the methodology and subsequent analyses are unavoidably lengthy. We have tried to err on the side of inclusiveness, rather than run the risk of omitting any information or analysis that might aid decision-makers and the public in evaluating the relative merits of the alternatives. Also, the description of modeling methods in Section 0 contains technical information and mathematical equations that we have seen fit to include in the text rather than consign to an appendix. Although we do not expect that all readers will want to follow these equations, we have placed the methods description prominently to encourage public scrutiny of the scientific rigor with which the analyses have been conducted. Yet, however lengthy, detailed, and technical the analyses, we have tried our best where possible to keep the information accessible to the reader.

This chapter also provides a summary of the reasonably foreseeable future actions that may change the predicted impacts of the alternatives on the resources components analyzed in this EA. Relevant and recent information on each of the resource components analyzed in this EIS is contained in the chapter addressing that resource component and is not repeated here in Chapter 3.

3.1 Estimating Chum salmon bycatch in the pollock fishery

Overall, salmon bycatch levels are estimated based on extensive observer coverage using the NMFS Catch Accounting System (CAS). For the pollock fishery, the vast majority of tows are observed either directly at sea or at offloading locations aboard motherships or at shore-based processing plants. The observer data is used to allow inseason managers to evaluate when to open and close all groundfish fisheries based on bycatch levels of prohibited species, such as salmon and halibut, and catch levels of target groundfish species. The process of using observer data (in addition to other landings information) to set fishery season length relies on assuming that catch and bycatch rate information collected by observers is similar to catch and bycatch rates by unobserved fishing vessels. Data from observed vessels and processors is extrapolated to catch made by unobserved vessels.

The sampling intensity for salmon bycatch in the pollock fishery is very high in order to reduce the severity of potential sampling issues and to satisfy the demands of inseason management. Because sampling fractions are high for the pollock fishery, uncertainty associated with the magnitude of salmon bycatch is relatively low. Statistically rigorous estimators have been developed that suggest that for the Eastern Bering Sea pollock fishery, the levels of salmon bycatch are precisely estimated with coefficients of variation of around 5 percent (Miller 2005[13]). This indicates that, assuming that the observed fishing operations are unbiased relative to unobserved operations, the total salmon bycatch levels are precisely estimated for the fleet as a whole. Imprecision of the estimates of total annual Chinook salmon bycatch is considered negligible.

[13] Miller's dissertation represents a thorough presentation of statistically sound methodology that accurately characterizes low variation in salmon bycatch estimates. However, NMFS recognizes the differences between its estimates and those presented in Miller 2005. See FEIS for Chinook salmon for details.

3.1.1 Monitoring Catcher/processors and motherships

Catcher/processors and motherships are required to carry two NMFS-certified observers during each fishing day. These vessels must also have an observer sampling station and a motion-compensated flow scale, which is used to weigh all catch in each haul. The observer sampling station is required to include a table, motion compensated platform scale, and other monitoring tools to assist observers in sampling. Each observer covers a 12 hour shift and all hauls are observed unless an observer is unable to sample (*e.g.,* due to illness or injury).

Estimates of the weight of each species in the catch are derived from sampling. A sample is a specific portion of the haul that is removed and examined by the observer. Catch in the sample is sorted by species, identified, and weighed by the observer. Species counts also are obtained for non-predominant species. Observer samples are collected using random sampling techniques to the extent possible on commercial fishing vessels. Observer samples are extrapolated to the haul level under the assumption that sample composition represents the composition of an entire haul. The sample proportion of each haul in the pollock fishery is relatively high because catch is generally not diverse and excellent sampling tools, such as flow scales and observer sample stations, are available.

Sampling for salmon is conducted as part of the overall species composition sampling for each haul. The observer collects and records information about the number of salmon in each sample and the total weight of each haul. NMFS estimates the total number of salmon in each haul by extrapolating the number of salmon in the species composition samples to the total haul weight. In the rare case that an observer on an AFA catcher/processor or mothership is unable to sample a haul for species composition, NMFS applies species composition information from observed hauls to non-observed hauls.

Catcher vessels deliver unsorted catch to the three motherships that participate in the AFA pollock fisheries. NMFS does not require these catcher vessels to carry observers because catch is not removed from the trawl's codend (the detachable end of the trawl net where catch accumulates) prior to it being transferred to the mothership. Observer sampling occurs on the mothership following the same estimation processes and monitoring protocols that are described above for catcher/processors.

While regulations require vessel personnel to retain salmon until sampled by an observer, salmon that are retained by catcher/processor and mothership crew outside of the observer's sample are not included in the observer's samples and are not used to estimate the total number of salmon caught. However, observers examine these salmon for coded-wire tags and may collect biological samples.

3.1.2 Monitoring catcher vessels delivering to shoreside processors or stationary floating processors

Catcher vessels in the inshore sector are required to carry observers based on vessel length.

Catcher vessels 125 feet in length or greater are required to carry an observer during all of their fishing days (100 percent coverage).

Catcher vessels greater than 60 feet in length and up to 125 feet in length are required to carry an observer at least 30 percent of their fishing days in each calendar quarter, and during at least one fishing trip in each target fishery category (30 percent coverage).

Catcher vessels less than 60 feet in length are not required to carry an observer. However, no vessels in this length category participate in the Bering Sea pollock fisheries.

Observers sample hauls onboard the catcher vessels to collect species composition and biological information. Observers use a random sampling methodology that requires observers to take multiple, equal sized, samples from throughout the haul to obtain a sample size of approximately 300 kilograms. Catch from catcher vessels delivering to shoreside processing plants or floating processors generally is either dumped or mechanically pumped from a codend (i.e., the end of the trawl net where catch accumulates) directly into recirculating seawater (RSW) tanks. Observers attempt to obtain random, species composition samples by collecting small amounts of catch as it flows from the codend to the RSW tanks.

This particular collection method is difficult and dangerous, as observers must obtain a relatively small amount of fish from the catch flowing out of the codend as it is emptied into the RSW tanks. A large codend may contain over 100 mt of fish. This sampling is typically done on-deck, where the observer is exposed to the elements and subject to the operational hazards associated with the vessel crew's hauling, lifting, and emptying of the codend into the large hatches leading to the tanks. In contrast, the sampling methods used on catcher/processors and motherships allow observers to collect larger samples under more controlled conditions. On these vessels, the observer is able to collect samples downstream of the fish holding tanks, just prior to the catch sorting area that precedes the fish processing equipment. Additionally, the observer is below decks and has access to catch weighing scales and an observer sampling station.

Because the composition of catch in the pollock fishery is almost 100 percent pollock, species composition sampling generally works well for common species. However, for uncommon species such as salmon, a larger sample size is desired; however, large sample sizes are generally not logistically possible on the catcher vessels. Instead, estimates of salmon bycatch by catcher vessels are based on a full count or census of the salmon bycatch at the shoreside processing plant or stationary floating processor whenever possible.

Vessel operators are prohibited from discarding salmon at sea until the number of salmon has been determined by an observer, either on the vessel or at the processing plant, and the collection of any scientific data or biological samples from the salmon has been completed. Few salmon are reported discarded at sea by observed catcher vessels. However, any salmon reported as discarded at sea by the observer are added into the observer's count of salmon at the processing plant. Unlawful discard of salmon at sea may also subject a vessel operator to enforcement action.

3.1.3 Monitoring shoreside processors

AFA inshore processors are required to provide an observer for each 12 consecutive hour period of each calendar day during which the processor takes delivery of, or processes, groundfish harvested by a vessel directed fishing for pollock in the Bering Sea. NMFS regulates plant monitoring through a permitting process. Each plant that receives AFA pollock is required to develop and operate under a NMFS-approved catch monitoring and control plan (CMCP). Monitoring standards for CMCP are described in regulation at 50 CFR 679.28(g).

These monitoring standards detail the flow of fish from the vessel to the plant ensuring all groundfish delivered are sorted and weighed by species. CMCPs include descriptions and diagram of the flow of catch from the vessel to the plant, scales for weighing catch, and accommodations for observations. Depending on the plant, observers will physically remove all salmon from the flow of fish before the scale as it is conveyed into the plant, or supervise the removal of salmon by plant personnel. Observers assigned to the processing plant are responsible for reading the CMCPs and verifying the plant is following the plan laid out in the CMCP. Vessel observers complete the majority of a salmon census during an offload, with the plant observer providing breaks during long offloads.

One performance standard required in CMCPs is that all catch must be sorted and weighed by species. The CMCP must describe the order in which sorting and weighing processes take place. Processors meet this performance standard in different ways. Some processors choose to weigh all of the catch prior to sorting and then deduct the weight of non-pollock catch in order to obtain the weight of pollock. Other processors choose to sort the catch prior to weighing and obtain the weight of pollock directly. No matter how the weight of pollock is obtained, it will only be accurate if bycatch is effectively sorted, and methods must be in place to minimize the amount of bycatch that makes it past the sorters into the factory. CMCPs were not designed to track individual fish throughout the shoreside processing plant and the focus of the performance standards is on monitoring the large volumes of species such as pollock, not on monitoring small quantities of bycatch. Currently, the practice of deducting bycatch from the total catch weight of pollock provides an incentive for processors to report bycatch, including salmon.

3.1.4 Salmon accounting at shoreside processors

When a catcher vessel offloads at the dock, prohibited species such as crab, salmon, and halibut are identified and enumerated by the vessel observer during the offload. The observer monitors the offload and, with the assistance of the plant's processing crew, attempts to remove all salmon from the catch. Salmon that are missed during sorting will end up in the processing facility, which requires special treatment by the plant and the observers to ensure they are counted. These "after-scale" salmon (so called because they were initially weighed along with pollock) creates tracking difficulties for the plant and the observer.

Although after scale salmon are required to be given to an observer, there is no direct observation of salmon once they are moved past the observer and into the plant. Observers currently record after scale salmon as if they had collected them. However, such salmon can better be characterized as plant reported information. Further complications in plant based salmon accounting occur when multiple vessels are delivering simultaneously, making it difficult or impossible to determine which vessel's trip these salmon should be assigned to. Currently, plant personnel are very cooperative with saving after-scale salmon for observers at this stage of sampling and after scale salmon numbers are relatively low. However, if management measures create incentives for not reporting salmon, this reportedly high level of cooperation could be reduced. Additionally, complications occur when multiple vessels are delivering in quick succession to a plant because it is often impossible to assign salmon to a vessel.

3.1.5 NMFS Catch Accounting System

NMFS determines the number of non-Chinook salmon caught as bycatch in the Bering Sea pollock fishery using the NMFS's CAS. The CAS was developed to receive catch reports from multiple sources, evaluate data for duplication or errors, estimate the total catch by species or species category, and determine the appropriate "bin" or account to attribute the catch. Historically, these accounts have been established to mirror the myriad combinations of gear, area, sector, and season that are established in the annual groundfish harvest specifications. In general, the degree to which a seasonal or annual allocation requires active NMFS management is often inversely related to the size of the allocation. Typically, the smaller the catch limit, the more intensive the management required to ensure that it is not exceeded.

The CAS account structure is different for each major regulatory program, such as the Amendment 80 Program, the GOA Rockfish Program, the AFA pollock fishery, and the CDQ Program. For example, separate accounts are used to monitor Atka mackerel caught by Amendment 80 vessels and non-Amendment 80 vessels. To monitor this catch, accounts are created for all Atka mackerel caught, separate accounts if the vessel is in a cooperative or limited access sector, separate accounts for fish caught in or outside special harvest limit areas, and finally, seasonal accounts for all scenarios combined. This results in 10 separate accounts that had to be created by programmers for use by NMFS fisheries managers.

The AFSC's Fisheries Monitoring and Analysis Division provides observer data about groundfish catch and salmon bycatch, including expanded information to NMFS. NMFS estimates salmon bycatch for unobserved catcher vessels using algorithms implemented in its CAS. The haul-specific observer information is used by the CAS to create salmon bycatch rates from observed vessels that are applied to total groundfish catch in each delivery (trip level) by an unobserved vessel. The rate is calculated using the observed salmon bycatch divided by the groundfish weight, which results in a measure of salmon per metric ton of groundfish caught. Salmon bycatch rates are calculated separately for Chinook salmon and non-Chinook salmon.

The CAS is programmed to extrapolate information from observed vessels to unobserved vessels by matching the type of information available from observed vessels with that of an unobserved vessel. Surrogate bycatch rates are applied using the most closely available data from an observed catcher vessel by:

- processing sector (in this case, inshore sector)
- week ending date,
- fishery (pollock),
- gear (pelagic trawl),
- trip target,
- special area (such as the catcher vessel operational area), and
- federal reporting area.

If no data are available for an observed vessel within the same sector, then rates will be applied based on observer data from vessels in all sectors in the target fishery. If observer data are not available from the same week, then a three-week moving average (if the reporting area or special area is the same) or three-month moving average (if data with the same reporting or special areas are not available) is applied. Similarly, if data from the same Federal reporting area is not available, then observer data from the pollock fishery in the Bering Sea, as a whole, will be applied. However, this latter methodology is rarely used. NMFS generally receives adequate information to calculate bycatch rates for observed vessels that operate in a similar time and place as the unobserved catcher vessels.

The CAS methodology used to estimate prohibited species catch is the same for the inshore and offshore sectors; however, the methodology to obtain haul-specific estimates is different between the sectors. The offshore sector relies on robust sampling methods and the inshore sector uses a census approach.

Estimates of salmon, crab, and halibut bycatch for catcher processors and motherships in the pollock fishery rely on at-sea sampling. To estimate the bycatch of these species, at-sea observers take several “within haul” samples that are extrapolate to obtain an estimate of specie-specific catch for a sampled haul. The haul-specific estimate is used by CAS to calculate a bycatch rate that is applied to unobserved hauls. Thus, there are several levels of estimation: (1) from sample to haul, (2) sampled hauls to unsampled hauls within a trip, and potentially, (3) sampled hauls to unsampled hauls between vessels.

The extrapolation method for prohibited species, such as halibut, salmon, and crab are the same for observed vessels in the inshore pollock sector. Sampling of prohibited species for this sector is conducted by observers both at-sea and shoreside. The majority of catch is assessed by observers when a vessel offloads catch at a plant (shoreside). During an offload, observers count all prohibited species as they are removed from the vessel. Prohibited species catch that is discarded at-sea is assessed by onboard observers. The total amount of prohibited species at-sea discard is added to the shoreside census information to obtain a total amount of specie-specific discard for a trip. NMFS uses the total discard information (inshore discards plus at-sea discards) to create a bycatch rate that is applied to unobserved vessels. The catch accounting system uses the shoreside information for salmon bycatch only if the offloading vessel also had an observer onboard. As a result, only salmon bycatch data from observed trips are used when calculating a bycatch rate.

3.1.6 Estimating non-Chinook salmon saved and forgone pollock catch

The first step in the impact analysis was to estimate how Chum salmon bycatch (and pollock catch) might have changed in each year from 2003 to 2010 under the different alternatives. The years 2003 to 2010 were chosen as the analytical base years because that was the most recent 8 year time period reflective of recent fishing patterns at the time of initial Council action, with 2005 representing the highest historical bycatch of non-Chinook. Catch accounting changed beginning in the 2003 pollock fishery with the CAS. Since 2003, the CAS has enabled consistent sector-specific and spatially-explicit treatment of the non-Chinook salmon bycatch data for comparative purposes across years. Thus, starting the analysis in 2003 provides the most consistent and uniform data set that was available from NMFS on a sector-specific basis.

This analysis assumes that past fleet behavior approximates operational behavior under the alternatives, but stops short of estimating changes in fishing vessel operations. While it is expected that the vessel operators will change their behavior to avoid salmon bycatch and associated potential losses in pollock revenue, data were unavailable to accurately predict the nature of these changes.

In some cases, the alternatives and options would not have closed the pollock fisheries earlier than actually occurred during these years and in other cases the alternative and options would have closed the pollock fisheries earlier than actually occurred. When an alternative would have closed the pollock fishery earlier, an estimate is made of (1) the amount of pollock TAC that would have been left unharvested and (2) the reduction in the amount of chum salmon bycatch as a result of the closure. The unharvested or forgone pollock catch and the reduction in chum salmon bycatch is then used as the basis for assessing the impacts of the alternative. This estimate of forgone pollock catch and reduction in chum salmon bycatch also is used as a basis for estimating the economic impacts of the alternatives.

The analysis used actual catch of chum salmon in the Bering Sea pollock fishery, by season, first at the fleet level (CDQ and non-CDQ), and then at the sector-level (inshore CV (S), Mothership (M), offshore CP (P), and CDQ) for the years 2003-2007. Weekly data from the NMFS Alaska Region were used to approximate when the potential cap would have been reached. The day when the fishery trigger areas would have closed was estimated by interpolating the week-ending totals that bracketed the fleet- or sector-specific seasonal cap. This date was then used to compute the bycatch rate for the remaining open areas (assuming that the same amount of pollock would have been harvested). The cost of moving from the closed areas was evaluated qualitatively. Using an interpolated value for the date a cap would be reached gives a better approximation of the procedure inseason management uses to notify the fleet (or sector) of an eminent closure area resulting from a PSC limit.

Preliminary tables indicating the fleet-wide and sector specific amount of salmon saved (in absolute numbers of salmon) for the trigger closure areas were drafted and will eventually be included in Chapter 5. Qualitative impact of these scenarios (in terms of added travel time and the based on the amount of fishing that was diverted) is presented in the RIR.

Chapter 4 will include analysis on the effect on the anticipated take of pollock within seasons and areas under the alternatives. Similar to the Chinook EIS, analysis of historical fishing patterns (among sectors and in space) and likely strategies to minimize trigger closure areas will be evalauted.

3.2 Estimating the stock composition of chum salmon bycatch

This section provides an overview the best available information used to determine the region or river of origin of the chum salmon caught as bycatch in the Bering Sea pollock fishery. The AEQ model uses genetic estimates of chum salmon taken as bycatch in the Bering Sea pollock fishery to determine where the AEQ chum salmon would have returned.

To determine the stock composition mixtures of chum salmon in the Bering Sea, a number of genetics analysis have been completed and presented to the Council (i.e., Guyon et al. 2010, Marvin et al. 2010, Gray et al. 2010, and McCraney et al. 2010). The details of this work are provided in these reports. These studies represent a large body of work on processing and analyzing the available genetics data and include comparisons of stock composition (of the bycatch samples) between early period of the B-season and later as summarized in Gray et al. (2010; Figure 3-1).

When these regions are aggregated even further by area, the pattern is that later in the season the potential impact on Alaska stocks declines with bycatch samples dropping from about 28% Alaska origins down to about 13% after July 18th (Table 3-1). Similar reductions continue for the proportion of bycatch that appears to arise from the Pacific NW region.

As with Chinook salmon bycatch, if general patterns in the stock-composition of chum salmon bycatch is relatively stable between years (i.e., the relative contribution by stock of origin for a given area or month is similar from one year to the next), then a key factor on estimating the overall bycatch proportions depends on the variability of where and when the bycatch occurs. For example, taking just the temporal results presented in Table 3-1 and applying the bycatch at time as presented in Table 3-6, then the relative stock composition can vary substantially over years (Figure 3-2).

For this impact analysis, it is desirable to provide some estimates of AEQ specific to individual western Alaska river systems. On a gross scale, one approach would be to apply baseline average run-sizes for each system and apply these proportions to the "Western Alaska" group identified in the genetics (Table 3-2). An alternative approach might be to include the time series of run-size estimates so that a dynamic proportion for these sub-groups could be estimated. Neither approach is without problems but may help to provide some indication of the potential for specific in-river impacts due to bycatch.

This presentation is intended to exhibit some key features of the genetics data that has already been presented to the Council when applied to stratified estimates of chum bycatch. Further refinements involve converting these bycatch estimates into AEQ and more fully presenting the scientific uncertainty. Hence these results should be considered preliminary.

Additional funding and research focus is being directed towards both collection of samples from the EBS trawl fishery for Chinook salmon species as well as the related genetic analyses to estimate stock composition of the bycatch. Additional information on the status of these data collections and analysis programs will be forthcoming.

For purposes of this analysis, genetic groupings are aggregated to six regions (Figure 3-3). Individual populations from each region are identified in Table 3-3.

Results to be presented in the initial review analysis for stock of origin will be consistent with these six regional groupings. To the extent possible assumptions of run sizes and maturity will be employed to indicate relative results to individual western Alaskan river systems (See section **Error! Reference source not found.**).

Table 3-1 Average percentage breakouts by aggregated regions and periods based on bycatch samples from 2005-2009. *Source: Combined data presented in Gray et al. 2010 (*Figure 3-1).

	Asia	Alaska	Pacific NW
Jun-July	39%	28%	33%
July-Aug	65%	13%	22%
Aug-Oct	71%	13%	16%

Table 3-2 Annual percentage distribution of chum bycatch by year and the averages used for monthly breakouts based on 2003-2010 data.

Stock or stock grouping	Approximate percentages by run size	Area	
Kotzebue	7%	Kotzebue	7%
Pilgrim	2%	Port Clarence	2%
Subdistrict 1 (Nome)	2%	Norton Sound	11%
Subdistrict 2 (Niukluk)	2%		
Subdistrict 3 (Kwiniuk)	2%		
Subdistrict 5 (Shaktoolik)	2%		
Subdistrict 6 (Unalakleet)	2%		
Yukon River summer	18%	Yukon	28%
Yukon River fall	10%		
Kuskokwim	44%	Kuskokwim	51%
District 4 (Quinhagak)	4%		
District 5 (Goodnews Bay)	3%		

Table 3-3 Chum salmon populations in the DFO microsatellite baseline with the regional designations used Gray et al, 2010. See Figure 3-3 for Region "No."

DFO	Population	No.	DFO	Population	No.	DFO	Population	No.	DFO	Population	No.
41	Abashiri	1	230	Udarnitsa	2	439	Porcupine	4	107	Clatse_Creek	6
215	Avakumovka	1	290	Utka_River	2	83	Salcha	4	118	Clyak	6
40	Chitose	1	208	Vorovskaya	2	4	Sheenjek	4	62	Cold_Creek	6
315	Gakko_River	1	387	Zhypanova	2	1	Tatchun	4	77	Colonial	6
292	Hayatsuki	1	348	Agiapuk	3	9	Teslin	4	353	Constantine	6
44	Horonai	1	376	Alagnak	3	84	Toklat	4	168	Cooper_Inlet	6
252	Kawabukuro	1	3	Andreafsky	3	360	Alagoshak	5	197	County_Line	6
313	Koizumi_River	1	357	Aniak	3	333	American_River	5	12	Cowichan	6
300	Kushiro	1	301	Anvik	3	366	Big_River	5	414	Crag_Cr	6
37	Miomote	1	80	Chulinak	3	354	Coleman_Creek	5	161	Dak_	6
391	Namdae_R	1	347	Eldorado	3	355	Delta_Creek	5	259	Dana_Creek	6
231	Narva	1	358	George	3	359	Egegik	5	123	Date_Creek	6
298	Nishibetsu	1	307	Gisasa	3	332	Frosty_Creek	5	250	Dawson_Inlet	6
293	Ohkawa	1	371	Goodnews	3	365	Gertrude_Creek	5	91	Dean_River	6
297	Orikasa	1	288	Henshaw_Creek	3	370	Joshua_Green	5	261	Deena	6
214	Ryazanovka	1	339	Imnachuk	3	364	Meshik	5	170	Deer_Pass	6
312	Sakari_River	1	361	Kanektok	3	283	Moller_Bay	5	46	Demamiel	6
311	Shari_River	1	362	Kasigluk	3	369	Pumice_Creek	5	210	Dipac_Hatchery	6
36	Shibetsu	1	328	Kelly_Lake	3	367	Stepovak_Bay	5	319	Disappearance	6
299	Shikiu	1	340	Kobuk	3	335	Sturgeon	5	269	Dog-tag	6
253	Shiriuchi	1	343	Koyuk	3	350	Uganik	5	177	Draney	6
310	Shizunai	1	363	Kwethluk	3	334	Volcano_Bay	5	114	Duthie_Creek	6
217	Suifen	1	336	Kwiniuk_River	3	356	Westward_Creek	5	427	East_Arm	6
35	Teshio	1	303	Melozitna	3	239	Ahnuhati	6	266	Ecstall_River	6
39	Tokachi	1	373	Mulchatna	3	69	Ahta______	6	94	Elcho_Creek	6
38	Tokoro	1	372	Naknek	3	155	Ain_	6	193	Ellsworth_Cr	6
314	Tokushibetsu	1	330	Niukluk	3	183	Algard	6	203	Elwha	6
291	Toshibetsu	1	329	Noatak	3	58	Alouette	6	276	Ensheshese	6
296	Tsugaruishi	1	345	Nome	3	325	Alouette_North	6	263	Fairfax_Inlet	6
316	Uono_River	1	302	Nulato	3	270	Andesite_Cr	6	32	Fish_Creek	6
309	Yurappu	1	374	Nunsatuk	3	428	Arnoup_Cr	6	429	Flux_Cr	6
218	Amur	2	13	Peel_River	3	153	Ashlulm	6	102	Foch_Creek	6
207	Anadyr	2	322	Pikmiktalik	3	156	Awun	6	179	Frenchman	6
384	Apuka_River	2	331	Pilgrim_River	3	133	Bag_Harbour	6	227	Gambier	6
382	Bolshaya	2	346	Shaktoolik	3	164	Barnard	6	96	Gill_Creek	6
380	Dranka	2	341	Snake	3	16	Bella_Bell	6	166	Gilttoyee	6
223	Hairusova	2	368	Stuyahok_River	3	79	Bella_Coola	6	145	Glendale	6
378	Ivashka	2	375	Togiak	3	49	Big_Qual	6	135	Gold_Harbour	6
213	Kalininka	2	154	Tozitna	3	201	Big_Quilcene	6	11	Goldstream	6
225	Kamchatka	2	342	Unalakleet	3	281	Bish_Cr	6	66	Goodspeed_River	6
219	Kanchalan	2	344	Ungalik	3	198	Bitter_Creek	6	136	Government	6
379	Karaga	2	8	Big_Creek	4	103	Blackrock_Creek	6	205	Grant_Creek	6
294	Kikchik	2	89	Big_Salt	4	390	Blaney_Creek	6	100	Green_River	6
209	Kol_	2	86	Black_River	4	138	Botany_Creek	6	450	GreenRrHatchery	6
233	Magadan	2	87	Chandalar	4	264	Buck_Channel	6	237	Greens	6
211	Naiba	2	28	Chandindu	4	169	Bullock_Chann	6	141	Harrison	6
295	Nerpichi	2	82	Cheena	4	61	Campbell_River	6	438	Harrison_late	6
381	Okhota	2	81	Delta	4	323	Carroll	6	64	Hathaway_Creek	6
212	Oklan	2	7	Donjek	4	78	Cascade	6	234	Herman_Creek	6
222	Ola_	2	5	Fishing_Br	4	76	Cayeghle	6	17	Heydon_Cre	6
386	Olutorsky_Bay	2	88	Jim_River	4	42	Cheakamus	6	407	Hicks_Cr	6
228	Ossora	2	85	Kantishna	4	398	Cheenis_Lake	6	400	Homathko	6
224	Penzhina	2	2	Kluane	4	51	Chehalis	6	411	Honna	6
385	Plotnikova_R	2	59	Kluane_Lake	4	19	Chemainus	6	204	Hoodsport	6
221	Pymta	2	181	Koyukuk_late	4	47	Chilliwack	6	185	Hooknose	6
220	Tauy	2	90	Koyukuk_south	4	392	Chilqua_Creek	6	406	Hopedale_Cr	6
383	Tugur_River	2	10	Minto	4	117	Chuckwalla	6	412	Hutton_Head	6

Table 3-3 (continued) Chum salmon populations in the DFO microsatellite baseline (code) with the regional designations used in the analyses (column titled "No.";Gray et al. 2010).

DFO	Population	No.	DFO	Population	No.	DFO	Population	No.
			254	Mountain_Cr	6	265	Stanley	6
			111	Mussel_River	6	52	Stave	6
226	Tym_	2	157	Naden	6	396	Stawamus	6
6	Pelly	4	337	Nahmint_River	6	409	Steel_Cr	6
152	Inch_Creek	6	444	Nakut_Su	6	424	Stewart_Cr	6
146	Indian_River	6	14	Nanaimo	6	416	Stumaun_Cr	6
92	Jenny_Bay	6	122	Nangeese	6	327	Sugsaw	6
115	Kainet_River	6	422	Nass_River	6	324	Surprise	6
144	Kakweiken	6	399	Necleetsconnay	6	75	Taaltz	6
268	Kalum	6	113	Neekas_Creek	6	30	Taku	6
395	Kanaka_Cr	6	321	Neets_Bay_early	6	18	Takwahoni	6
402	Kano_Inlet_Cr	6	320	Neets_Bay_late	6	251	Tarundl_Creek	6
162	Kateen	6	173	Nekite	6	149	Theodosia	6
389	Kawkawa	6	104	Nias_Creek	6	22	Thorsen	6
95	Kemano	6	143	Nimpkish	6	129	Toon	6
192	Kennedy_Creek	6	53	Nitinat	6	279	Tseax	6
238	Kennell	6	191	Nooksack	6	202	Tulalip	6
351	Keta_Creek	6	186	Nooseseck	6	97	Turn_Creek	6
101	Khutze_River	6	318	NorrishWorth	6	430	Turtle_Cr	6
126	Khutzeymateen	6	159	North_Arm	6	247	Tuskwa	6
282	Kiltuish	6	377	Olsen_Creek	6	165	Tyler	6
93	Kimsquit	6	184	Orford	6	33	Tzoonie	6
187	Kimsquit_Bay	6	287	Pa-aat_River	6	124	Upper_Kitsumkal	6
419	Kincolith	6	260	Pacofi	6	140	Vedder	6
273	Kispiox	6	56	Pallant	6	70	Viner_Sound	6
106	Kitasoo	6	65	Pegattum_Creek	6	45	Wahleach	6
99	Kitimat_River	6	48	Puntledge	6	172	Walkum	6
275	Kitsault_Riv	6	98	Quaal_River	6	73	Waump	6
163	Kitwanga	6	147	Quap	6	232	Wells_Bridge	6
271	Kleanza_Cr	6	108	Quartcha_Creek	6	352	Wells_River	6
437	Klewnuggit_Cr	6	199	Quinault	6	105	West_Arm_Creek	6
21	Klinaklini	6	110	Roscoe_Creek	6	267	Whitebottom_Cr	6
418	Ksedin	6	397	Salmon_Bay	6	326	Widgeon_Slough	6
125	Kshwan	6	195	Salmon_Cr	6	277	Wilauks_Cr	6
423	Kumealon	6	134	Salmon_River	6	120	Wilson_Creek	6
112	Kwakusdis_River	6	200	Satsop	6	401	Worth_Creek	6
436	Kxngeal_Cr	6	236	Sawmill	6	60	Wortley_Creek	6
127	Lachmach	6	410	Seal_Inlet_Cr	6	248	Yellow_Bluff	6
262	Lagins	6	158	Security	6	434	Zymagotitz	6
131	Lagoon_Inlet	6	130	Sedgewick	6	139	Clapp_Basin	6
448	LagoonCr	6	393	Serpentine_R	6			
167	Lard	6	317	Shovelnose_Cr	6			
160	Little_Goose	6	249	Shustnini	6			
50	Little_Qua	6	206	Siberia_Creek	6			
413	Lizard_Cr	6	25	Silverdale	6			
119	Lockhart-Gordon	6	196	Skagit	6			
176	Lower_Lillooet	6	274	Skeena	6			
137	Mace_Creek	6	171	Skowquiltz	6			
242	Mackenzie_Sound	6	447	SkykomishRiv	6			
116	MacNair_Creek	6	132	Slatechuck_Cre	6			
55	Mamquam	6	43	Sliammon	6			
121	Markle_Inlet_Cr	6	15	Smith_Cree	6			
27	Martin_Riv	6	54	Snootli	6			
338	Mashiter_Creek	6	180	Southgate	6			
109	McLoughin_Creek	6	26	Squakum	6			
178	Milton	6	142	Squamish	6			
194	Minter_Cr	6	128	Stagoo	6			

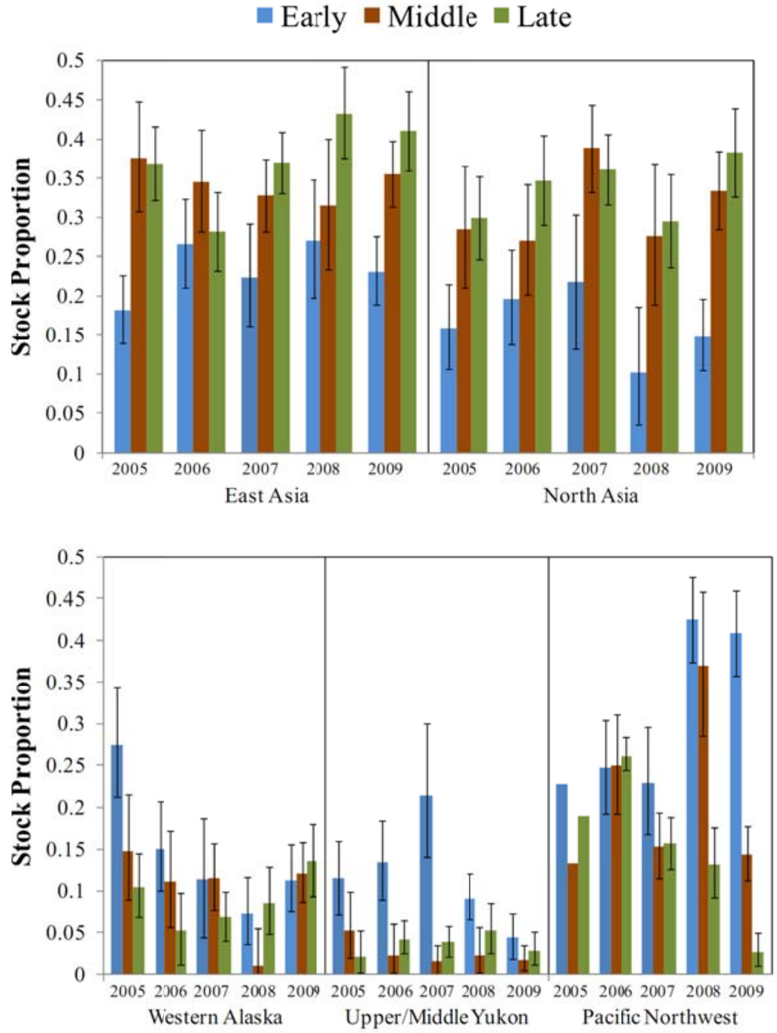


Figure 3-1 Stock composition estimates of chum salmon bycatch ***samples*** (unadjusted for area/season specific bycatch levels) based on a number of different studies, 2005-2009 (From Gray et al. 2010).

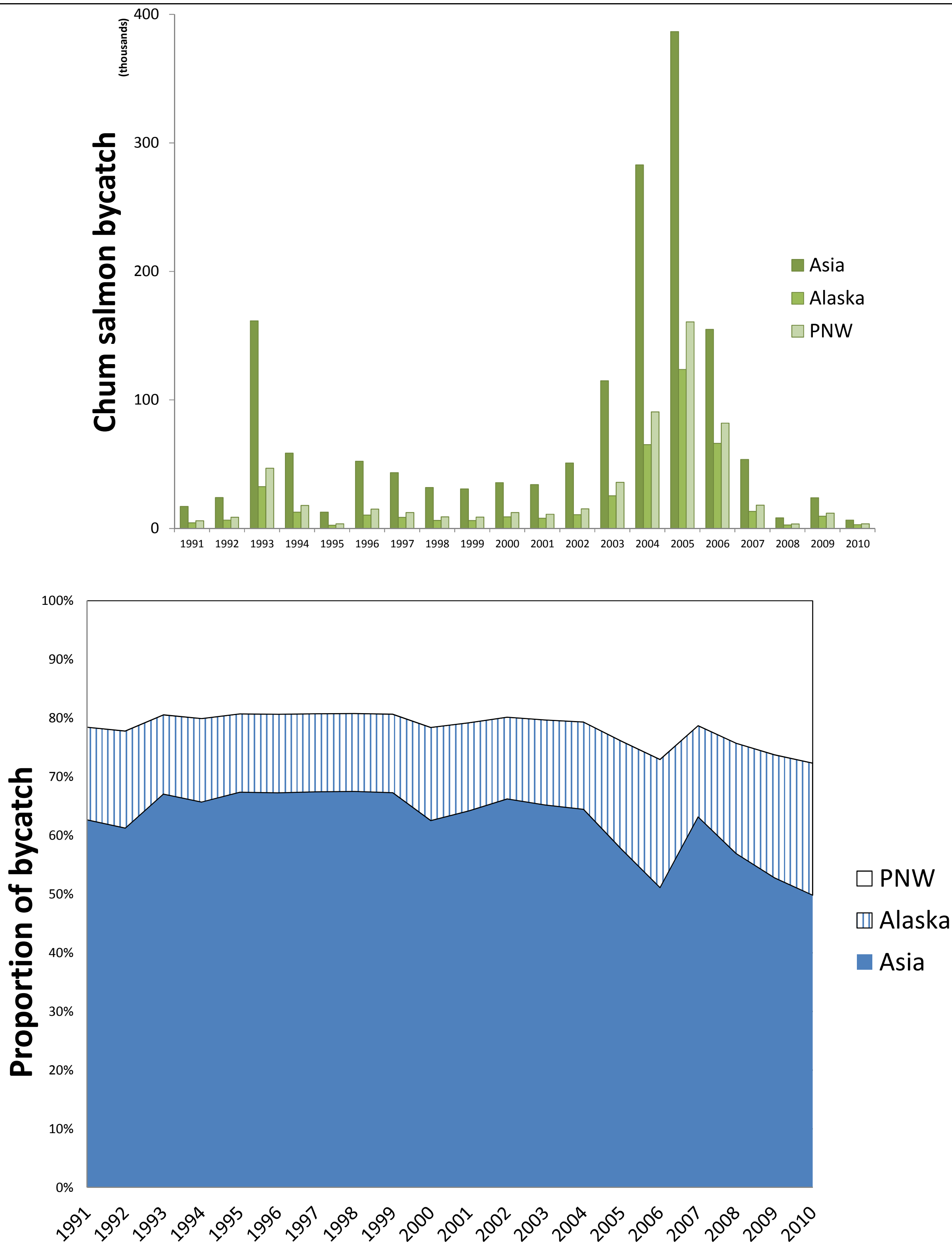


Figure 3-2 Gross stock composition estimates of chum salmon bycatch totals (top panel) and proportions (bottom panel) based on applying the mean values (Table 3-1)to the temporally stratified bycatch (Table 3-6). Genetics results from Gray et al. (2010). PNW represents the Pacific northwest and includes Canada and lower 48 coastal states.

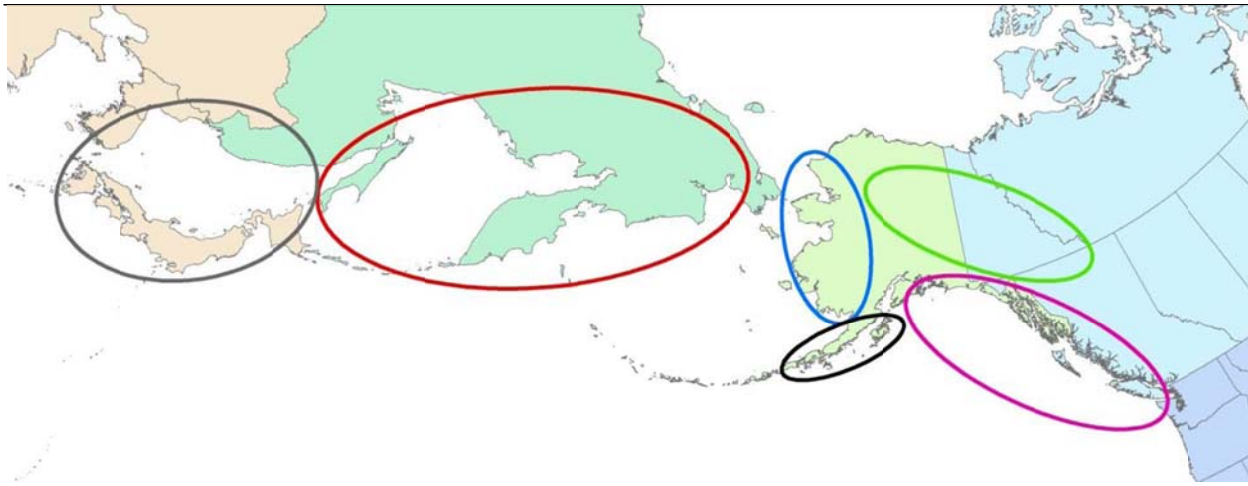


Figure 3-3 Six regional groupings of chum salmon populations used in the analysis including east Asia (grey), north Asia (red), coastal western Alaska (blue), upper/middle Yukon (green), southwest Alaska (black), and the Pacific Northwest (magenta). From Gray et al. 2010.

3.3 Estimating Chum salmon adult equivalent bycatch

To understand impacts on chum populations, a method was developed to estimate how the different bycatch numbers would propagate to adult equivalent spawning salmon. Estimating the adult equivalent bycatch is necessary because not all salmon caught as bycatch in the pollock fishery would otherwise have survived to return to their spawning streams. This analysis relies on analyses of historical data using a stochastic "adult equivalence" model similar to that developed for Chinook salmon. This approach strives to account for sources of uncertainty.

Adult-equivalency (AEQ) of the bycatch was estimated to translate how different trigger cap scenarios may affect chum salmon stocks. Compared to the annual bycatch numbers recorded by observers each year for management purposes, the AEQ mortality considers the extensive observer data on chum salmon length frequencies. These length frequencies are used to estimate the ages of the bycaught salmon, appropriately accounting for the time of year that catch occurred. Coupled with information on the proportion of salmon that return to different river systems at various ages, the bycatch-at-age data is used to pro-rate, for any given year, how bycatch affects future potential spawning runs of salmon.

Evaluating impacts to specific stocks was done by applying available genetics studies from samples collected in 2005-2009 (see section 3.2). While sample collection issues exist, stock estimates appear to have consistencies depending on the time of year and location.

3.3.1 Estimating Chum salmon catch-at-age

In order to appropriately account for the impact of salmon bycatch in the groundfish fisheries, it is desirable to correct for the age composition of the bycatch. For example, the impact on salmon populations of a bycatch level of 10,000 adult mature salmon is likely greater than the impact of catching 10,000 salmon that have just emerged from rivers and only a portion of which are expected to return for spawning in several years' time. Hence, estimation of the age composition of the bycatch (and the measure of uncertainty) is critical. The method follows an expanded version of Kimura (1989) and modified by Dorn (1992). Length at age data are used to construct age-length keys for each stratum and sex. These keys are then applied to randomly sampled catch-at-length frequency data. The stratum-specific age composition estimates are then weighted by the catch within each stratum to arrive at an overall age composition for each year.

The modification from Kimura's (1989) approach was simply to apply a two-stage bootstrap scheme to obtain variance estimates. In the first stage, for a given year, sampled tows were drawn with replacement from all tows from which salmon were measured. In the second stage, given the collection of tows from the first stage, individual fish measurements were resampled with replacement. All stratum-specific information was carried with each record. For the length-age data, a separate but similar two-stage bootstrap process was done. Once samples of lengths and ages were obtained, age-length keys were constructed and applied to the catch-weighted length frequencies to compute age composition estimates. This process was repeated 100 times, and the results stored to obtain a distribution of both length and age composition.

Length frequency data on chum salmon from NMFS observer database was used to estimate the overall length and age composition of the bycatch. The first step in conducting this analysis was to estimate the catch by regions and period within the season. Initially a simple 2-area and 2-period approach was considered for a total of 4 strata. However, in some historical years the bycatch and data for the "early" period of the B-season (June and July) had very low sampling levels and bycatch, particularly for the region west of 170°W (Table 3-4 and Table 3-5). Consequently, the strata were re-considered as being EBS-wide for the early period and geographically stratified from the later seasonal period (Aug-October). This provided a compromise of samples and bycatch over the entire time series from which ages, lengths, and catch (Table 3-6) could be applied. The age data were used to construct annual stratified age-length keys when sample sizes were appropriate and stratified combined-year age length keys for years where age samples were limited. To the extent possible, sex-specific age-length keys within each stratum were created and where cells were missing, a "global" sex-specific age-length key was used. The global key was simply computed over all strata within the same season. For years other than 2005-2009, a combined-year age-length key was used (based on data spanning all years; Table 3-5).

Applying the available length frequencies with stratified catch and age data result in age composition estimates in the bycatch that are predominately age 4 (Table 3-7). Generally, it is inappropriate to use the same age-length key over multiple years since it functions to lengths into proportions at age that can be influenced by variability in relative year-class strengths. Combining age data over all the years will average the year-class effects to some degree but may mask the actual variability in age compositions in individual years. To evaluate the sensitivity of our estimates to this problem we compared results using the combined-year age length key with results when annual keys were available. Results suggested that the differences using the combined-year age-length key were relatively minor (Figure 3-4). For the purposes of this analysis, i.e., to provide improved estimates of the impact of bycatch on salmon returns, having age-specific bycatch estimates using these data is preferred.

The body size of chum salmon in the bycatch is generally larger during June and July then for the rest of the summer-fall season (Stram and Ianelli 2009). This pattern is also reflected by age as well with the average age of the bycatch older in the first stratum (June-July) compared to the other strata (Figure 3-5). Also apparent in these data are the differences in body size by sex and strata with males consistently being bigger than females (Figure 3-6).

Table 3-4 Chum salmon length samples by area and season strata used for converting length frequency data to age composition data. Row with labels E and W represent geographic strata for east and west of 170°W, respectively. *Source: NMFS Alaska Fisheries Science Center observer data.*

	June-July			Aug-Oct			Other months			Total
	E	W	Total	E	W	Total	E	W	Total	
1991	646	128	774	1,622	375	1,997	40	3	43	2,814
1992	1,339	565	1,904	6,921	2	6,923	163	1	164	8,991
1993	870	7	877	23,508	599	24,107	68	3	71	25,055
1994	773	36	809	12,552	1,734	14,286	81	3	84	15,179
1995	7	1	8	5,517	65	5,582	37	1	38	5,628
1996	407		407	14,593	2,735	17,328	45	1	46	17,781
1997	1		1	10,923	5,821	16,744	745	12	757	17,502
1998	59		59	8,684	404	9,088	453	20	473	9,620
1999	12	1	13	13,269	387	13,656	39	3	42	13,711
2000	1,872	46	1,918	14,391	1,199	15,590	108	4	112	17,620
2001	1,302	714	2,016	12,774	2,675	15,449	914	81	995	18,460
2002	1,556	591	2,147	23,597	954	24,551	169	6	175	26,873
2003	6,909	828	7,737	47,147	7,673	54,820	1,391	84	1,475	64,032
2004	10,117	8,369	18,486	31,925	13,926	45,851	250	97	347	64,684
2005	19,905	2,871	22,776	20,871	30,284	51,155	153	137	290	74,221
2006	19,175	2,228	21,403	18,119	7,714	25,833	628	22	650	47,886
2007	2,147	2,154	4,301	15,444	10,615	26,059	3,771	43	3,814	34,174
2008	85	131	216	79	725	804	84	9	93	1,113
2009	284	879	1,163	98	1,076	1,174		1	1	2,338
2010	82	865	947	44	500	544	2	5	7	1,498
Total	67,548	20,414	87,962	282,078	89,463	371,541	9,141	536	9,677	469,180

Table 3-5 Chum salmon age samples by area and season strata used for converting length frequency data to age composition data. Row with labels E and W represent geographic strata for east and west of 170°W, respectively.

	June-July			Aug-Oct			Total
	E	W	Total	E	W	Total	
1988	0	0	0	204	0	204	204
1989	0	0	0	94	59	153	153
1990	103	0	103	281	41	322	425
1997	0	0	0	163	53	216	216
1998	0	0	0	92	69	161	161
1999	0	0	0	115	0	115	115
2000	0	0	0	122	0	122	122
2001	89	0	89	135	0	135	224
2002	67	0	67	144	0	144	211
2003	125	0	125	0	0	0	125
2004	224	0	224	103	62	165	389
2005	591	55	646	265	763	1,028	1,674
2006	202	65	267	280	483	763	1,030
2007	34	138	172	274	569	843	1,015
2008	106	41	147	151	213	364	511
2009	304	128	432	216	375	591	1,023
Total	1,845	427	2,272	2,639	2,687	5,326	7,598

Table 3-6 Chum salmon caught by area and season strata (top section) used for converting length frequency data to age composition data. Also shown are estimates of pollock catch (bottom section). Note that these totals differ slightly from the actual total values due to minor spatio-temporal mapping discrepancies.

Year	June-July	E Aug-Oct	W Aug-Oct	Total	June-July	E Aug-Oct	W Aug-Oct
				Chum (numbers)			
1991	4,817	19,801	2,796	27,414	18%	72%	10%
1992	8,781	30,330	34	39,145	22%	77%	0%
1993	4,550	229,180	7,142	240,872	2%	95%	3%
1994	5,971	75,239	7,930	89,140	7%	84%	9%
1995	122	18,329	418	18,870	1%	97%	2%
1996	893	45,707	31,058	77,659	1%	59%	40%
1997	319	31,503	32,452	64,274	0%	49%	50%
1998	102	44,895	2,217	47,214	0%	95%	5%
1999	470	44,438	874	45,783	1%	97%	2%
2000	10,229	44,502	2,286	57,017	18%	78%	4%
2001	6,371	36,578	10,105	53,055	12%	69%	19%
2002	3,712	71,096	2,067	76,875	5%	92%	3%
2003	14,843	142,319	18,986	176,147	8%	81%	11%
2004	48,540	345,507	44,780	438,827	11%	79%	10%
2005	238,338	304,078	128,740	671,156	36%	45%	19%
2006	177,663	90,507	34,898	303,068	59%	30%	12%
2007	13,352	31,901	39,841	85,094	16%	37%	47%
2008	5,544	6,513	2,514	14,571	38%	45%	17%
2009	23,890	16,879	4,576	45,346	53%	37%	10%
2010	8,284	2,869	1,946	13,099	63%	22%	15%
				Pollock (t)			
1991	480,617	146,566	258,332	885,515	54%	17%	29%
1992	481,266	225,503	23,639	730,407	66%	31%	3%
1993	16,780	583,778	111,519	712,077	2%	82%	16%
1994	33,303	516,557	154,842	704,703	5%	73%	22%
1995	9,359	558,420	87,949	655,728	1%	85%	13%
1996	12,139	513,922	103,967	630,028	2%	82%	17%
1997	2,736	257,394	301,282	561,412	0%	46%	54%
1998	1,748	441,128	133,283	576,159	0%	77%	23%
1999	15,518	359,934	190,750	566,203	3%	64%	34%
2000	68,868	351,649	244,314	664,831	10%	53%	37%
2001	184,100	439,385	203,622	827,107	22%	53%	25%
2002	268,146	478,689	132,809	879,644	30%	54%	15%
2003	349,518	313,814	208,151	871,483	40%	36%	24%
2004	360,000	245,770	249,329	855,099	42%	29%	29%
2005	372,508	133,659	354,905	861,072	43%	16%	41%
2006	347,953	105,202	409,078	862,234	40%	12%	47%
2007	327,698	136,438	309,729	773,865	42%	18%	40%
2008	277,689	48,327	245,132	571,147	49%	8%	43%
2009	279,731	28,013	158,797	466,540	60%	6%	34%
2010	298,925	39,816	133,066	471,808	63%	8%	28%

Table 3-7 Estimated chum salmon by age based on stratified, catch-corrected application of bycatch length frequencies, 1991-2010. A combined age-length key was used (italicized values) for all years except 2005-2009 due to the availability of samples. Note that totals differ slightly from the actual total values due to minor spatio-temporal mapping discrepancies.

	Age							
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
1991	*63*	*564*	*7,552*	*15,641*	*3,315*	*204*	*24*	27,363
1992	*64*	*136*	*11,409*	*22,869*	*4,372*	*224*	*48*	39,123
1993	*201*	*912*	*70,305*	*141,809*	*25,939*	*1,258*	*302*	240,726
1994	*200*	*69*	*17,133*	*58,652*	*12,214*	*680*	*164*	89,111
1995	*15*	*66*	*3,430*	*12,311*	*2,809*	*172*	*53*	18,857
1996	*585*	*1,443*	*20,195*	*43,908*	*10,651*	*620*	*138*	77,540
1997	*600*	*953*	*17,683*	*34,726*	*9,374*	*681*	*107*	64,124
1998	*65*	*55*	*6,244*	*31,672*	*7,877*	*530*	*109*	46,552
1999	*37*	*153*	*7,952*	*30,313*	*6,792*	*374*	*102*	45,724
2000	*140*	*82*	*9,243*	*37,670*	*9,260*	*511*	*70*	56,975
2001	*252*	*425*	*9,771*	*33,582*	*8,490*	*455*	*58*	53,033
2002	*86*	*291*	*13,554*	*50,440*	*11,658*	*630*	*185*	76,844
2003	*454*	*1,943*	*37,379*	*109,221*	*25,249*	*1,520*	*311*	176,077
2004	*1,260*	*1,408*	*103,576*	*266,650*	*61,006*	*3,380*	*661*	437,940
2005	12,849	2,273	132,119	439,843	77,139	3,742	78	668,042
2006	0	0	47,852	155,360	93,930	3,997	70	301,209
2007	0	506	17,287	48,913	15,323	2,110	128	84,267
2008	0	0	799	10,092	2,928	573	10	14,402
2009	0	1,664	14,220	22,867	6,031	491	39	45,313
2010	*92*	*85*	*2,182*	*7,677*	*2,857*	*189*	*17*	13,099

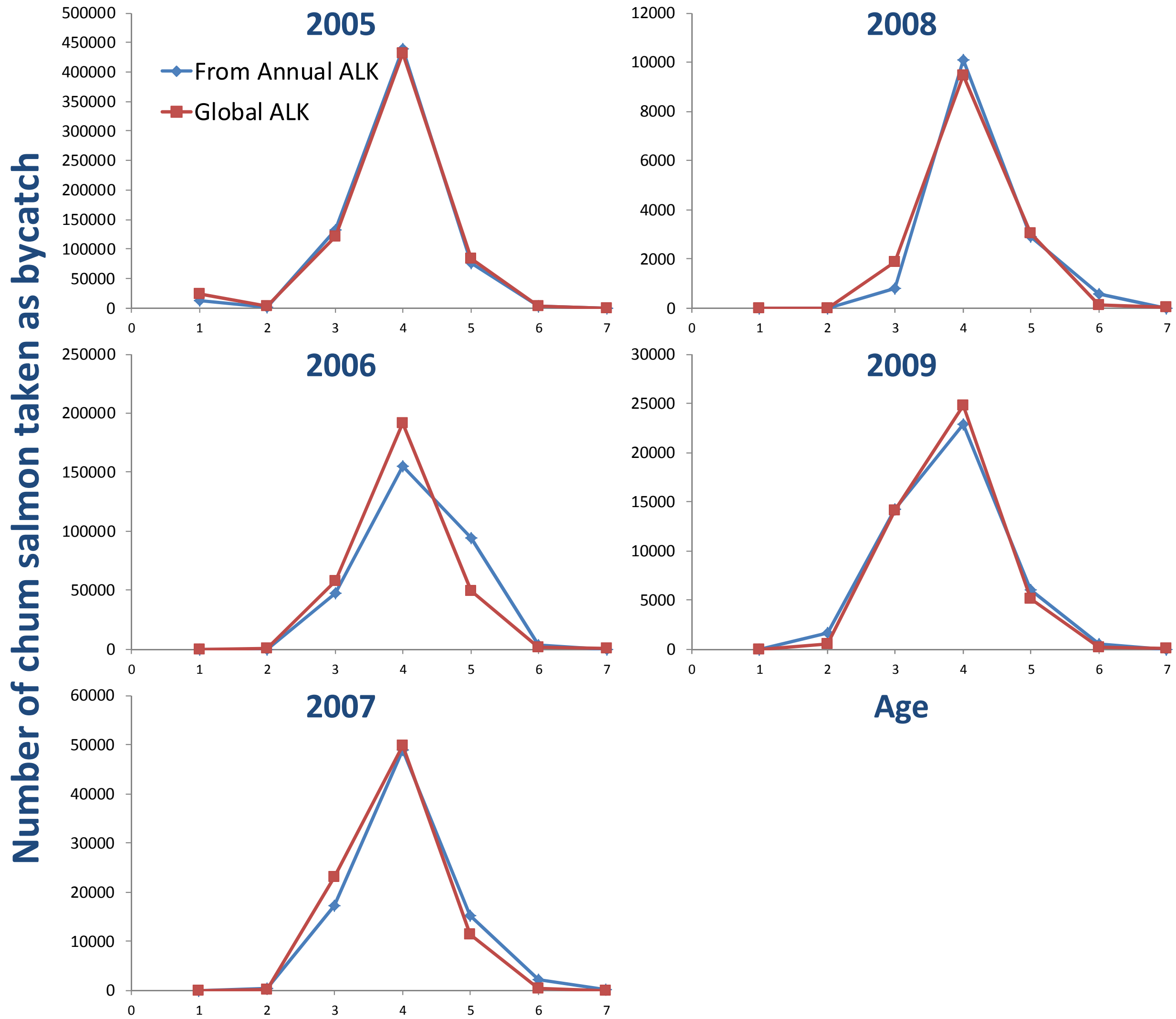


Figure 3-4 Estimated chum bycatch at age as estimated using the combined-year stratified age-length key compared to estimates using annually varying stratified age-length keys, 2005-2009.

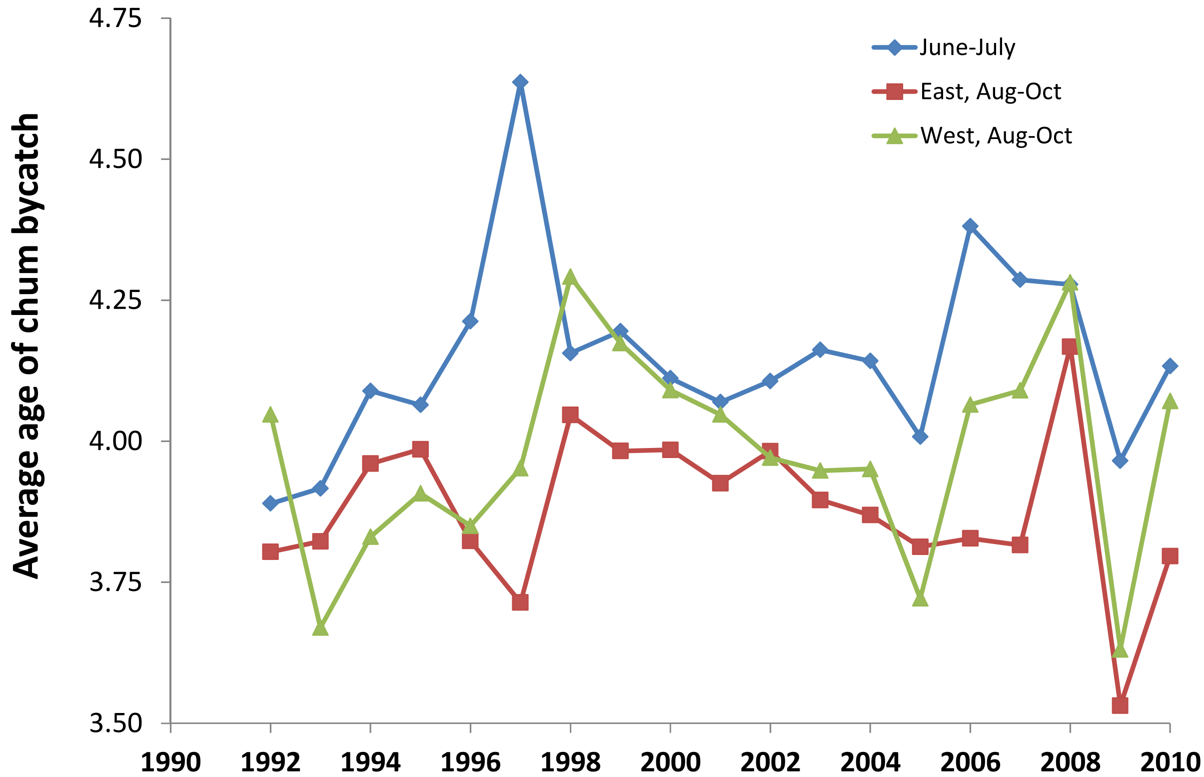


Figure 3-5 Stratified estimates of average age (years) of chum bycatch based on catch-at-age estimates from NMFS observer collected length frequencies and age determinations, 1991-2010.

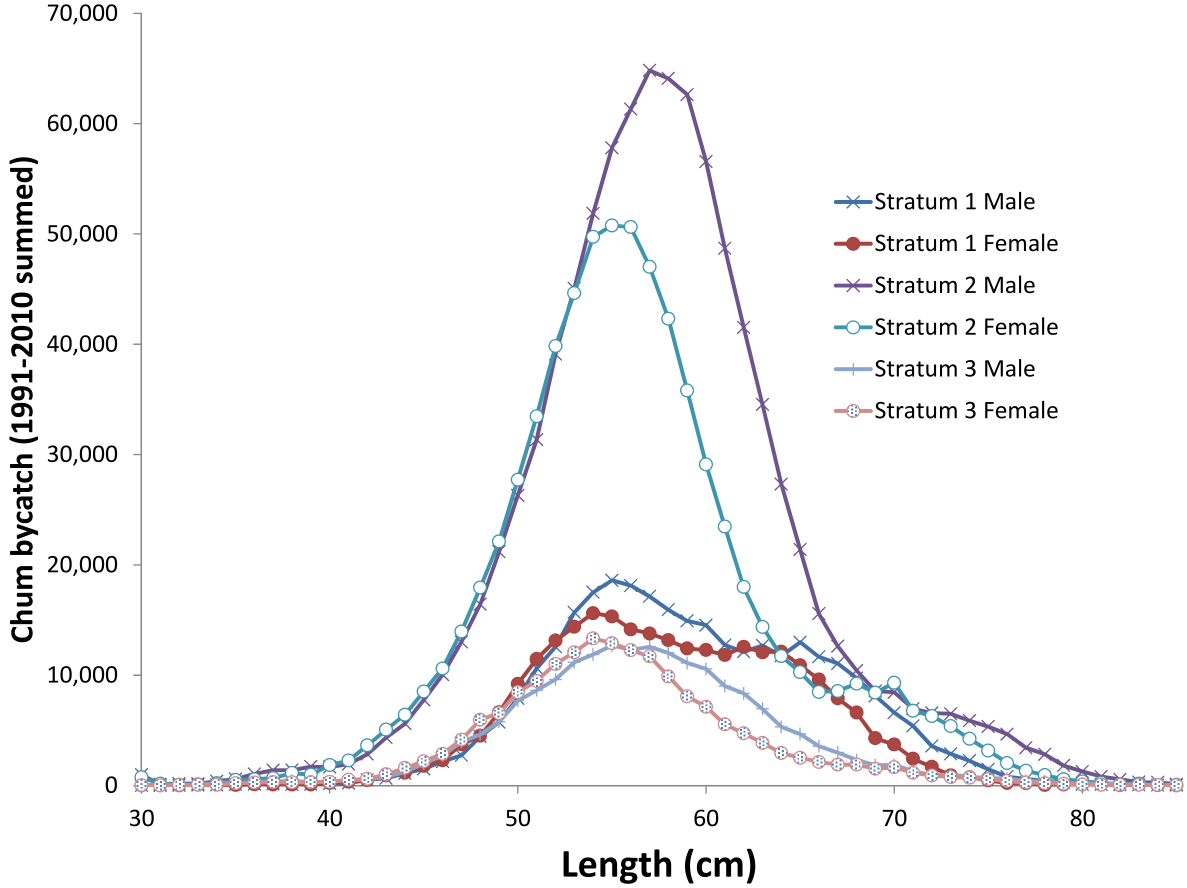


Figure 3-6 Stratified estimates of total catch-at-length by sex from NMFS observer collected length frequencies , 1991-2010 combined.

[to come]

Figure 3-7 Annual length frequency of chum salmon occurring as bycatch in the pollock fishery.

3.3.2 Adult equivalence model

A simplified version of implementing Adult equivalence (AEQ) analysis to chum was possible because most all of the bycatch occurred during the summer-fall fishery (only samples from this period are used for analysis). As with the Chinook model, given the age specific bycatch estimates by strata, oceanic natural mortality, and age composition of chum returning to spawn (for the AYK region), it is possible to estimate the AEQ for chum salmon. Alternative oceanic mortality rates can also evaluated since these are poorly known.

The impact of bycatch on salmon runs measures the historical bycatch levels relative to the subsequent returning salmon run *k* in year *t* as:

$$u_{t,k} = \frac{AEQ_{t,k}}{AEQ_{t,k} + S_{t,k}} \qquad (1)$$

where $AEQ_{t,k}$ and $S_{t,k}$ are the adult-equivalent bycatch and stock size (run return) estimates of the salmon species in question, respectively. The calculation of $AEQ_{t,k}$ includes the bycatch of salmon returning to spawn in year *t* and the bycatch from previous years for the same brood year (i.e., at younger, immature ages). This latter component needs to be decremented by ocean survival rates and maturity schedules. The impact of current year and previous years bycatch on salmon returning (as adult equivalents in year *t*) can be expressed in expanded form (without stock specificity) as:

$$
\begin{aligned}
AEQ_t = &\sum_{a=3}^{7} c_{t,a}\gamma_a + \\
&\gamma_4\left(1-\gamma_3\right)s_3c_{t-1,3} + \\
&\gamma_5\left(1-\gamma_4\right)\left(1-\gamma_3\right)s_3s_4c_{t-2,3} + \\
&\gamma_6\left(1-\gamma_5\right)\left(1-\gamma_4\right)\left(1-\gamma_3\right)s_3s_4s_5c_{t-3,3} + \\
&\gamma_7\left(1-\gamma_6\right)\left(1-\gamma_5\right)\left(1-\gamma_4\right)\left(1-\gamma_3\right)s_3s_4s_5s_6c_{t-4,3} + \\
\\
&\gamma_5\left(1-\gamma_4\right)s_4c_{t-1,4} + \\
&\gamma_6\left(1-\gamma_5\right)\left(1-\gamma_4\right)s_4s_5c_{t-2,4} + \\
&\gamma_7\left(1-\gamma_6\right)\left(1-\gamma_5\right)\left(1-\gamma_4\right)s_4s_5s_6c_{t-3,4} + \\
\\
&\gamma_6\left(1-\gamma_5\right)s_5c_{t-1,5} + \\
&\gamma_7\left(1-\gamma_6\right)\left(1-\gamma_5\right)s_5s_6c_{t-2,5} + \\
\\
&\gamma_7\left(1-\gamma_6\right)s_6c_{t-1,6}
\end{aligned}
\qquad (2)
$$

where $c_{t,a}$ is the bycatch of age *a* salmon in year *t*, s_a is the proportion of salmon surviving from age *a* to *a+1,* and γ_a is the proportion of salmon at sea that will return to spawn at age *a*. Since this model is central to the calculation of *AEQ* values, an explanatory schematic is given in Figure 3-8. Maturation rates vary over time and among stocks detailed information on this is available from a wide variety of sources. For the purpose of this study, an average over putative stocks was developed based on a variety of studies (Table 3-8). Note that there is a distinction between the distribution of mature age salmon found in rivers (Table 3-8) and the expected age-specific maturation rate of oceanic salmon ($\gamma_{a,k}$) used in this model (Table 3-9). However, given ocean survival rates the values for $\gamma_{a,k}$ can be solved which satisfy the age-specific maturation averaged over different stocks (2nd from bottom row of Table 3-8).

To carry out the computations in a straightforward manner, the numbers of salmon that remain in the ocean (i.e., they put off spawning for at least another year) are tracked through time until age 7 where for this model, all chum salmon in the ocean at that age are considered mature and will spawn in that year.

Stochastic versions of the adult equivalence calculations acknowledge both run-size inter-annual variability and run size estimation error, as well as uncertainty in maturation rates, the natural mortality rates (oceanic), river-of-origin estimates, and age assignments. The variability in run size can be written as (with $\dot{S}_{t,k}$ representing the stochastic version of $S_{t,k}$):

$$
\dot{S}_{t,k} = \overline{S}_k e^{\varepsilon_t+\delta_t} \quad \begin{aligned} &\varepsilon_t \sim N\left(0,\sigma_1^2\right), \\ &\delta_t \sim N\left(0,\sigma_2^2\right) \end{aligned} \qquad (3)
$$

where σ_1^2, σ_2^2 are specified levels of variability in inter-annual run sizes and run-size estimation variances, respectively. Note that for the purposes of this EIS, estimates of run sizes were unavailable for some stocks hence this method is described here for conceptual purposes only.

The stochastic survival rates were simulated as:

$$\dot{s}_a = 1 - \exp\left(-M_a + \delta\right), \qquad \delta \sim N\left(0, 0.1^2\right) \tag{4}$$

whereas the maturity in a given year and age was drawn from beta-distributions:

$$\dot{\gamma}_a \sim B\left(\alpha_a, \beta_a\right) \tag{5}$$

with parameters α_a, β_a specified to satisfy the expected value of age at maturation (Table 3-8) and a pre-specified coefficient of variation term (provided as model input).

Similarly, the parameter responsible for assigning bycatch to river-system of origin was modeled using a combination of years and "parametric bootstrap" approach, also with the beta distribution:

$$\dot{p}_k \sim B(\alpha_k, \beta_k) \tag{6}$$

again with α_k, β_k specified to satisfy the expected value the estimates and variances shown from proportions based on the genetic analysis of the bycatch samples. For the purposes of this study, the estimation uncertainty is considered as part of the inter-annual variability in this parameter. The steps (implemented in a spreadsheet) for the AEQ analysis can be outlined as follows:

1. Select a bootstrap sample of salmon bycatch-at-age ($c_{t,a}$) for each year from the catch-age procedure described above;
2. Sum the bycatch-at-age for each year and proceed to account for year-of-return factors (e.g., stochastic maturation rates and ocean survival (Eqs. 2-5);
3. Partition the bycatch estimates to stock proportions (by year and area) drawn randomly from each parametric bootstrap;
4. Store stratum-specific AEQ values for each year;
5. Repeat 1-4 200 times;
6. Based on updated genetics results, assign to river of origin components ($\dot{p}_k$, Eq. 6).
7. Compile results over all years and compute frequencies from which relative probabilities can be estimated;

Sensitivity analyses on maturation rates by brood year were conducted and contrasted with alternative assumptions about natural mortality (M_a) schedules during their oceanic phase interacts with the corresponding age-specific probabilities that a salmon would return to spawn (given the in-river mature population proportions shown in Table 3-8).

The pattern of bycatch relative to AEQ is variable and relatively insensitive to mortality assumptions (Figure 3-9). For simplicity in presenting the analysis, subsequent values are based on the intermediate age-specific natural mortality (Scenario 2).

Notice that in some years, the bycatch records may be below the actual AEQ due to the lagged impact of previous years' catches (e.g., in 1994 and 2006). A similar result would be predicted for AEQ model results in 2010 regardless of actual bycatch levels in this year due to the cumulative effect of bycatch prior to 2010.

Overall, the estimate of AEQ chum salmon mortality from 1994-2010 ranged from about 16,000 fish to just over 540,000 (Table 3-10). Breaking out this AEQ mortality in a coarse way by applying results presented in Table 3-1 and Table 3-2 indicates that 18% of the AEQ came from Alaska and assuming roughly 11% of the runs (conservatively) return to all the Norton Sound rivers, then the impact of the bycatch on that system works out to about 2.0% of all mortality or a loss of about 11,000 chum salmon during 2005. This is a rough approximation but indicates that the relative magnitude of the chum bycatch impact on Alaska systems. In all other years the bycatch was considerably lower (the 1994-2010 AEQ average is 23% of the 2005 value at 125,000 chum salmon AEQ mortality—2,500 chum salmon on average impacting the Norton Sound region).

Evaluations of alternative chum salmon trigger caps were done based on re-casting historical catch levels as if a cap proposal had been implemented. Since the alternatives all have specific values by season and sector, the effect on bycatch levels can vary for each alternative and over different years. This is caused by the distribution of the fleet relative to the resource and the variability of bycatch rates by season and years. This is meant to align the seasonal aspect (early and late B-season) relative to the impact on the stock ID of the bycatch. For example, if a particular trigger cap effected fewer chum salmon earlier in the year, and the same amount later, then overall, the proportion of western Alaska stocks in the bycatch would be expected to be lower (since the stock composition appears to vary between early and later in the season).

Table 3-8 In-river maturity-at-age distribution of chum salmon by district. Note that the column "assumed average run" was used for computing a weighted mean maturity rate for chum salmon. *Source: Dani Eveson, ADFG pers. comm. 2010.*

		Assumed	Age-specific in-river maturity				
Area	Approx size	Average run	3	4	5	6	7
Kotzebue	>200k	250,000	5.0%	52.4%	38.1%	4.4%	0.1%
Pilgrim	<100k	75,000	3.1%	51.1%	39.6%	6.0%	0.2%
NS Subdistrict 1 (Nome)	<100k	75,000	2.3%	52.9%	41.6%	3.2%	0.0%
NS Subdistrict 2 (Niukluk)	<100k	75,000	7.0%	49.4%	40.5%	3.1%	0.0%
NS Subdistrict 3 (Kwiniuk)	<100k	75,000	7.0%	49.4%	40.5%	3.1%	0.0%
NS Subdistrict 5 (Shaktoolik)	<100k	75,000	6.4%	46.3%	43.7%	4.5%	0.0%
NS Subdistrict 6 (Unalakleet)	<100k	75,000	2.3%	47.3%	47.3%	3.2%	0.1%
Yukon River summer	>500k	600,000	1.4%	52.9%	42.7%	3.1%	0.0%
Yukon River fall	>300k	350,000	3.8%	67.8%	27.5%	0.9%	0.0%
Kuskokwim	1,500,000	1,500,000	2.0%	65.0%	32.0%	1.0%	0.0%
District 4 (Quinhagak)	150,000	150,000	2.0%	60.0%	37.0%	2.0%	0.0%
District 5 (Goodnews Bay)	100,000	100,000	1.0%	51.0%	47.0%	1.0%	0.0%
Weighted average		3,400,000	2.6%	59.5%	35.9%	2.0%	0.0%
Simple mean			3.6%	53.8%	39.8%	2.9%	0.0%

Table 3-9 Estimated maturity-at-age for chum salmon bycatch based on the weighted in-river maturity observations (Table 3-8) and different assumptions of ocean annual survival rates.

	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
Scenario 1							
Maturity(γ_a)	0.000	0.000	0.118	0.760	0.984	0.999	1.000
M	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Scenario 2							
Maturity(γ_a)	0.000	0.000	0.110	0.744	0.986	0.999	1.000
M	0.400	0.300	0.200	0.150	0.100	0.050	0.000
Scenario 3							
Maturity(γ_a)	0.000	0.000	0.114	0.748	0.985	0.999	1.000
M	0.100	0.100	0.100	0.100	0.100	0.100	0.100

Table 3-10 Estimated chum bycatch by year, their age-equivalent removals to mature returning salmon (AEQ) and removals by chum salmon brood year (last two columns)

Bycatch year	Annual bycatch	AEQ	Brood year	Estimated bycatch
1991	26,736	15,958	1988	54,817
1992	38,923	30,427	1989	158,818
1993	239,613	153,021	1990	117,300
1994	88,842	129,753	1991	37,788
1995	18,775	46,715	1992	55,229
1996	75,512	53,947	1993	58,314
1997	62,571	59,266	1994	53,125
1998	46,431	53,945	1995	44,991
1999	45,534	44,654	1996	52,469
2000	56,754	51,204	1997	53,823
2001	52,356	49,754	1998	85,298
2002	76,468	65,714	1999	181,345
2003	173,680	132,441	2000	368,851
2004	435,273	320,923	2001	605,280
2005	652,920	543,645	2002	274,052
2006	301,209	404,106	2003	91,338
2007	83,761	141,135	2004	35,156
2008	14,402	43,440	2005	25,851
2009	43,648	31,911	2006	18,954
2010	12,922	22,114		
2011		*5,885*		
2012		*632*		

The sum over ages of catch in year *t* that would have returned in that year

$$AEQ_t = \sum_{a=3}^{7} c_{t,a}\gamma_a + \text{ Fish caught in earlier years that would have survived:}$$

The catch of age 3 salmon in previous years that survived and had not returned in earlier years

$$\begin{cases} \gamma_4(1-\gamma_3)s_3c_{t-1,3} + \\ \gamma_5(1-\gamma_4)(1-\gamma_3)s_3s_4c_{t-2,3} + \\ \gamma_6(1-\gamma_5)(1-\gamma_4)(1-\gamma_3)s_3s_4s_5c_{t-3,3} + \\ \gamma_7(1-\gamma_6)(1-\gamma_5)(1-\gamma_4)(1-\gamma_3)s_3s_4s_5s_6c_{t-4,3} + \end{cases}$$

The catch of age 4 salmon in previous years that survived and had not returned in earlier years

$$\begin{cases} \gamma_5(1-\gamma_4)s_4c_{t-1,4} + \\ \gamma_6(1-\gamma_5)(1-\gamma_4)s_4s_5c_{t-2,4} + \\ \gamma_7(1-\gamma_6)(1-\gamma_5)(1-\gamma_4)s_4s_5s_6c_{t-3,4} + \end{cases}$$

The catch of age 5 salmon…

$$\begin{cases} \gamma_6(1-\gamma_5)s_5c_{t-1,5} + \\ \gamma_7(1-\gamma_6)(1-\gamma_5)s_5s_6c_{t-2,5} + \end{cases}$$

$$\gamma_7(1-\gamma_6)s_6c_{t-1,6}$$

Figure 3-8 Explanatory schematic of main AEQ equation. Symbols are defined in text.

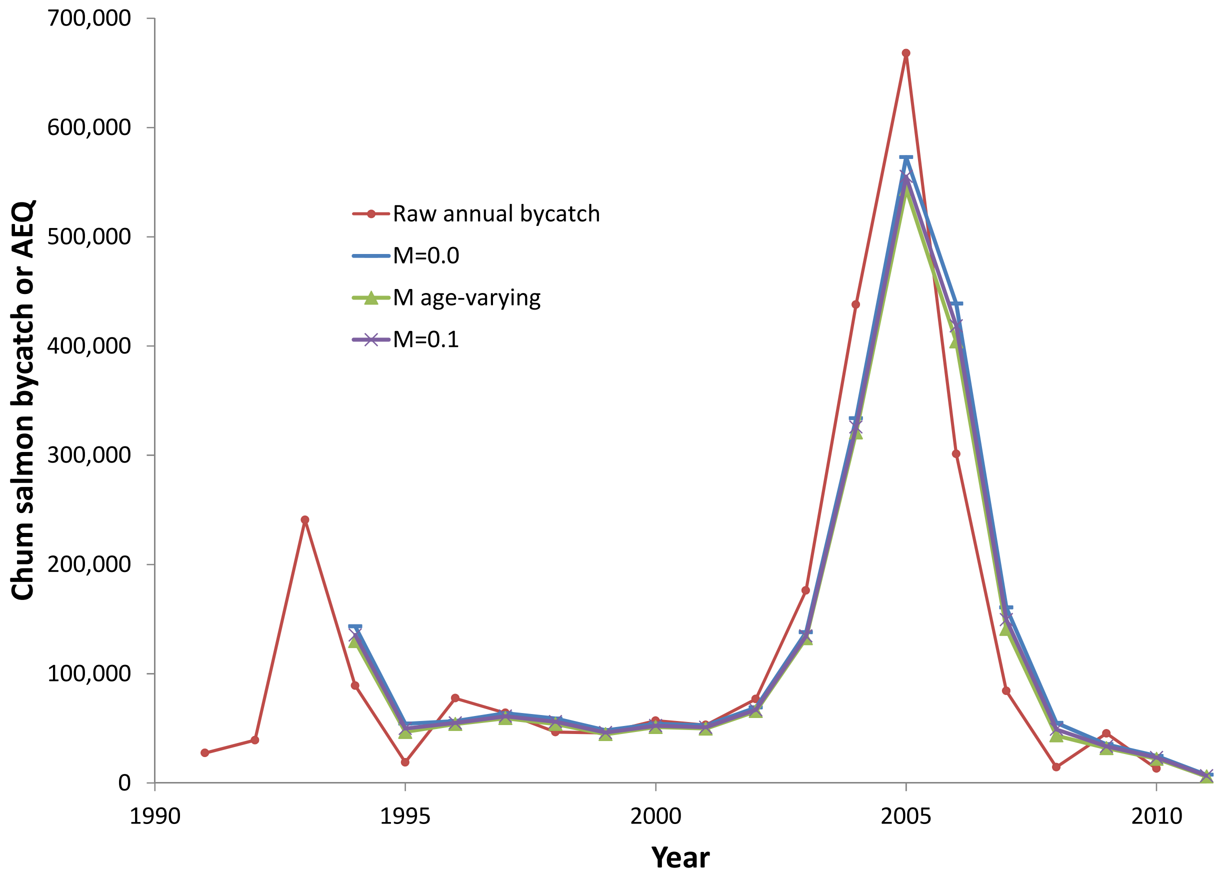


Figure 3-9 Estimated chum bycatch age-equivalent (AEQ) chum bycatch for three different assumptions about oceanic natural mortality rates compared to the annual tally

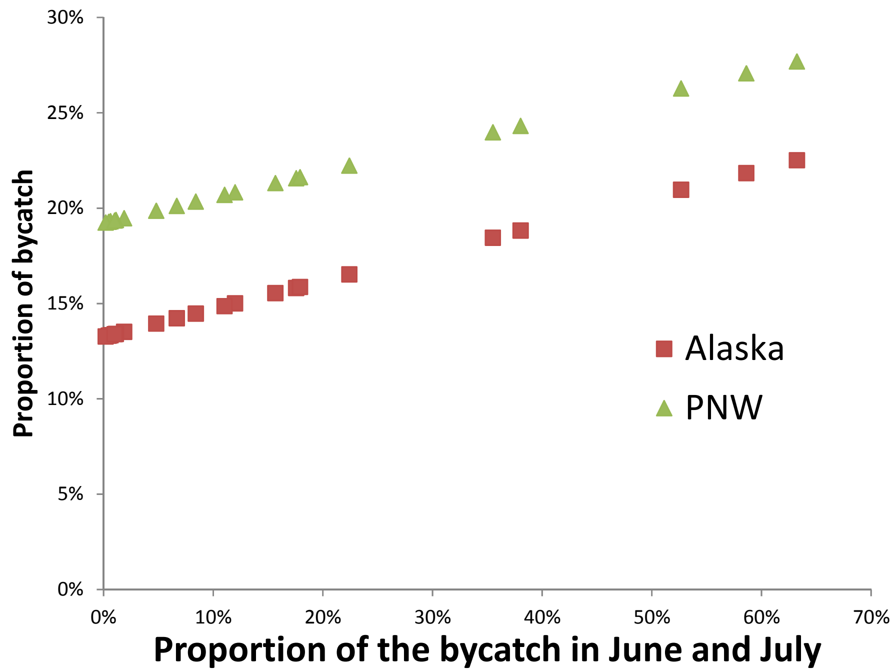


Figure 3-10 Figure showing how the overall proportion of broad categories of chum salmon bycatch changes with the relative proportion of all chum bycatch that occurs in June-July

3.4 Evaluating trigger-cap scenarios

As noted in section 2.3.1, the 50% area scenarios were selected to evaluate the range of caps apportioned by sector and month. The historical data from 2003-2010 was used for each cap scenario. As a monthly trigger limit was reached, the areas designated for that month are closed to that sector and re-opened in the subsequent month (unless the cumulative total was exceeded for that month—if that is the case, then that month begins with the "optimal" closures for that month). When areas become closed, the remaining pollock observed for that sector is assumed to be taken *outside of the closed areas* at the mean bycatch rate / t of pollock observed outside the closed areas.

This process requires careful accounting so a model was developed in ADMB to take advantage of a number of programming features and to track open and closed area rates simply. Also, it was written with a view that parameters describing the mean and variance of each ADFG statistical area in each week could potentially be estimated. The advantage of estimating these parameters would be that the variability could be better characterized and easily evaluated. Progress was made on estimating these parameters. However, due to apparent higher order interactions (between weeks-areas-and years) and missing cells and outliers, model fitting has been unsatisfactory to date.

Presently, the model code works well for evaluating the historical period (2003-2010) and is flexible to change input specifications (i.e., different spatial closures, cap/sector allocations). Preliminary results indicate that the closure areas generally result in reductions in chum salmon bycatch. The relative magnitude of the reductions by cap and sector level will be presented when more testing is completed.

4 Walleye pollock

[Placeholder]

5 Chum salmon

5.1 Overview of Chum salmon biology and distribution

Information on chum salmon may be found at the ADF&G website: www.adfg.state.ak.us/pubs/notebook/fish/chum.php.

Chum salmon have the widest distribution of any of the Pacific salmon species. They range south to the Sacramento River in California and the island of Kyushu in the Sea of Japan. In the north they range east in the Arctic Ocean to the Mackenzie River in Canada and west to the Lena River in Siberia.

Chum salmon often spawn in small side channels and other areas of large rivers where upwelling springs provide excellent conditions for egg survival. They also spawn in many of the same places as do pink salmon (i.e., small streams and intertidal zones). Some chum in the Yukon River travel over 2,000 miles to spawn in the Yukon Territory. These have the brightest color and possess the highest oil content of any chum salmon when they begin their upstream journey. Chum salmon spawning is typical of Pacific salmon with the eggs deposited in redds located primarily in upwelling spring areas of streams.

Chum salmon do not have a period of freshwater residence after emergence of the fry as do Chinook, coho, and sockeye salmon. Chum fry feed on small insects in the stream and estuary before forming into schools in salt water where their diet usually consists of zooplankton. By fall they move out into the Bering Sea and Gulf of Alaska where they spend two or more of the winters of their three to six year lives. In southeastern Alaska most chum salmon mature at four years of age, although there is considerable variation in age at maturity between streams. There is also a higher percentage of chums in the northern areas of the state. Chum salmon vary in size from four to over thirty pounds, but usually range from seven to eighteen pounds, with females generally smaller than males.

Chum salmon are the most abundant commercially harvested salmon species in arctic, northwestern, and Interior Alaska. They are known locally as 'dog salmon' and are an important year-round source of fresh and dried fish for subsistence and personal use purposes, but are of relatively less importance in other areas of the state. Sport fishermen generally capture chum salmon incidental to fishing for other Pacific salmon in either fresh or salt water. After entering fresh water, chums are most often prepared as smoked product. In the commercial fishery, most chum salmon are caught by purse seines and drift gillnets, but troll gear and set gillnets harvest a portion of the catch as well. In many areas they have been harvested incidental to the catch of pink salmon. The development of markets for ikura (roe) and fresh and frozen chum in Japan and northern Europe has increased their demand.

Because chum salmon are generally caught incidental to other species, catches may not be good indicators of abundance. In recent years chum salmon catch in many areas has been depressed by low prices. Directed chum salmon fisheries occur in Arctic-Yukon-Kuskokwim area and on hatchery runs in Prince William Sound and Southeast Alaska. Chum salmon runs to Arctic-Yukon-Kuskokwim Rivers have been declining in recent years and chum salmon in the Yukon River and in some areas of Norton Sound continue to be managed as a stocks of concern.

5.1.1 Food habits/ecological role

Chum salmon diet composition in summer is primarily euphausids and pteropods with some smaller amounts of amphipods, squid, fish, and gelatinous zooplankton. Chum from the shelf region contained a higher proportion of pteropods than the other regions while Aleutian Islands chum salmon contained higher proportions of euphausids and amphipods. Basin chum salmon samples had higher amounts of fish and gelatinous zooplankton. Fish prey species consumed in the basin included northern lampfish and juvenile Atka mackerel, sculpins, and flatfish while shelf samples consumed juvenile rockfish, sablefish, and pollock.

5.1.1 Hatchery releases

5.1.1.1 Pacific Rim

Commercial salmon fisheries exist around the Pacific Rim with most countries releasing salmon fry in varying amounts by species. The North Pacific Anadromous Fish Commission summarizes information on hatchery releases by country and by area where available. Reports submitted to the NPAFC were used to summarize hatchery information by Country and by US state below (Table 5-1,Table 5-2). For more information see the following: Russia (Anon., 2007; TINRO-centre 2008; 2006; 2005); Canada (Cook and Irvine, 2007); USA (Josephson 2008; 2007; Eggers, 2006; 2005; Bartlett, 2008, 2007; 2006; 2005); Korea (SRT 2008, 2007, 2006, 2005). Chum salmon hatchery releases by country are shown below in Table 5-2 .

For chum salmon, Japanese hatchery releases far exceed releases by any other Pacific Rim country. This is followed by the US and Russia. A further break-out of hatchery releases by area in the US show that the majority of chum salmon fry releases occur in the Alaska region (Table 5-2).

Combined Asian hatchery releases in 2007 (Russia, Japan, Korea) account for 74% of the total releases while Alaskan chum releases account for 20% of the total releases. Chum enhancement projects in Alaska are not active in the AYK region.

Table 5-1 Hatchery releases of juvenile chum salmon in millions of fish

Year	Russia	Japan	Korea	Canada	US	Total
1999	278.7	1,867.9	21.5	172.0	520.8	2,860.9
2000	326.1	1,817.4	19.0	124.1	546.5	2,833.1
2001	316.0	1,831.2	5.3	75.8	493.8	2,722.1
2002	306.8	1,851.6	10.5	155.3	507.2	2,831.4
2003	363.2	1,840.6	14.7	136.7	496.3	2,851.5
2004	363.1	1,817.0	12.9	105.2	630.2	2,928.4
2005	387.3	1,844.0	10.9	131.8	596.9	2,970.9
2006	344.3	1,858.0	7.3	107.1	578.8	2,895.5
2007	350.4	1,870.0	13.8	142.0	653.3	3,029.5
2008	*	*	16.6	*	*	

*2008-2009 to be updated for initial review draft

Table 5-2 US west coast hatchery releases of juvenile chum salmon in millions of fish

Year	Alaska	Washington	Oregon	California	Idaho	Combined WA/OR/CA/ID	Total
1999	460.9	59.9	0	0	0		520.8
2000	507.7	38.8	0	0	0		546.5
2001	465.4	28.4	0	0	0		493.8
2002	450.8	56.4	0	0	0		507.2
2003	435.6	60.7	0	0	0		496.3
2004	578.5					51.7	630.2
2005	549.0					47.9	596.9
2006	541.2					37.6	578.8
2007	604.7	48.6	0	0	0	48.6	653.3

*2008-2009 to be updated for initial review draft

5.1.1.2 Alaska

Hatchery-produced salmon are harvested in traditional common property fisheries, common property hatchery terminal area fisheries, and in private hatchery cost recovery fisheries. As enhanced fish enter terminal areas near hatchery release sites, fishery management is focused on the harvest of hatchery-produced surplus returns. In several locations terminal harvest areas (THAs) must be managed in cooperation with hatchery organizations to provide for broodstock needs and cost recovery harvests. Harvests in hatchery Special Harvest Areas (SHAs) are opened so hatchery operators can harvest returning fish to pay for operating costs and to reserve sufficient broodstock to provide for egg take goals. For some terminal locations only cost recovery harvest takes place; for some locations both common property and cost recovery harvests occur; at other locations only common property harvests occur.

Most hatchery fish harvested in terminal areas are segregated from wild stocks while common property fisheries harvest hatchery fish in mixed-stock fisheries during their migration to terminal areas. Hatchery operators are required to provide ADF&G with estimates of the total number of chum salmon harvested each year. The methods used to estimate harvests in mixed-stock fisheries vary from comprehensive thermal mark sampling to best estimates based on consultation with ADF&G management biologist and hatchery operators. Harvest estimates of wild chum salmon are based on estimates of the harvest of hatchery fish (i.e., subtracting the estimated contribution of hatchery fish to the common property fisheries from the total commercial harvest of chum salmon). More detail on local hatcheries is provided as a component in each of the regional management area sections below.

5.1.2 BASIS surveys

[PLACEHOLDER]

5.1.3 Migration corridors

[PLACEHOLDER]

5.2 Chum salmon assessment overview by major river system or region in western Alaska

Note that tables and figures in this section are only internally numbered. This will be modified consistent with the rest of the document for initial review.

5.2.1 Management of salmon stocks

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

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

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

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

A healthy salmon stock is defined as a stock of salmon that has annual runs typically of a size to meet escapement goals and a potential harvestable surplus to support optimum or maximum yield. In contrast, a depleted salmon stock means a salmon stock for which there is a conservation concern. Further, a stock of concern is defined as a stock of salmon for which there is a yield, management, or conservation concern (5 AAC 39.222(f)(16)(7)(35)). Yield concerns arise from a chronic inability to maintain expected yields or harvestable surpluses above escapement needs. Management concerns are precipitated by a chronic failure to maintain escapements within the bounds, or above the lower bound of an established goal. A conservation concern may arise from a failure to maintain escapements above a sustained escapement threshold (defined below).

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

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

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

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

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

The Policy for Statewide Salmon Escapement Goals is codified in 5 AAC 39.223. In this policy, the board recognizes ADF&G's responsibility to document existing salmon escapement goals; to establish BEGs, SEGs, and SETs; to prepare scientific analyses with supporting data for new escapement goals or to modify existing ones; and to notify the public of its actions. The Policy for Statewide Salmon Escapement Goals further requires that BEGs be established for salmon stocks for which the department can reliably enumerate escapement levels, as well as total annual returns. Biological escapement goals, therefore, require accurate knowledge of catch and escapement by age class. Given such measures taken by ADF&G, the board will take regulatory actions as may be necessary to address allocation issues arising from new or modified escapement goals and determine the appropriateness of establishing an OEG. In conjunction with the SSFP, this policy recognizes that the establishment of salmon escapement goals is the responsibility of both the board and ADF&G.

5.2.1.1 Chum salmon escapement

Stock-specific harvest information is not available for the vast majority of wild chum salmon stocks in Alaska, which are predominantly harvested in mixed stock fisheries far from their spawning grounds. Chum salmon are mostly harvested incidental to other salmon species in common property fisheries that are managed based on abundance of the target species. For example, summer-run chum salmon stocks in Southeast Alaska are harvested incidentally in directed pink salmon purse seine fisheries. The increase in the pink salmon population has masked the abundance of chum salmon and greatly limited ADF&G's ability to estimate numbers of chum salmon in many or most streams in Alaska.

Chum salmon escapement estimates are made using a variety of methods including aerial surveys, foot surveys, and weir counts. Estimating chum salmon escapements using aerial observations is more difficult than estimating escapements of other species of salmon. Chum salmon migrate into small sloughs and side creeks as well as into major river systems, and may also occupy more turbid systems, making observations difficult.

Available information for most chum salmon stocks in Alaska fits into the "fair" or "poor" categories as defined by Bue and Hasbrouck (*unpublished*)[14], primarily due to lack of stock-specific harvest information, estimates of total escapement, or estimates of return by age. A fair category determination is made when escapement is estimated or indexed and harvest is estimated with reasonably good accuracy but precision lacking for one if not both; no age data exists and/or data is insufficient to estimate total return and construct brood tables. A poor category determination is made when escapement is indexed (e.g., single foot/aerial survey) such that the index provides a fairly reliable measure of escapement but no harvest and age data is available.

5.2.2 Western chum salmon stocks and chum salmon stocks outside western Alaska

5.2.2.1 Bristol Bay

The Bristol Bay management area includes all coastal and inland waters east of a line from Cape Newenham to Cape Menshikof (Figure 1). The area includes nine major river systems: Ugashik, Egegik, Naknek, Alagnak (Branch), Kvichak, Nushagak, Wood, Igushik, and Togiak. Collectively, these rivers are home to the largest commercial sockeye salmon fishery in the world. Sockeye salmon are by far the most abundant salmon species that return to Bristol Bay each year, but Chinook, chum, coho, and (in even years) pink salmon returns are important to the fishery as well. The Bristol Bay area is divided into 5 management districts (Ugashik, Egegik, Naknek-Kvichak, Nushagak, and Togiak) that correspond to the major river drainages. The management objective for each river is to achieve escapements within established ranges for the major salmon species while harvesting fish excess of those ranges through orderly fisheries. In addition, regulatory management plans have been adopted for individual species in certain districts.

[14] Bue, B. G., and J. J. Hasbrouck. *Unpublished*. Escapement goal review of salmon stocks of Upper Cook Inlet, Report to the Alaska Board of Fisheries, 2001. Alaska Department of Fish and Game, Anchorage.

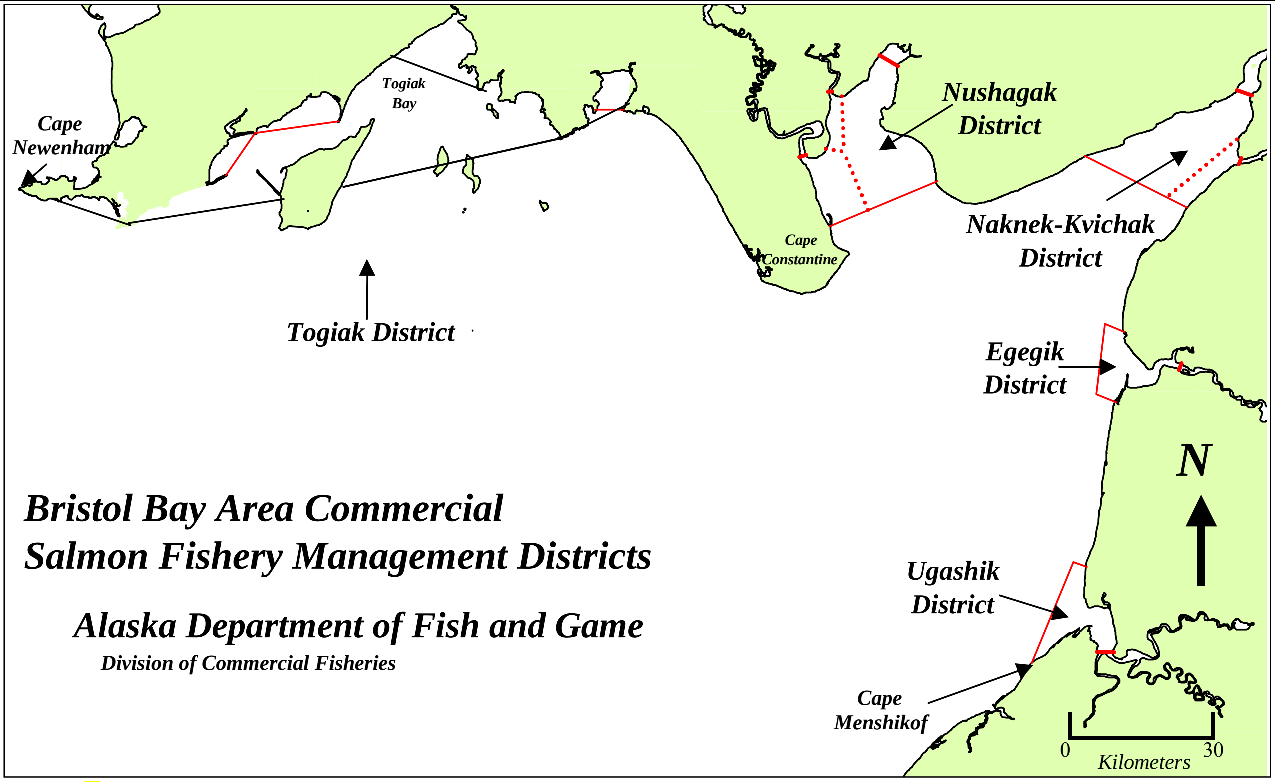


Figure 1–Bristol Bay area commercial fisheries salmon management districts

The five species of Pacific salmon found in Bristol Bay are the focus of major commercial, subsistence, and sport fisheries. Annual commercial catches for the most recent 20-year span (1990–2009) average nearly 25.7 million sockeye, 64,900 Chinook, 947,000 chum, 97,000 coho, and 170,000 (even-years only) pink salmon (Morstad et al. 2010). Since 1990, the value of the commercial salmon harvest in Bristol Bay has averaged $120.70 million, with sockeye salmon being the most valuable, worth an average $118.6 million. Subsistence catches are comprised primarily of sockeye salmon and average approximately 142,000 fish. Sport fisheries harvest all species of salmon, with most effort directed toward Chinook and coho salmon stocks.

Management of the commercial fisheries in Bristol Bay is primarily focused on sockeye salmon. Discrete stocks are managed with harvests directed at terminal areas around the mouths of major river systems. Each stock is managed to achieve a spawning escapement goal based on sustained yield. Escapement goals are achieved by regulating fishing time and area by emergency order (EO) and/or adjusting weekly fishing schedules. Legal gear for the commercial salmon fishery includes both drift (150 fathoms) and set (50 fathoms) gillnets. There are 1,863 drift gillnet permits and 981 set gillnet permits in Bristol Bay.

Chum salmon are harvested incidentally to sockeye salmon. The total commercial harvest in Bristol Bay was 1.40 million chum salmon in 2009 (Morstad et al 2010). This was 38% more than the 20-year average of 946,000 chum salmon. Approximately half of the commercial chum salmon harvest occurs in the Nushagak District with the reminder split between Togiak, Naknek-Kvichak, Egegik, and Ugashik Districts.

5.2.2.2 Nushagak River

Stock Size

The largest run of chum salmon in Bristol Bay occurs in the Nushagak River. The 2009 total run of chum salmon to the Nushagak River was 1,213,821 (Table 1). The total run was 421,878 (53%) more than the recent 20-year (1989-2008) average of 791,943 and 28% more than the recent 10-year (1999-2008) average of 947,042 (Table 1).

Escapement

Chum salmon are enumerated in the Nushagak River using Dual Frequency Identification (DIDSON) sonar. The spawning escapement in the Nushagak River was 438,481 chum salmon in 2009 (Table 1). The Nushagak River has a sustainable escapement goal (SEG) threshold of 190,000 chum salmon. Chum salmon escapement has exceeded the 190,000 threshold in most years since 1989 (Table 1).

Harvest & Exploitation Rate

A total of 775,340 chum salmon were harvested in the commercial fishery of the Nushagak District in 2009. It is assumed that these chum salmon are bound for the Nushagak River as this is the only river with a significant chum population within the District. The 2009 commercial harvest of chum salmon was 61% higher than the 20-year average of 481,481 and 31% higher than the 10-year average of 591,806. The exploitation rate in 2009 was 64%, which was 5% higher than both the 10-year and 20-year averages. The commercial harvest in 2009 was one of largest harvests of chum salmon in the Nushagak District since 1966; only harvests in 2005, 2006 and 2007 have been larger.

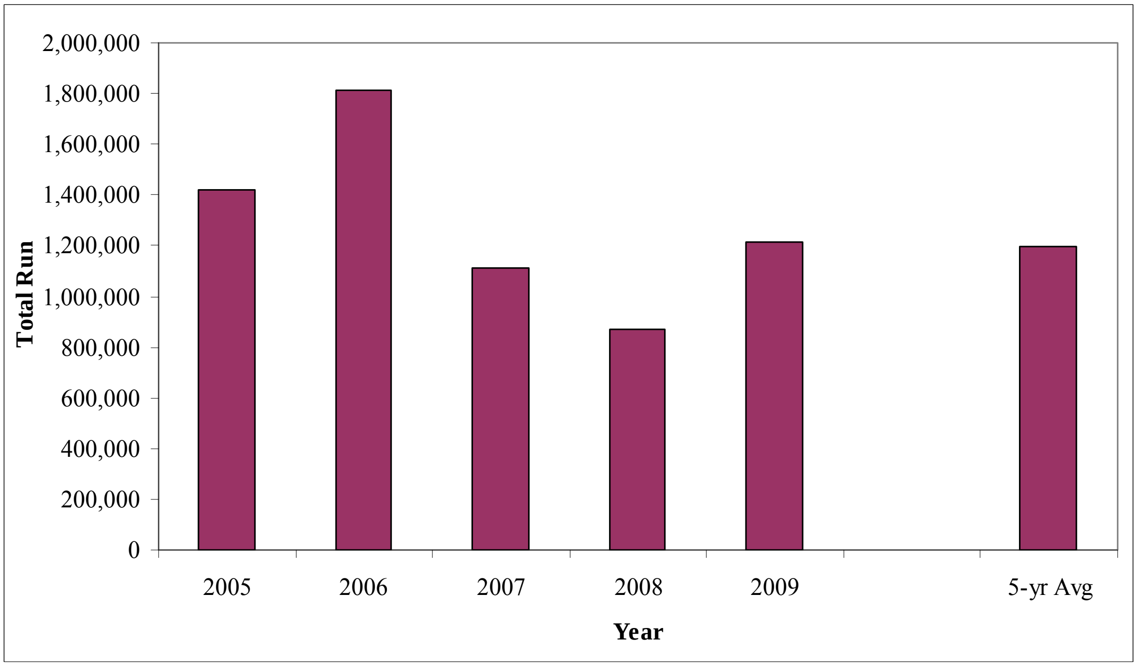


Figure 1 – Total chum salmon run, Nushagak River, 2005-2009 with 5-year average. 2009 data are preliminary.

Age Composition/Maturity

The 2009 age composition of the total run was 2% (19,082) age-0.2, 61% (736,745) age-0.3, 37% (453,785) age-0.4, and <1% (4,208) age-0.5%. The 2009 age composition is similar to what we have observed historically for Chum salmon in the Nushagak River. Age-0.3 fish have comprised the majority of the production of chum salmon in the Nushagak River (Table 2).

5.2.3 Kuskokwim Area

The Kuskokwim Salmon Management Area encompasses the Kuskokwim River drainage and all waters of Alaska that flow into the Bering Sea between Cape Newenham and the Naskonat Peninsula, including Nelson, Nunivak, and St. Matthew Islands. Subsistence and sport fishing for salmon can occur throughout the area but commercial salmon fishing is restricted to four discreet districts: two within the Kuskokwim River and two in marine waters of Kuskokwim Bay.

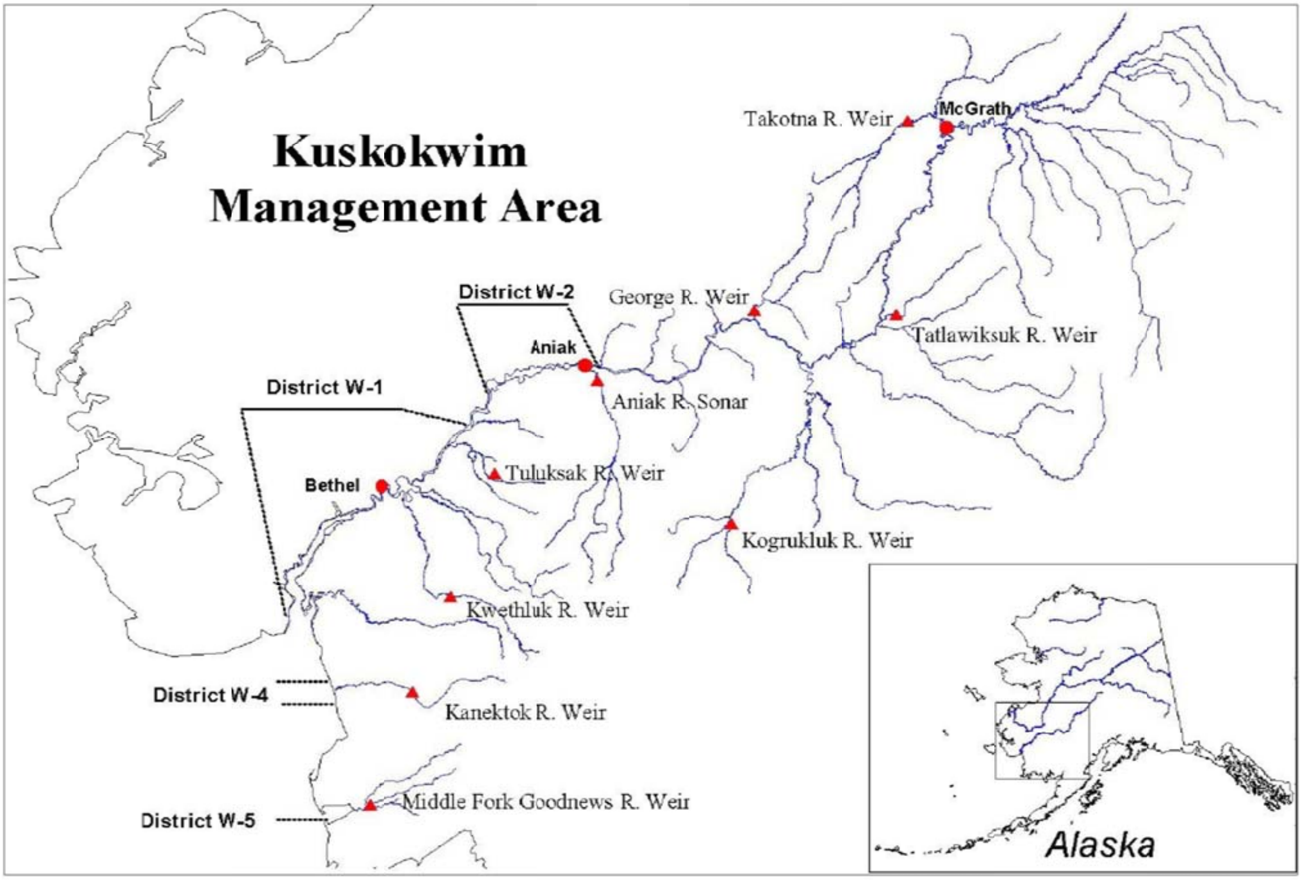


Figure 1–Map of Kuskokwim River Alaska, showing the distribution of commercial harvest areas and escapement monitoring sites.

5.2.3.1 Kuskokwim River

Salmon spawn and rear throughout the Kuskokwim River drainage, which is the second largest river in Alaska, draining an area of about 130,000 km^2 along its 1,500 km course from interior Alaska to the Bering Sea (Johnson and Daigneault 2008; Figure 1). The river produces Chinook (*Oncorhynchus tshawytscha)*, chum (*O. keta)*, sockeye (*O. nerka)*, pink *(O. gorbuscha)*, and coho salmon (*O. kisutch)*, each with numerous stock assemblages and overlapping migratory timings as they enter the lower Kuskokwim River. Subsistence, commercial, and sport fisheries are directed at harvest of Chinook, chum, sockeye, and coho salmon. The commercial and sport fisheries are relatively modest in size, but the Kuskokwim River subsistence fishery is one of the largest in Alaska (e.g., Fall et al. 2007). Subsistence and sport fisheries occur throughout the drainage, but the commercial fishery is confined to two discreet commercial fishing districts (Figure 1). District 1 extends from the mouth of the Kuskokwim River (rkm 0) upstream to Bogus Creek (rkm 203), and since 2000 is sometimes managed as two subdistricts with fisherman required to only fish in one or the other subdistrict depending on fish processing capacity (Whitmore et al 2008). Subdistrict 1-A is that portion of District 1 upstream ("above") Bethel (rkm 106) and subdistrict 1-B is downstream ("below") of Bethel. District 2 is in the middle Kuskokwim River from rkm 262 near Lower Kalskag, and extends upstream to the rkm 322 at Chuathbaluk. The District 2 commercial fishery has been inactive, with the last harvest occurring in 2000 (Whitmore et al 2008). Historically, there was also a District 3 that encompassed waters upstream of District 2, but District 3 was deleted from regulation in 1966 due to inactivity of the commercial fishery.

Kuskokwim River chum

Introduction

Entering the lower river from early June through mid August, Kuskokwim River chum salmon are the most abundant salmon species in the drainage (Estensen et al 2009). Two genetically distinct populations have been identified: the more predominant summer chum salmon that spawn mostly in July and August, and the less common fall chum that spawn mostly in September (Gilk et al. 2005). Spawning distributions do not overlap between these two populations; summer chum spawn mostly in tributaries of the lower and middle Kuskokwim River, and fall chums limited to a few upper Kuskokwim River tributaries. There is evidence that run timings through the lower Kuskokwim River do overlap between summer and fall chum salmon, but details are limited. Genetically, summer chum in the Kuskokwim and Yukon rivers are very similar; however, Kuskokwim fall chum are distinct from Kuskokwim and Yukon summer chum, and from Yukon fall chum populations. Genetic mixed-stock analysis has shown that both summer and fall chum are exploited in the Kuskokwim River in-river fisheries but, unlike the Yukon River, management statistics do not distinguish between the two populations.

Low chum salmon abundance from 1997 through 2000 prompted the Alaska Board of Fisheries to declare Kuskokwim River chum salmon as a stock of yield concern in September 2000 (Burkey et al. 2000). The chum salmon runs to the Kuskokwim River improved throughout 2000s, with near record runs from 2005 through 2007, which led to the stock of concern finding being lifted in January 2007 (Linderman and Bergstrom 2006).

Stock Assessment Background

Escapement

Escapement monitoring is limited to summer chum salmon and occurs on seven tributaries: six employing weirs and one sonar (Figure 1, Table 1). Collectively, these monitoring projects provide a means to index annual escapement abundance, but they do not provide absolute total annual abundance estimates. Efforts by Bue et al. (2008) and Shotwell and Adkison (2004) to reconstruct the total in-river chum salmon abundance based on these indices have been moderately successful. The estimates produced by each of these methods show a similar pattern in the variation of chum salmon abundances across years, but the values from the Shotwell and Adkison (2004) model are consistently lower than those produced by the Bue et al. (2008) model (Figure 2). The Bue et al. model had the advantage of more escapement information, so is thought to better reflect actual chum salmon abundance. Still, reliable historical total annual chum salmon abundance estimates for the Kuskokwim River remain elusive due to inadequate abundance estimates needed to scale the model.

Table 1 Kuskokwim River chum salmon escapement by projects, 1975-2009

	Escapement Project						
Year	Kwethluk R. Weir	Tuluksak R. Weir	Aniak R. Sonar	George R. Weir	Kogrukluk R. Weir	Tatlawiksuk R. Weir	Takotna R. Weir
1975							
1976					8,117		
1977							
1978					48,125		
1979					18,599		
1980			1,600,032				
1981			646,849		57,374		
1982			529,758		61,859		
1983			166,452				
1984			317,688		41,484		
1985			273,306		15,005		
1986			219,770		14,693		
1987			204,834				
1988			485,077		39,543		
1989			295,993		39,547		
1990			246,813		26,765		
1991		7,675	366,687		24,188		
1992	30,595	11,183	87,467		34,104		
1993		13,804	15,278		31,901		
1994		15,724	474,356		46,635		
1995					31,265		
1996			402,195	19,393 [a]	48,478		2,872
1997	10,659		289,654	5,907 [a]	7,958		1,779
1998			351,792		36,441		
1999			214,429	11,552 [a]	13,820	9,599 [a]	
2000	11,691		177,384	3,492 [a]	11,491	7,044 [a]	1,254
2001		19,321	408,830	11,601 [a]	30,570	23,718 [a]	5,414
2002	35,854	9,958	472,346	6,543	51,570	24,542	4,377
2003	41,812	11,724	477,544	33,666	23,413		3,393
2004	38,646 [a]	11,796	673,445	14,409 [a]	24,201 [a]	21,245	1,630
2005		35,696	1,173,155	14,828	197,723	55,720	6,467
2006	47,489	25,648	1,108,626	41,467	176,508	32,301	12,613
2007	57,230	17,286	699,178	55,842	49,505	83,246	8,900
2008	20,048	12,518	427,911	29,978	44,978	30,896	5,691
2009	32,028	13,658	479,531	7,941	84,940	19,975	2,487

[a] Escapement was adjusted to account for inoperable periods.

Escapement Goals

There is no formal escapement goal for the overall Kuskokwim River chum salmon run; however, escapement goals have been established for the Kogrukluk River (assessed by weir) and the Aniak River (assessed with sonar counts unapportioned to species). These goals have been annually achieved or exceeded in all but one of the last 10 years (Figures 3 and 4). Escapement goals have not been established at the five other locations where chum salmon escapements are currently being monitored.

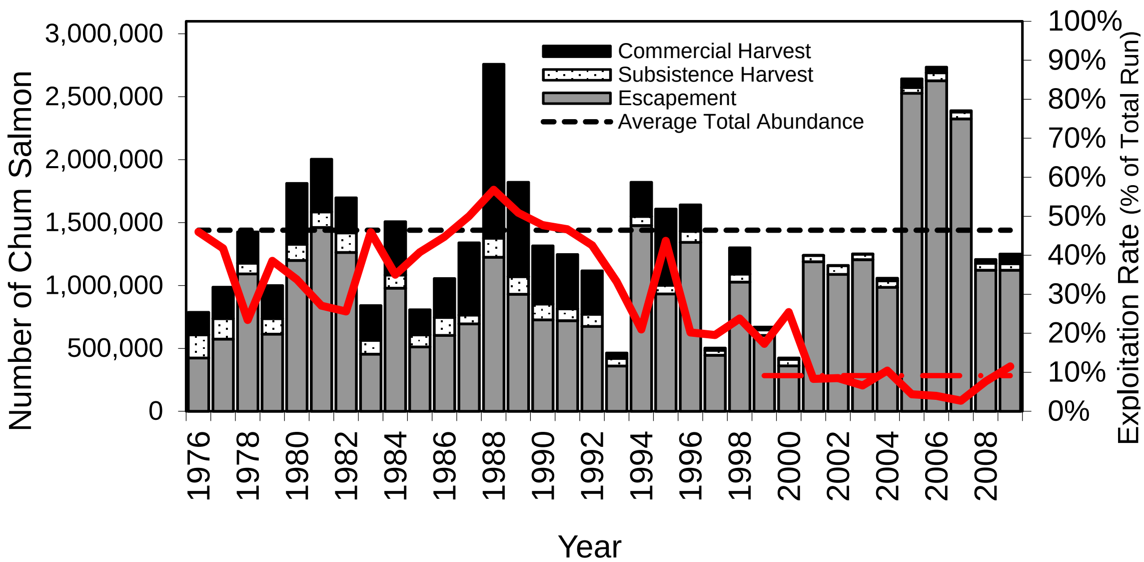


Figure 2 Draft Kuskokwim River chum salmon run reconstruction 1976-2009, showing total annual abundance and exploitation rates based on Bue et al. 2009.

Current escapement goals for Kuskokwim River chum salmon stocks are as follows:

Stock Unit	Enumeration Method	Current Escapement Goal		
		Goal	Type	Year Established
Chum Salmon				
Aniak River	Sonar	220,000–480,000	SEG	2007
Kogrukluk River	Weir	15,000–49,000	SEG	2005

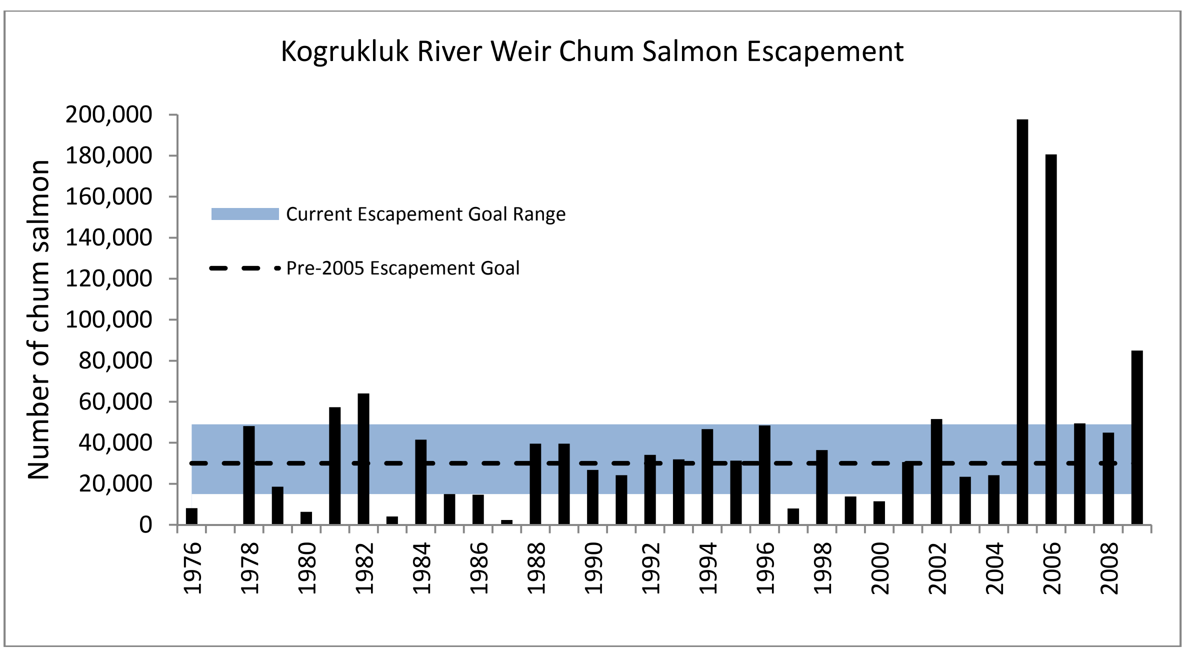


Figure 3 Chum salmon escapement at Kogrukluk River weir, 1976-2009 with escapement goal range (15,000 - 49,000) adopted in 2005, and the minimum escapement goal (30,000) used from 1983 to 2004.

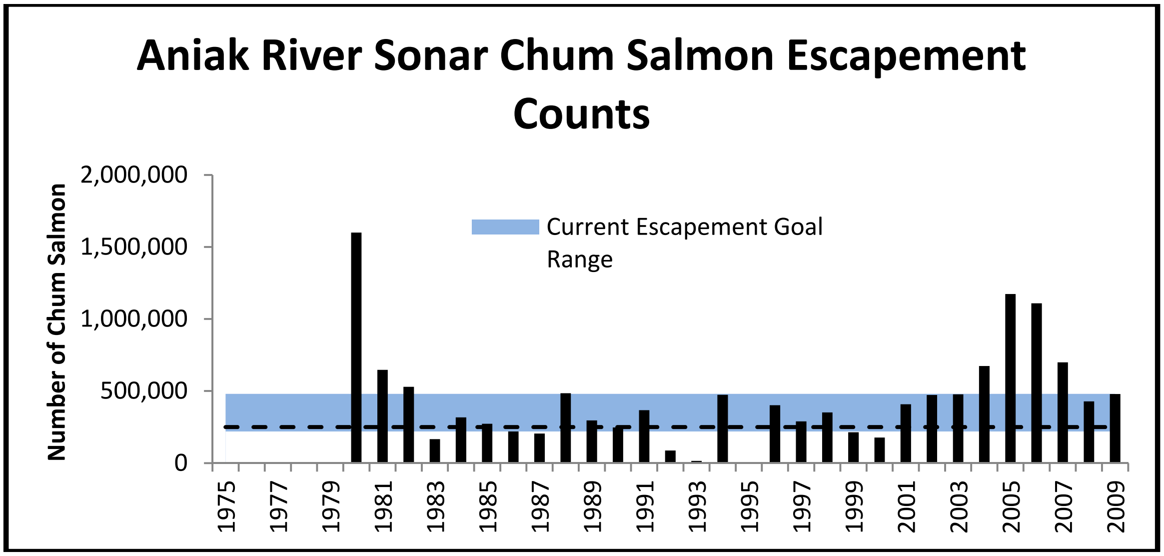


Figure 4 Chum salmon escapement index at the Aniak River Sonar site, 1980-2009 with the escapement goal range (220,000 - 480,000) adopted in 2007, and the minimum escapement goal (250,000) used from 1983 to 2004.

Maturity

Age composition of Kuskokwim River chum salmon is estimated for the commercial fishery and escapements through scale sampling (Molyneaux et al. 2009). The compositions tend to be similar, but they are not combined to provide age compositions estimates of the total run. Table 2 describes average maturity schedule based on the District 1 commercial fishery.

Table 2 Average age structure of Kuskokwim River chum salmon, as identified from the commercial harvest (Molyneaux et al 2009).

	Age Class				
	3	4	5	6	7
Proportion of total harvest	0.02	0.65	0.32	0.01	0.00

Harvest and Exploitation

Historically, Kuskokwim River chum salmon, though an important subsistence species, have been primarily targeted for commercial harvest (Figure 5). From 1976 to 1989 the average commercial harvest was 430,868, but from 2000 to 2009 declined to 26,893 due to low market interest in chum salmon and limited local processing capacity. In 2009, there was a modest increase in commercial harvest to 76,790 fish, the largest harvest since 1998, which was the result of improved processing capacity from a new fish processing plant in Platinum. Since 2005, commercial chum salmon harvests have contributed about 2% to the total exvessel value of the District 1 commercial salmon fishery. Average annual subsistence harvest is approximately 50,000 chum salmon (Figure 5), and harvest has been within or above the Amount Necessary for Subsistence every year since 1990. Preliminary run reconstruction information indicates the total in-river exploitation rate of chum salmon in 2009 was approximately 12%, compared to the recent 10-year average of 9% (Figure 2; Bue et al. 2008). Through the mid-1990's exploitation rates likely ranged between 20 and 60%.

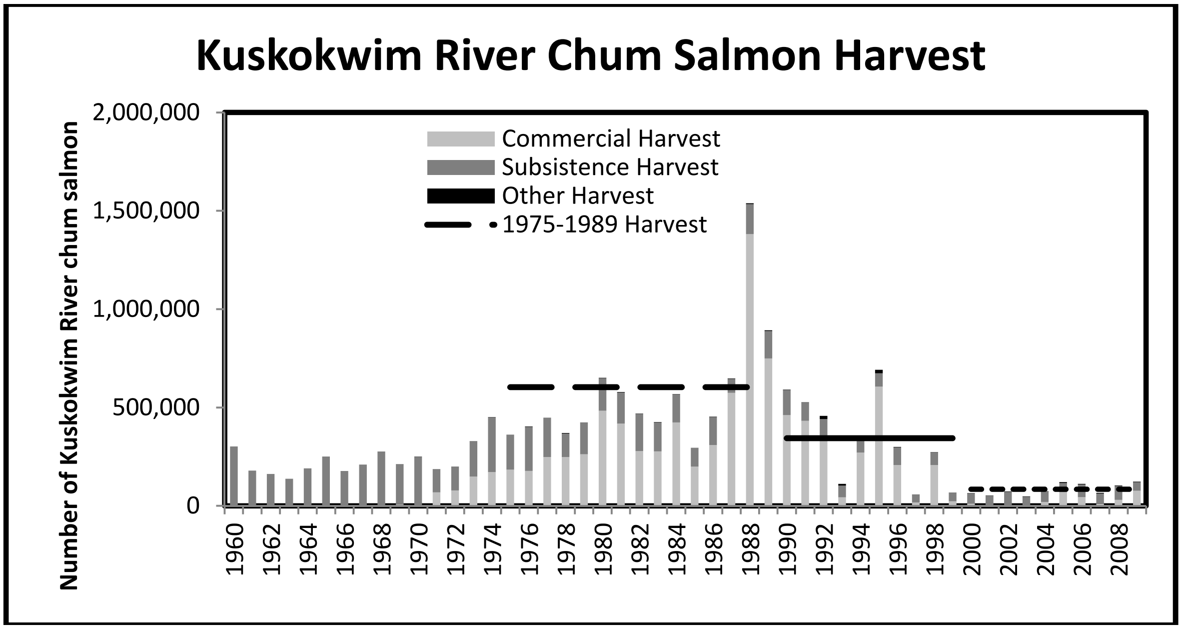


Figure 5. Kuskokwim River chum salmon harvest, from commercial, subsistence, test, and sport fisheries, 1960-2009, with approximately decadal average harvest ranges.

Outlook

The Kuskokwim Area has no formal forecast for salmon returns. Broad expectations are developed based on parent-year escapements and recent year trends. The 2011 outlook and management plan should be available by spring of 2011.

5.2.3.2 Kuskokwim Bay

The Kuskokwim Bay in southwest Alaska is approximately 160 km wide by 160 km long and includes all waters from Cape Newenham to Cape Avinof. The primary salmon spawning tributaries are the Kuskokwim, Kanektok, Arolik, and Goodnews Rivers. For management purposes Kukokwim Bay refers to the Kanektok, Arolik, and Goodnews Rivers. These drainages produce Chinook (*Oncorhynchus tshawytscha)*, chum (*O. keta)*, sockeye (*O. nerka)*, pink *(O. gorbuscha)*, and coho salmon (*O. kisutch).*

Kuskokwim Bay has two commercial salmon fishing districts. District 4 extends from the northern-most edge of the mouth of Weelung Creek to the southern-most tip of the south mouth of Arolik River, and 3 miles from the coast into Kuskokwim Bay (Figure 1). The Kanektok and Arolik Rivers are the main spawning tributaries in District 4. District 5 extends east of a line from ADF&G regulatory markers located approximately 2 miles south and 2 miles north on the seaward side of the entrance of Goodnews Bay and east to a line between the mouth of Ukfigag Creek to the mouth of the Tunulik River (Figure 2). The Goodnews River drainage is the main spawning tributary in

District 5 with the Middle and North Forks of the Goodnews River contributing the majority of salmon production.

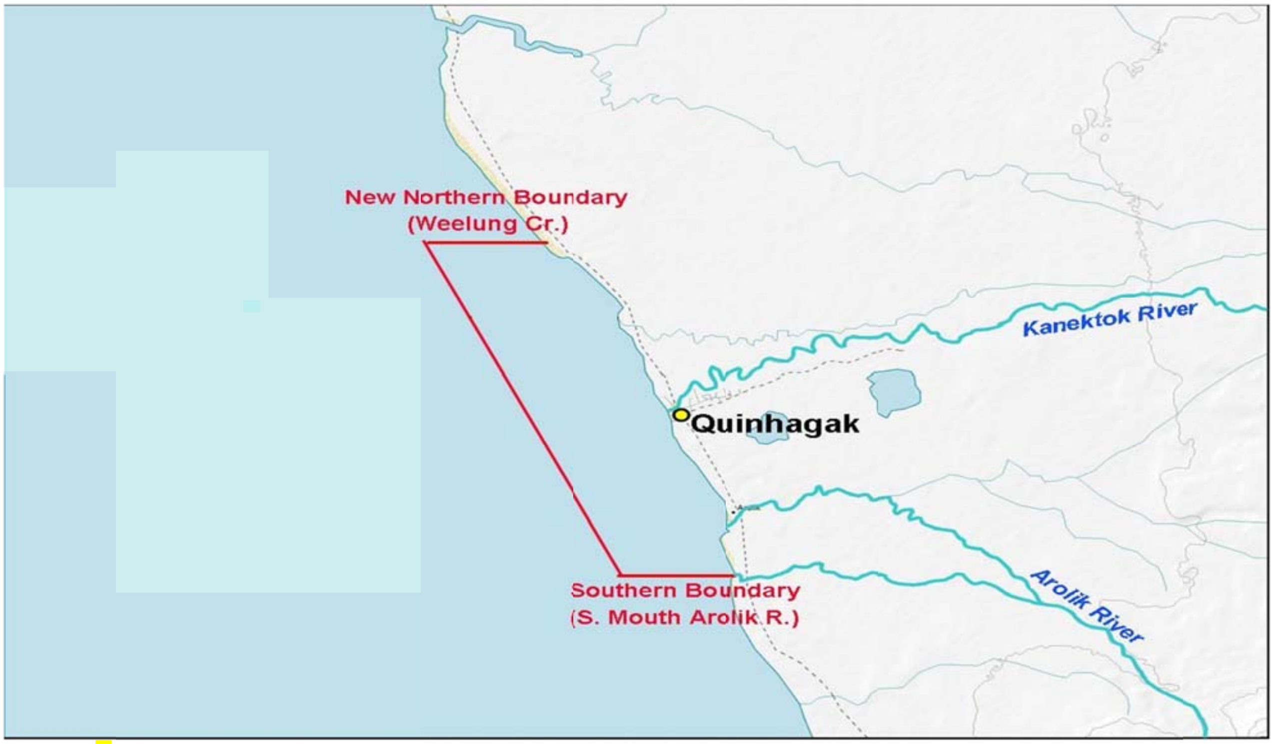


Figure 1 District 4 commercial fishing boundaries, Kuskokwim Bay, Alaska.

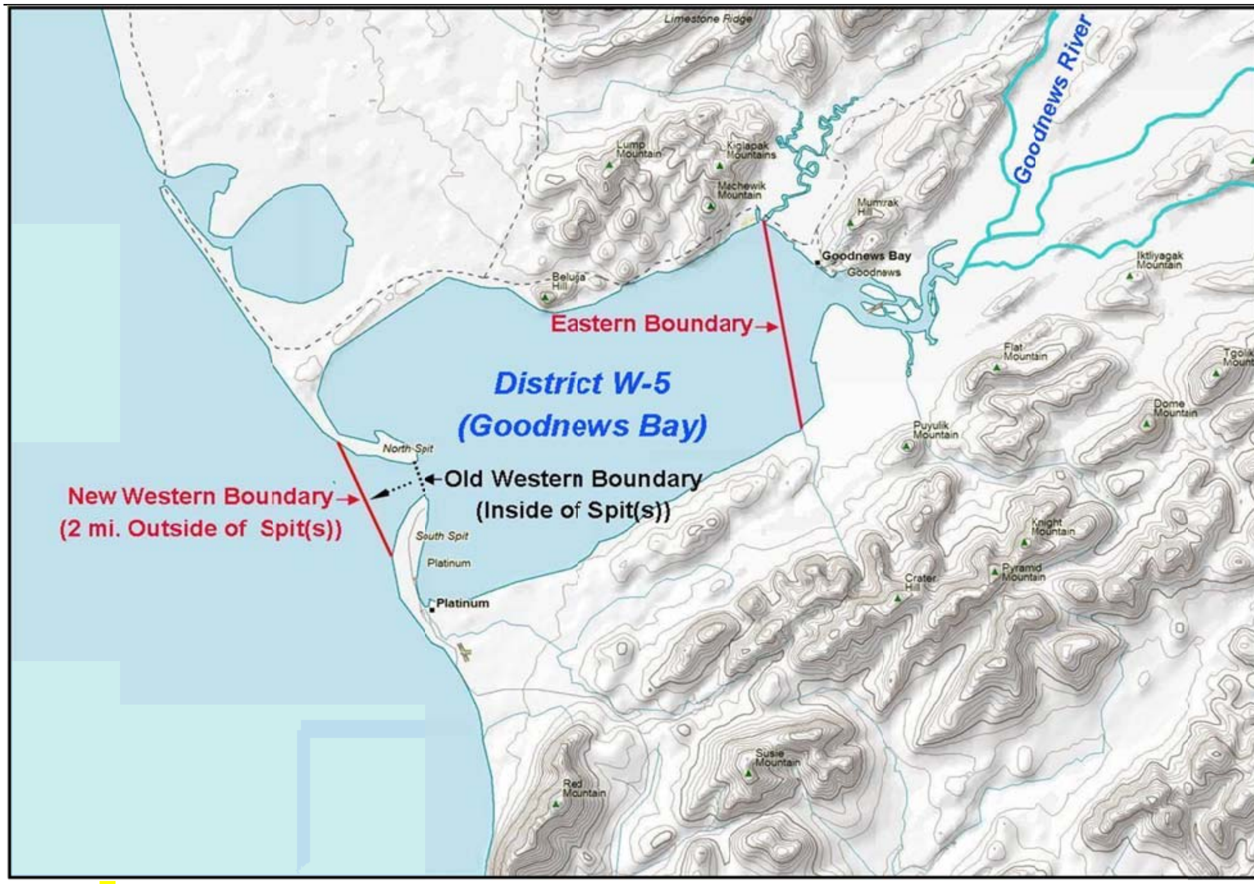


Figure 2. District 5 commercial fishing boundaries, Kuskokwim Bay, Alaska.

Kuskokwim Bay supports commercial, subsistence, and sport fisheries harvesting predominately Chinook, sockeye, chum, and coho salmon. Although some pink salmon are harvested, there is no directed interest in harvest. While the commercial fishery is confined to the identified commercial fishing districts, the subsistence and sport fisheries occur within the commercial fishing districts and within the Kanektok, Arolik, and Goodnews Rivers.

Kuskokwim Bay chum
Introduction
Kuskokwim Bay chum salmon are harvested incidentally to sockeye salmon directed commercial fisheries in Districts 4 and 5. There is also a small subsistence harvest of chum salmon in Goodnews Village, Platinum, and Quinhagak, but these are likely harvested incidentally to Chinook and sockeye salmon.

Stock Assessment Background
Escapement
Kuskokwim Bay chum salmon start entering the rivers in late June and continue through early August. Chum salmon spawn throughout the Kanektok, Arolik, and Goodnews River drainages. Escapements are monitored using weirs on the Kanektok River and Middle Fork Goodnews River. These weirs observe only a portion of the total escapement into these drainages because of the location of weirs within the drainages (Figures 3 and 4). Since 2005 at Kanektok weir, escapement estimates have ranged from 51,652 to 133,215 (Table 1). The 2009 escapement of 51,652 was below the historical average of 60,141; however this average is driven by the record escapement of

133,215 in 2007. Since 2005 at Middle Fork Goodnews River weir, escapement estimates have ranged from 19,715 to 54,699 (Table 1). The 2009 escapement of 19,715 was below the historical average of 24,460. Aerial surveys for chum salmon have not been flown since 2004.

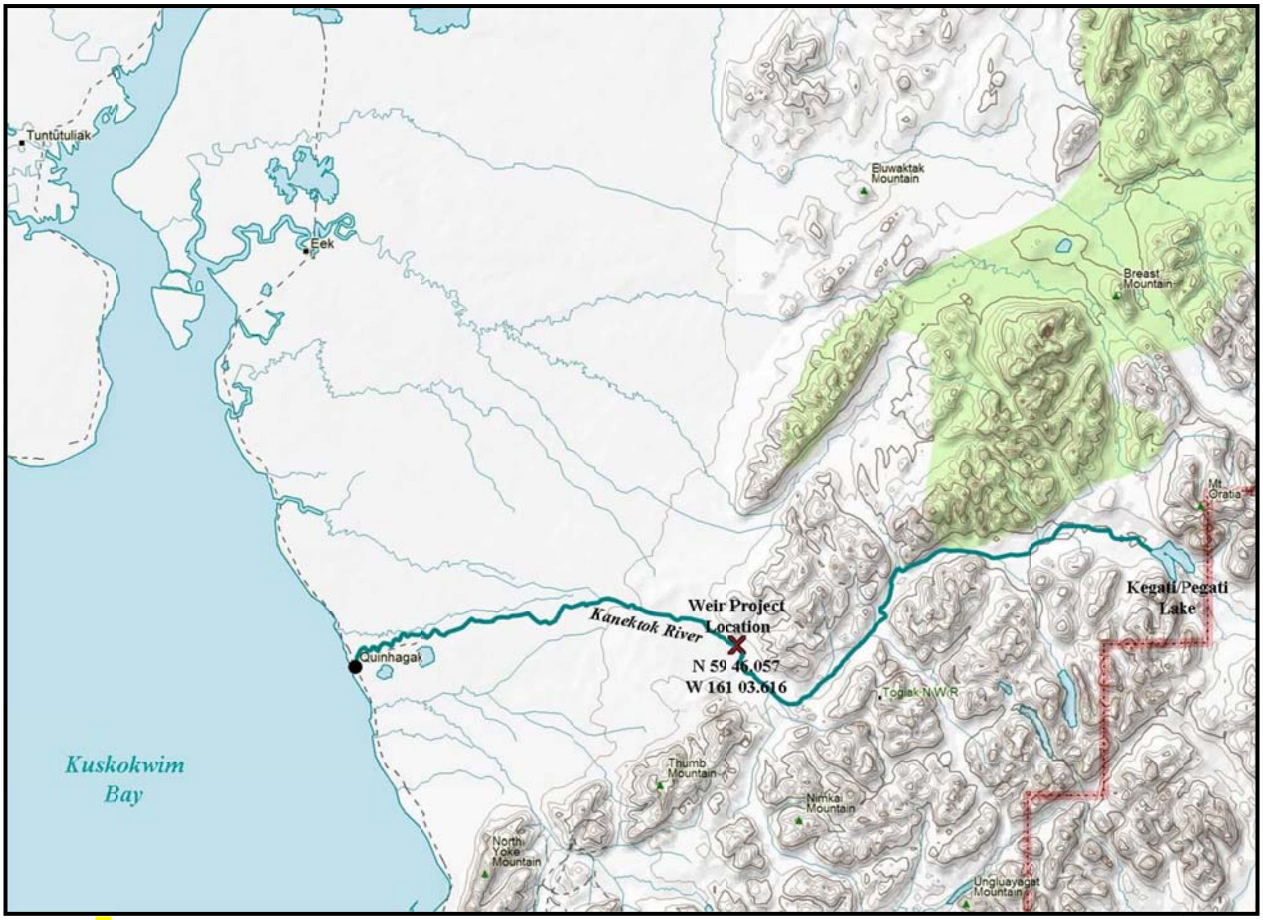


Figure 3. Kanektok River drainage and weir location, Kuskokwim Bay, Alaska.

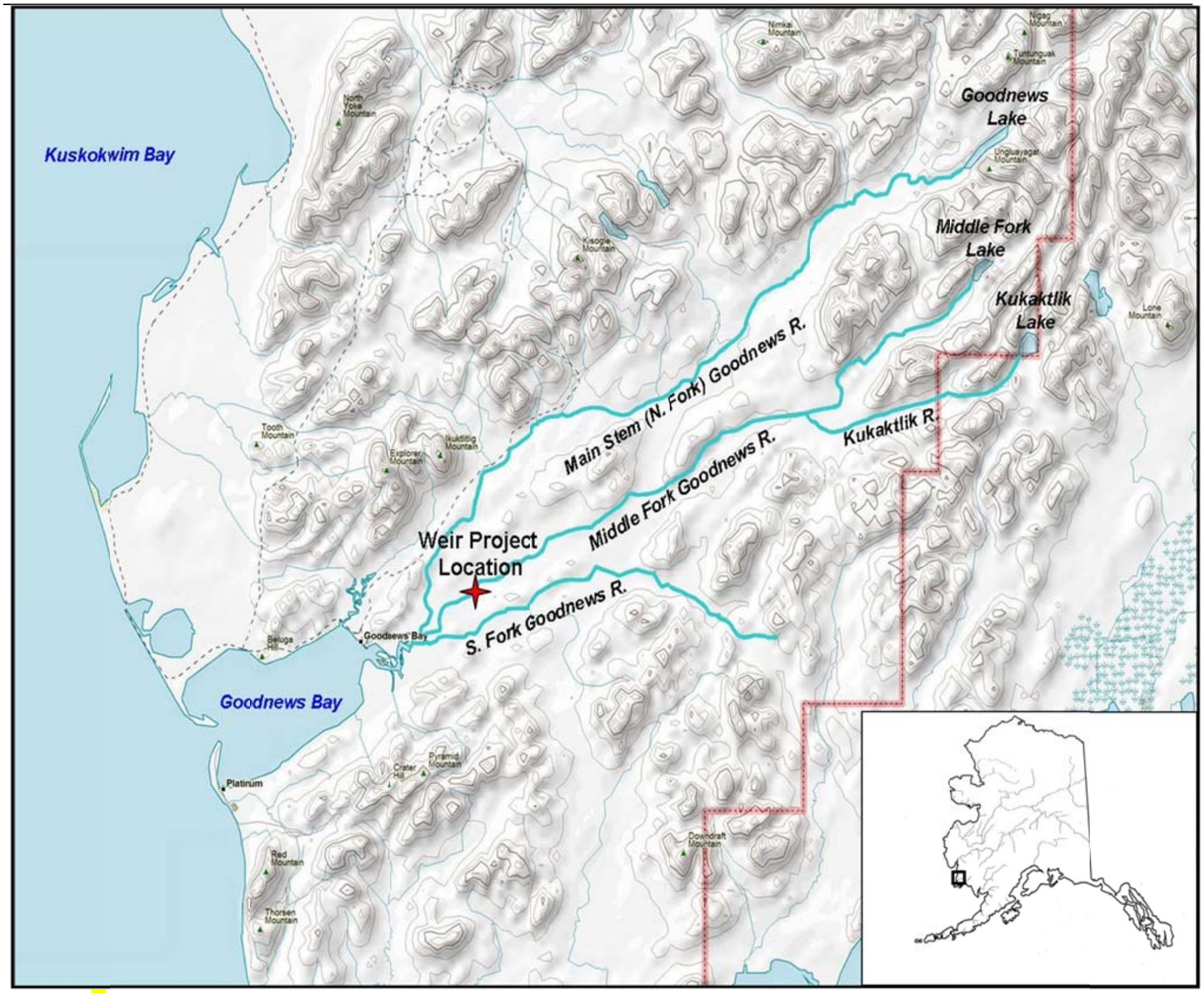


Figure 4. Goodnews River drainage and weir location, Kuskokwim Bay, Alaska.

Escapement goals

There are two formal escapement goals for chum salmon in Kuskokwim Bay. There is an aerial survey SEG threshold of greater than 5,200 for Kanektok River and a SEG threshold of greater than 12,000 at the Middle Fork Goodnews River weir. Both of these SEG's were established in 2005. Escapement goals have not been established at the Kanektok River weir because of an insufficient number of escapement estimates (Volk et al., 2009).

The escapement goal for Kanektok River aerial surveys has not been evaluated since it was established because aerial surveys for chum salmon have not been flown since 2004 (Estensen et al., 2009). The escapement goal at the Middle Fork Goodnews River weir has been achieved every year since it was established (Figure 5).

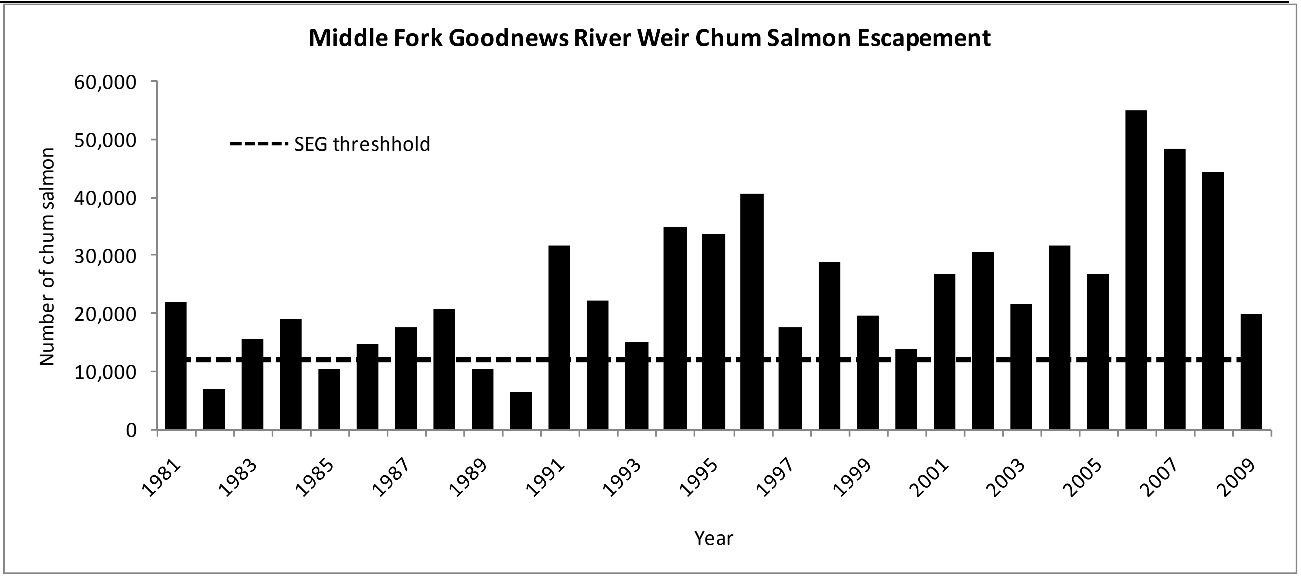


Figure 5. Chum salmon escapement, Middle Fork Goodnews River weir, Kuskokwim Bay, 1981-2009.

Maturity

Kuskokwim Bay chum salmon age composition is estimated through scale sampling in Districts 4 and 5 commercial fisheries and at the escapement projects (Table 2).

Table 2. Age composition of commercially harvested chum salmon, Kuskokwim Bay, 2009.

	Age Class				
	0.2	**0.3**	**0.4**	**0.5**	**0.6**
District 4 (Quinhagak)	0.02	0.60	0.37	0.02	0.00
District 5 (Goodnews Bay)	0.01	0.51	0.47	0.01	0.00

Harvest and Exploitation

Historically, Kuskokwim Bay chum salmon harvests were at a low in 1985; average to above average from 1987 to 1999; and below average from 2000 to 2005, with 2005 experiencing the minimum harvest of 13,529 and 2,568 in Districts 4 and 5, respectively. Harvests have increased almost annually since 2005 (Figure 6). The 2009 harvest of 91,158 chum salmon in District 4 was the highest on record and 121% above the historical average (1981-2008) of 41,256 fish. The 2009 commercial harvest of 16,985 chum salmon in District 5 was 38% above the historical average (1981-2008) of 12,304 fish (Table 3).

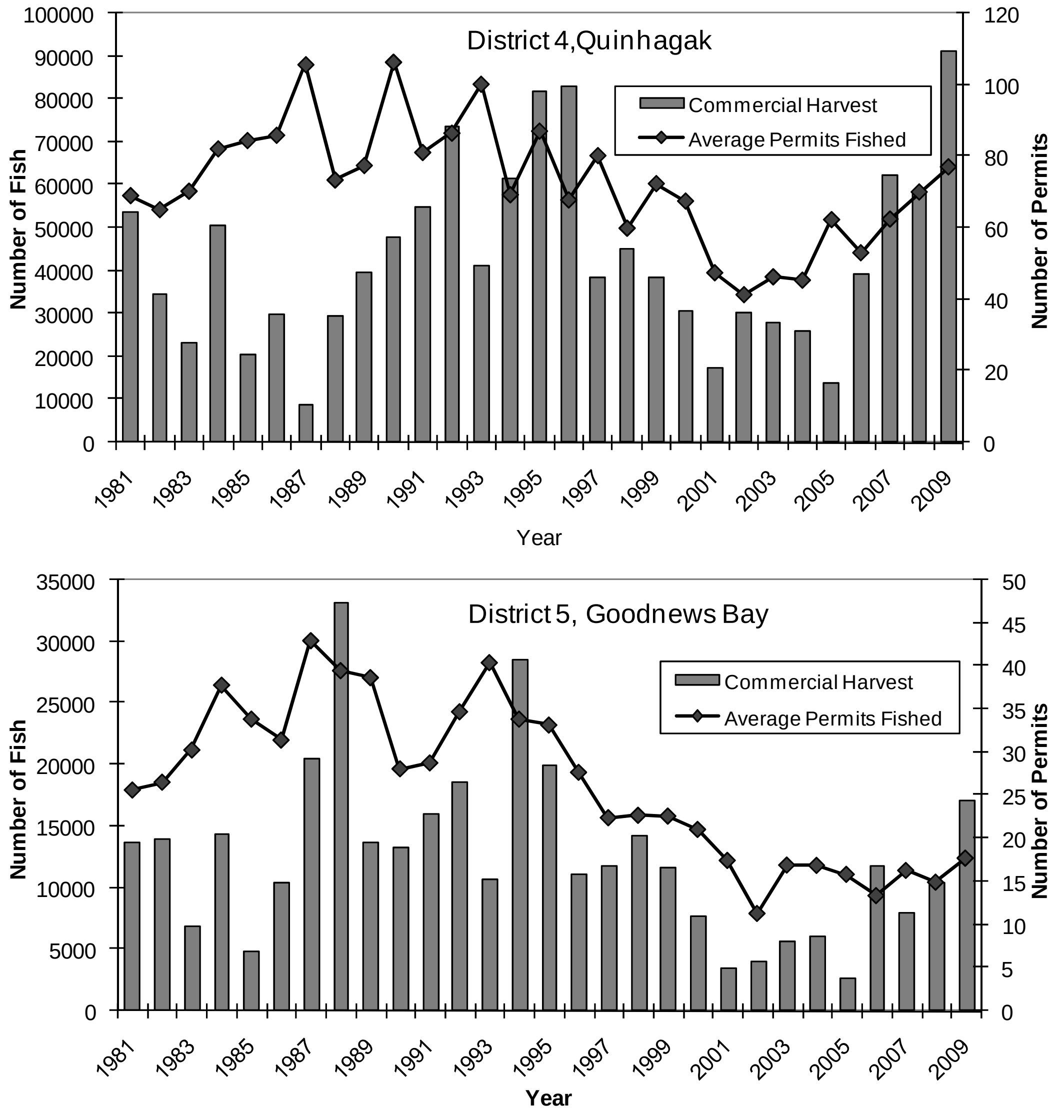


Figure 6. Commercial harvest of chum salmon and fishing effort, Districts 4 and 5, Kuskokwim Bay, 1981-2009.

Table 3. Commercial harvest of chum salmon by district, Kuskokwim Bay, 1981-2009.

Year	District 4	District 5
1981	53,334	13,642
1982	34,346	13,829
1983	23,090	6,766
1984	50,422	14,340
1985	20,418	4,784
1986	29,700	10,356
1987	8,557	20,381
1988	29,247	33,059
1989	39,395	13,622
1990	47,717	13,194
1991	54,493	15,892
1992	73,383	18,520
1993	40,924	10,657
1994	61,301	28,477
1995	81,462	19,832
1996	83,005	11,093
1997	38,435	11,729
1998	45,095	14,155
1999	38,091	11,562
2000	30,553	7,450
2001	17,209	3,412
2002	29,319	3,799
2003	27,868	5,593
2004	25,850	5,965
2005	13,529	2,568
2006	39,151	11,568
2007	62,232	7,853
2008	57,033	10,408
2009	91,158	16,985
Historical Average (1981-2009)	42,976	12,465

Average annual subsistence harvest in Quinhagak has been approximately 1,385 chum salmon annually. Average annual subsistence harvest in Platinum and Goodnews Bay Village has been approximately 350 chum salmon annually.

Sport fish harvest of chum salmon is minimal in Kuskokwim Bay with the Kanektok River averaging approximately 140 fish annually and Goodnews River averaging less than 25 fish annually.

Outlook
See Appendix A for the 2010 Kuskokwim Bay salmon outlook and management plan. The 2011 outlook and management plan should be available in the spring of 2011.

Add Kuskokwim Bay chum EA final.doc appendix A.

5.2.4 Yukon River

The Yukon Area includes all waters of Alaska within the Yukon River drainage and coastal waters from Naskonat Peninsula to Point Romanof, northeast of the village of Kotlik. For management purposes, the Yukon Area is divided into 7 districts and 10 subdistricts (Figure 1). Commercial fishing may be allowed along the entire 1,224 miles of Yukon River in Alaska and along the lower 225 miles of Tanana River. Coastal District includes the majority of coastal marine waters within the Yukon Area and is only open to subsistence fishing. Lower Yukon Area (Districts 1, 2, and 3) includes coastal waters of the Yukon River delta and that portion of the Yukon River drainage downstream of Old Paradise Village (river mile 301). Upper Yukon Area (Districts 4, 5, and 6) is the Alaskan portion of the Yukon River drainage upstream of Old Paradise Village.

Chinook Oncorhynchus tshawytscha, chum O. keta, and coho O. kisutch salmon are harvested in Yukon River commercial, subsistence, personal use, and sport fisheries. Subsistence fishing in portions of the Yukon Area is under dual regulatory authority of Alaska Department of Fish and Game (ADF&G) and U.S. Fish and Wildlife Service (USFWS). Yukon River chum salmon consists of an earlier and typically more abundant summer chum salmon run, and a later fall chum salmon run. No directed commercial fishing has occurred for pink O. gorbuscha salmon, which overlap in run timing with summer chum salmon. However, sporadic sales of incidental harvests of pink salmon have been documented.

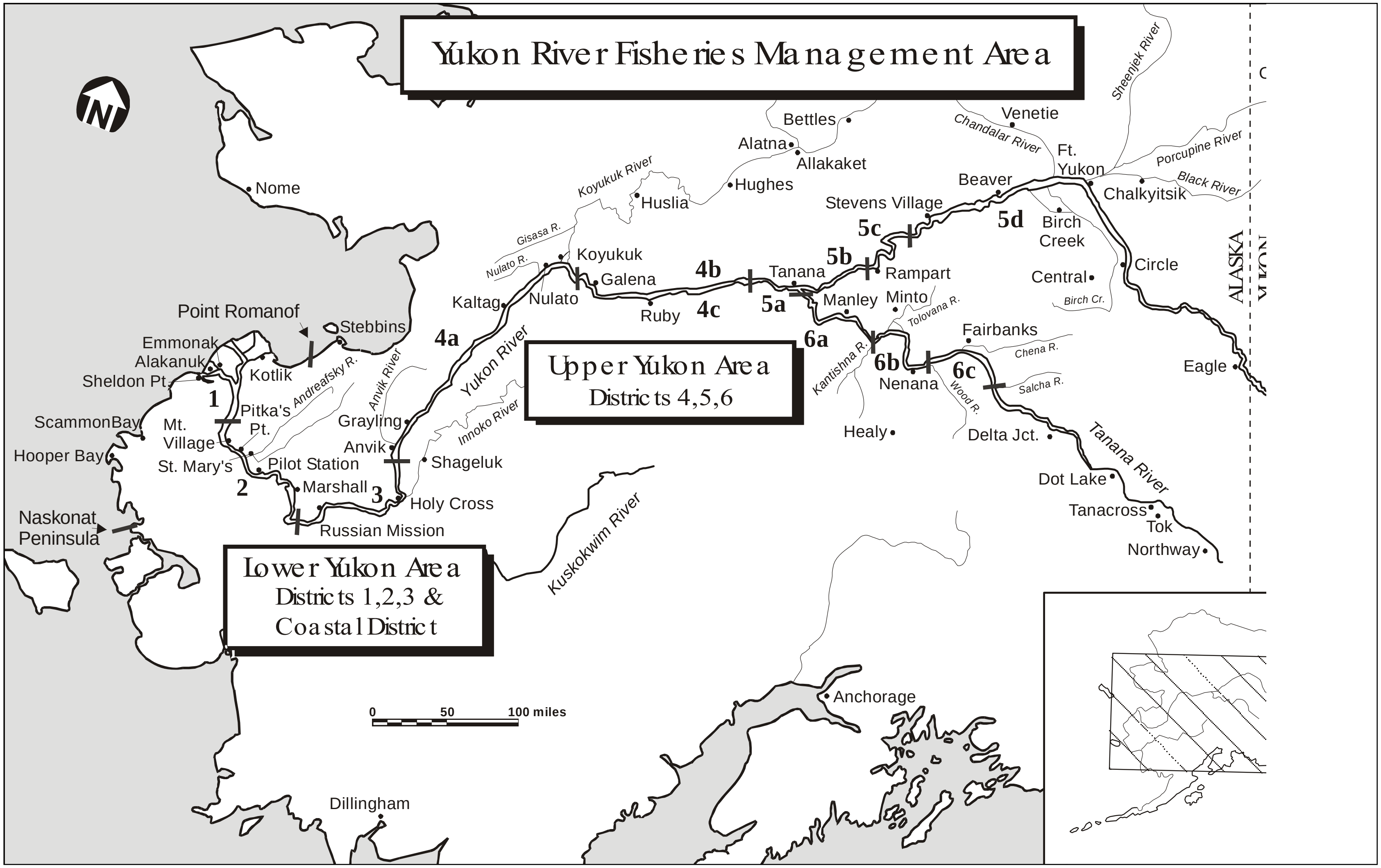


Figure 11. Alaska portion of the Yukon River drainage showing communities and fishing districts.

5.2.4.1 Summer run

In response to the guidelines established in the SSFP (5 AAC 39.222(f)(21)), the BOF classified Yukon River summer chum salmon stock as a management concern at its September 2000 work session. This determination of a management concern was based on documented low escapements during 1998–2000 and an anticipated low run in 2001. An action plan was subsequently developed by the department (ADF&G 2000) and enacted by the BOF in January 2001. The classification as a management concern was continued at the January 2004 BOF meeting due to established escapement goals not being achieved in East Fork Andreafsky River from 1998–2003 and in Anvik River in 1998–2001 and 2003 (Salomone and Bergstrom 2004).

Given the collectively large spawning escapements of the Yukon River summer chum salmon stock over the 3 years preceding the January 2007 BOF meeting (2004–2006), including a near record run in 2006, the stock no longer met stock of management concern criteria (Clark et al. 2006). Although Yukon River drainage subsistence and commercial harvests from 1999–2003 were significantly below the 1989–1998 historic baseline average, a near average surplus yield available during 2004–2006 was not taken, primarily due to the lack of commercial markets. Based on definitions provided in the SSFP (5 AAC 39.222(f)(21) and (42)), the BOF discontinued the classification as a stock of concern in January 2007. This report focuses on the recent 5-year period prior to the January 2010 BOF cycle meeting.

Stock Assessment Background

Escapement

Most summer chum salmon spawn in the Yukon River drainage downstream of and within the Tanana River drainage (Figure 1). The Yukon River summer chum salmon run is typically managed as a single stock for which there is currently a drainagewide OEG of 600,000, measured at Pilot Station sonar, as identified in the regulatory management plan, 5 AAC 05.362. *Yukon River Summer Chum Salmon Management Plan*. An approximate estimate of total run of summer chum salmon in Yukon River can be obtained by summing: (1) the sonar based estimates of summer chum salmon passage at Pilot Station, which successfully estimated summer chum salmon passage in the years 1995 and 1997–2009, (2) total harvest of summer chum salmon in District 1 and that portion of District 2 below the Pilot Station sonar site, and (3) summer chum salmon escapement estimates in East and West forks of Andreafsky River. The estimate is approximate because some commercial and subsistence harvest in District 2 may not be accurately reported by location in relation to the Pilot Station sonar site, the escapement to West Fork Andreafsky is estimated based on the numbers observed in East Fork (Clark 2001), and some minor stocks of summer chum salmon spawn in tributaries below Pilot Station. However, Pilot Station sonar counts are so much greater than total catch and monitored escapement, that the total run estimate is primarily based upon sonar passage estimates. The total run of Yukon River summer chum salmon estimated in this manner averaged about 1.8 million fish during the 14-year period (1995 and 1997–2009), ranging from a low of about 550,000 fish in 2000 and 2001 to over 4.0 million fish in 1995 and 2006, about an 8-fold level of variation (Figure 2). Summer chum salmon run strength was poor to below average from 1998 through 2003 with 2000 and 2001 being the weakest runs on record. More recently, summer chum salmon runs have shown marked improvement with estimated drainagewide escapement exceeding 1.0 million salmon annually since 2001, with approximately 3.9 million in 2006, the largest escapement on record. The drainagewide OEG of 600,000 summer chum salmon was not met in 2000 and 2001, but has been exceeded annually since that time (Figure 2).

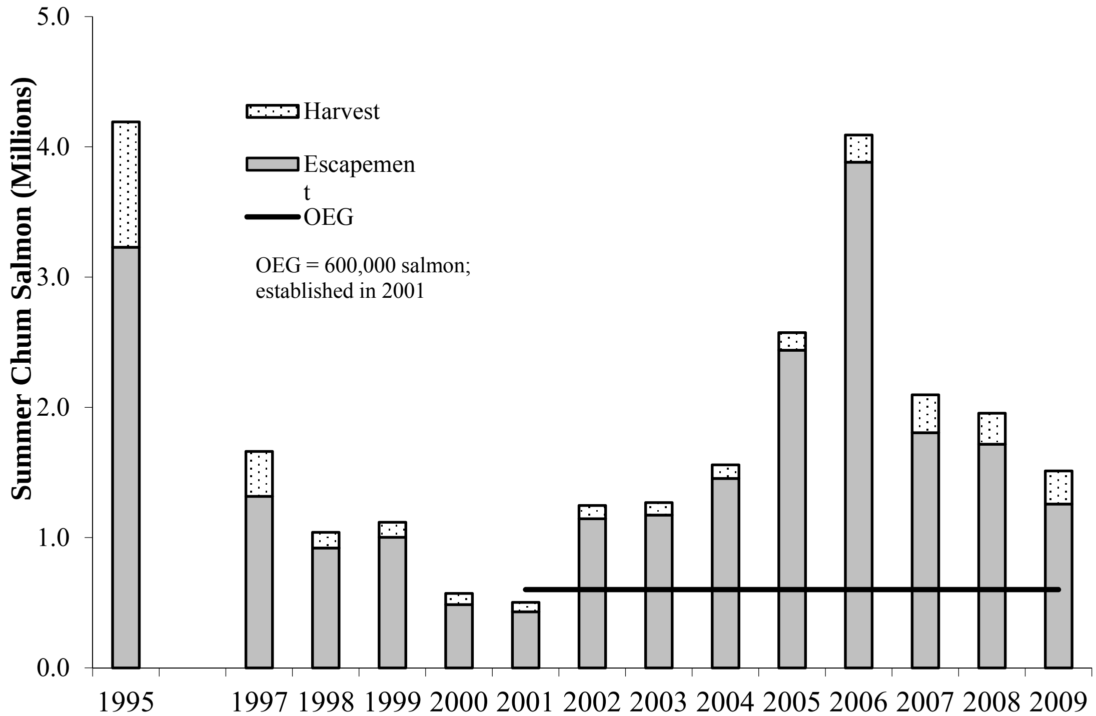


Figure 2. Estimated total annual runs of summer chum salmon by harvest and escapement and drainage-wide OEG, Yukon River, 1995 and 1997-2009. Data are unavailable for 1996.

Escapement Goals

There is not an established drainagewide escapement goal for summer chum salmon, due to a lack of adequate data. However, the comprehensive management plan identifies summer chum salmon runs above a projected run size of 1 million fish as surplus available for commercial harvest (Table 1). Thus, in effect, there is an escapement threshold of 1 million minus the annual subsistence harvest, which equates to a riverwide escapement greater than approximately 900,000 fish. Escapement goal analysis of fall chum salmon indicates that there is a wide range of escapement that will provide similar yield and this would likely be the case for summer chum salmon. Of note is that the near record abundance in 2006 was from some of the lowest parent year escapements on record (2001 and 2002).

Table 1. Yukon River drainage summer chum salmon management plan overview, 2010.

	Required Management Actions Summer Chum Salmon-Directed Fisheries			
Projected Run Size [a]	Commercial	Personal Use	Sport	Subsistence
600,000 or Less	Closure	Closure	Closure	Closure [b]
600,000 to 700,000	Closure	Closure	Closure	Possible Restrictions [c]
700,001 to 1,000,000	Restrictions [d]	Restrictions [e]	Restrictions [e]	Normal Fishing Schedules
Greater Than 1,000,000	Open [f]	Open	Open	Normal Fishing Schedules

a The department will use the best available data including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects to assess the run size.
b The department may, by emergency order, open subsistence chum salmon directed fisheries where indicators show that the escapement goal(s) in that area will be achieved.
c The department shall manage the fishery to achieve drainage wide escapement of no less than 600,000 summer chum salmon, except that the department may, by emergency order, open a less restrictive directed subsistence summer chum fishery in areas that indicator(s) show that the escapement goal(s) in that area will be achieved.
d The department may, by emergency order, open commercial fishing in areas that show the escapement goal(s) in that area will be achieved.
e The department may, by emergency order, open personal use and sport fishing in areas that indicator(s) show the escapement goal(s) in that area will be achieved.
f The department may open a drainage-wide commercial fishery with the harvestable surplus distributed by district or subdistrict in proportion to the guideline harvest levels established in 5 AAC 05.362. (f) and (g).

Presently, there is one established BEG and one SEG for summer chum salmon in the Yukon River drainage. The BEG range for Anvik River is 350,000–700,000 chum salmon and the SEG threshold for East Fork Andreafsky River is >40,000 chum salmon. The East Fork Andreafsky threshold is a recent adjustment from the previous BEG escapement goal of 65,000-130,000 summer chum salmon, in effect 2001–2009. The BEG for Anvik River has been met or exceeded in 26 of 30 years (86%) since 1980; the 4 years when the BEG was not met were 2000, 2001, 2003, and 2009 (Table 2; Figure 3). Assessment of annual escapements has occurred in 22 of 29 years since 1981 in East

Fork Andreafsky River with the BEG met or exceeded in 12 out of 22 years (54%), and last met in 2007 (Table 2; Figure 3).

Current BEG and SEGs for Yukon River summer chum salmon are as follows:

Stream (Project Type)	Current Goal	Type of Goal
East Fork Andreafsky River (Weir)	>40,000	SEG
Anvik River Index (Sonar)	350,000–700,000	BEG

Table 2. Yukon River summer chum salmon historical escapements 1980-2009, and Pilot Station sonar passage estimates 1995 and 1997-2009.

Year	Pilot Station Sonar	East Fork Andreafsky River	Anvik River Sonar	Kaltag Creek Tower	Nulato River Tower	Gisasa River Weir	(Clear Creek tower or weir)	Henshaw Creek Weir
Number of Fish								
1980			492,676					
1981		147,312 [a]	1,486,182					
1982		181,352 [a]	444,581					
1983		110,608 [a]	362,912					
1984		70,125 [a]	891,028					
1985		[b]	1,080,243					
1986		167,614 [c]	1,085,750					
1987		45,221 [c]	455,876					
1988		68,937 [c]	1,125,449					
1989			636,906					
1990			403,627					
1991			847,772					
1992			775,626					
1993			517,409					
1994		200,981 [b,d]	1,124,689	47,295	148,762 [b]	51,116 [b]		
1995	3,556,445	172,148 [d]	1,339,418	77,193	236,890	136,886	116,735	
1996	[e]	108,450 [d]	933,240	51,269	129,694	158,752	100,912	
1997	1,415,641	51,139 [d]	609,118	48,018	158,395	31,800	76,454	
1998	826,385	67,720 [d]	469,574	8,113	50,750	21,142	212 [b]	
1999	973,708	32,587 [d]	441,305	5,339	30,456	10,155	11,283 [b]	[b]
2000	456,271	24,783 [d]	205,460	6,727	24,308	11,410	19,376	27,271
2001	441,450	[b,d]	224,058	[b]	[b]	17,946 [b]	3,674	35,031
2002	1,088,463	44,194 [d]	462,396	13,583	72,286	33,481	13,150	25,249
2003	1,168,518	22,461 [d]	205,682	3,056 [b]	17,814 [b]	25,999	5,230	22,556
2004	1,357,826	64,883 [d]	365,556	5,247	[f]	37,851	15,661	86,474

-continued-

Table 2.-Page 2 of 2.

2005	2,439,616	20,127 [d]	525,391	22,093	[f]	172,259	26,420	237,481
2006	3,767,044	102,260 [d]	992,378 [g]	[f]	[f]	261,305	29,166 [h]	[b]
2007	1,726,885	69,642 [d]	459,038	[f]	[f]	46,257	[f]	32,080
2008	1,665,667	57,259 [d]	374,929	[f]	[f]	36,938	[f]	97,281
2009	1,285,437 [i]	8,770 [d,i]	193,099 [i]	[f]	[f]	25,904 [i]	[f]	156,201 [i]
2005-2009 avg.	2,176,930	51,612	508,967	n/a	n/a	108,533	n/a	130,761
BEG		65,000-130,000	350,000-700,000	n/a	n/a	n/a	n/a	n/a

Note: Years with no data are years in which the project was not operated or was inoperable for a large portion of the season due to water conditions.

[a] Sonar counts used.

[b] Incomplete count caused by late installation and/or early removal of project, or high water.

[c] Tower counts used.

[d] Weir counts used.

[e] Pilot Station sonar operated in training mode only and no estimates were generated.

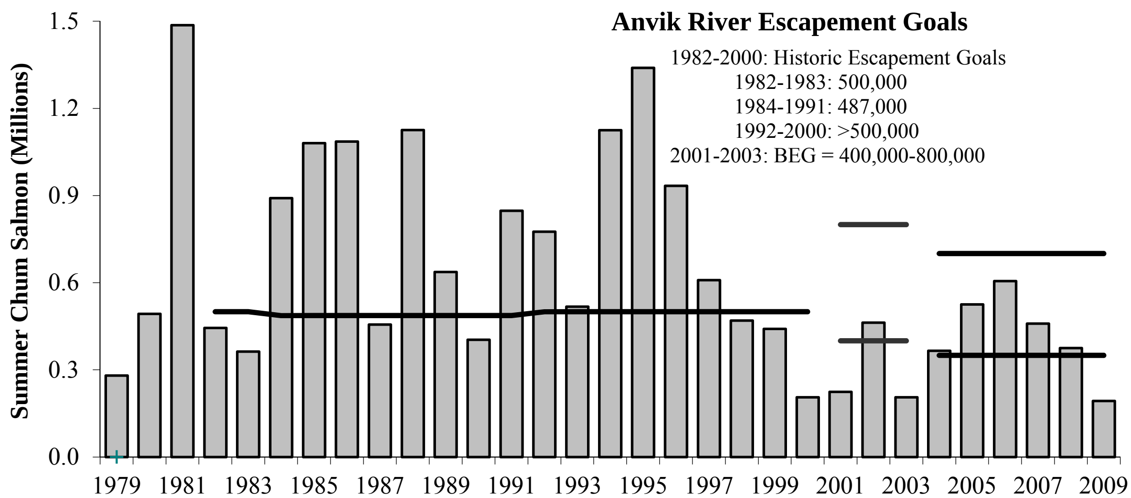
[f] Project did not operate.

[g] HTI and Didson sonar equuipment were both used in 2006, and the estimate reported is Didson derived.

[h] Videography count used.

[i] Data are preliminary.

The Anvik River BEG was met in 2004–2008 (Figure 3). A substantial decrease in Anvik River summer chum salmon production began with the 1993 brood year and has continued through the 2004 brood year. These escapements produced salmon that returned in 1997 through 2009. Escapements during this time period included large escapements in 1994, 1995, and 1996 (Figure 3) that failed to replace themselves (recruits per spawner (R/S) <1.0; Clark and Sandone 2001).



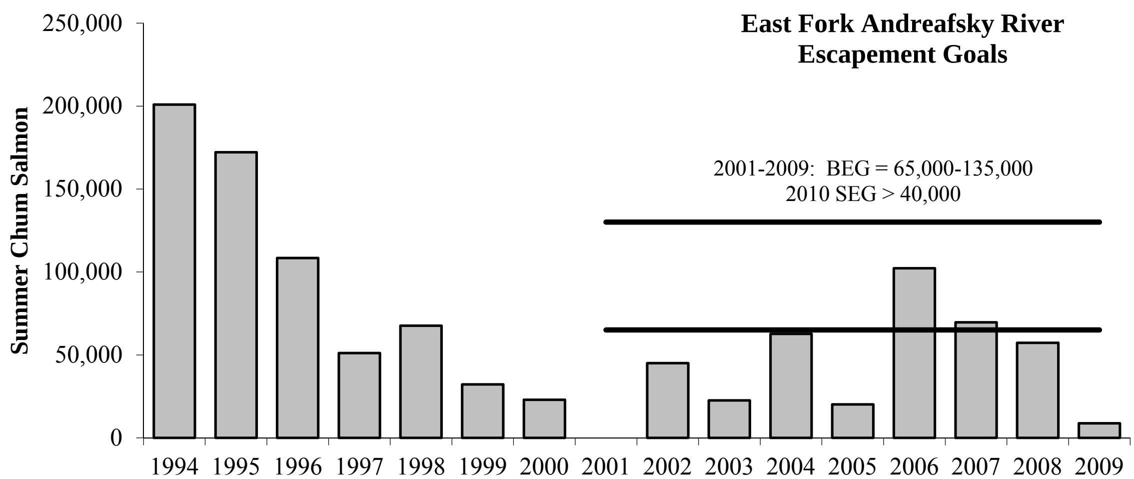


Figure 3. Summer chum salmon escapement estimates and escapement goals for Anvik River sonar (1979-2009), and E.F. Andreafsky River weir (1994-2009).

Stock composition of Yukon River summer chum runs has been in flux over the last decade. Anvik River, the largest producer of summer chum salmon, contribution to the overall Yukon River stock production above Pilot Station sonar has decreased from approximately 46% during the period from 1995 through 2002 to an average of 24% after 2002. This reduction corresponds with a shift to increased production in other chum salmon spawning streams such as in the Koyukuk River drainage, where record escapements of 170,000 and 225,000 in Gisasa River were observed in 2005 and 2006, respectively. However, runs in the Tanana River drainage are also exhibiting instability with record escapements of over 100,000 summer chum salmon observed in Salcha River in 2005 and 2006, yet less than 15,000 observed in 2007. These fluctuations have been observed elsewhere in the Yukon River drainage. The disparate strength of individual stocks within and among years seems to signal a shift in summer chum production, and exploratory aerial surveys were conducted in 2009 to better assess primary locations of summer chum salmon escapement in lower and middle Yukon River tributaries.

Although the Yukon River summer chum salmon stock appears to have recovered as a whole, the BEG for East Fork Andreafsky summer chum salmon has been met twice, in 2006 and 2007, since 2002 (Figure 3). However, the 2004 East Fork Andreafsky River escapement was within 2,000 summer chum salmon of the lower range of the BEG of 65,000. It is interesting to note that from 2002 through 2006, no directed summer chum salmon commercial fisheries occurred below the mouth of Andreafsky River, with the exception of a 3-hour commercial period in 2006, and the subsistence exploitation rate is relatively low. It is thought that Andreafsky River fish enter the Yukon River delta late in the run and are watermarked, making them less desirable to commercial buyers and fishermen. Further, it is believed that Andreafsky River fish are not readily susceptible to harvest because most, if not all, subsistence harvest has been completed by the time Andreafsky River summer chum salmon enter lower Yukon River. Regardless, under current management practices, Andreafsky River summer chum salmon are managed incidental to the overall Yukon River summer chum salmon run, and no management actions have been taken specifically for this tributary stock.

Maturity

While data are not available to estimate the age composition of the overall Yukon River summer chum salmon return, data are available for the Anvik River. Since the Anvik River represents approximately 25% of the overall run in recent years, it is believed that it is likely representative of the overall population. The 2000-2009 average age composition for the Anvik River is dominated by age-4 fish.

	Age Class				
	3	4	5	6	7
Proportion	0.014	0.529	0.427	0.031	1.00E-04

Harvest

Combined commercial and subsistence harvests show a substantial decrease from the 1980s and 1990s compared to the recent 5-year (2005–2009) average of approximately 226,994 (Figure 4). The recent decline in utilization is largely due to reductions in commercial harvest. Commercial harvest of summer chum salmon averaged about 394,400 during the 1990s and 130,611 from 2005 through 2009. Below average runs from 1998 through 2003 resulted in low available yields of summer chum salmon. In 2004, a modest surplus was identified, whereas in 2005 and 2006, substantial surpluses were available for commercial harvest. However, there was little exploitation of these available surpluses due to poor commercial market conditions for summer chum salmon. From 1997 through 2006, the commercial harvest of summer chum salmon was primarily incidental to directed Chinook salmon fisheries. Since 2007 there has been renewed market interest and directed summer chum salmon commercial opportunity has been provided in 2007 through 2009. Unfortunately, despite harvestable surpluses available in these years, redevelopment of this fishery has been largely hindered by management strategies taken in response to poor Chinook salmon runs which co-migrate with summer chum salmon. Management actions taken to reduce Chinook salmon harvest, including incidental harvest in summer chum salmon-directed fisheries, have negatively affected the summer chum salmon fishery.

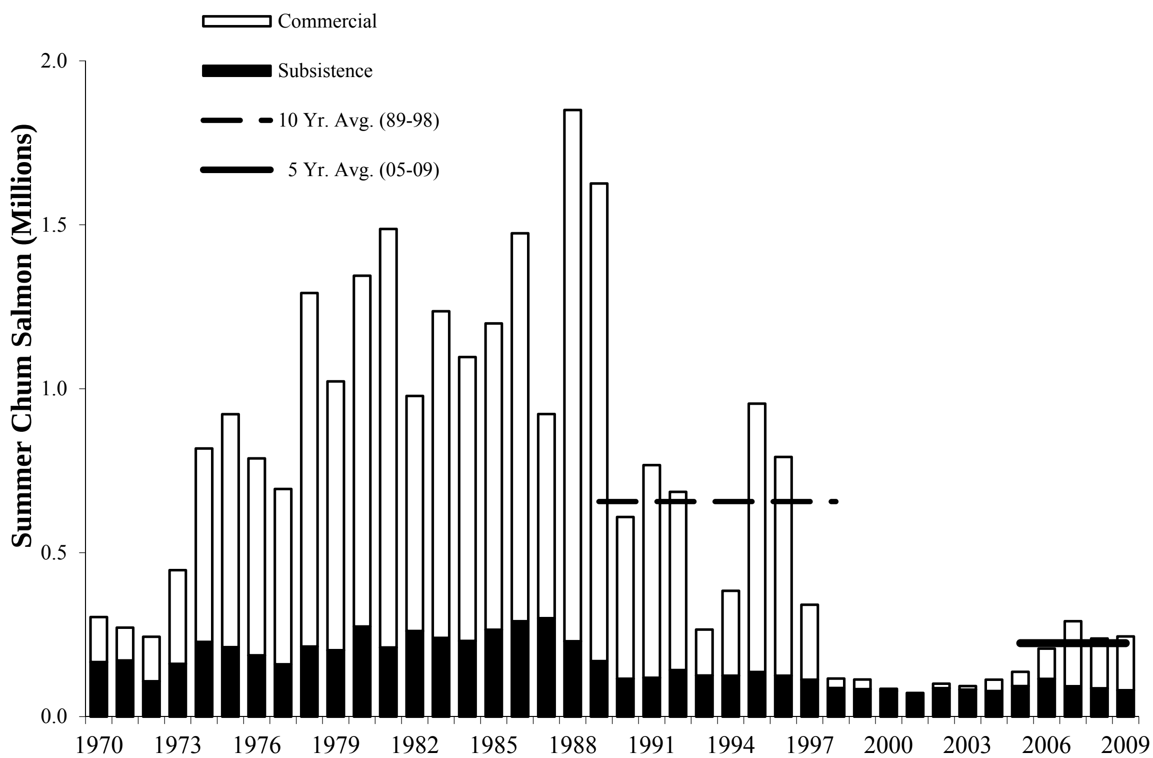


Figure 4. Yukon River summer chum salmon subsistence and commercial harvests from 1970 to 2009, compared to the 1989–1998 average (approximately 665,100 fish) and the 2005–2009 average (226,994 fish).

Exploitation Rates

Annual total run estimates can be coupled with total inriver utilization to estimate exploitation rates exerted on Yukon River summer chum salmon for the years 1995 and 1997–2009 (Figure 5). Total exploitation rates exerted by Yukon River fisheries on summer chum salmon over 14 years averaged about 12.2%, ranging from as high as 23.0% in 1995 to as low as 4.3% in 2006. Note that both these years had run sizes in excess of 4.0 million fish. Exploitation rates on the 2 lowest runs, approximately 550,000 fish, in 2000 and 2001, were 15.1% and 13.1%, respectively (Figure 5). Exploitation rates have been increasing slightly since 2007 owing to increased market interest; however, these harvest rates are low in comparison to exploitation rates exerted on most Alaska salmon populations and primarily reflect the lack of commercial markets.

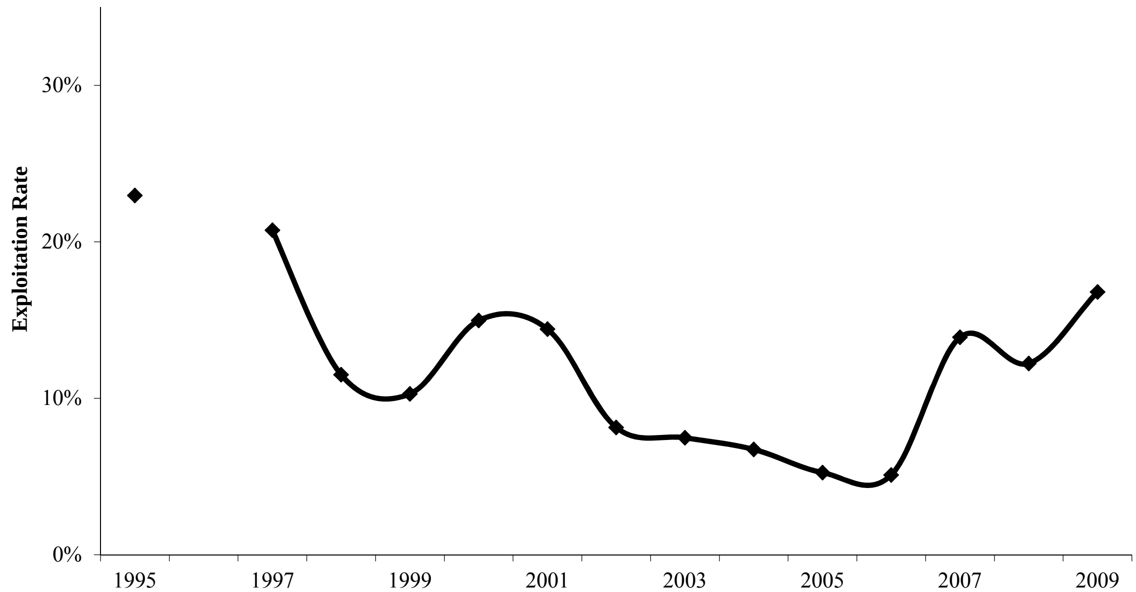


Figure 5. Approximate exploitation rates on Yukon River summer chum salmon stocks, 1995 and 1997–2009. Data are unavailable for 1996.

Outlook
[THE PRELIMINARY INFORMAL OUTLOOK FOR 2011;PLACEHOLDER FOR INSERTION IN SPRING 2011 AS AVAILABLE]

5.2.4.2 Fall run

In response to guidelines established in the SSFP (5 AAC 39.222(f)(21)), the BOF classified Yukon River fall chum salmon as a stock of yield concern and classified Toklat and Fishing Branch rivers fall chum salmon as a stock of management concerns at its September 2000 work session. The determination for the entire Yukon River fall chum salmon as a stock of yield concern was based on substantial decrease in yields and harvestable surpluses during the period 1998–2000, and the anticipated very low run expected in 2001. The determination for Toklat and Fishing Branch rivers as stocks of management concern was based on escapements not meeting the OEG of 33,000 for Toklat River from 1996 to 2000, and not meeting the escapement objective of 50,000–120,000 salmon for Fishing Branch River from 1997 to 2000. An action plan was subsequently developed by ADF&G (ADF&G 2000) and acted upon by the BOF in January 2001.

Yukon River fall chum salmon classification as a yield concern was continued at the January 2004 BOF meeting because the combined commercial and subsistence harvests showed a substantial decrease in fall chum salmon yield from the 10-year period (1989–1998) to the more recent 5-year (1999–2003) average (Bue et al. 2004). Toklat River stock was removed from management concern classification as a result of the BEG review presented at that BOF meeting. However, as a component of the Yukon River drainage, Toklat River fall chum salmon stock was included in the drainagewide yield concern classification. Fishing Branch River stock was also removed from the management concern classification because management of that portion of the drainage is covered by an annex to the Pacific Salmon Treaty, the U.S./Canada Yukon River Salmon Agreement (Agreement), which is governed under the authority of the Yukon River Panel (Panel).

In January 2007, the BOF determined that Yukon River fall chum salmon stock no longer met the criteria for a yield concern. Run strength was poor from 1998 through 2002; however, steady improvement had been observed since 2003 (JTC 2006). The 2005 run was the largest in 30 years and 2006 was above average for an even-numbered year run; the drainagewide OEG of 300,000 fall chum salmon was exceeded in the preceding 5 years. The 5-year average (2002–2006) total reconstructed run of approximately 950,000 fish was greater than the 1989–1998 10-year average of approximately 818,000 fish, which indicated a return to historical run levels.

Stock Assessment Background

Escapement

Because fall chum salmon congregate in fairly unique areas of the drainage in search of upwelling warmer waters to incubate their eggs in a shorter time frame than summer chum salmon habitats would allow (Figure 1). Analysis of biological escapement goals (BEGs) conducted by Eggers (2001) provided a drainagewide goal of 300,000 to 600,000 fall chum salmon, as well as tributary goals for main monitored systems in the upper Yukon River drainage, including Tanana River. Management of the fall season fishery is prescribed in 5 AAC 01.249. *Yukon River Drainage Fall Chum Salmon Management Plan* and describes recommended fishery actions based on estimates of run size (Table 1). The plan aligns the escapement goal threshold with the lower end of the established BEG range. This provides more subsistence fishing opportunity in years of poor runs while still attaining escapement goals. Drainagewide commercial fishing is allowed on the projected surplus above 600,000 fish which provides for subsistence use priority and bolsters escapement on strong runs.

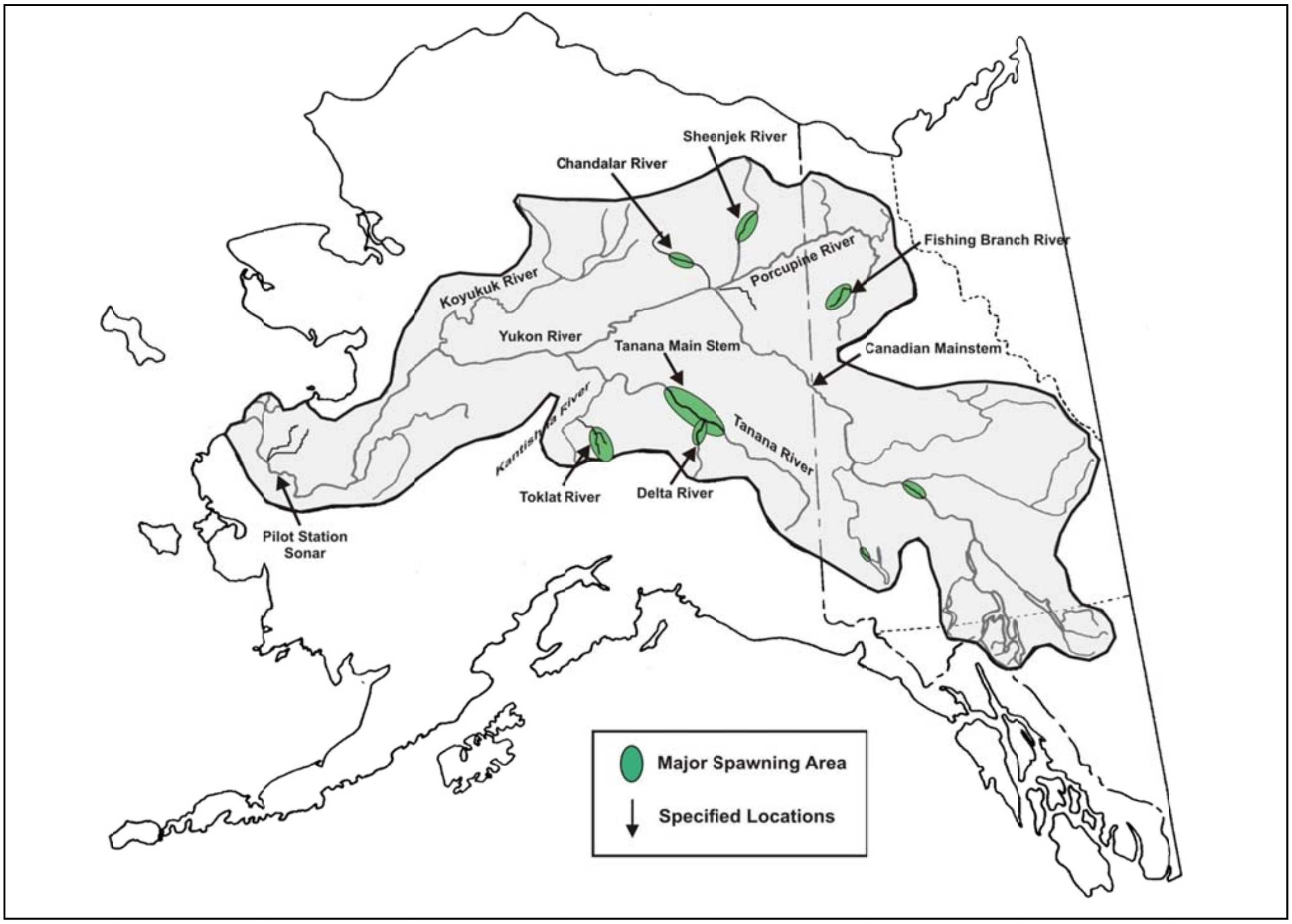


Figure 1. Map showing major spawning areas of fall chum salmon in Alaska and Canada.

Table 5-3.–Yukon River drainage fall chum salmon management plan, 5AAC 01.249, 2009.

Run Size Estimate [b] (Point Estimate)	Recommended Management Action Fall Chum Salmon Directed Fisheries [a] Commercial	Personal Use	Sport	Subsistence	Targeted Drainagewide Escapement
300,000 or Less	Closure	Closure	Closure	Closure [c]	
300,001 to 500,000	Closure	Closure [c]	Closure [c]	Possible Restrictions [c, d]	300,000 to 600,000
500,001 to 600,000	Restrictions [c]	Open	Open	Pre-2001 Fishing Schedules	
Greater Than 600,000	Open [e]	Open	Open	Pre-2001 Fishing Schedules	

[a] Considerations for the Toklat River and Canadian mainstem rebuilding plans may require more restrictive management actions.

[b] The department will use the best available data, including preseason projections, mainstem river sonar passage estimates, test fisheries indices, subsistence and commercial fishing reports, and passage estimates from escapement monitoring projects.

[c] The fisheries may be opened or less restrictive in areas where indicator(s) suggest the escapement goal(s) in that area will be achieved.

[d] Subsistence fishing will be managed to achieve a minimum drainagewide escapement goal of 300,000 fall chum salmon.

[e] Drainagewide commercial fisheries may be open and the harvestable surplus above 600,000 fall chum salmon will be distributed by district or subdistrict (in proportion to the guidelines harvest levels established in 5 AAC 05.365 and 5 AAC 05.367).

Fall chum salmon run abundance is assessed inseason using estimates provided by Pilot Station sonar whereas post season run reconstruction uses the estimates of the individual escapement projects. One method of obtaining an estimate of total run of fall chum salmon in Yukon River consists of the following summation: (1) the sonar based estimates of fall chum salmon passage at Pilot Station, in the years 1995 and 1997–2009, (2) the total harvest of fall chum salmon in District 1 and that portion of District 2 below the Pilot Station sonar site, and (3) an estimate of passage of fall chum salmon after the sonar operations ceased typically around end of August with on average 7% (based on years that the sonar was operated to mid September or using run timing at Mt. Village test fishery that operates annually beyond the firs t week of September). The second method used for run reconstruction post season includes adding the escapement projects together including: Chandalar (sonar), Sheenjek (sonar), Fishing Branch (weir), Mainstem Yukon at U.S./Canada Border (mark-recapture to sonar) and Tanana (mark-recapture) rivers as well as consideration of harvests where appropriate. The most complete escapement coverage of fall chum salmon occurred between 1995 and 2007 within the Yukon River drainage. Brood tables were updated from Eggers (2001) which included 1974 to 1995 through 2004 in Fleischman and Borba (2009) for the spawner-recruit analysis. Note that the harvests estimates that were used in the run reconstruction (Table 2) are slightly different (not significant) than those presented in the JTC (2010) report because of maintaining Eggers (2001) dataset with recent updates to the harvests of both US and Canada.

Based on run reconstruction the total run of Yukon River fall chum salmon averages about 868,000 fish during the 36-year period (1974–2009), ranging from a low of about 239,000 fish in 2000 to over 2.2 million fish in 2005, about an 8-fold level of variation (Table 2 and Figure 2). Historically estimated total returns indicated cycles in Yukon River fall chum salmon abundance from 1974 through 1992 even-odd numbered year cycles dominated and more recently a ten year pattern of high abundance also appears to be emerging (1975, 1985, 1995 and 2005). Generally, smaller run sizes occur during even-numbered years and larger returns in odd-numbered years fairly regularly between 1974 and 1992. From 1974 through 2009, estimated total run size in odd-numbered years averaged 1,000,000 fall chum salmon, ranging from approximately 382,000 fish (2001 – lowest odd-numbered year return on record) to 2,286,000 fish in 2005. Run size in even-numbered years averaged 687,000 fall chum salmon and ranges from approximately 239,000 fish (2000 – lowest return on record) to 1,144,000 fish in 2006. It is notable that 1996 and 2006 are the only even-numbered years that total fall chum salmon run size exceeded the average run size for odd-numbered years.

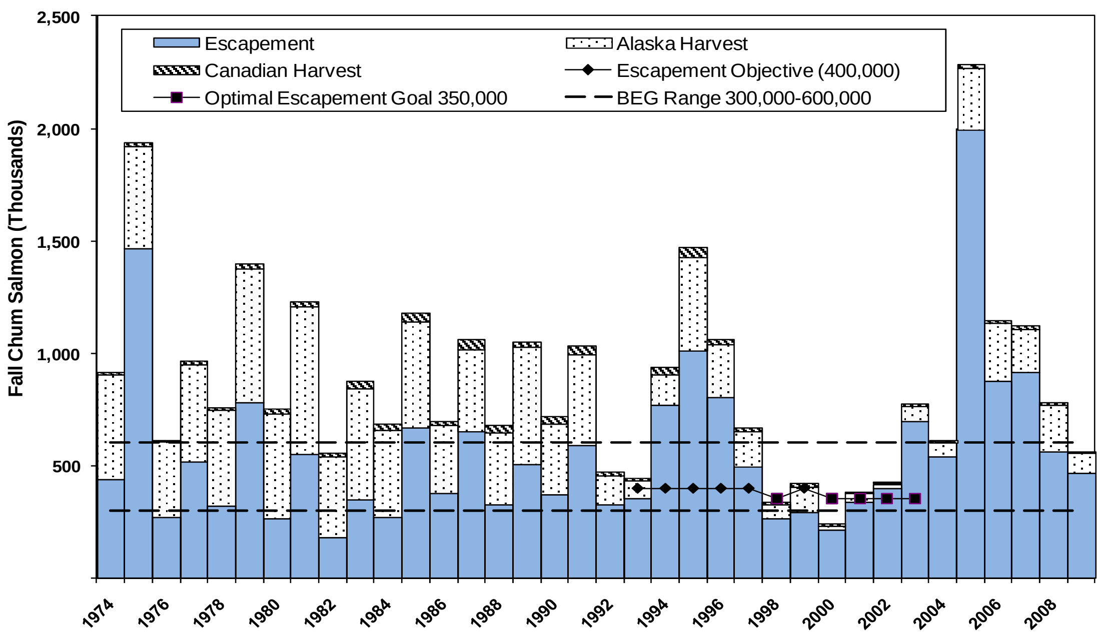


Figure 12.–Total run reconstruction based on estimated harvest and escapement of fall chum salmon, Yukon River drainage, 1974–2008 with the 2009 run size estimate.

Note: The drainagewide escapement goal of 400,000 fall chum salmon was established in 1993. In 1996, an optimal escapement goal of 350,000 fall chum salmon was established in the *Yukon River Fall Chum Salmon Management Plan* and was utilized in 1998, 2000, and 2001. In 2004, a drainagewide escapement goal range of 300,000 to 600,000 fall chum salmon was established.

Table 5-4.–Fall chum salmon estimated brood year production and return per spawner estimates, Yukon Area, 1974–2009.

	(P)			Estimated Brood Year Return								(R)	(R/P)
Estimated Annual Totals				Number of Salmon [a]				Percent				Total Brood	Return/
Year	Escapement [b]	Catch	Return	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Year Return[a]	Spawner
1974	436,485	478,875	915,360	91,751	497,755	68,693	0	0.139	0.756	0.104	0.000	658,199	1.51
1975	1,465,213	473,062	1,938,275	150,451	1,225,440	61,401	123	0.105	0.853	0.043	0.000	1,437,415	0.98
1976	268,841	339,043	607,884	102,062	587,479	137,039	4,316	0.123	0.707	0.165	0.005	830,895	3.09
1977	514,843	447,918	962,761	102,660	1,075,198	175,688	4,189	0.076	0.792	0.129	0.003	1,357,735	2.64
1978	320,487	434,030	754,517	22,222	332,230	90,580	0	0.050	0.747	0.204	0.000	445,032	1.39
1979	780,818	615,377	1,396,195	41,114	769,496	274,311	3,894	0.038	0.707	0.252	0.004	1,088,814	1.39
1980	263,167	488,373	751,540	8,377	362,199	208,962	3,125	0.014	0.622	0.359	0.005	582,663	2.21
1981	551,192	683,391	1,234,583	45,855	955,725	278,386	8,888	0.036	0.742	0.216	0.007	1,288,853	2.34
1982	179,828	373,519	553,347	11,327	400,323	166,754	679	0.020	0.691	0.288	0.001	579,083	3.22
1983	347,157	525,485	872,642	12,569	875,355	223,468	2,313	0.011	0.786	0.201	0.002	1,113,704	3.21
1984	270,042	412,323	682,365	7,089	408,040	174,207	8,516	0.012	0.683	0.291	0.014	597,852	2.21
1985	664,426	515,481	1,179,907	46,635	874,819	270,984	3,194	0.039	0.732	0.227	0.003	1,195,632	1.80
1986	376,374	318,028	694,402	0	429,749	368,513	4,353	0.000	0.535	0.459	0.005	802,614	2.13
1987	651,943	406,143	1,058,086	12,413	617,519	290,767	7,720	0.013	0.665	0.313	0.008	928,418	1.42
1988	325,137	353,685	678,822	41,003	175,236	152,368	10,894	[c] 0.108	0.462	0.401	0.029	379,501	1.17
1989	506,173	545,166	1,051,339	2,744	282,905	345,136	[c] 20,290	0.004	0.435	0.530	0.031	651,075	1.29
1990	369,654	352,007	721,661	710	579,452	[c] 418,448	30,449	0.001	0.563	0.407	0.030	1,029,059	2.78
1991	591,132	439,096	1,030,228	3,663	[c] 1,024,800	369,103	12,167	0.003	0.727	0.262	0.009	1,409,733	2.38
1992	324,253	148,846	473,099	6,763	653,648	197,073	3,907	0.008	0.759	0.229	0.005	861,392	2.66
1993	352,688	91,015	443,703	7,745	451,327	102,420	3,235	0.014	0.799	0.181	0.006	564,727	1.60
1994	769,920	169,225	939,145	4,322	225,243	149,527	1,603	[c] 0.011	0.592	0.393	0.004	380,695	0.49

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Table 2.–Page 2 of 2.

	(P)			Estimated Brood Year Return								(R)	(R/P)
Estimated Annual Totals				Number of Salmon				Percent				Total Brood	Return
Year	Escapement	Catch	Return	Age 3	Age 4	Age 5	Age 6	Age 3	Age 4	Age 5	Age 6	Year Return	Spawner
1995	1,009,155	461,147	1,470,302	2,371	266,955	68,918	[c] 383	0.007	0.788	0.204	0.001	338,627	0.34
1996	800,022	260,923	1,060,945	420	165,691	[c] 136,906	8,295	0.001	0.532	0.440	0.027	311,312	0.39
1997	494,831	170,059	664,890	3,087	[c] 244,801	118,343	3,332	0.008	0.662	0.320	0.009	369,563	0.75
1998	263,121	70,820	333,941	651	269,653	57,962	6,694	0.002	0.805	0.173	0.020	334,960	1.27
1999	288,962	131,175	420,137	29,097	705,152	174,424	13,720	0.032	0.764	0.189	0.015	922,392	3.19
2000	210,756	28,543	239,299	8,446	297,012	115,478	0	0.020	0.706	0.274	0.000	420,937	2.00
2001	337,765	44,976	382,741	136,038	2,157,498	675,688	33,955	0.045	0.718	0.225	0.011	3,003,179	8.89
2002	397,977	27,411	425,388	0	444,507	239,154	13,067	0.000	0.638	0.343	0.019	696,728	1.75
2003	695,363	79,529	774,892	24,263	858,714	434,639	16,010	0.018	0.644	0.326	0.012	1,333,626	1.92
2004	537,873	76,296	614,169	0	332,454	145,202	7,377	0.000	0.685	0.299		485,033	[d] >0.90
2005	1,996,513	290,183	2,286,696	2,269	370,342	150,844						523,455	[e] >0.26
2006	873,987	270,471	1,144,458	24,349									
2007	928,430	203,393	1,131,823										
2008	564,482	217,947	782,429										
2009	462,583	93,319	555,902										
2009 Avg.	560,878	306,563	867,441										
	494,258	All Brood Years (1974–2003)		30,862	607,131	218,178	7,644	0.0319	0.6870	0.2716	0.0095	863,814	2.08
	371,738	Even Brood Years (1974–2003)		20,343	388,548	178,778	6,393	0.0340	0.6531	0.3020	0.0109	594,062	1.89
	616,777	Odd Brood Years (1974–2003)		41,380	825,714	257,578	8,894	0.0299	0.7209	0.2412	0.0080	1,133,566	2.28

[a] The estimated number of salmon which returned are based upon annual age composition observed in lower Yukon test nets each year, weighted by test fish CPUE.

[b] Contrast in escapement data is 11.10.

[c] Based upon expanded test fish age composition estimates for years in which the test fishery terminated early (both in 1994 and 2000).

[d] Brood year return for 3, 4, and 5 year fish, indicate that production (R/P) from brood year 2004 was at least 0.90. Recruits estimated for incomplete brood year.

[e] Brood year return for 3 and 4 year fish, indicate that production (R/P) from brood year 2005 was at least 0.26. Recruits estimated for incomplete brood year.

Escapement goals
Current BEGs and SEGs for Yukon River fall chum salmon are as follows:

Stream (Project Type)	Current Goal	Type of Goal
Yukon Drainage (multiple)	300,000–600,000	SEG
Tanana River (mark-recapture)	61,000–136,000	BEG
Delta River (foot surveys)	6,000–13,000	BEG
Toklat River (foot survey)	15,000–33,000	Eliminated
Upper Yukon R. Tributaries (multiple)	152,000–312,000	BEG
Chandalar River (sonar)	74,000–152,000	BEG
Sheenjek River (sonar)	50,000–104,000	BEG
Canadian Upper Yukon River (sonar)	>80,000[a]	IMEG[b]
Fishing Branch River (weir)	50,000–120,000[a]	IMEG[b]

[a] U.S./Canada escapement goals based on Yukon Salmon Agreement.
[b] Interim Management Escapement Goals (IMEG) are set by the U.S./Canada Panel. The current IMEG for Fishing Branch River is 22,000 to 49,000 fall chum salmon through 2010.

Fall chum salmon run strength was poor to below average from 1998 through 2002 with 1998 and 2000 being the weakest runs on record. More recently, fall chum salmon runs have shown marked improvement with estimated drainagewide escapement exceeding the upper end of the OEG range of 600,000 fish in 2003 and 2005 through 2007, with approximately 2.0 million in 2005, the largest escapement on record. The low end of the drainagewide escapement goal of 300,000 fall chum salmon was not met in 1998 through 2000, but has been exceeded annually since that time (Figure 2).

Biological escapement goals in Chandalar and Delta rivers have been met or exceeded in each of the past 10 years, except for low escapements in 2000 (Table 3 and Figure 3). Sheenjek River BEG is based on estimated passage for only one bank and the goal has only been met 4 times since 1997. Escapement objectives for fall chum salmon stocks in Yukon River Canadian mainstem and Fishing Branch River were originally recommended by the U.S./Canada Joint Technical Committee (JTC) and specifically stipulated in the Agreement. Because of poor runs in the early 2000s, the Panel agreed to lower escapement targets through 2005 for Canadian mainstem fall chum salmon stock to allow for some U.S. subsistence and Canadian aboriginal harvest, while rebuilding the stock over 3 life cycles. However, the escapement objective of >80,000 for this stock had been exceeded since 2002 and since 2006 goals were again based on rebuilt status (Table 3 and Figure 4).

Table 5-5.–Fall chum salmon passage estimates and escapement estimates for selected spawning areas, Yukon River drainage, 1971–2009.

	Alaska									
	Yukon	Tanana River Drainage					Upper Yukon River Drainage		Canada	
Year	Yukon River Mainstem Sonar Estimate	Toklat River [a]	Kantishna / Toklat Rivers Tagging Estimate [b]	Delta River [c]	Bluff Cabin Slough [d]	Upper Tanana River Tagging Estimate [e]	Chandalar River [f]	Sheenjek River [g]	Fishing Branch River [h]	Mainstem Tagging Escapement Estimate [i]
1971									312,800 [j]	
1972									35,125 [k]	
1973									15,989	
1974		41,798		5,915 [l]				89,966 [m]	31,525	
1975		92,265		3,734				173,371 [m]	353,282	
1976		52,891		6,312				26,354 [m]	36,584 [j]	
1977		34,887		16,876				45,544 [m]	88,400 [j]	
1978		37,001		11,136 [l]				32,449 [m]	40,800 [j]	
1979		158,336		8,355 [l]				91,372 [m]	119,898 [j]	
1980		26,346		5,137 [l]	3,190 [n]			28,933 [m]	55,268 [j]	22,912
1981		15,623		23,508 [l]	6,120 [n]			74,560	57,386 [o]	47,066 [p]
1982		3,624		4,235 [l]	1,156			31,421	15,901 [j]	31,958
1983		21,869		7,705 [l]	12,715			49,392	27,200 [j]	90,875
1984		16,758		12,411 [l]	4,017			27,130	15,150 [j]	56,633 [p]
1985		22,750		17,276	2,655 [n]			152,768 [q]	56,016	62,010
1986		17,976		6,703	3,458		59,313	84,207 [q, r]	31,723	87,940
1987		22,117		21,180 [l]	9,395		52,416	153,267 [q, r]	48,956	80,776
1988		13,436		18,024 [l]	4,481 [n]		33,619	45,206 [r]	23,597	36,786
1989		30,421		21,342	5,386 [n]		69,161	99,116 [r]	43,834	35,750
1990		34,739		8,992	1,632		78,631	77,750 [r]	35,000 [s]	51,735
1991		13,347		32,905	7,198			86,496	37,733	78,461
1992		14,070		8,893	3,615 [n]			78,808	22,517	49,082
1993	295,000	27,838		19,857 [l]	5,550 [n]			42,922	28,707	29,743
1994	407,000	76,057		23,777	2,277 [n]			150,565	65,247	98,358
1995	1,053,245	54,513 [t]		20,587 [l]	19,460	268,173	280,999	241,855	51,971 [u]	158,092

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Table 3.–Page 2 of 4.

Year	Alaska Yukon River M115 instem Sonar Estimate	Tanana River Drainage: Toklat River [a]	Tanana River Drainage: Kantishna / Toklat Rivers Tagging Estimate [b]	Tanana River Drainage: Delta River [c]	Tanana River Drainage: Bluff Cabin Slough [d]	Tanana River Drainage: Upper Tanana River Tagging Estimate [e]	Upper Yukon River Drainage: Chandalar River [f]	Upper Yukon River Drainage: Sheenjek River [g]	Canada: Fishing Branch River [h]	Canada: Mainstem Tagging Escapement Estimate [i]
1996		18,264		19,758	7,074 [d]	134,563	208,170	246,889	77,278	122,429
1997	506,621	14,511		7,705	5,707 [d]	71,661	199,874	80,423 [v]	26,959	85,439
1998	372,927	15,605		7,804	3,549 [d]	62,384	75,811	33,058	13,564	46,305
1999	379,493	4,551	27,199	16,534	7,037 [d]	97,843	88,662	14,229	12,904	58,682
2000	247,935	8,911	21,450	3,001	1,595	34,844	65,894	30,084 [w]	5,053	53,742
2001	376,182	6,007 [x]	22,992	8,103	1,808 [n]	96,556 [y]	110,971	53,932	21,669	33,851
2002	326,858	28,519	56,665	11,992	3,116	109,961	89,850	31,642	13,563	98,695
2003	889,778	21,492	87,359	22,582	10,600 [n]	193,418	214,416	44,047 [z]	29,519	142,683
2004	594,060	35,480	76,163	25,073	10,270 [n]	123,879	136,703	37,878	20,274	154,080
2005	1,813,589	17,779 [t]	107,719	28,132	11,964 [n]	377,755	496,484	438,253 [q]	121,413	437,920
2006	790,563	-	71,135	14,055	-	202,669	245,090	160,178 [q]	30,849	211,193
2007	684,011	-	81,843	18,610	-	320,811	228,056	65,435 [q]	33,750	214,802
2008	615,127	-	-	23,055	1,198 [n]	-	178,278	50,353 [q]	20,055 [aa]	174,424
2009 [ab]	240,449	-	-	13,492		-	-	54,126 [q]	25,828 [aa]	92,626
Five Year Average	828,748	N/A	86,899	19,469	6,581	300,412	286,977	153,669	46,379	226,193
BEG Range		15,000	N/A	6,000	N/A	46,000 [ac]	74,000	50,000	27,000	60,000
		33,000		13,000		103,000	152,000	104,000	56,000	129,000
Drainagewide BEG						Treaty Negotiated Interim Objectives:			50,000-120,000	>80,000
300,000-600,000					Yukon River Panel Negotiated Objectives for 2008-2010:				22,000-49,000	

-continued-

Table 3.–Page 3 of 4.

Note: Latest table revision September 9, 2010.

[a] Total abundance estimates for upper Toklat River drainage spawning index area using stream life curve method developed with 1987 to 1993 data.

[b] Fall chum salmon passage estimate for Kantishna and Toklat river drainages is based on tag deployment from a fish wheel located at the lower end of Kantishna River and recaptures from three fish wheels; two located on Toklat River (1999 to 2007) about eight miles upstream of the mouth and one fish wheel on Kantishna River (2000 and 2007) near Bear Paw River.

[c] Population estimate generated from replicate foot surveys and stream life data (area under the curve method), unless otherwise noted.

[d] Peak counts from foot surveys unless otherwise noted.

[e] Fall chum salmon passage estimate for upper Tanana River drainage based on tag deployment from a fish wheel (two fish wheels in 1995) located just upstream of Kantishna River and recaptures from one fish wheel (two fish wheels from 1995 to 1998) located downstream from the village of Nenana.

[f] Side-scan sonar estimate from 1986 through 1990. Split beam sonar estimate from 1995 through 2006. DIDSON sonar estimate in 2007 to present.

[g] Side-scan sonar estimate from 1986 through 1999, 2001, and 2002. Split-beam sonar estimate from 2003 through 2004. DIDSON sonar estimate since 2005. Counts prior to 1986 are considered conservative, approximating the period from the end of August through middle of the fourth week of September. Since 1991, total abundance estimates are for the approximate period second week in August through the middle of the fourth week of September.

[h] Total escapement estimated using weir count unless otherwise indicated. Counts for 1974, 1975, and 1998 revised from DFO, February 23, 2000.

[i] Estimated border passage minus Canadian mainstem harvest and excluding Canadian Porcupine River drainage escapement. Based on mark-recapture from 1980 to 2007 and sonar thereafter.

[j] Total escapement estimated using weir to aerial survey expansion factor of 2.72.

[k] Weir installed on September 22, 1972. Estimate consists of a weir count of 17,190 after September 22 and a tagging passage estimate of 17,935 prior to weir installation.

[l] Total escapement estimate generated from the migratory time density curve method.

[m] Total escapement estimate using sonar to aerial survey expansion factor of 2.22.

[n] Peak counts aerial surveys.

[o] In 1981, the initial aerial survey count was doubled before applying the weir to aerial expansion factor of 2.72 since only half of the spawning area was surveyed.

[p] In 1984, the escapement estimate based on mark-recapture program is unavailable. Estimate is based on assumed average exploitation rate.

[q] Sonar counts included both banks in 1985-1987 and 2005 to present.

[r] Expanded estimates, using Chandalar River fall chum salmon run timing data, for the approximate period from mid-August through the middle of the fourth week of September 1986-1990.

[s] Population of spawners was reported by DFO as between 30,000 to 40,000 fish considering aerial survey timing. For purpose of this table, an average of 35,000 fall chum salmon was estimated to pass by the weir. Note: A single survey flown October 26, 1990, counted 7,541 chum salmon. A population estimate of approximately 27,000 fish was made through date of survey, based upon historic average aerial to weir expansion of 28%.

[t] Minimal estimate because of late timing of ground surveys with respect to peak of spawning.

[u] Minimal count because weir was closed while submerged due to high water, during the period August 31 to September 8, 1995.

[v] The passage estimate includes an additional 15,134 salmon that were estimated to have passed during 127 hours that the sonar was inoperable due to high water from August 29 until September 3, 1997.

[w] Project ended early; sonar passage estimate was 18,652 (62% of normal run timing). The total sonar passage estimate, 30,083, was expanded to reflect the 1986-1999 average run timing through September 24.

[x] Minimal estimate because Sushana River was breached by the main channel and uncountable.

[y] Due to low numbers of tags deployed and recovered on Tanana River the estimate has a large range in confidence interval (95% CI + 41,172).

[z] Project ended on peak daily passages due to late run timing; estimate was expanded based on run timing (87%) at Rapids.

[aa] Project estimated for late run timing through October 25 as project ended on October 10, 2008 and October 12, 2009.

[ab] Preliminary.

[ac] Upper Tanana River goal is Tanana River drainage BEG (61,000 to 136,000) minus the lower and upper ranges of Toklat River goal based on Eggers (2001), and is not an established BEG.

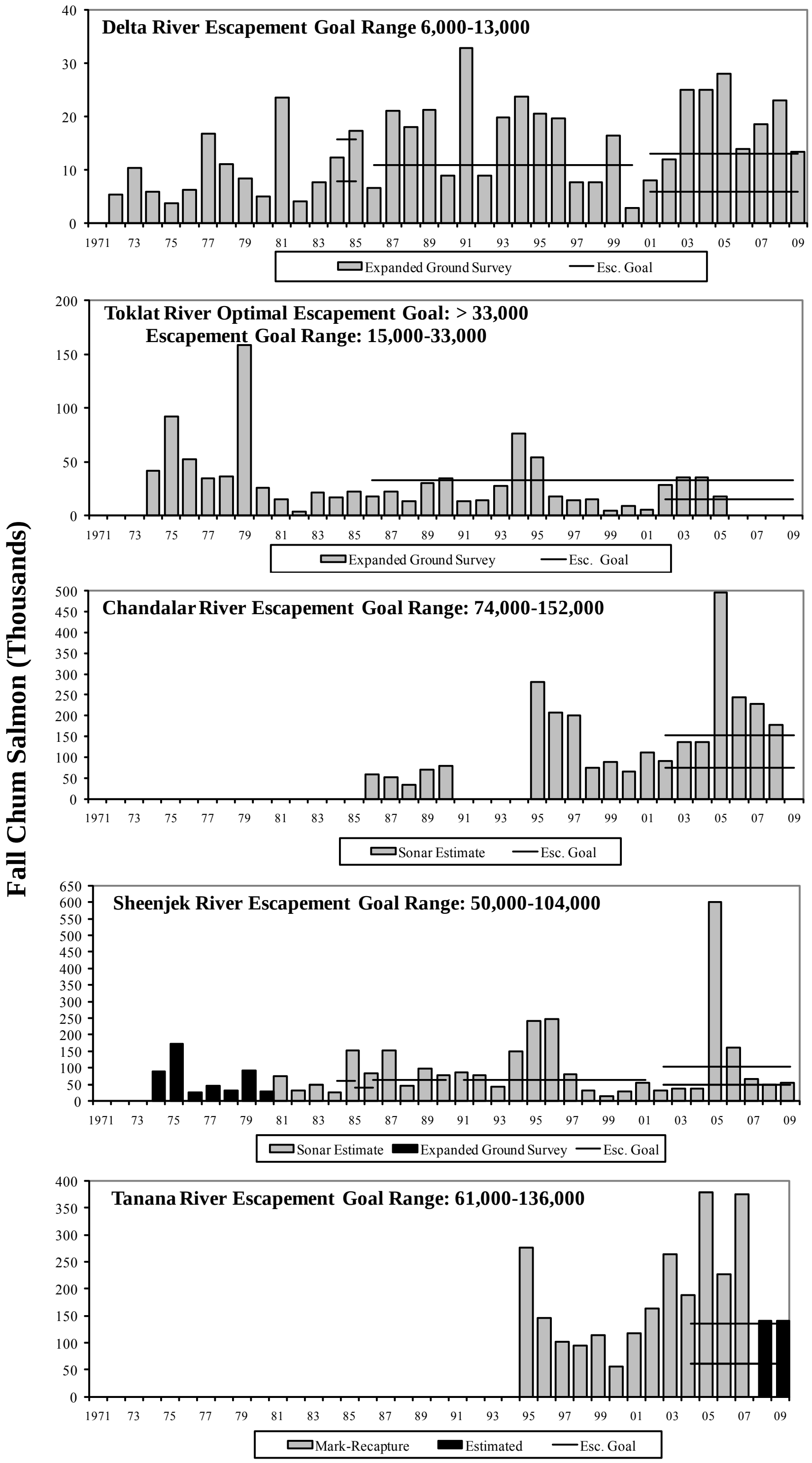

Figure 3.– Fall chum salmon escapement estimates for selected spawning areas in the Alaskan portion of the Yukon River drainage, 1971-2009. Horizontal lines represent escapement goals or ranges. Note: vertical scale is variable Escapement in Fishing.

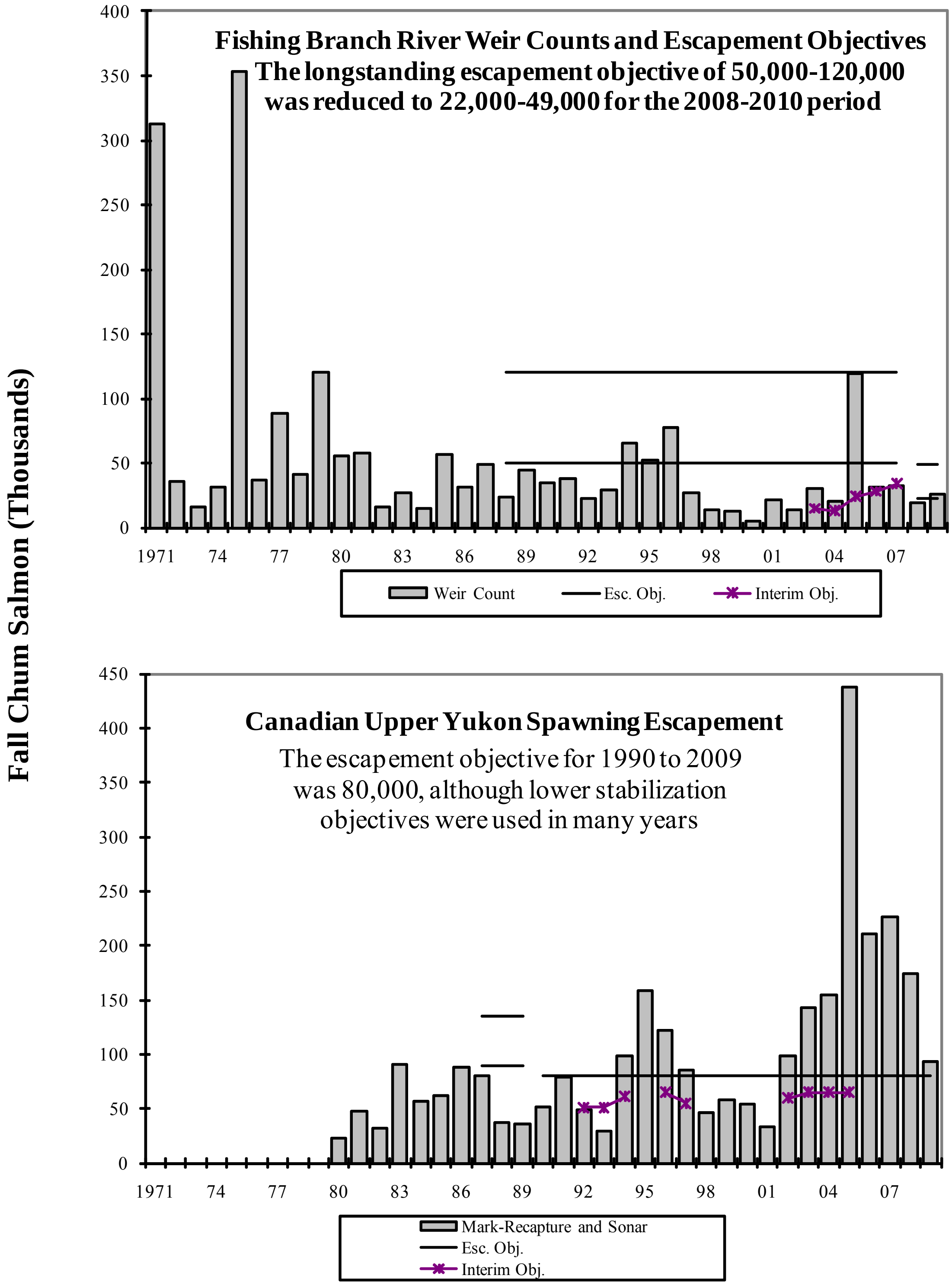

Figure 4.– Chum salmon spawning escapement estimates for Canadian portion of the Yukon River drainage, 1971-2009. Sonar estimates were used in 2008 and 2009. Horizontal lines represent escapement goal objectives or ranges. The interim stabilization or rebuilding objectives are also shown.

Branch River in Canada has only met the escapement objective established in 1987 of 50,000 to 120,000 fall chum salmon once in the past 12 years, in 2005 (Table 3 and Figure 4). ADF&G developed a BEG for this stock of 27,000 to 56,000 in conjunction with total run reconstruction analysis in 2000 (Eggers 2001); however, this goal has only been met 4 times since 1997. Like the Canadian mainstem stock, the Fishing Branch River fall chum salmon stock is managed based on recommendations of the Panel that are addressed annually. The Panel agreed to an interim management goal of 28,000 fish for the 2006 season and 33,667 fish in 2007, which were both exceeded. For the years 2008–2010, JTC has recommended an Interim Management Escapement Goal (IMEG) range of 22,000–49,000 fall chum salmon for Fishing Branch River (JTC 2009). This recommendation was based on the Bue and Hasbrouck[15] percentile method of determining an SEG. The IMEG for Fishing Branch River was nearly achieved in 2008 and was met in 2009.

In 1993, the BOF established the Toklat River OEG of 33,000 fall chum salmon based on an average return for this system. As part of the total run reconstruction analysis conducted by Eggers (2001), a BEG range of 15,000 to 33,000 fall chum salmon was recommended and adopted by ADF&G. The BOF removed the OEG from regulation in 2004. Based on the BEG range, the goal has been met each year from 2002 to 2005; however, assessment of the area has been hampered by the later freeze ups and counts used for developing an annual population estimate have not been achieved since 2005 (Table 3 and Figure 3). At the 2010 BOF meeting this goal was discontinued. The results of mark–recapture projects on both Kantishna and Tanana rivers suggest that the index streams of Toklat and Delta rivers support relatively small proportions of fall chum salmon. A radiotelemetry study conducted in 2008 has confirmed major mainstem spawning in Tanana River between Fairbanks and Delta Junction.

Maturity

Annual inseason estimates of fall chum salmon age composition since 1977 are derived by the following sources. Inseason estimates of age prior to 1981 are based on fish sampled at Emmonak from 6" commercial gillnet catches. Estimates of age from 1981 to 2000 are based on 6" set gillnet test fish catches at Big Eddy and Middle Mouth sites (LYTF), in 2001 fishing gear was changed to 6" drift gillnets. All test fishery age composition data were weighted by daily CPUE from 1981 through 2009. Because of low sample sizes obtained in the normal operations of the LYTF in 2009 (due to difficulty catching fall chum salmon) samples were supplemented by an extra drift site in Big Eddy and from the Mountain Village test fishery. Estimates for 1994 and 2000 were obtained by apportioning daily CPUE among ages, fitting age specific run timing curves to each age, and extending the curves to the end of the season since the projects were terminated early due to the poor returns. Estimated annual age composition from 1977 through 2009 has averaged approximately 4% age-3, 68% age-4, 27% age-5, and less than 1% age-6.

Age composition from 1974 through 2003 is used to estimate age structure of brood year returns (Table 2). Additionally, recruits are estimated from 2004 (age-6) and 2005 (age-5) brood year returns. Although the overall proportion of age-4 and age-5 fish combined varies little among brood year returns, (averaging approximately 95% annually), there is a change in the proportion of these age groups between even and odd-numbered brood year returns. For example, age-4 fish averaged approximately 72% of returns from odd-numbered brood years between 1974 and 2003, whereas only 65% from even-numbered brood years. By comparison, returning age-5 fish averaged

[15] Bue, B. G., and J. J. Hasbrouck. *Unpublished*. Escapement goal review of salmon stocks of Upper Cook Inlet, Report to the Alaska Board of Fisheries, 2001. Alaska Department of Fish and Game, Anchorage.

approximately 24% from odd-numbered brood year returns and 30% from even-numbered brood years. The 2001 brood year had extremely good marine survival as evidenced by the large return of each age class from age-3 returns in 2004 through age-6 returns in 2007. However, age-4 component that retuned from the 2005 brood year was much lower than would be expected if the return had actually produced a run commensurate with the large escapement.

Harvest

Combined commercial and subsistence harvests of fall chum salmon in Alaska show a substantial decrease from the 1980s and 1990s compared to the recent 5-year (2005–2009) average of approximately 205,000 fish. The recent decline in subsistence harvest resulted after several extremely poor runs (1998 through 2002) where subsistence fishing restrictions were enacted as well as changes in the culture such as causing many fishermen to move away from long-established fish camps and allowing fishing gear to fall into disrepair. Equally important is the decline is commercial harvests that were nonexistent during several years of poor returns causing loss of markets as businesses shifted interest to other fisheries outside the region because of unpredictability of run strength, and increased operating costs in remote Yukon River drainage communities. Commercial harvest of fall chum salmon averaged about 262,000 during the 1980s and 118,000 from 2005 through 2009. In 2004, a modest surplus was identified, whereas in 2005 and 2006, substantial surpluses were available for commercial harvest. However, there was little exploitation of these available surpluses due to poor commercial market conditions for fall chum salmon. Since 2007 there has been renewed market interest and directed fall chum salmon commercial opportunity has been provided in 2007 through 2009. Coho salmon runs overlap in timing with fall chum salmon and are typically taken as incidental harvest in the fisheries. Directed coho salmon fisheries are rare because of the tie between their respective management plans. Coho salmon directed fisheries were conducted on the Yukon in 2009 after the majority of the fall chum salmon had past.

Exploitation Rates

Annual total run estimates can be coupled with total inriver harvests to estimate exploitation rates exerted on fall chum salmon for the years 1974–2009 (Figure 5). Total exploitation rates exerted by Yukon River fisheries on fall chum salmon over 36 years averaged about 17.4%, ranging from as high as 67.5% in 1982 to as low as 6.4% in 2002. Exploitation rates on 2 of the lowest runs, approximately 239,000 fish, in 2000 and 334,000 fish in 2001 were 11.9% and 21.2%, respectively. Exploitation rates have been increasing slightly since 2002 with improvements in run size and reestablishment of market interest; however, current exploitation rates are much lower than historical rates (averaging 51% pre-1992 to an average of 20% post-1991), partly due to highly variable runs occurring in the last 2 decades which are highly unpredictable.

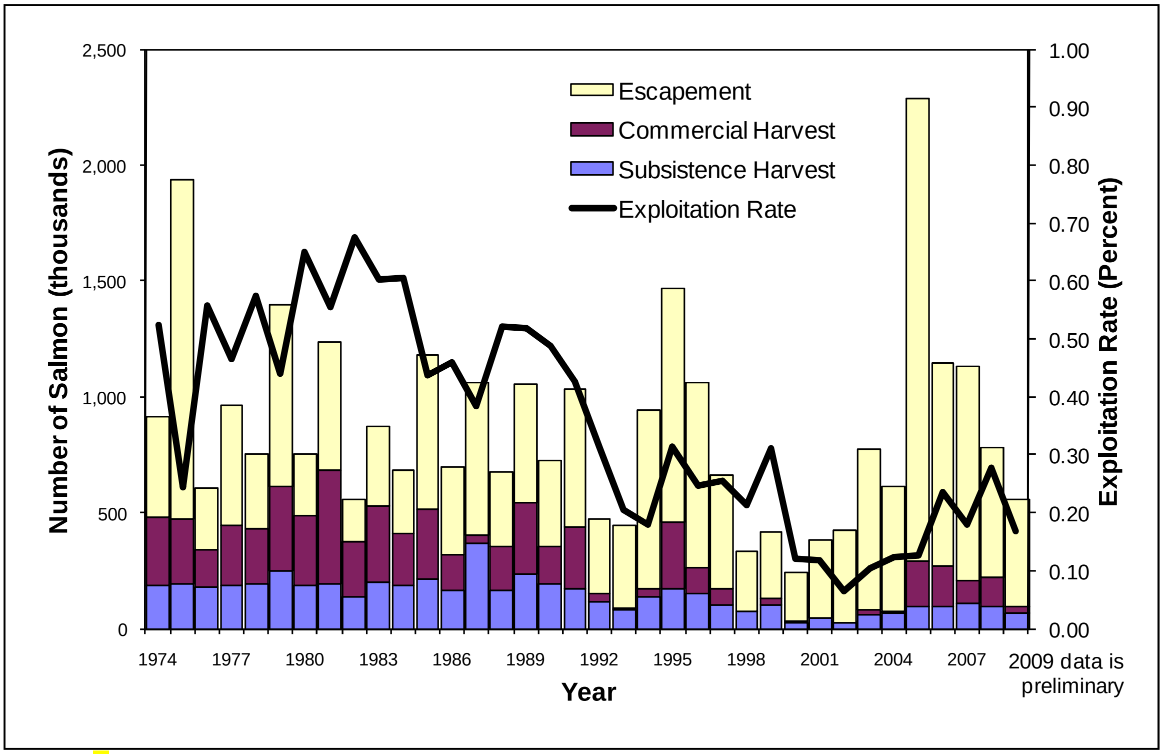

Figure 5.–Estimated fall chum salmon harvest and escapement with exploitation rate, Yukon Area, 1974–2009.

Yields based on brood return from individual escapements have also become highly variable in the last 2 decades (Figure 6). Yields from brood years pre-1992 averaged 400,000 fish and ranged from 27,000 in 1975 to 840,000 in 1977, whereas yields after 1991 average 143,000 fall chum salmon, with 6 of the last 13 brood year returns (through 2005) resulting in negative yields representing substantially less production. Production levels for years 1974 through 1992 allowed for average harvests of 456,000 fish, whereas current production levels and conservative management actions through this period of high and low production extremes has reduced harvests to less than 200,000 fish. Harvests from 1999–2003 were at all time lows that averaged only 62,000 fall chum salmon drainagewide, whereas harvests from 2004–2008 average 211,000 fall chum salmon; this level of harvest is comparable to average harvest taken from 1994–1998 (Figure 5). As a result of previous poor fall chum salmon runs in the early 2000s and subsequent fishing restrictions and closures, it appears subsistence fishing effort and harvest has remained relatively low even in those years with much larger runs, as in 2003 and 2005 through 2008 (Figure 5). With the exception of 1995, fall chum salmon commercial harvests (Figure 5) have been low since 1992, partly due to weak market conditions, but also because of uncertainty in predicting run strength. Most recently this has resulted in underutilization of the stock in commercial fisheries in 2003, and 2005 through 2007. Fall chum salmon runs in 2008 and 2009 were fully utilized, with most escapement objectives attained and below average harvests due to below average available surpluses.

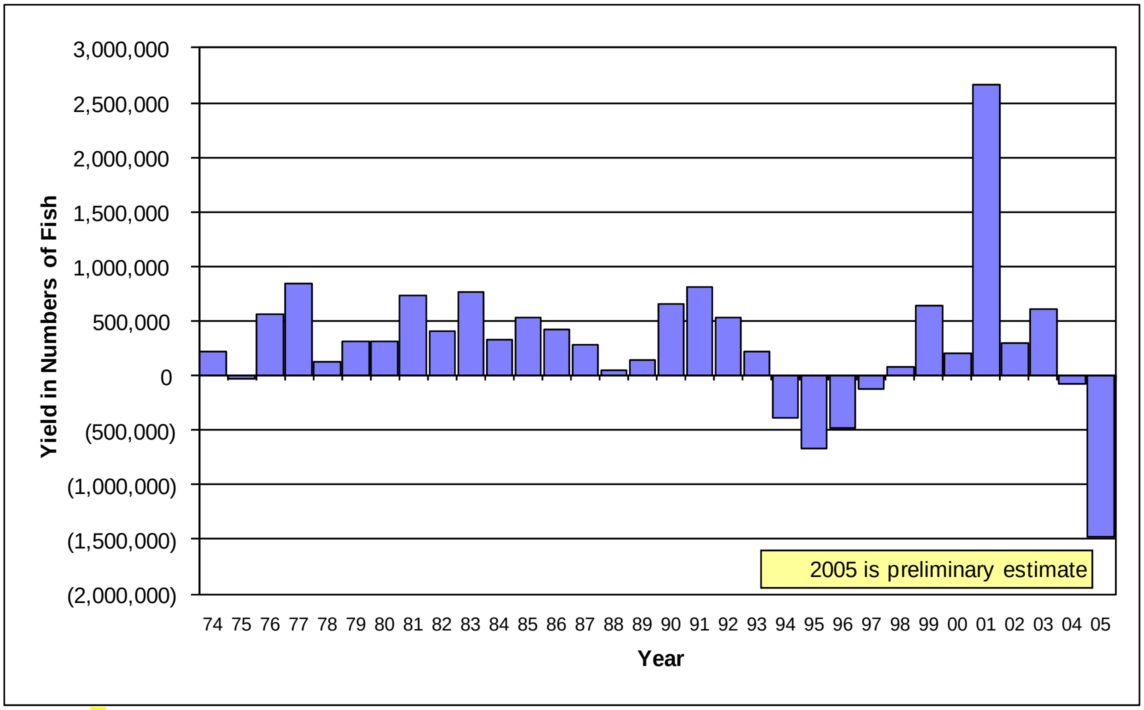

Figure 6.–Yields of fall chum salmon based on parent year escapements and resulting brood year returns, 1974-2005.

Outlook

[THE PRELIMINARY INFORMAL OUTLOOK FOR 2011;PLACEHOLDER FOR INSERTION IN SPRING 2011 AS AVAILABLE]

5.2.5 Norton Sound

Norton Sound Salmon District consists of all waters between Cape Douglas in the north and Point Romanof in the south. The district is divided into six subdistricts: Subdistrict 1, Nome; Subdistrict 2, Golovin; Subdistrict 3, Moses Point; Subdistrict 4, Norton Bay; Subdistrict 5, Shaktoolik; and Subdistrict 6, Unalakleet (Figure 1). The subdistrict and statistical area boundaries were established to facilitate management of individual salmon stocks, and each subdistrict contains at least one major salmon-producing stream.

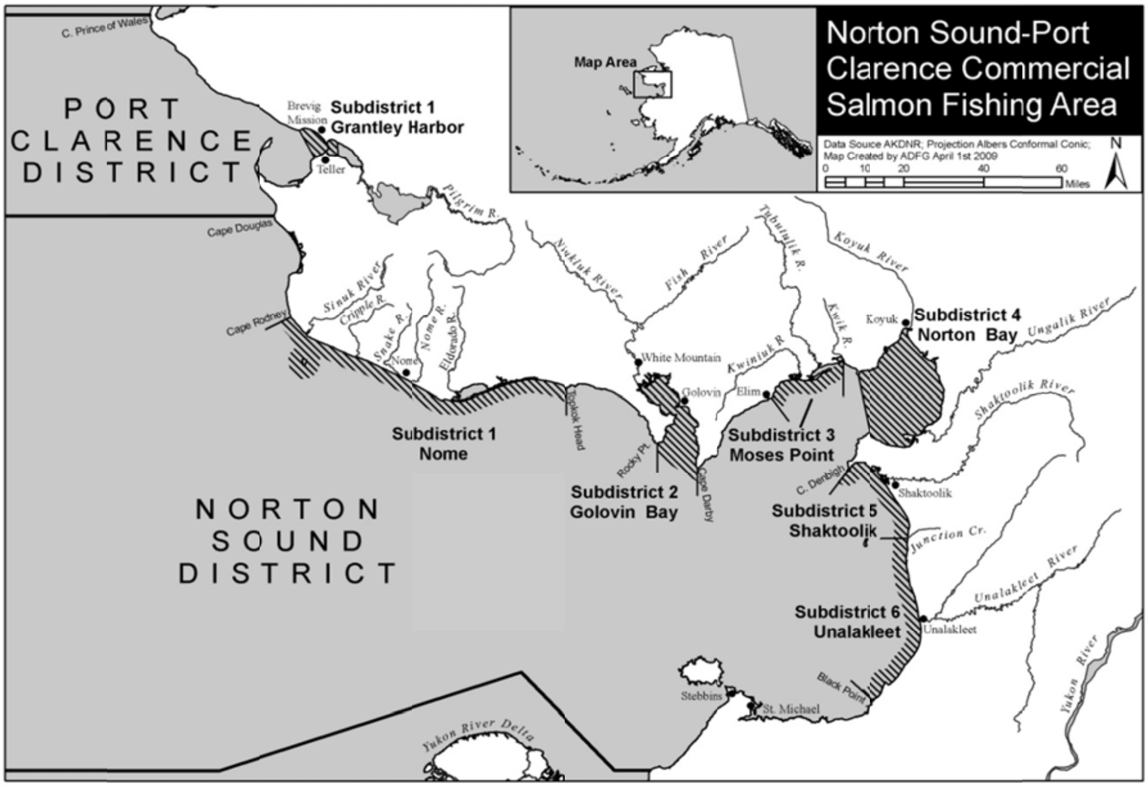

Figure 1. Norton Sound commercial salmon fishing districts and subdistricts.

Chinook *Oncorhynchus tshawytscha,* chum *O. keta,* pink *O. gorbuscha*, and coho *O. kisutch* salmon are harvested in Norton Sound commercial, subsistence, and sport fisheries all managed by ADF&G. All commercial salmon fishing in the district is by set gillnets in marine waters and fishing effort is usually concentrated near river mouths. Commercial fishing typically begins in June and targets Chinook salmon if sufficient run strength exists. Emphasis switches to chum salmon in late June and then to coho salmon at the end of July. Most commercial fishing is completed by early September. Pink salmon returns are much more abundant in even numbered years. A pink salmon directed fishery may coincide with or be scheduled to alternate periods with the historical chum directed fishery. Subsistence fishermen operate gillnets or seines in the main rivers, and to a lesser extent in coastal marine waters, capturing salmon, whitefish, Dolly Varden, and inconnu (sheefish). Beach seines are used to catch schooling or spawning salmon and other species of fish. The major portion of fish taken during summer months is air dried or smoked for later consumption by residents or occasionally their dogs.

5.2.5.1 Northern Norton Sound chum salmon

Introduction

Northern Norton Sound includes Subdistricts 1, 2, and 3 (Figure 1). In response to guidelines established in the SSFP (5 AAC 39.222(f)(21)), the BOF classified Subdistrict 1 chum salmon stock as a management concern in 2000 (Bue 2000a). The classification was upheld at the 2004 BOF meeting (Menard and Bergstrom 2003a). In 2007, based on definitions provided in SSFP (5 AAC 39.222(f)(21) and (42)), only the most recent 5-year yield and escapement information (2002–2006), and the historical level of yield or harvestable surpluses were considered. Accordingly, ADF&G recommended a change in status of the Subdistrict 1 chum salmon stock from a management concern to a yield concern at the October 2006 BOF work session because in the preceding 5 years (2002–2006) a majority of chum salmon escapement goals had been achieved in Subdistrict 1. The BOF accepted ADF&G's recommendation and the Subdistrict 1 chum salmon stock was reclassified at its 2007 meeting (Menard and Bergstrom 2006a). At the 2009 BOF meeting, ADF&G recommended continuation of Norton Sound Subdistrict 1 chum salmon as a stock of yield concern (Menard and Bergstrom 2009a). During the most recent 5 years (2005–2009), a majority of chum salmon escapement goals had been achieved in Subdistrict 1. Since the 2006 fishing season, Subdistrict 1 has reverted back to Tier I subsistence fishing regulations because projected runs of chum salmon exceeded the Amount Necessary for Subsistence (ANS). ADF&G's recommendation to continue classification of this stock as a yield concern was based on low yields for the recent 5-year period (2005–2009) compared to historical yields in the 1980s.

In response to the guidelines established in the SSFP (5 AAC 39.222(f)(42)), the BOF classified Norton Sound Subdistricts 2 and 3 chum salmon as a stock of yield concern at its September 2000 work session. This determination as a yield concern was based on low harvest levels for the previous 5-year period (1995–1999). An action plan was subsequently developed by ADF&G (Bue 2000b) and acted upon by the BOF in January 2001. The classification as a yield concern was continued at the January 2004 BOF meeting (Menard and Bergstrom 2003b) and at the January 2007 BOF meeting (Menard and Bergstrom 2006b). ADF&G recommended continuation of the Norton Sound Subdistrict 2 and Subdistrict 3 chum salmon as a stock of yield concern at the 2009 BOF meeting (Menard and Bergstrom 2009b). From 2005 to 2009, low yields of chum salmon have continued in Norton Sound Subdistrict 2 and in Subdistrict 3; yields have been inconsistent, but often low.

Stock Assessment Background

Escapement

The Subdistrict 1 BEG was achieved or exceeded from 2005–2008 and fell short of the goal in 2009 (Figure 2). During this same time period (2005–2009), the SEG has been achieved or exceeded for 3 of 5 years at Nome and Snake Rivers (Table 1, Figures 3, 4), and 4 of 5 years at Eldorado River (Table 1, Figure 5). Comparing escapements during 2005–2009 to the escapement goals established in 2001 shows there has not been a chronic inability to meet escapement goals.

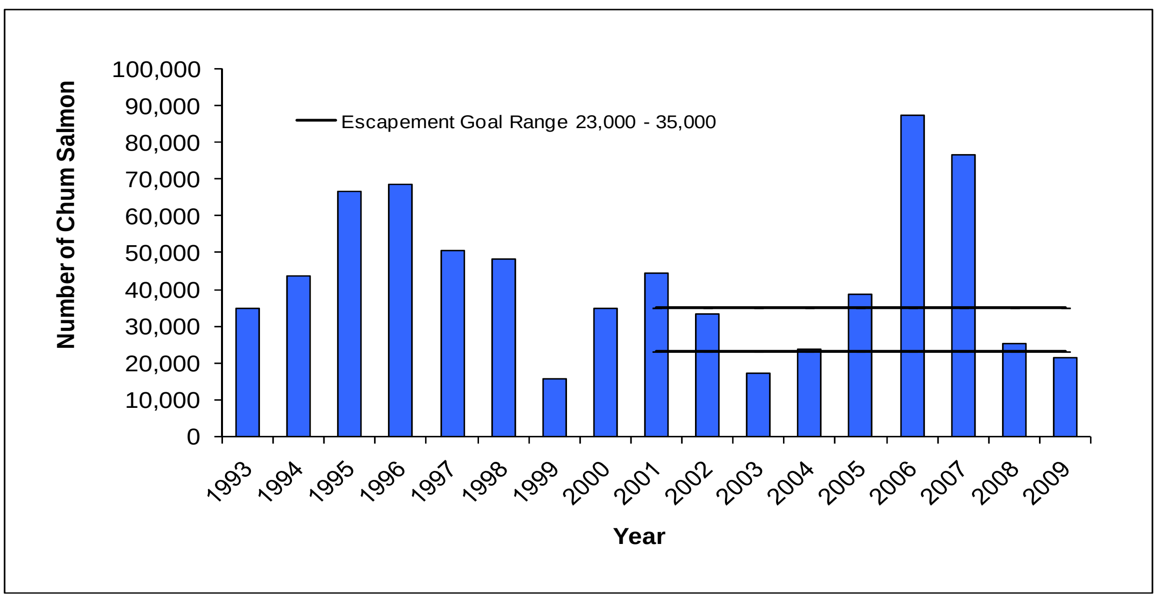

Figure 2.-Subdistrict 1estimated chum salmon escapement, 1993–2009, and in relation to the biological escapement goal range, 2001–2009.

Table 1. Subdistrict 1 chum salmon escapement, 1993–2009.

Year	Solomon River [a]	Bonanza River [a]	Flambeau River [a]	Sinuk River [a]	Eldorado River [b]	Snake River [c]	Nome River [d]	Subdistrict Total
1993	2,525	3,007	6,103	6,052	9,048	2,115	5,925	34,775
1994	1,066	5,178	12,889	4,905	13,202	3,519	2,893	43,652
1995	2,106	11,182	16,474	9,464	18,955	4,395	5,093	67,669
1996	2,141	7,049	13,613	6,658	32,970	2,772	3,339	68,542
1997	2,111	4,140	9,455	9,212	14,302	6,184	5,147	50,551
1998	925	4,552	9,129	6,720	13,808	11,067	1,930	48,131
1999	637	2,304	637	6,370	4,218	484	1,048	15,698
2000	1,294	4,876	3,947	7,198	11,617	1,911	4,056	34,899
2001	1,949	4,745	10,465	10,718	11,635	2,182	2,859	44,553
2002	2,150	3,199	6,804	6,333	10,243	2,776	1,720	33,225
2003	806	1,664	3,380	3,482	3,591	2,201	1,957	17,081
2004	1,436	2,166	7,667	3,197	3,273	2,145	3,903	23,787
2005	1,914	5,534	7,692	4,710	10,426	2,948	5,584	38,808
2006	2,062	708	27,828	4,834	41,985	4,128	5,677	87,222
2007	3,469	8,491	12,006	16,481	21,312	8,147	7,084	76,990
2008 [e]	1,000	1,000	11,618	1,000	6,746	1,244	2,607	25,215
2009	918	6,744	4,075	2,232	4,943	891	1,565	21,368
2005-2009 avg.	1,873	4,495	12,644	5,851	17,082	3,472	4,503	49,921
2000-2009 avg.	1,700	3,913	9,548	6,019	12,577	2,857	3,701	40,315

[a] The Bonanza, Flambeau, Sinuk and Solomon Rivers escapement estimate is obtained by expanded aerial survey counts and expanding by calculation from Clark, J.H. 2001.

[b] The Eldorado River escapement estimate is the same method as in Clark, J.H. 2001 for 1993-1996. From 1997 - 2002 escapement estimates are from counting tower and from 2003-2009 by weir.

[c] The Snake River escapement estimate is the same method as in Clark, J.H. 2001 for 1993-1994. From 1995 - 2002 escapement estimates are from counting tower and from 2003-2009 by weir.

[d] The Nome River escapement estimate is the same method as in Clark, J.H. 2001 for 1993. From 1994-1995 escapement estimates are from counting tower and from 1996 – 2009 by weir.

[e] A huge pink salmon run prevented surveyors from estimating chum salmon in the Solomon, Bonanza and Sinuk rivers; escapement was conservatively listed at 1,000 chum salmon for each river, but based on historical data was likely higher.

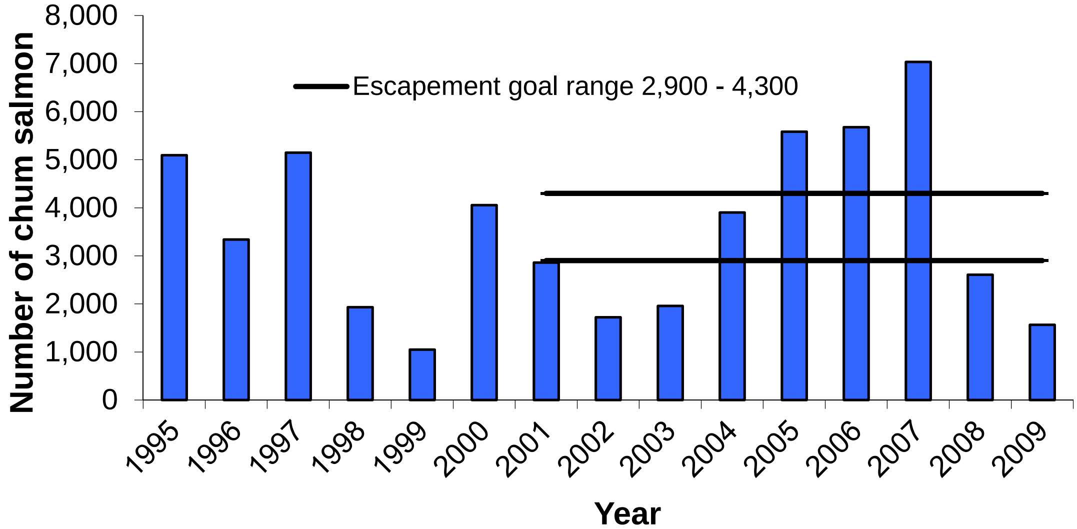

Figure 3. Nome River estimated chum salmon escapement, 1995–2009, and in relation to the sustainable escapement goal, 2001–2009.

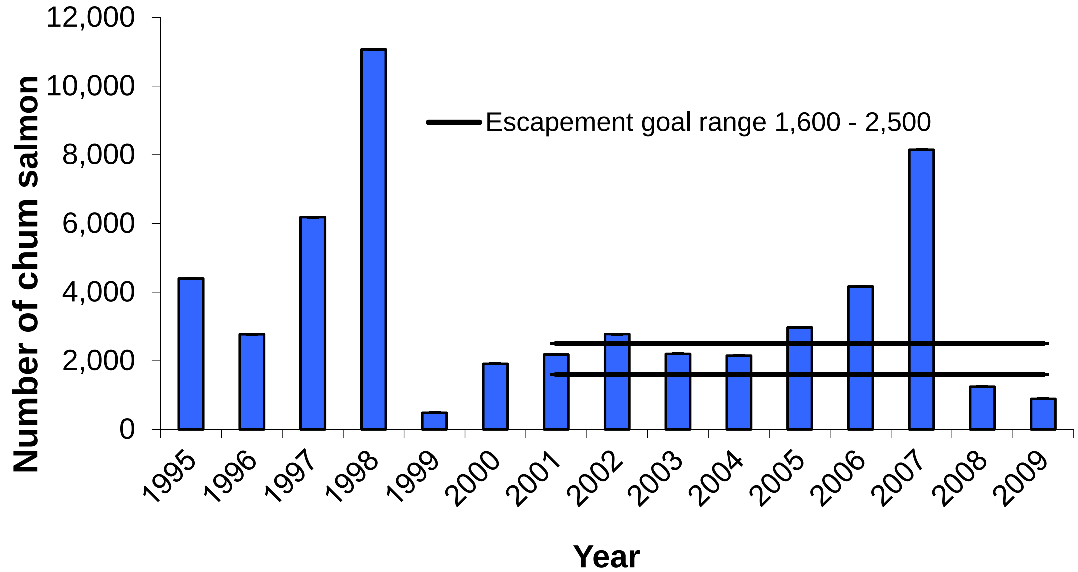

Figure 4. Snake River estimated chum salmon escapement,1995–2009, and in relation to the sustainable escapement goal, 2001–2009.

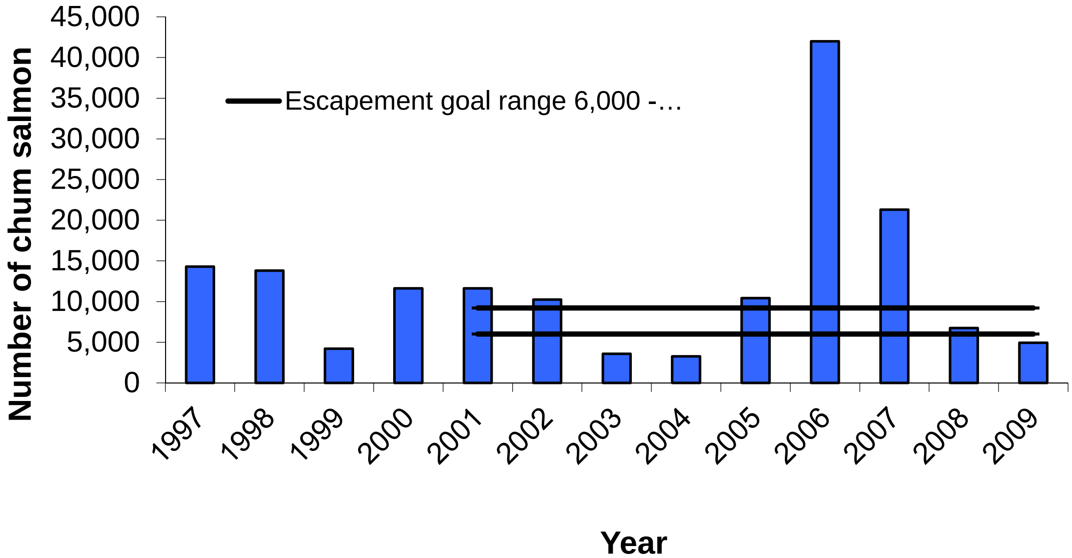

Figure 5. Eldorado River estimated chum salmon escapement, 1997–2009, and in relation to the sustainable escapement goal, 2001–2009.

Niukluk River in Subdistrict 2 exceeded the SEG in 2007, and was close to the goal in 2006. There has been a decreasing trend in escapement since the project was established in 1995 (Table 2, Figure 6).

Table 2.-Historical salmon migration passed Niukluk River counting tower, 1995–2009.

Year	Operating period	Chum	Pink	Chinook	Coho
1995	June 29 - Sept 12	86,332	17,088	123	4,713
1996	June 23 - Sept 12	80,178	1,154,922	243	12,781
1997	June 28 - Sept 09	57,305	10,468	259	3,994
1998	July 04 - Aug 09	45,588	1,624,438	260	840
1999	June 04 - Sept 04	35,239	20,351	40	4,260
2000	July 04 - Aug 27	29,573	961,603	48	11,382
2001	July 10 - Sept 08	30,662	41,625	30	3,468
2002	June 25 - Sept 10	35,307	645,141	621	7,391
2003	June 25 - Sept 10	20,018	75,855	179	1,282
2004	June 25 - Sept 08	10,770	975,895	141	2,064
2005	June 28 - Sept 09	25,598	270,424	41	2,727
2006	June 26 - Sept 08	29,199	1,371,919	39	11,169
2007	July 01 - Sept 04	50,994	43,617	30	3,498
2008	July 01 - Sept 06	12,078	669,234	33	13,779
2009	July 03 - Sept 02	15,879	24,204	204	6,861
2005-2009 avg.		26,750	475,880	69	7,607

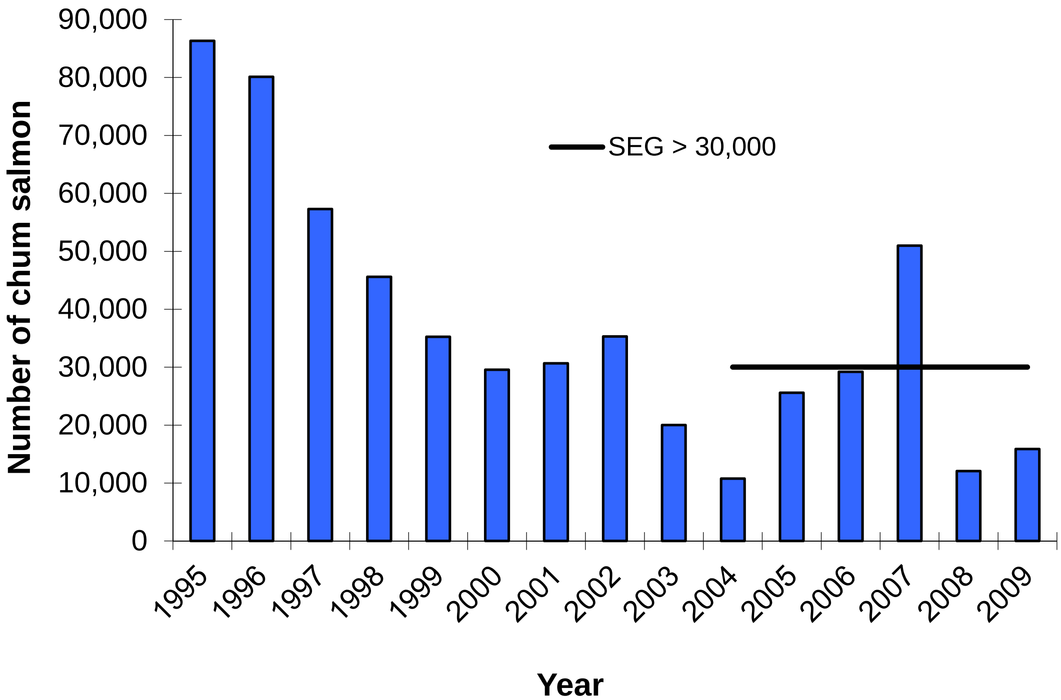

Figure 6. Niukluk River estimated chum slamon escapement, 1995–2009, and in relation to the sustainable escapement goal, 2004–2009.

Based on escapement counts from the Kwiniuk River counting tower project, the OEG for Subdistrict 3 of 11,500 to 23,000 chum salmon has been achieved or exceeded in 3 of the 5 recent years (2005–2009) (Table 3, Figure 7). The SEG for the Tubutulik chum salmon stock is 9,200 to 18,400 chum salmon as assessed by aerial surveys. It is difficult to determine if the SEG was achieved in most years because aerial surveys were often incomplete due to poor weather conditions or lack of aircraft. Another difficulty in surveying Tubutulik River beginning in 2004 was the huge numbers of pink salmon with the same rune timing as chum salmon. Pink salmon prevented accurate enumeration of chum salmon in 2004–2006 and in 2008. An aerial survey in 2009 counted 3,161 chum salmon on Tubutulik River. Overall, chum salmon runs in Subdistrict 3 have been lower in the 1990s and 2000s than in the 1980s based on Kwiniuk River escapements and reported harvests.

Table 3.-Historical salmon migration passed Kwiniuk counting tower, 1965–2009.

Year	Chum	Pink	Chinook	Coho
1965	32,861	8,668	19	
1966	32,786	10,629	7	
1967	26,661	3,587	13	
1968	19,976	129,052	27	
1969	19,687	56,683	12	
1970	66,604	226,831		
1971	38,679	16,634		
1972	30,686	62,461	65	
1973	28,029	37,070	57	
1974	35,161	39,375	62	
1975	14,049	55,293	44	
1976	8,508	35,226	12	
1977	21,798	47,934		
1978	11,049	70,148		
1979	12,355	167,492	107	
1980	19,374	319,363	177	
1981	34,565	566,534	136	
1982	44,099	469,674	138	
1983	56,907	251,965	267	
1984	54,043	736,544	736 [a]	
1985	9,013	18,237	955	
1986	24,700	241,446	654	
1987	16,133	5,566	317	
1988	13,303	187,907	321	
1989	14,529	27,488	248	
1990	13,957	416,512	900	
1991	19,801	53,499	708	
1992	12,077	1,464,716	479	
1993	15,824	43,063	600	
1994	33,012	2,303,114	625	2,547
1995	42,500	17,511	498	114
1996	28,493	907,893	577	461
1997	20,119	9,535	974	
1998	24,247	655,934	303	
1999	8,763	607	116	
2000	12,879	750,173	144	41
2001	16,598	8,423	261	9,532
2002	37,995	1,114,410	778	6,459
2003	12,123	22,329	744	5,490
2004	10,362	3,054,684	663	11,240
2005	12,083	341,048	342	12,950
2006	39,519	1,347,090	195	22,341
2007	27,756	54,255	258	9,429
2008	9,462	1,442,246	237	10,461
2009	8,733	42,957	444	8,563
2005-2009 avg.	19,511	645,519	295	12,749

[a] Chinook salmon counts from 1965-1984 were not expanded; counts in 1985 and after were expanded.

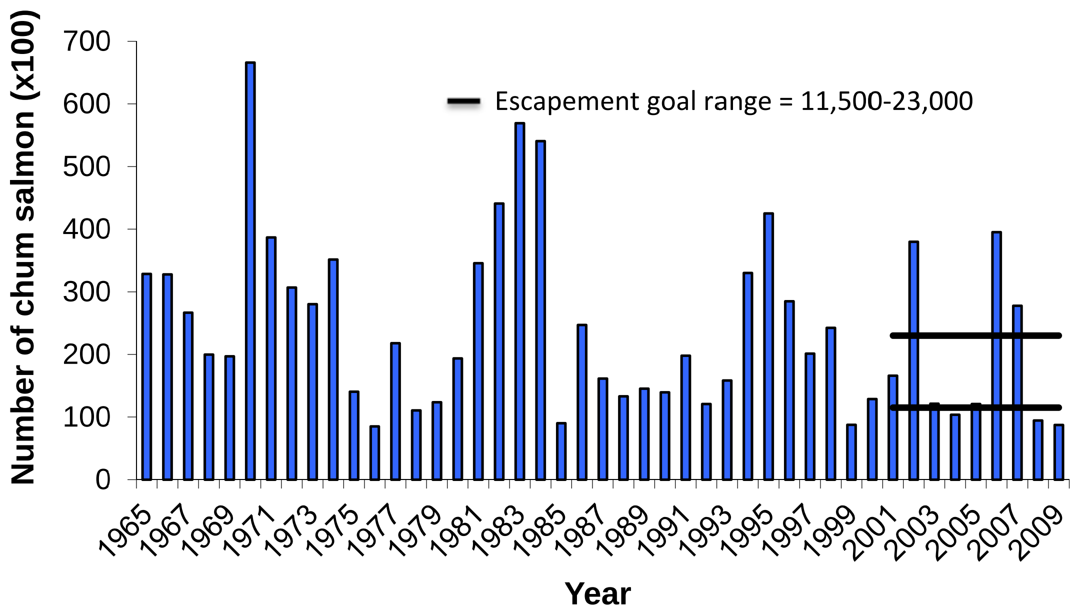

Figure 7. Kwiniuk River estimated chum salmon escapement, 1965–2009, and in relation to the optimal escapement goal range, 2001–2009.

Escapement Goals
Current Subdistrict 1 SEGs and district-wide BEG are as follows:

River	Enumeration Method	Goal	Type
Eldorado River	Weir	6,000-9,000	SEG
Nome River	Weir	2,900-4,300	SEG
Snake River	Weir	1,600-2,500	SEG
Subdistrict 1	Multiple	23,000-35,000	BEG

In 2001, ADF&G established a BEG for Subdistrict 1 chum salmon of 23,000–35,000 fish (Clark 2001). At this time, SEGs were also established for the major rivers within the subdistrict. Nome, Snake, and Eldorado Rivers used weirs and towers to assess escapement while the other 4 river systems relied on expanded aerial surveys to obtain escapement estimates. In 2009, ADF&G eliminated the SEGs on those rivers using expanded aerial surveys yet maintained aerial surveys to help obtain information to assess the overall escapement to Subdistrict 1 in relation to the BEG.

There is no district-wide escapement goal for Subdistrict 2 (Volk et al 2009). However, in 2005, an SEG of >30,000 chum salmon passed the Niukluk River counting tower was established; in 2010 ADF&G lowered the SEG threshold to > 23,000 chum salmon passed the counting tower.

In Subdistrict 3, there are two major river drainages, Kwiniuk and Tubutulik Rivers with biological escapement goals (BEG) of 10,000–20,000 and 8,000–16,000 chum salmon, respectively. In January 2001, the BOF established optimal escapement goal (OEG) ranges for chum salmon in Kwiniuk River and Tubutulik River by adding an additional 15% to the BEG range to account for subsistence harvests that may occur above the tower site.

Maturity

In Subdistrict 1, the Nome, Snake, and Eldorado Rivers have had age, sex, and length (ASL) data collected consistently from escapement since 2001. The 9-year average (2001–2009) age composition of escapement is dominated by 4 and 5-year old chum salmon.

	Age				
River	0.2	0.3	0.4	0.5	0.6
Nome River	0.026	0.530	0.412	0.031	5.56E-04
Snake River	0.016	0.537	0.410	0.037	0.00E+00
Eldorado River	0.027	0.520	0.424	0.029	4.44E-04

In Subdistrict 2, the Niukluk River escapement has been monitored since 1995. The 10-year (2000–2009) average age composition of escapement is dominated by 4 and 5-year old chum salmon.

	Age				
	0.2	0.3	0.4	0.5	0.6
Niukluk River	0.024	0.521	0.428	0.026	2.510E-04

In Subdistrict 3, the Kwiniuk River escapement has been monitored since 1965. The 10-year (2000–2009) average age composition is dominated by 4 and 5-year old chum salmon.

	Age				
	0.2	0.3	0.4	0.5	0.6
Kwiniuk River	0.051	0.490	0.441	0.019	0.000

Harvest

There has been no commercial harvest of chum salmon in Subdistrict 1 since 1996 and subsistence harvest has been diminishing since the 1980s (Figure 8). The average subsistence harvest of 1,636 chum salmon for 1990–2009 was less than one half the average subsistence harvests of 4,645 chum salmon for the previous twenty years (1970–1989). Contributing to this decrease were low runs and increasing subsistence restrictions. However, even with fishing closures, escapements did not increase in the late 1990s and early 2000s in response to less fishing pressure. In recent years, chum salmon runs have started increasing, yet subsistence harvests remain low in large part due to a preference for pink and coho salmon by subsistence users.

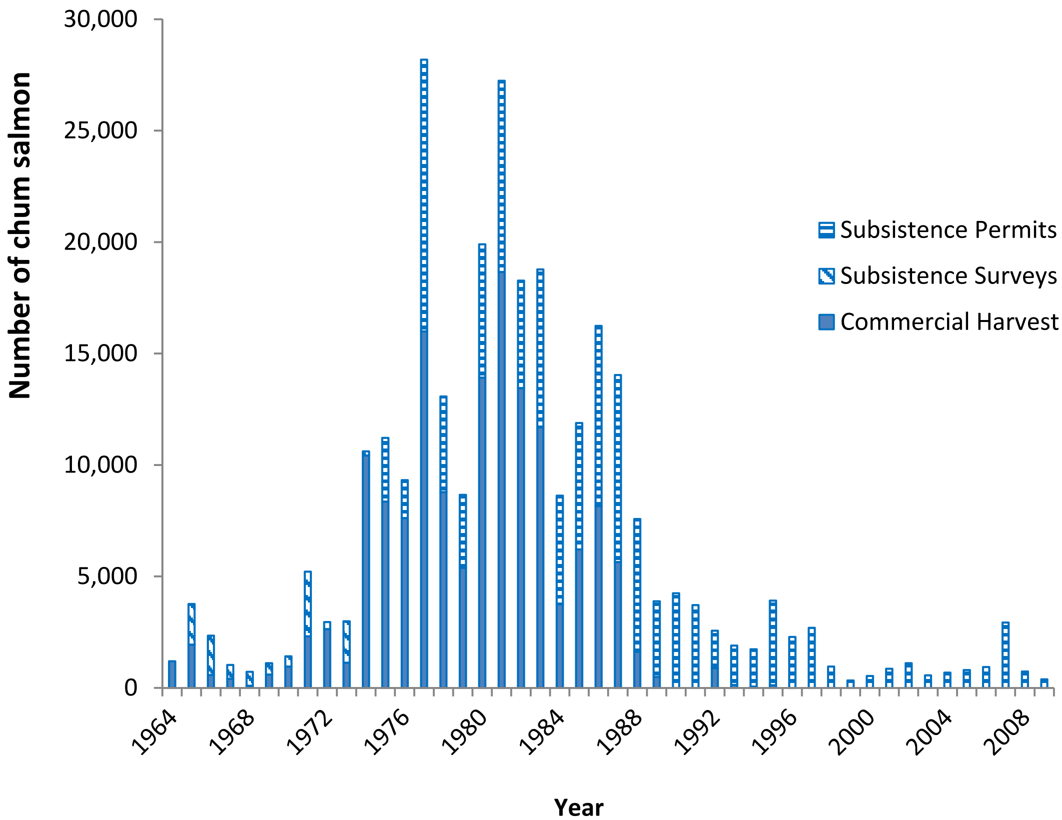

Figure 8. Nome Subdistrict commercial and subsistence chum salmon harvest, 1964–2009.

In Subdistricts 2 and 3, chum salmon harvests in the 2000s have been very minimal. In Subdistrict 2, chum salmon harvests averaged 1,767 fish from 2005 through 2009, only slightly more than one half the previous 10-year (1995–2004) average subsistence harvest of 3,237 chum salmon (Figure 9). In Subdistrict 3, an average of 1,216 chum salmon were harvested for subsistence from 2005 through 2009, slightly less than the previous 10-year (1995–2004) average subsistence harvest of 1,617 chum salmon (Figure 10). In most years since 2003, chum salmon runs have been insufficient to allow for a commercial harvest in Subdistricts 2 and 3. However, in 2007 there was a large surplus of chum salmon, but the buyer was only able to purchase fish in Subdistrict 3.

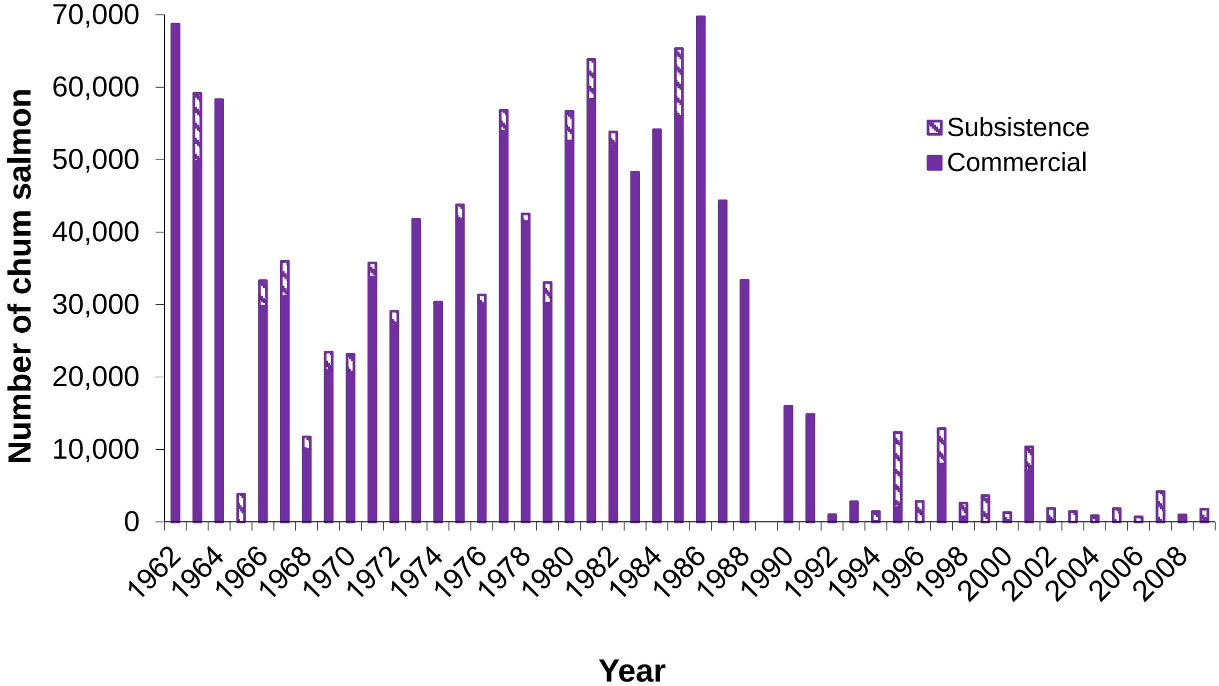

Figure 9. Subdistrict 2 commercial and subsistence chum salmon harvest, 1961–2009.

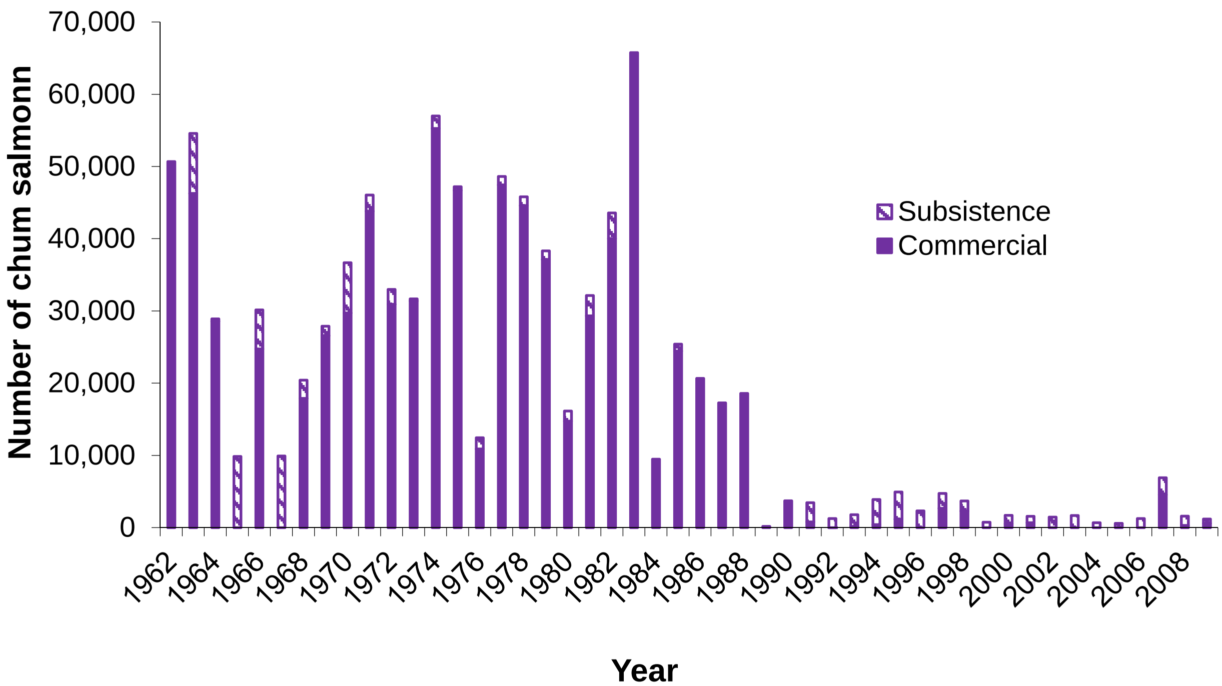

Figure 10. Subdistrict 3 commercial and subsistence chum salmon harvest, 1962–2009.

Exploitation Rates

Exploitation rates in Subdistrict 1 have declined since the early 1990s (Figure 11) and dropped from an average of 3.5% (1993–2004) to an average of 2.3% in the last 5 years (2005–2009). In Subdistrict 2, the exploitation rate has been more consistent in the 2000s then earlier years and has been trending up since 2007 (Figure 11) yet it has dropped from an average of 3.1% (1995–2004) to an average of 2.1 (2004–2009). The exploitation rate in Subdistrict 3 peaked in the late 1990s and has been decreasing since (Figure 11) with an average exploitation rate of 2.5% (2005–2009) down from 3.8% (1994–2004). These harvest rates are low in comparison to exploitation rates exerted on most Alaska salmon populations and primarily reflect low runs and lack of commercial markets during larger runs.

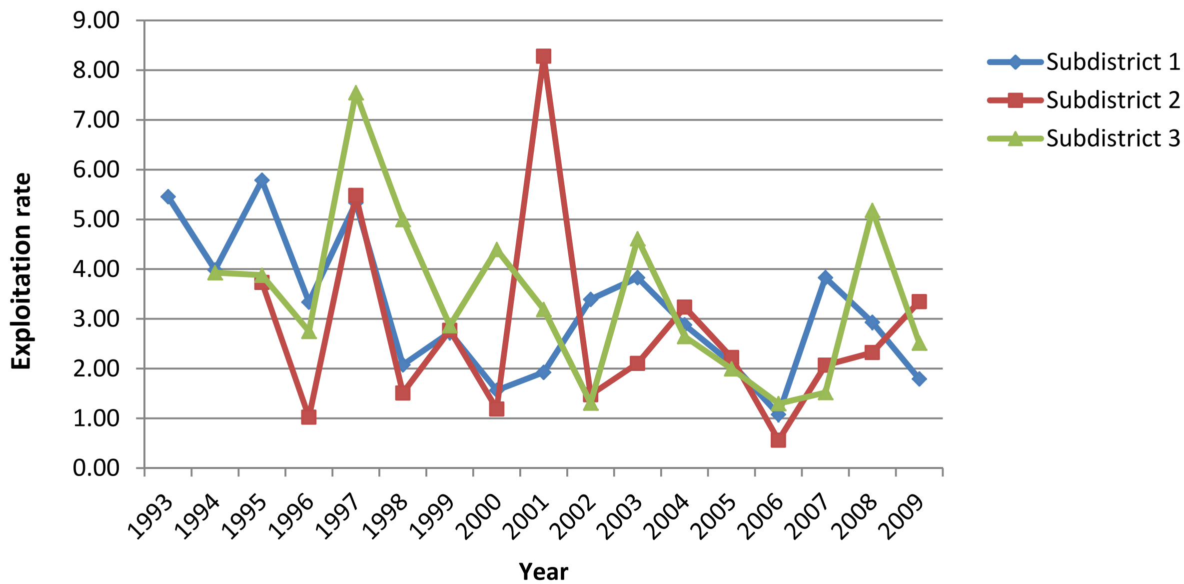

Figure 11. Exploitation rates in Subdistrict 1, 1993–2009; Subdistrict 2, 1995–2009; and Subdistrict 3, 1994–2009.

Outlook

Norton Sound Subdistricts 1–3 have no formal forecast for salmon returns. Broad expectations are developed based on parent-year escapements and recent year trends. The 2011 outlook and management plan will be available Spring 2011.

5.2.5.2 Eastern Norton Sound chum salmon

Eastern Norton Sound includes Subdistricts 4, 5, and 6 (Figure 1) and the majority of the chum salmon run comes from the Koyuk, Inglutalik, and Ungalik Rivers in Subdistrict 4, Shaktoolik River in Subdistrict 5 and Unalakleet River in Subdistrict 6. Aerial surveys are used to assess chum salmon escapements in Subdistricts 4 and 5. In Subdistrict 6, chum salmon escapement is assessed using a test fishery on the Unalakleet River and a counting tower on the North River, a tributary of the Unalakleet River. Commercial fisheries in Subdistricts 5 and 6 are managed concurrently according to test fishery and escapement indices in Subdistrict 6 because tagging studies conducted in the late 1970s showed an intermingling in near shore waters of chum salmon bound for both subdistricts. Subdistrict 4 is typically managed similar to Subdistricts 5 and 6 because they are believed to have similar trends in salmon run strength and timing; however there have been limited commercial fishing opportunities in Subdistrict 4.

Stock Assessment Background
Escapement
There are no escapement monitoring programs in Subdistricts 4 and 5. The historical average escapement as enumerated at the North River counting tower is 6,232 chum salmon and this has been exceeded 5 times in the last ten years (Table 4, Figure 12). Area managers estimate drainage-wide chum salmon escapement in the Unalakleet River by expanding North River tower chum salmon passage estimates using proportional abundance estimates determined from radiotelemetry investigations. The recent 5-year average (2005–2009) drainage-wide chum salmon escapement estimate of 69,591 chum salmon was 41% above the previous 9-year average (1996–2004) escapement estimate of 49,328 chum salmon (Table 5). Additionally, the number of chum salmon caught in 2008 and 2009 in the Unalakleet River test fishery was higher than in any other years over the 25 years the project has been operating (Table 6).

Year	Operating Period	Chum	Pink	Chinook	Coho
1972	July 07-July 28	2,332	54,934	561	
1973	June 29-July 23	4,334	26,542	298	
1974	June 25-July 17	826	143,789	196	
1984	June 25-July 28	2,915	458,387	2,844	
1985	June 27-Aug 31	4,567	4,360	1,426	2,045
1986	June 25-July 18	3,738	236,487	1,613	
1996	June 16-July 25	9,789	332,539	1,197	1,229
1997	June 16-Aug 21	6,904	127,926	4,185	5,768
1998	June 15-Aug 12	1,526	74,045	2,100	3,361
1999	June 30-Aug 31	5,600	48,993	1,639	4,792
2000	June 17-Aug 12	4,971	69,703	1,046	6,959
2001	July 05-Sept 15	6,515	24,737	1,337	12,383
2002	June 19-Aug 29	5,918	321,756	1,484	2,966
2003	June 15-Sept 13	9,859	280,212	1,452	5,837
2004	June 15-Sept 14	10,036	1,162,978	1,125	11,187
2005	June 15-Sept 15	11,984	1,670,934	1,015	19,189
2006	June 18-Sept 11	5,385	2,169,890	906	9,835
2007	June 16-Sept 05	8,151	580,929	1,948	19,965
2008	June 19-Sept 13	9,502	240,286	903	15,648
2009	June 19-Sept 11	9,783	189,939	2,352	22,266

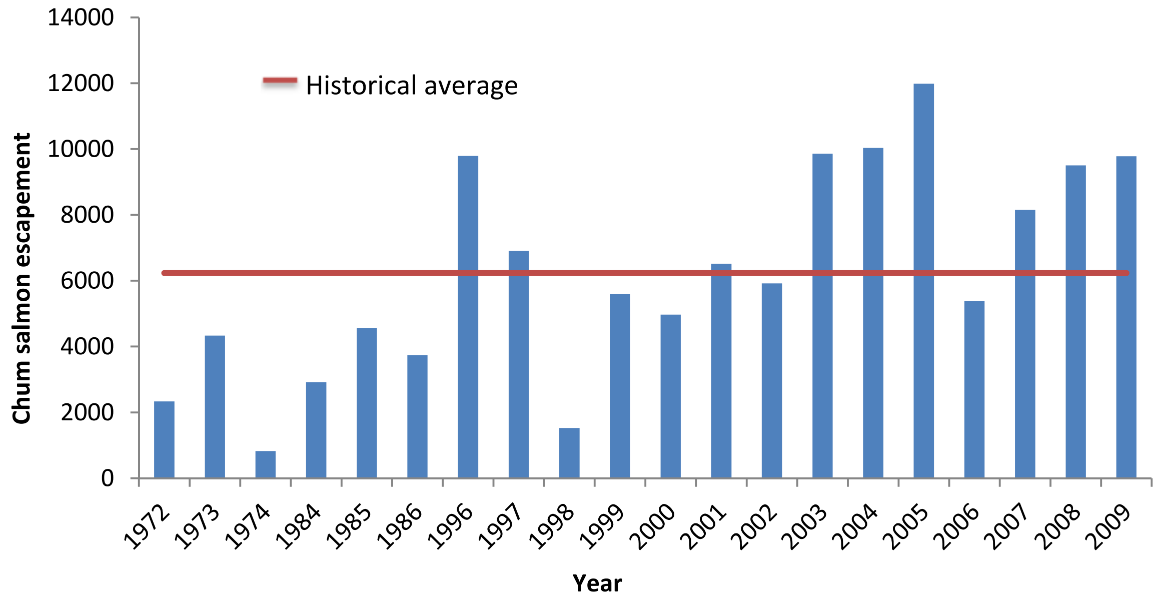

Figure 12. Chum salmon escapement passed the North River tower, 1972–2009.

Table 5. Historical salmon catches in the Unalakleet set gillnet test fishery, 1985–2009.

		Chinook		Chum		Coho	
Year	Dates of Operation	Total Catch	Midpoint Date	Total Catch	Midpoint Date	Total Catch	Midpoint Date
1985	6/05-9/21	193	7/08	916	7/10	206	8/21
1986	6/17-9/10	52	6/26	1,063	7/23	163	8/18
1987	6/20-9/08	52	7/07	707	7/22	149	8/27
1988	6/20-9/12	15	6/27	662	7/25	216	8/12
1989	6/13-9/12	50	6/19	856	7/11	232	8/16
1990	6/15-9/13	43	6/20	383	7/14	284	8/21
1991	6/10-9/10	36	6/24	834	7/27	177	8/26
1992	6/27-9/08	25	7/12	976	7/12	455	8/12
1993	6/08-9/08	94	6/26	700	7/29	156	8/24
1994	6/16-9/07	35	6/22	949	7/02	297	8/22
1995	6/05-9/11	99	6/20	1,212	7/11	213	8/14
1996	6/05-9/11	138	6/14	1,635	7/06	717	8/06
1997	6/05-9/10	202	6/27	832	7/16	197	8/12
1998	6/05-9/09	110	7/07	535	7/18	220	8/17
1999	6/05-9/08	63	7/08	1,022	7/27	206	8/23
2000	6/05-9/08	61	6/28	1,075	7/18	257	8/16
2001	6/15-9/07	79	7/04	645	7/09	219	8/15
2002	6/05-9/08	44	6/26	852	7/08	394	8/25
2003	6/02-9/08	25	7/02	458	7/30	267	8/24
2004	6/02-9/10	29	7/01	976	7/17	829	8/15
2005	6/04-9/08	78	6/23	1,209	7/10	1,080	8/19
2006	6/08-9/14	79	6/30	1,482	7/01	1,738	8/16
2007	6/04-9/09	96	6/29	978	7/15	1,087	8/06
2008	6/09-9/13	123	7/07	1,932	7/18	1,988	8/15
2009	6/08-9/11	135	6/28	1,687	7/18	2,104	8/18

Table 6. Estimated chum salmon escapement, total harvest, and total run compared to exploitation rates, Unalakleet River, 1984–1986, 1996–2009.

	Escapement		Total		
Year	North River	Unalakleet River Drainage[a]	Harvest [b]	Estimated Run Size	Exploitation Rate Percent
1984	2,915	21,123	46,665	67,788	68.8
1985	4,567	33,094	27,079	60,173	45.0
1986	3,738	27,087	30,239 [c]	57,326	52.7
1996 [d]	9,789	70,935	11,596	89,677	12.9
1997	6,904	50,029	18,742	59,277	31.6
1998	1,526	11,058	9,248	20,450	45.2
1999	5,600	40,580	9,392	46,280	20.3
2000	4,971	36,022	5,700	40,452	14.1
2001	6,515	47,210	4,430	51,426	8.6
2002	5,918	42,884	4,216	47,744	8.8
2003	9,859	71,442	4,860	78,520	6.2
2004	10,036	73,794	7,078	79,646	8.9
2005	11,984	118,653	5,852	128,086	4.6
2006	5,397	30,492	9,433	44,337	21.3
2007	8,151	59,066	13,845	79,519	17.4
2008	9,502	68,855	20,453	68,855	29.7
2009	9,783	70,891	23,614	94,505	25.0
Previous 9-yr Avg.	6,791	49,328	8,362	57,052	17.4
2005-2009 Avg.	8,963	69,591	14,639	83,060	19.6

[a] Drainage-wide escapement estimates for the 2004-2006 seasons calculated by expanding tower counts by North River proportional abundance estimates determined from radiotelemetry (0.136, 0.101, and 0.177, respectively). Drainage-wide escapements estimated for all other years by expanding tower counts by the average proportion (0.138) of chum salmon migrating into the North River, 2004-2006 (Estensen & Balland, *in prep*).

[b] Harvest includes commercial, subsistence, sport and Unalakleet River test fishery catches from 1984-1986 and 1996-2009.

[c] Subsistence harvest data unavailable in 1986 and was estimated by averaging subsistence harvest from 1981-1985.

[d] North River Tower not operational from 1987-1995.

Escapement Goals

There are no chum salmon escapement goals for Subdistricts 4 and 5. In Subdistrict 6, an aerial survey SEG of 2,400–4,800 chum salmon for Old Women River, in the upper Unalakleet River is the only established escapement goal. Additionally, drainage-wide escapement is estimated using North River chum salmon proportional abundance estimates determined by radiotelemetry during the 2004–2006 seasons. Drainage-wide chum salmon escapement estimates for the 2004–2006 seasons were calculated by dividing the North River tower chum salmon passage by the actual proportional abundance estimates for those years. The average North River abundance proportion (0.138) was used to expand North River tower chum salmon passage for years radiotelemetry work was not conducted.

Maturity

The age composition of chum salmon in Subdistrict 5 was calculated from commercial fisheries in 2002, 2004, 2006, and 2007–2009. The commercial fisheries are dominated by age-4 chum salmon.

	Age				
	0.2	0.3	0.4	0.5	0.6
Commercial	0.064	0.463	0.437	0.045	0.000

In Subdistrict 6 age composition is determined by age, sex, and length data collected during the test fishery and the commercial fisheries. The test fishery is dominated by 5-year old chum salmon while the commercial fishery is predominantly 4-year old chum salmon. The disparity of age between the test fishery and the commercial catch may highlight a bias in fishing gear; the 5 7/8-inch mesh deployed in the test fishery preferentially selects large male chum salmon in the 5 and 6-year old age classes.

	Age				
	0.2	0.3	0.4	0.5	0.6
Test Fish	0.022	0.445	0.499	0.034	0.001
Commercial	0.024	0.535	0.415	0.027	0.000

Harvest

Subdistrict 4 typically has difficulty attracting a buyer due to its remoteness and its reputation for watermarked fish. Improving market conditions allowed for commercial chum salmon fishing in Norton Bay in 2008 and 2009. Commercial chum salmon fishing has only occurred 6 times since 1987 and the harvest of 1,850 chum salmon in 2009 was the highest since 1988 (Table 7). A total of 7 permits holders participated at some time during the 2009 season compared to 4 permit holders in 2008. Subsistence harvest in Subdistrict 4 was not assessed from 2004–2007 but shows a slight decreasing trend with an average harvest of 4,826 chum salmon in the 1990s to an average harvest of 3,840 chum salmon in the 2000s (Table 7).

Table 7. Commercial and subsistence salmon catch by species, by year in Norton Bay Subdistrict, Norton Sound District, 1962-2009.

Year	Commercial	Subsistence
1962	24380	-
1963	12469	-
1964	5916	-
1965	-	3032
1966	-	3612
1967	-	2945
1968	-	1872
1969	3974	3855
1970		3500
1971	-	2619
1972	7799	2022
1973	4672	130
1974	3826	900
1975	17385	361
1976	7161	236
1977	13563	2055
1978	21973	1060
1979	15599	1400
1980	7855	1132
1981	3111	3515
1982	7128	2485
1983	17157	[a]
1984	3442	[a]
1985	9948	[a]
1986	1994	[a]
1987	3586	[a]
1988	7521	[a]
1989	-	[a]
1990	0	[a]
1991	0	[a]
1992	1787	[a]
1993	1378	[a]
1994 [b]	0	4581
1995 [b]	0	5828
1996 [b]	0	4161
1997 [b]	531	4040
1998 [b]	0	6192
1999 [b]	0	4153
2000 [b]	0	4714
2001 [b]	0	4445
2002 [b]	0	3971
2003 [b]	0	3397
2004	0	[a]
2005	0	[a]
2006	0	[a]
2007	0	[a]
2008	507	3330
2009	1850	3183

[a] Subsistence surveys were not conducted.

[b] Subsistence harvests were estimated from Division of Subsistence surveys.

In Subdistrict 5, the majority of chum salmon are taken in the commercial fishery; there is little subsistence harvest. There has been a trend of increasing commercial harvest since 2006. The 2009 commercial harvest was 10,915 chum salmon, well above the recent 5-year (2004–2008) average of 3,520 fish (Figure 13).

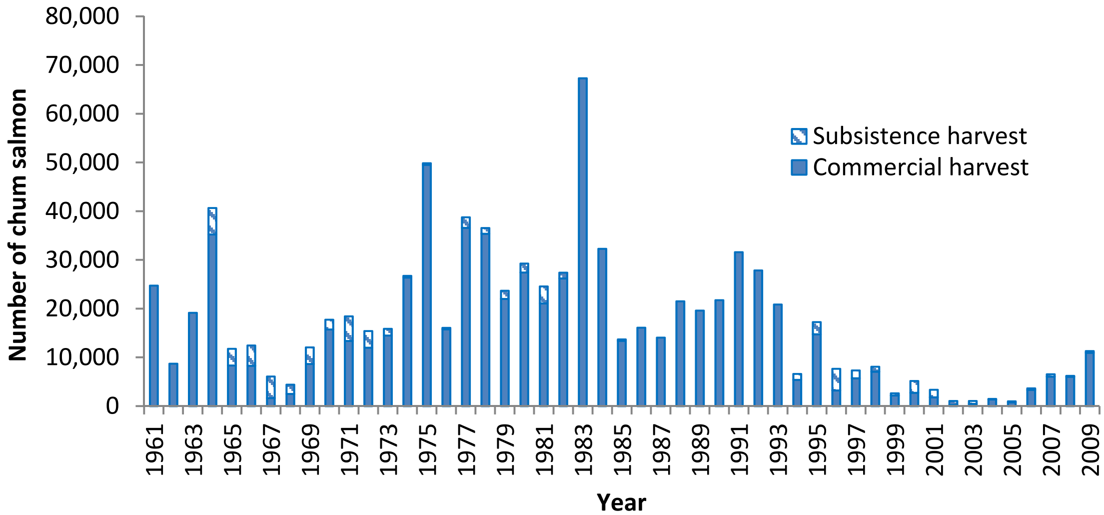

Figure 13. Commercial and subsistence chum salmon harvest in Subdistrict 5, 1961–2009.

In Subdistrict 6, commercial harvest is also showing an increase since 2006. The commercial harvest in 2009 of 20,647 chum salmon was well above the most recent 5-year (2004–2008) average of 8,855 fish. Subsistence harvest has remained relatively consistent since 2004 but has decreased slightly with an average harvest of 2,668 chum salmon in the 2000s down from an average of 3,557 chum salmon harvested in the 1990s (Figure 14).

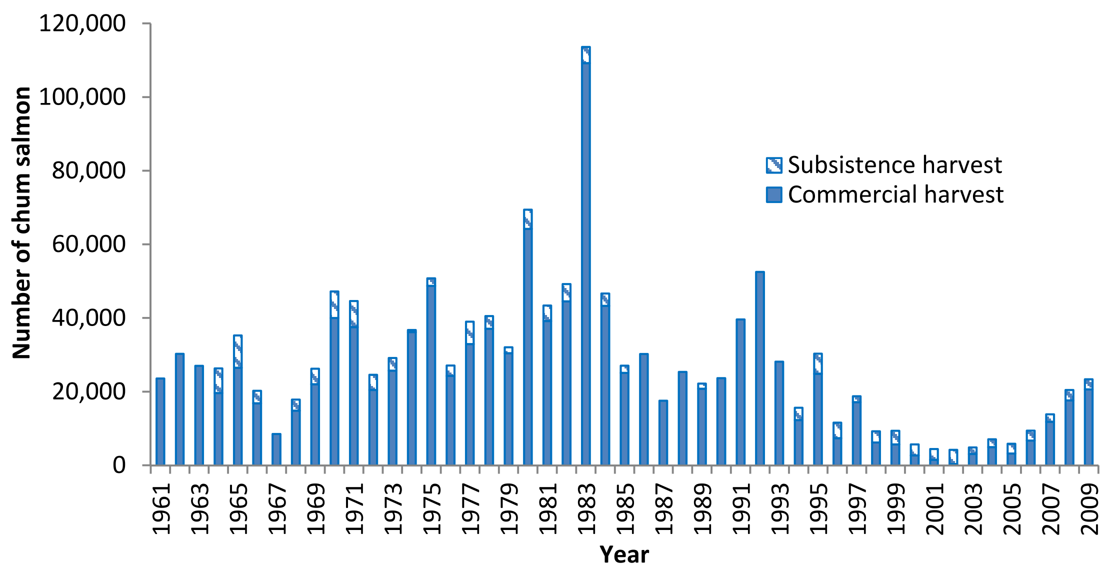

Figure 14. Commercial and subsistence chum salmon harvest in Subdistrict 6, 1961–2009.

Exploitation Rates

There are no complete escapement estimates for Subdistricts 4 and 5 hence it is not possible to calculate exploitation rates for these subdistricts. The exploitation rate of chum salmon in Subdistrict 6 is calculated using the drainage-wide escapement estimate and harvest. There is an increasing trend in exploitation since the early 2000s yet it is still well below the 1998 exploitation rate of 45% (Figure 15).

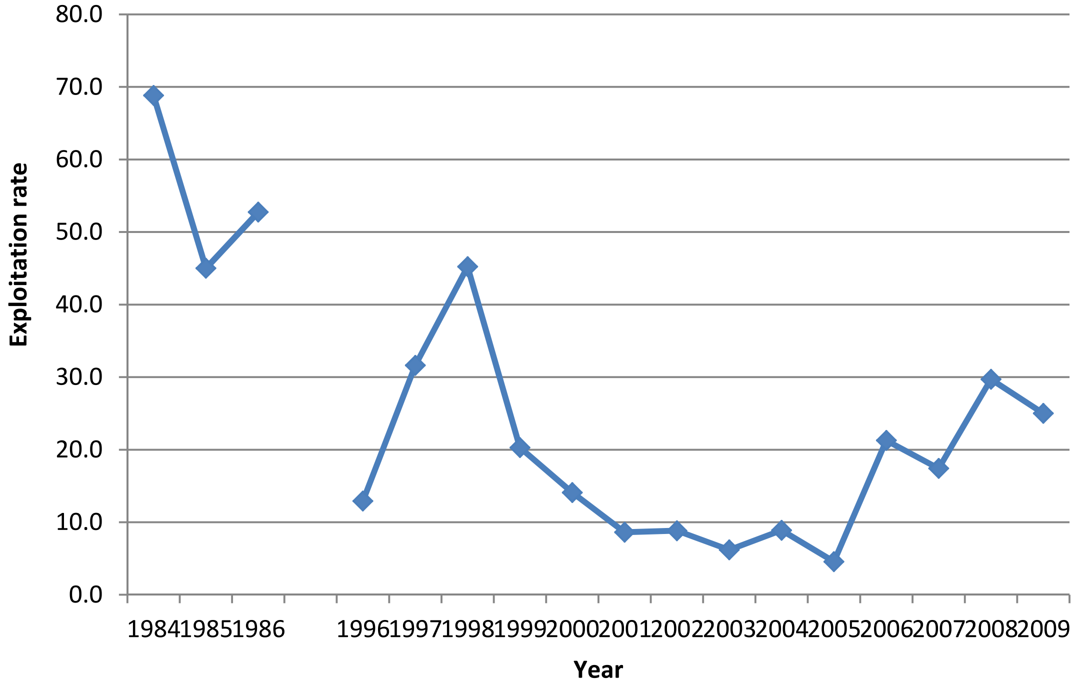

Figure 15.-Exploitation rate of chum salmon in Subdistrict 6, Norton Sound, 1984–2009. Note: No data are available for 1987–1995.

Outlook

Norton Sound Subdistricts 4–6 have no formal forecast for salmon returns. Broad expectations are developed based on parent-year escapements and recent year trends. The 2011 outlook and management plan will be available spring 2011.

5.2.6 Kotzebue

Kotzebue Sound District encompasses all waters from Point Hope to Cape Prince of Wales, including those waters draining into the Chukchi Sea (Figure 16). Salmon, saffron cod, whitefish, and herring are the major subsistence species. There are two rivers in the Kotzebue area providing the majority of chum salmon, the Kobuk River and Noatak River.

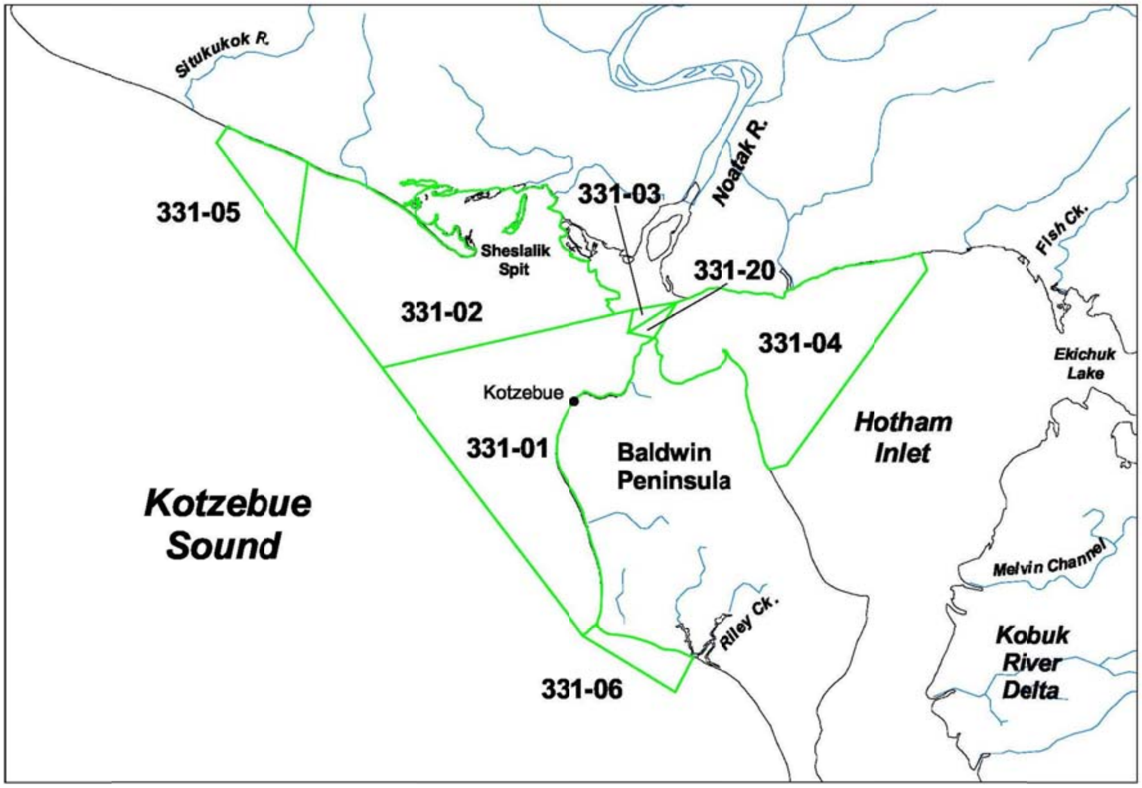

Figure 16.-Kotzebue Sound commercial fishing Subdistricts.

Kotzebue Sound District supports the northernmost commercial salmon fishery in Alaska and is divided into three subdistricts and Subdistrict 1 is where commercial salmon fishing may occur (Figure 16). Commercial fishing began in 1962 harvesting primarily chum salmon and in recent years has been limited by processing capacity. The commercial fishing season is opened by ADF&G for set periods and the buyer recommends adjustments fishing period length based on processing capacity.

Subsistence salmon fishing in Kotzebue Sound District is important, but fish abundance and fishing activities vary between communities. Along the Noatak and Kobuk Rivers where chum salmon runs are strong, household subsistence activities in middle and late summer revolve around catching, drying, and storing salmon. In southern Kotzebue Sound other fish species may be taken for subsistence because salmon are not abundant. Additionally, fishermen may base fishing effort out of the village or move seasonally to fish camps.

The department operates a test fish project near the village of Kiana, approximately 75 miles upstream of the Kobuk River mouth. The department also attempts to conduct test fishing on the Noatak River to obtain age, sex and length composition. Aerial surveys are infrequent on the Kobuk and Noatak Rivers because of poor weather conditions and occur every several years.

Stock Assessment Background

Escapement

Escapement for the Kotzebue Subdistrict is determined with aerial survey SEGs within the two major river drainages and a district-wide BEG. In years when surveys were conducted, the lower SEGs for the Noatak and Kobuk Rivers were exceeded about half the time. Additionally, the upper SEG for the Kobuk River drainage was exceeded in 2008 and 2009 while the upper SEG for the Noatak River drainage was surpassed in 2008 (Figure 17). The test fishery on the Kobuk River has been conducted since 1993. The index of 971 chum salmon caught in the test fishery for 2009 was slightly below the 10-year average of 1,202 chum salmon (Table 8, Figure 18).

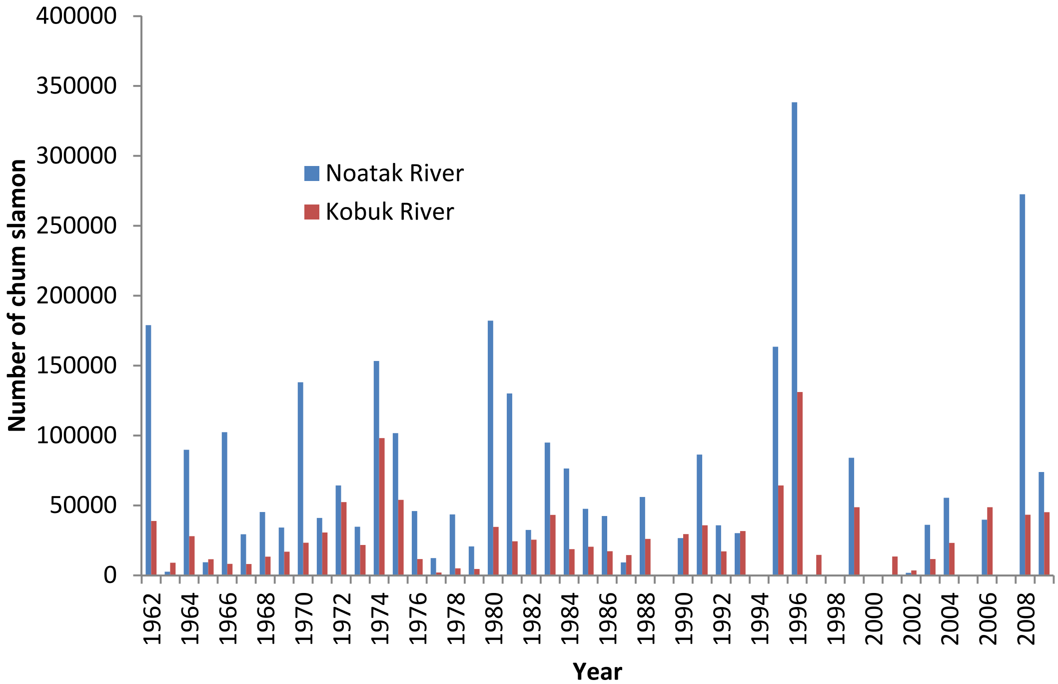

Figure 17. Chum salmon escapement in to the Noatak and Kobuk River drainages in Kotzebue Sound District determined by aerial surveys, 1962–2009. Note: Foot surveys were conducted in 1962 and 1968; blanks represent years with no surveys or poor survey conditions.

Year	Dates of Operation	Number of Drifts	Cumulative CPUE[a]	Midpoint Date
1993	7/12-8/12	164	494	8/03
1994	7/13-8/30	248	1,207	8/04
1995	7/12-8/16	196	1,188	8/02
1996	7/09-8/14	208	2,581	7/31
1997	7/09-8/14	202	797	8/03
1998	7/10-8/15	182	538	7/29
1999	7/11-8/13	176	1,357	8/02
2000	7/07-8/14	228	1,481	8/01
2001	7/05-8/13	232	1,575	7/26
2002	7/05-8/12	218	875	7/23
2003	7/09-8/13	214	749	8/02
2004	7/02-8/12	242	855	8/05
2005	7/07-8/15	207	1,207	8/06
2006	7/07-8/19	217	743	8/16
2007	7/11-8/20	207	1,342	8/09
2008	7/09-8/14	200	2,269	7/30
2009	7/10-8/20	242	971	8/06

[a] Cumulative CPUE is calculated as the sum of daily CPUE during the period of data collection, and daily CPUE (I) is calculated as the number of fish that would have been caught if 100 fathoms of gillnet had been fished for 60 minutes.
I = (6,000 * c) / l * t, where c = number of chum salmon caught,
l = length of gillnet in fathoms, and t = mean fishing time in minutes.

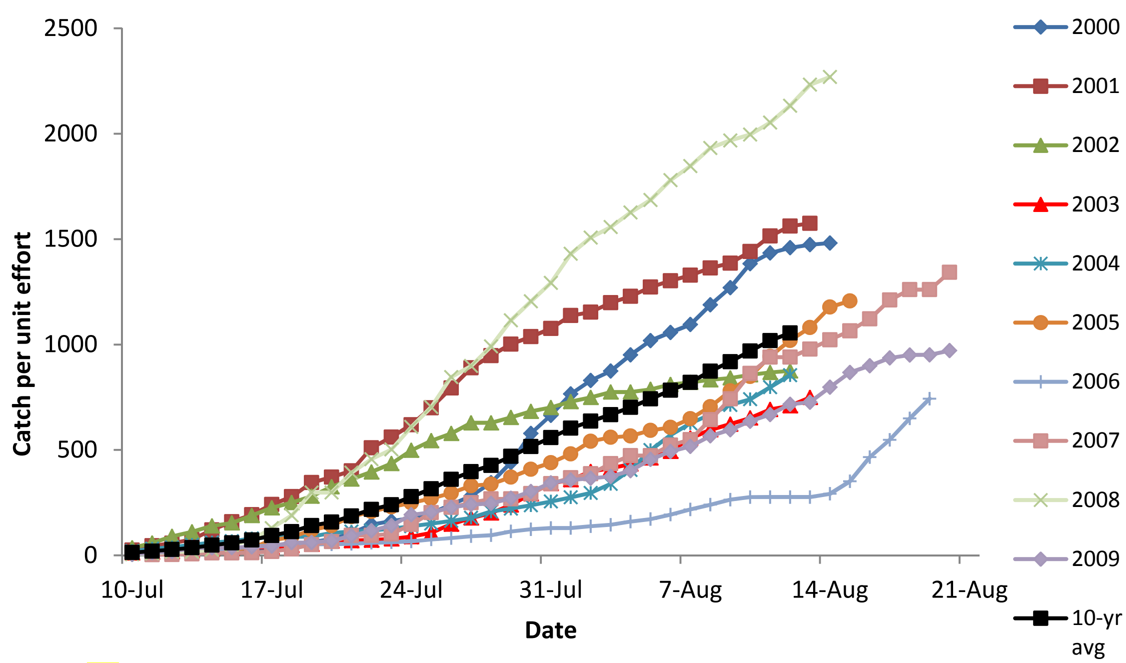

Figure 18. Catch per unit effort of chum salmon from the Kobuk River test fishery, 2000–2009.

Escapement Goals

Chum salmon escapement goals were established in 2007 for the Kotzebue area. All goals are determined from aerial surveys.

River	Enumeration method	Goal	Type
Noatak/Eli Rivers	Aerial Survey	42,000-91,000	SEG
Kobuk River drainage			
Salmon River	Aerial Survey	3,300-7,200	SEG
Squirrel River	Aerial Survey	4,900-10,500	SEG
Tutuksuk River	Aerial Survey	1,400-3,000	SEG
Upper Kobuk/Selby River	Aerial Survey	9,700-21,000	SEG
Kotzebue (all areas)	Expanded aerial survey	196,000-421,000	BEG

Maturity

The age composition of chum salmon from the Noatak River is obtained from a yearly test fishery. The average age composition (2001-2009) is dominated by 4-year old chum salmon.

	Age				
	0.2	0.3	0.4	0.5	0.6
Noatak River	0.064	0.605	0.290	0.035	0.006

	Age				
	0.2	0.3	0.4	0.5	0.6
Kobuk River	0.099	0.476	0.369	0.054	0.002

Age composition is also determined for the commercial chum fishery in Kotzebue Sound District. The 7-year (2003-2009) average age composition for the commercial fishery is dominated by 4-year old chum salmon.

	Age					
	0.2	0.3	0.4	0.5	0.6	0.7
Commercial	0.051	0.544	0.357	0.045	0.002	0.001

Harvest

Commercial harvest in Kotzebue Sound District has been limited because of processor capacity and is slowly recovering since not having a local buyer in 2002–2003. The 2009 harvest of 187,000 chum salmon was well above the average harvest of 119,000 in the 2000s but is still well below harvests in the 1980s which averaged close to 300,000 fish. The number of fishing permits is also rebounding slightly with 62, the highest number since 2001 (Figure 19). Subsistence harvest is not available beyond 2004.

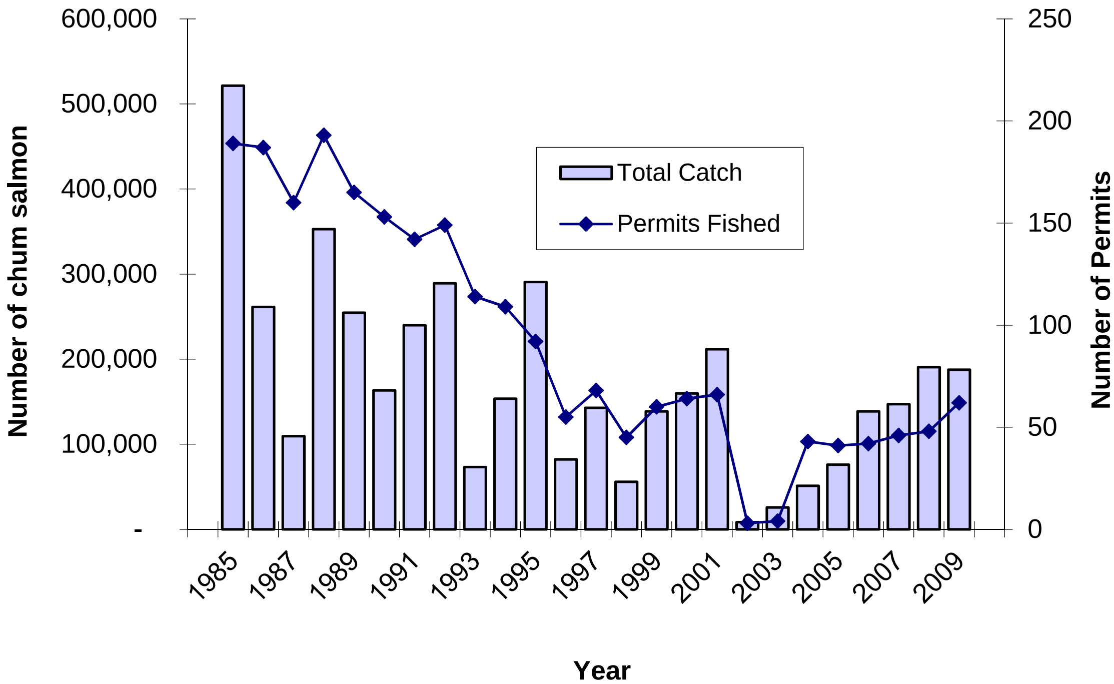

Figure 19. Kotzebue Sound commerical chum salmon harvest and permit fished, 1985–2009.

Exploitation Rates

There are no complete escapement estimates for the Kotzebue Sounds District; hence, it is not possible to calculate exploitation rates.

Outlook

Kotzebue Sound chum salmon fisheries have no formal forecast for salmon returns. Broad expectations are developed based on parent-year escapements and recent year trends. The 2011 outlook and management plan will be available Spring 2011.

5.2.7 Alaska Peninsula/Area M

The Alaska Peninsula Area (Area M) includes the waters of Alaska on the north side of the Alaska Peninsula, southwest of a line from Cape Menshikof (57º 28.34' N. lat., 157º 55.84' W. long.) to Cape Newenham (58º 39.00' N. lat., 162º W. long.) and east of the longitude of Cape Sarichef Light (164º 55.70' W. long.) and on the south side of the Alaska Peninsula, from a line extending from Scotch Cap through the easternmost tip of Ugamak Island to a line extending 135º southeast from Kupreanof Point (55º 33.98' N. lat., 159 º 35.88' W. long.; Figure 1). Area M is further divided into two management areas, the North Alaska management area and the South Alaska management area. The two management areas will be summarized separately.

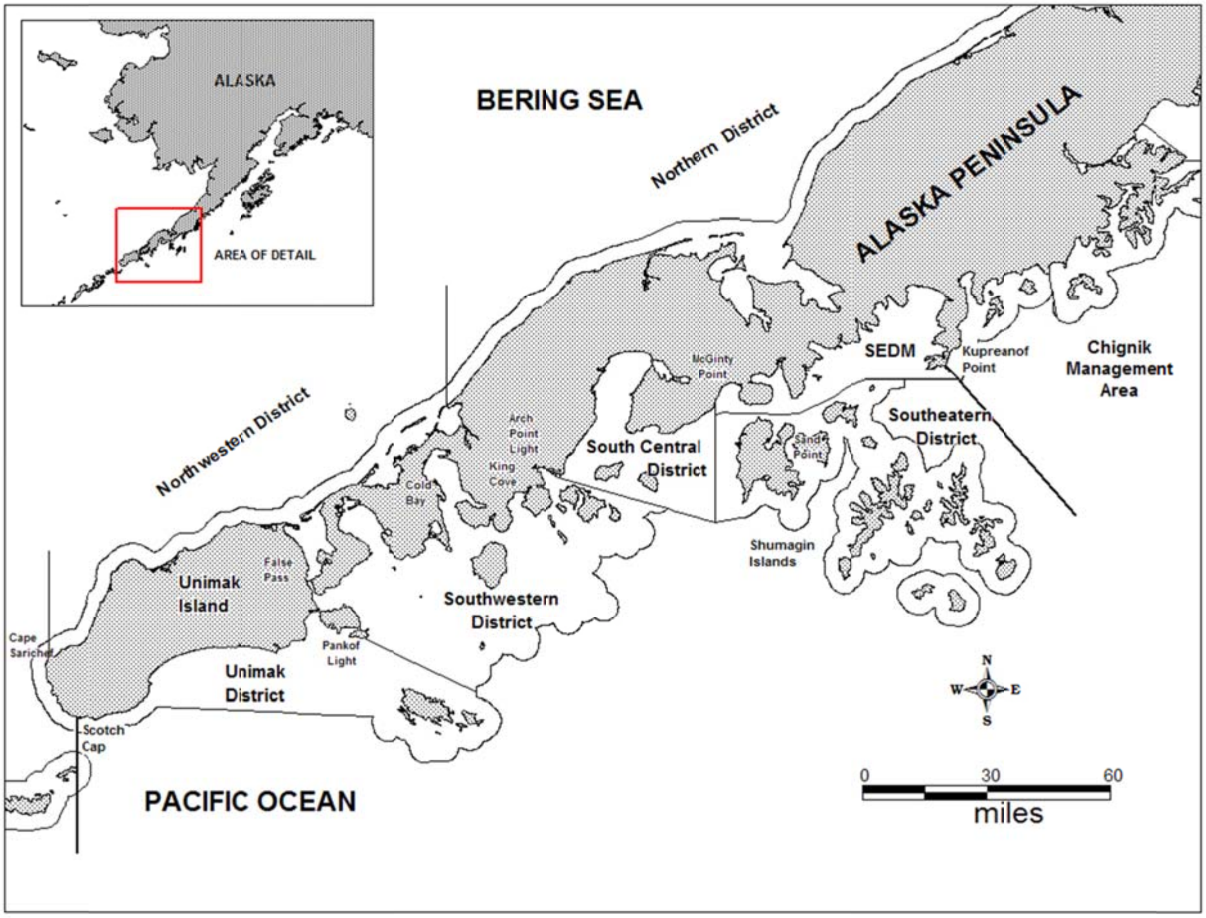

Figure 1. Alaska Peninsula/Area M identifying commercial salmon fishing districts.

Area M Escapement

Salmon migration or spawning has been documented in approximately 307 Area M streams. The South Peninsula has approximately 136 systems with chum salmon spawning populations while the North Peninsula has approximately73 systems with chum salmon spawning populations. A total of six stock-aggregate escapement goals have been established for chum salmon in Area M (Table 1). These stock-aggregate goals comprise the respective sums of aerial survey escapement objectives for 136 individual index streams (Honnold et al. 2007; Nelson and Lloyd 2001). Sixty-seven of these index streams are located along the South Peninsula and 69 are found along the North Peninsula.

North Peninsula Chum salmon Escapement

The North Alaska Peninsula has two chum salmon escapement goals, one for the entire Northern District and one for the entire Northwestern District (Figure 1). In 2009, the Northern District chum salmon escapement goal (119,600 to 239,200 fish; Honnold et al. 2007) was met when 154,131 fish were documented in Northern District streams (Table 1; Figure 2). The Northwestern District chum salmon escapement of 84,460 fish did not meet the goal of 100,000 to 215,000 fish, and was below the previous ten year average of 319,706 fish (Table 1; Figure 3; Honnold et al. 2007). The total North Alaska Peninsula estimated chum salmon escapement of 238,591 was below the previous ten year average of 569,630 fish.

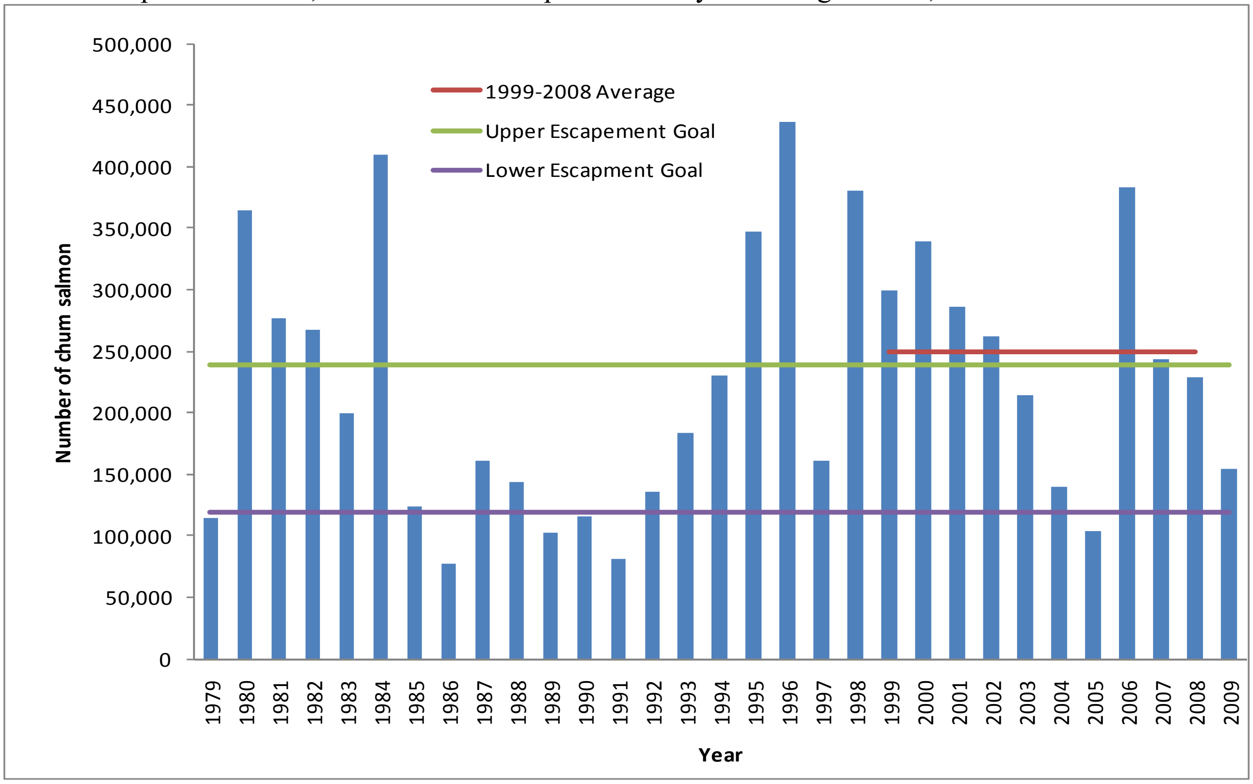

Figure 2. Northern District chum salmon escapement with comparison of upper and lower escapement goal and 10 year average, 1979-2009.

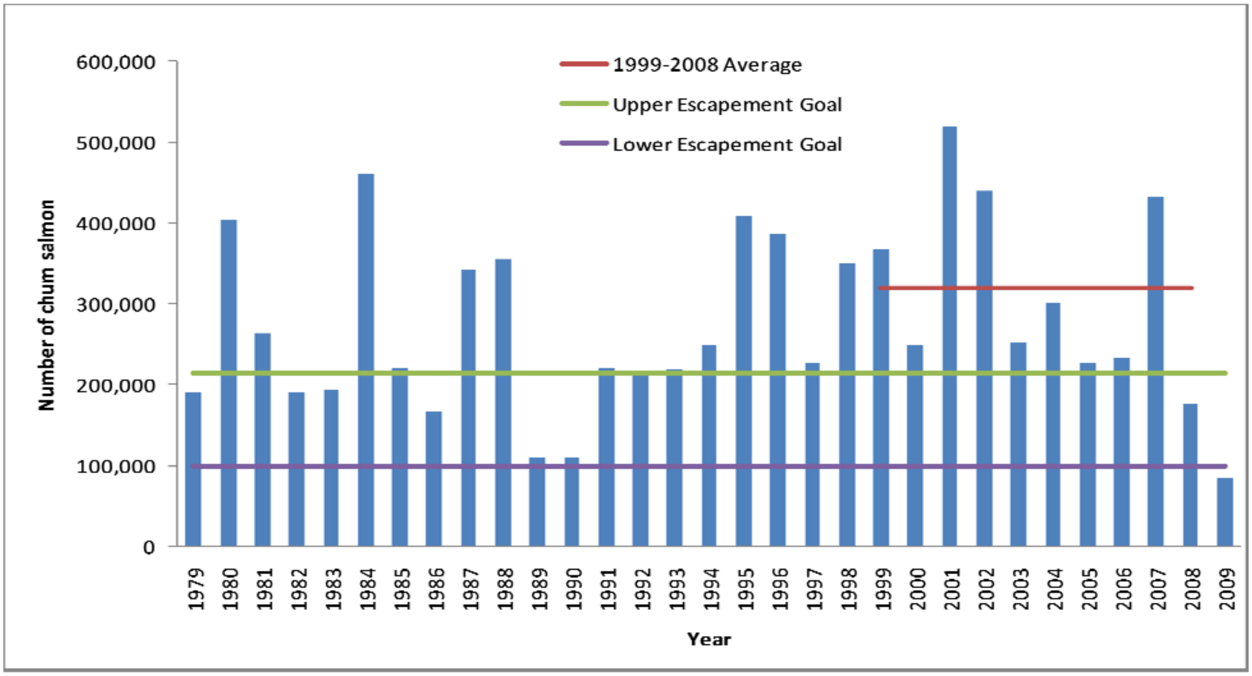

Figure 3. Northwestern District chum salmon escapement with comparison of upper and lower escapement goal and 10 year average, 1979-2009.

South Peninsula Chum salmon Escapement

Chum salmon are managed on district-wide SEGs of 106,400 to 212,800 fish for Southeastern District; 89,800-179,600 fish in the South Central District; 133,400 to 266,800 fish in the Southwestern District; and a lower bound SEG of 800 fish for the Unimak District (Honnold et al. 2007).

In 2009, chum salmon escapement in the Unimak District was 1,400 fish and was the only district to exceed its SEG (Table 1; Figure 4). Chum salmon escapement was within the established SEG for the Southeastern District (106,500; Figure 5) and the Southwestern District of (385,730 fish; Figure 6). The South Central District chum salmon escapement of 18,600 fish was below the SEG (Figure 7). South Peninsula total indexed chum salmon escapement of 512,230 fish was within the combined escapement goal range of 330,400 to 659,200 fish.

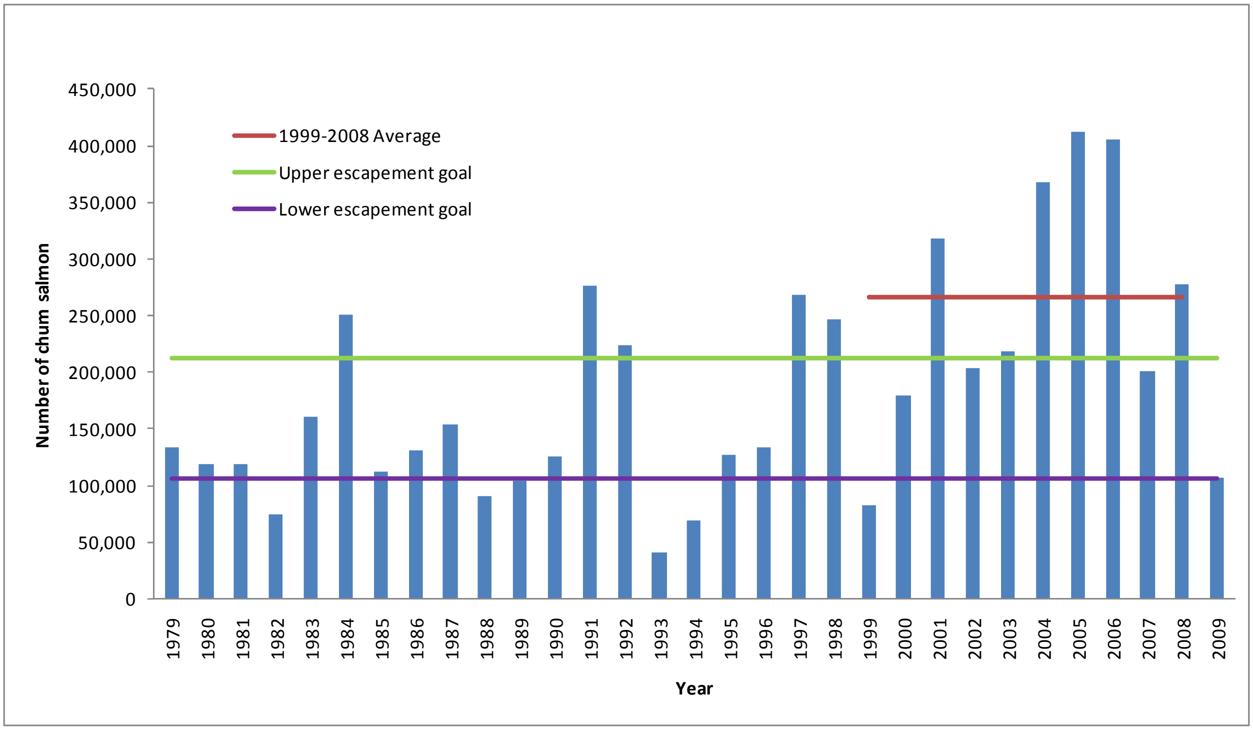

Figure 4. Unimak District chum salmon escapement including the lower escapement goal and 10 year average, 1979-2009.

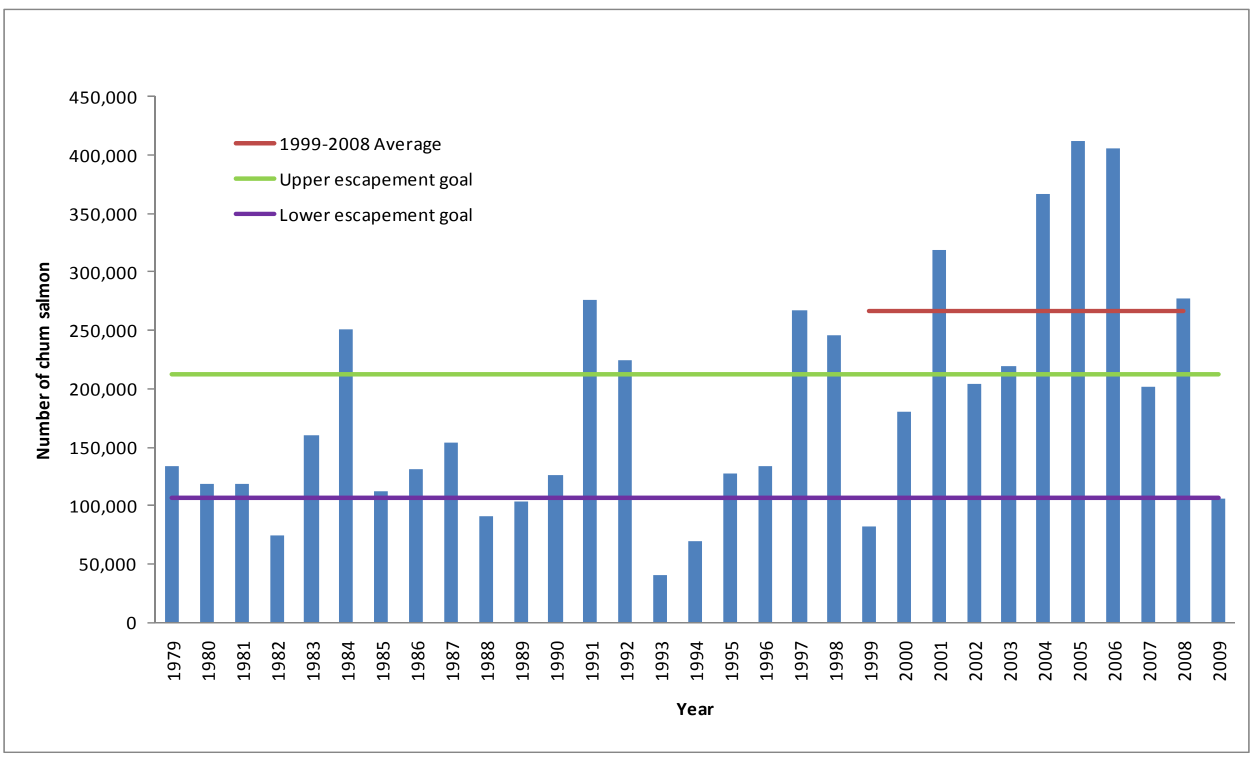

Figure 5. Southeastern District chum salmon escapement including the lower and upper escapement goal and 10 year average, 1979-2009.

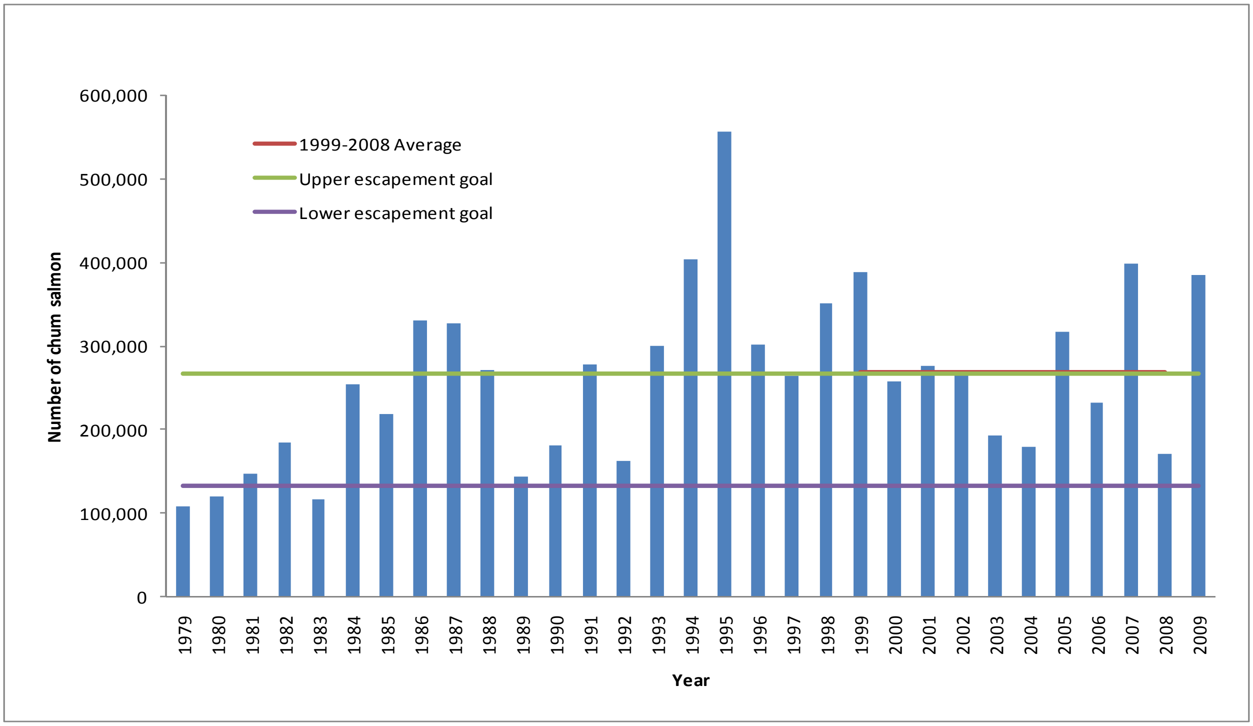

Figure 6. Southwestern District chum salmon escapement including the lower and upper escapement goal and 10 year average, 1979-2009.

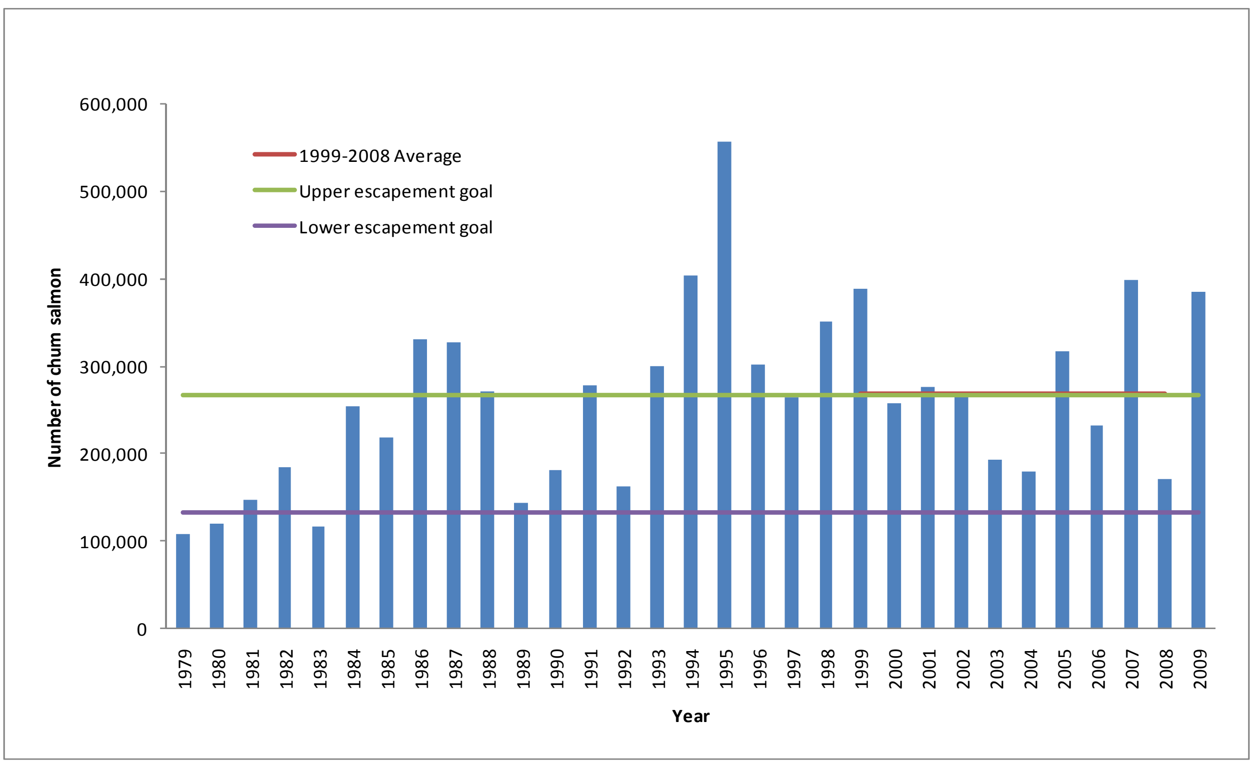

Figure 7. South Central District chum salmon escapement including the lower and upper escapement goal and 10 year average, 1979-2009.

Area M Commercial Chum Salmon Fishery

In 2009, 54 of the 119 available seine, 143 of 162 available drift gillnet, and 91 of 113 available set gillnet Area M permits were fished. Overall effort by the different gear groups was similar to the most recent ten year average. In 2009, the Alaska Peninsula Area commercial chum salmon harvest totaled 1,786,713 fish which was higher than the 1999-2008 average harvest of 939,588 (Table 2; Hartill and Keyes 2010).

Table 2. Area M chum salmon harvest by year and district, 1979-2009.

	Area M Salmon Management Districts						
Year	North	Northwest	Southeastern	South Central	Southwestern	Unimak	Total
1979	35,371	30,340	215,955	105,650	128,431	33,145	548,892
1980	332,685	367,511	534,752	191,080	223,100	404,540	2,053,668
1981	351,322	355,496	781,060	240,631	273,239	475,770	2,477,518
1982	236,014	95,119	845,086	240,172	643,885	545,504	2,605,780
1983	178,681	169,626	637,701	128,906	207,956	728,824	2,051,694
1984	614,268	182,455	630,929	311,193	430,211	282,332	2,451,388
1985	423,489	243,127	482,176	165,893	428,201	272,181	2,015,067
1986	157,653	113,563	825,398	254,835	467,475	201,943	2,020,867
1987	155,446	213,250	591,960	198,350	230,802	354,775	1,744,583
1988	214,790	178,285	736,086	155,378	514,960	502,083	2,301,582
1989	131,250	25,742	418,334	49,861	129,786	419,792	1,174,765
1990	95,541	30,572	564,118	60,370	208,090	445,430	1,404,121
1991	128,538	62,740	509,423	156,552	322,742	585,056	1,765,051
1992	236,884	104,732	441,023	253,811	358,237	257,266	1,651,953
1993	86,563	48,394	337,403	143,660	232,895	332,449	1,181,364
1994	43,658	40,239	581,256	317,664	962,369	317,621	2,262,807
1995	72,588	26,705	684,643	176,827	551,587	302,010	1,814,360
1996	60,225	7,731	446,435	70,607	170,952	87,063	843,013
1997	51,169	46,211	172,629	55,050	240,914	137,661	703,634
1998	37,487	32,029	252,947	90,080	217,498	151,001	781,042
1999	42,220	7,900	385,200	69,651	235,981	126,134	867,086
2000	63,087	30,609	390,120	118,854	424,916	121,426	1,149,012
2001	61,297	113,226	331,095	122,593	451,313	16,985	1,096,509
2002	29,201	21,839	342,590	44,283	320,902	111,255	870,070
2003	22,178	16,577	271,634	15,376	271,316	78,979	676,060
2004	8,480	6,478	557,336	40,423	100,116	92,234	805,067
2005	8,915	33,617	459,546	51,248	148,139	80,527	781,992
2006	92,330	39,388	664,189	110,116	326,023	77,478	1,309,524
2007	85,003	96,006	352,448	42,511	170,809	114,019	860,796
2008	73,224	104,140	337,605	71,108	121,331	272,360	979,768
2009	51,825	54,169	866,938	77,233	605,457	131,091	1,786,713
1999-2008 Average	48,594	46,978	409,176	68,616	257,085	109,140	939,588

North Alaska Peninsula

The 2009 North Alaska Peninsula chum salmon harvest of 105,994 fish was above the 1999-2008 average harvest of 95,572 fish. In the Northern District, the chum salmon harvest of 51,825 fish was just above the 1999-2008 average of 48,594 fish (Figure 4). The remaining 54,169 chum salmon were harvested in the Northwestern District, which was also above the previous ten-year average of 46,978 fish (Figure 5). In 2009, the chum salmon harvested in the Northern District were caught incidentally during sockeye salmon fisheries, while in the Northwestern District the majority of the chum salmon harvest was from directed fisheries (Hartill and Murphy 2010).

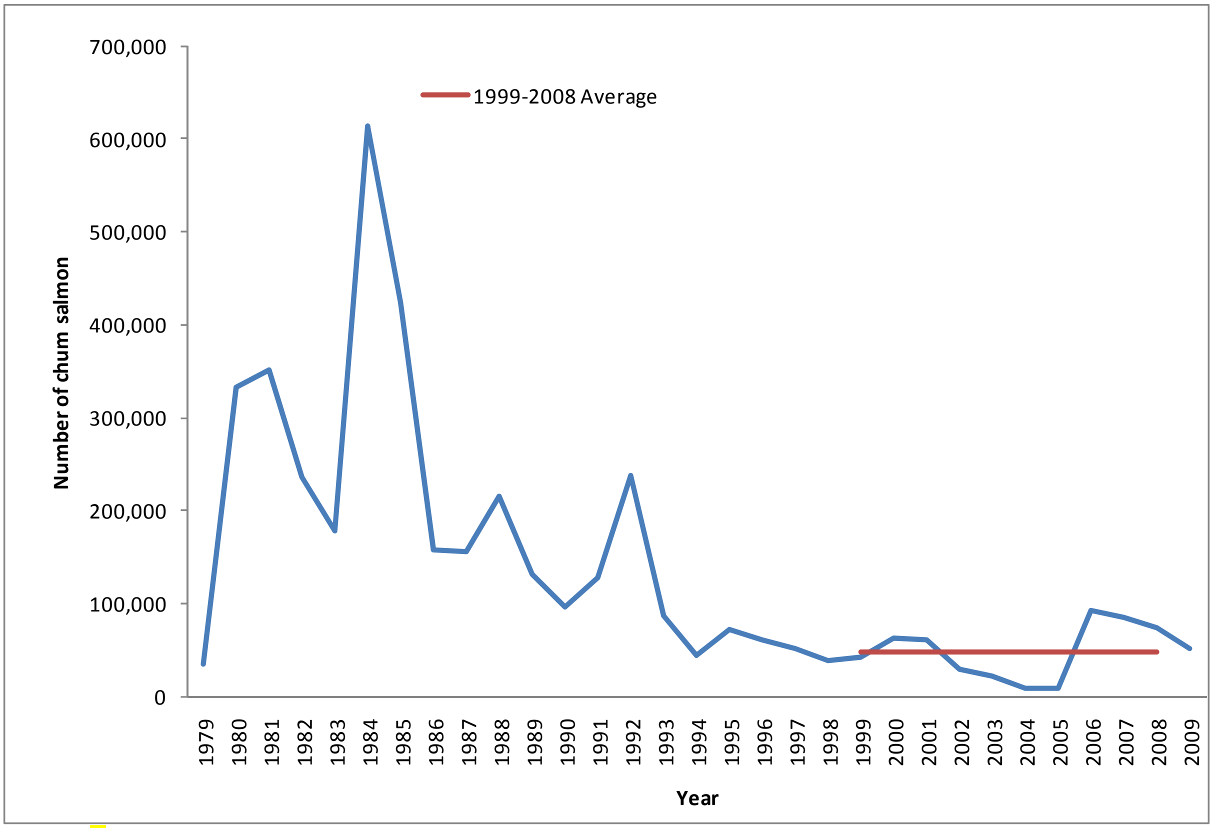

Figure 4. Northern District chum salmon harvest and 10 year average, 1979-2009.

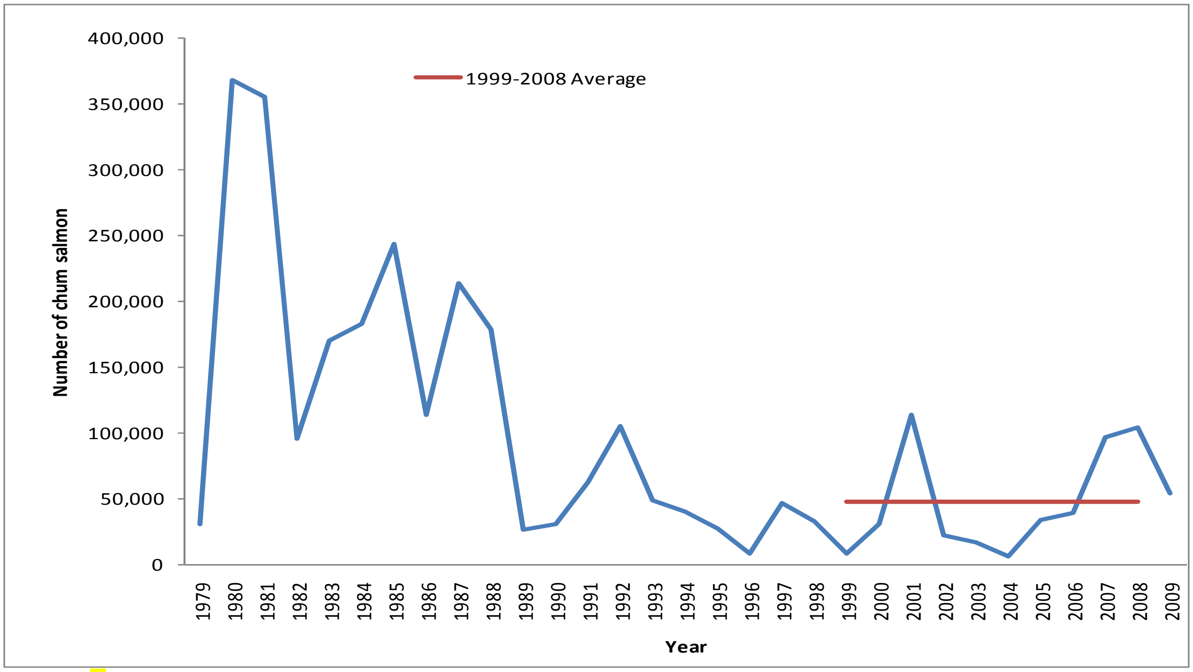

Figure 5. Northwestern District chum salmon harvest and 10 year average, 1979-2009

South Alaska Peninsula

The 2009 South Alaska Peninsula chum salmon harvest of 1,680,719 fish was well above the 1999-2008 average harvest of 844,017 fish. In the Southeastern District, the chum salmon harvest of 866,938 fish was above the 1999-2008 average of 409,176 fish (Figure 6). For the South Central District a total of 77,233 chum salmon were harvested which was slightly above the previous ten year average of 68,616 fish (Table 2; Figure 7). Fishermen in the Southwest District harvested 605,457 chum salmon which was higher than the 1999-2008 average harvest of 257,085 fish (Figure 8). A total of 131,091 chum salmon were harvest in the Unimak District, which was also above the previous ten-year average of 109,140 fish (Figure 9; Poetter et al).

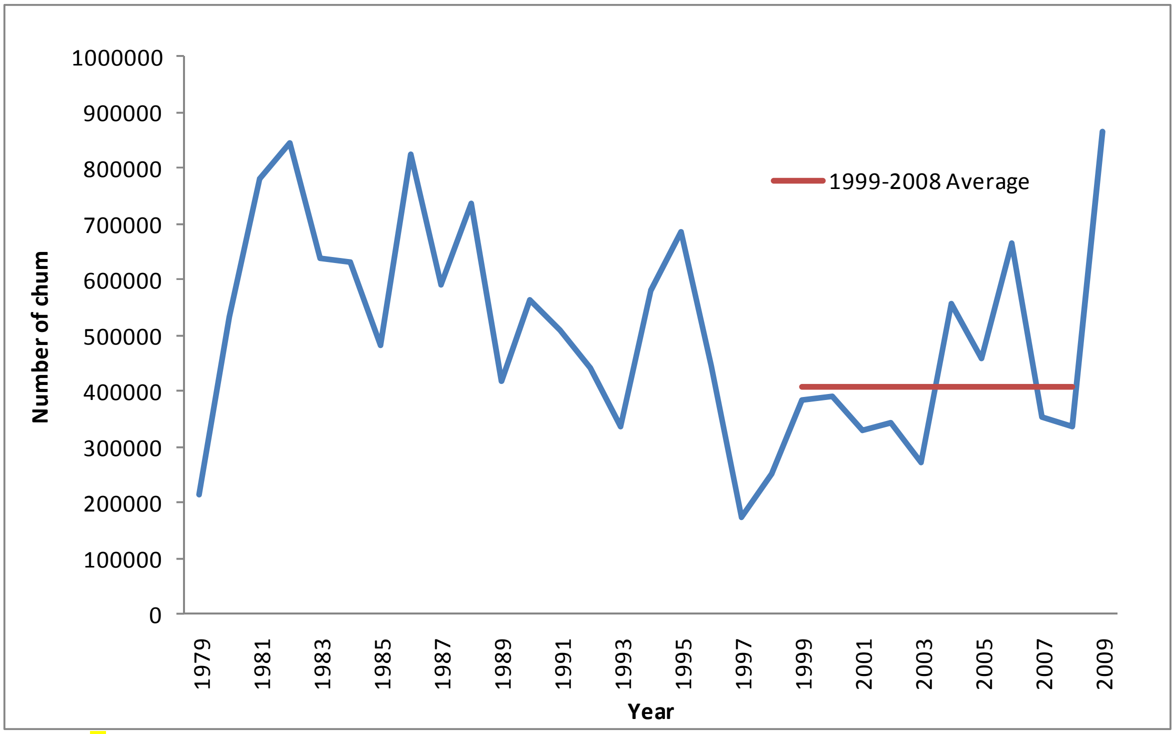

Figure 6. Southeastern District chum salmon harvest and 10 year average, 1979-2009

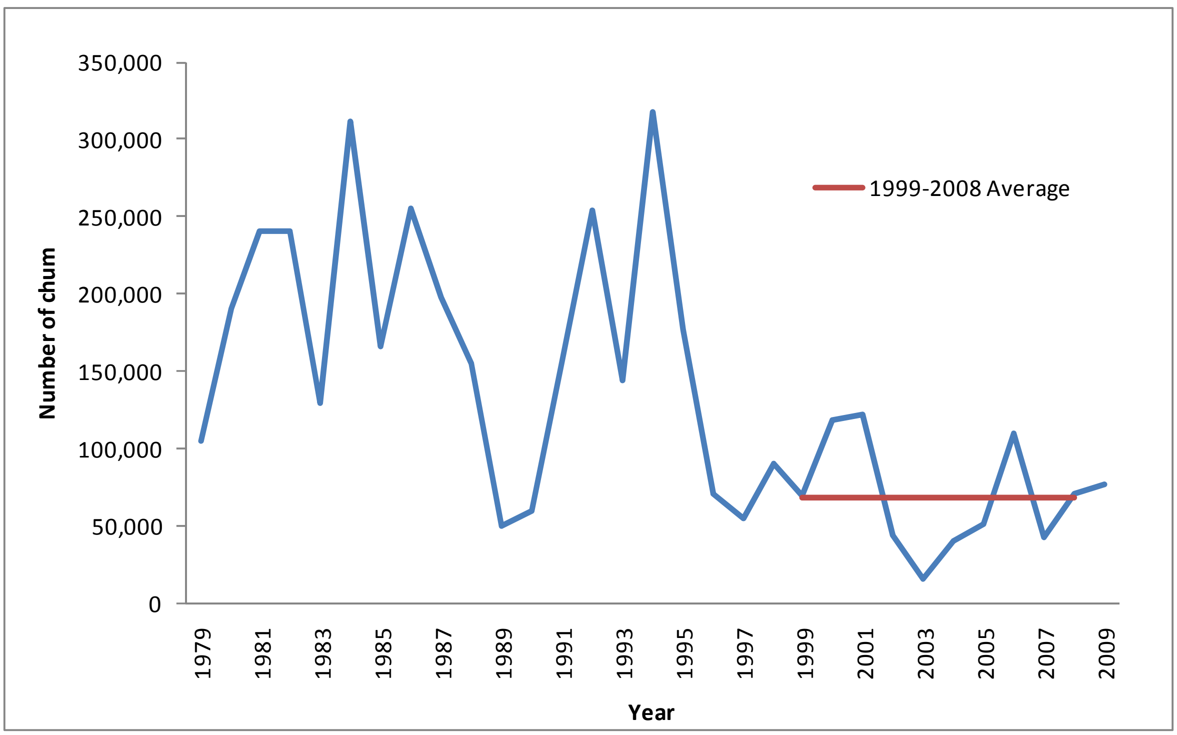

Figure 7. South Central District chum salmon harvest and 10 year average, 1979-2009

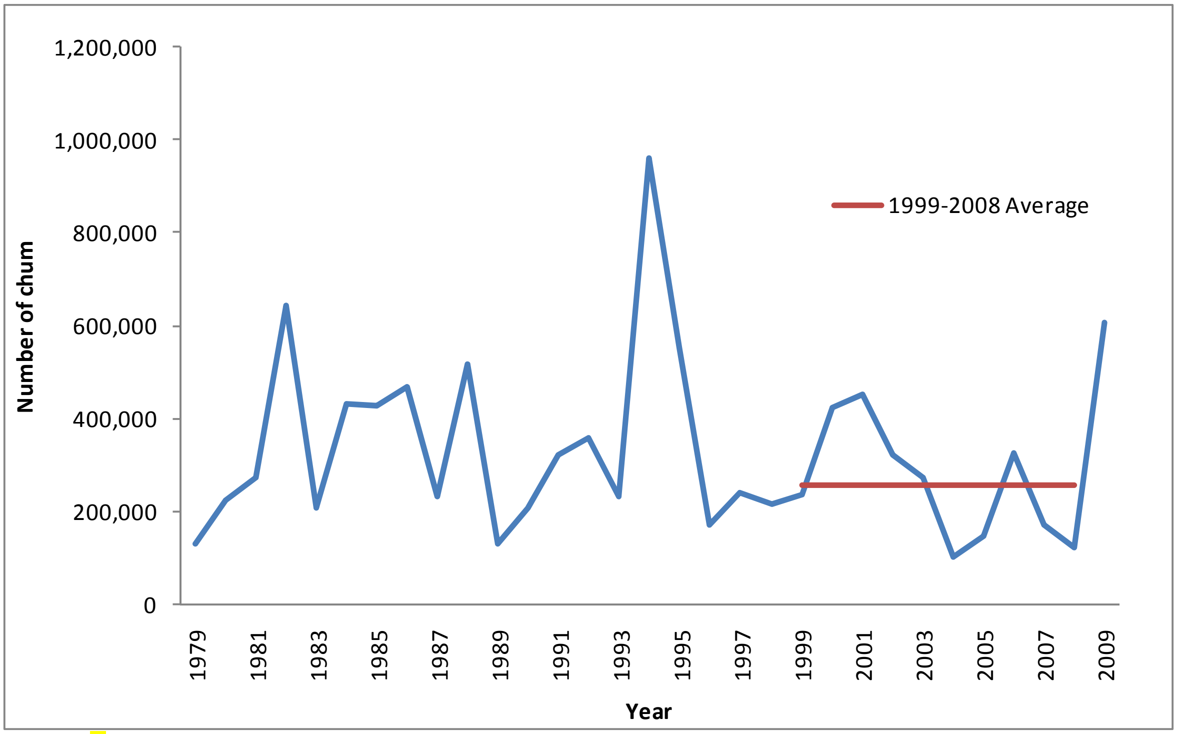

Figure 8. Southwestern District chum salmon harvest and 10 year average, 1979-2009

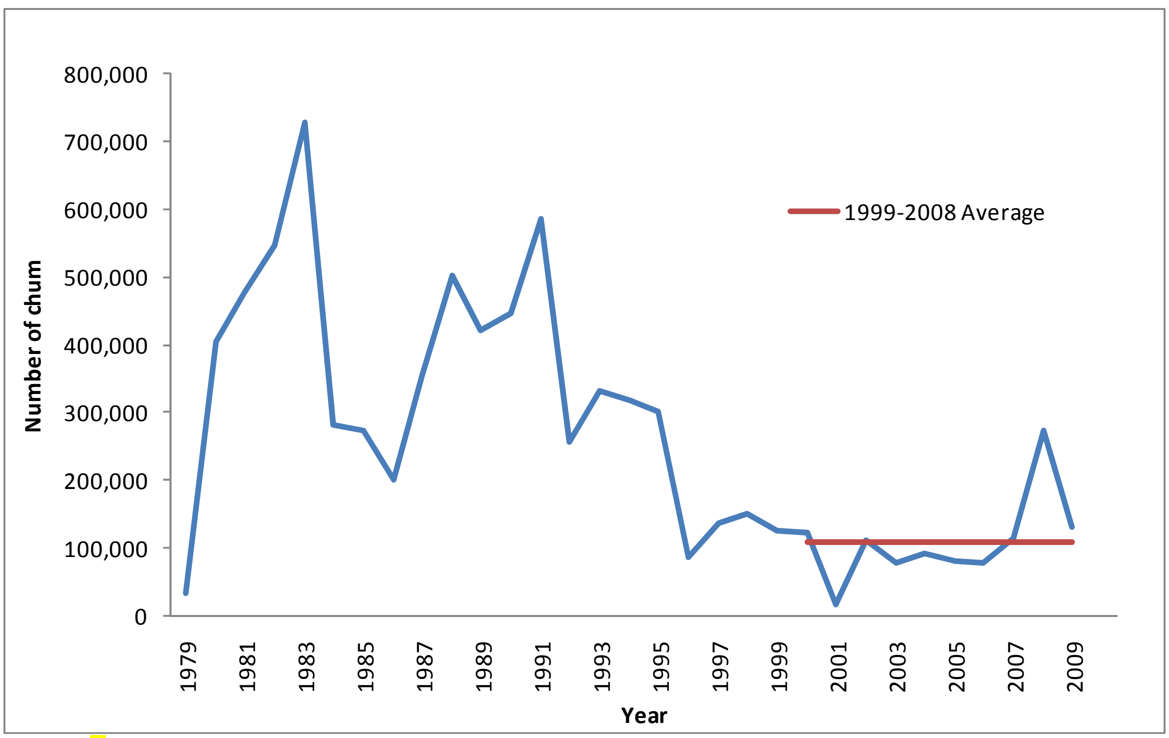

Figure 9. Unimak District chum salmon harvest and 10 year average, 1979-2009

Outlook

The Area M districts have no formal forecast for salmon returns. Broad expectations are developed based on parent-year escapements and recent year trends. The 2011 outlook and management plan will be available spring 2011.

5.2.8 Statewide summary for major western Alaska stocks

Western Alaska includes the Alaska Peninsula, Bristol Bay, Kuskokwim, Yukon, Norton Sound, and Kotzebue Sound management areas. Nushagak, Kuskokwim, Yukon, Unalakleet, and Kobuk rivers comprise the chum salmon index stocks for this region along with Kuskokwim Bay and Norton Sound stocks. Western Alaska chum salmon stocks declined sharply in the late 1990s through the early 2000s, rebuilt rapidly with record and near record runs in the mid 2000s, and abundance has been variable since 2007.

In 2010, all stocks exhibited average to above average abundance except for the South Alaska Peninsula stocks and Yukon River fall chum salmon, which were below average. Subsistence restrictions were required on the Yukon River fall chum run and six of eight escapement goals were achieved. Two of the four escapement goals in the South Alaska Peninsula were not achieved and the area was closed to commercial fishing from August 4 through September 14 due to low escapements of both pink and chum salmon. Norton Sound 2010 chum salmon runs were some of the strongest on record. More southerly stocks in Kuskokwim Bay and Nushagak River showed above average runs from 2008–2010 and the most northerly stocks in Noatak and Kobuk rivers were also above average.

Commercial fisheries occurred in most areas of western Alaska in 2010. North Alaska Peninsula, Norton Sound, and Kuskokwim Bay had some of the largest chum salmon commercial harvests on record. Two Yukon River (summer run) and Kuskokwim River chum salmon harvests were more modest owing to potential for incidental harvest of weak Chinook salmon stocks and limited processing capacity in the Kuskokwim River. Generally, these were the largest commercial harvests since 1998 for most of western Alaska, and in Norton Sound, since 1986. Commercial fisheries targeting Yukon River fall chum salmon were limited to a late season terminal fishery in the Tanana River, as some restrictions were placed on subsistence fisheries and the sport fishery was closed.

Overall, chum salmon escapement goals were easily achieved throughout western Alaska in 2010 (see summary table on page 139-140).

5.3 Chum salmon assessment overview for stock groupings outside western Alaska

5.3.1 Cook Inlet

5.3.1.1 Upper Cook Inlet

Description of Management Area

The Upper Cook Inlet (UCI) commercial fisheries management area consists of that portion of Cook Inlet north of the latitude of the Anchor Point Light and is divided into the Central and Northern Districts (Figure 1). The Central District is approximately 75 miles long, averages 32 miles in width, and is divided into six subdistricts. The Northern District is 50 miles long, averages 20 miles in width and is divided into two subdistricts. At present, all five species of Pacific salmon are subject to commercial harvest in Upper Cook Inlet.

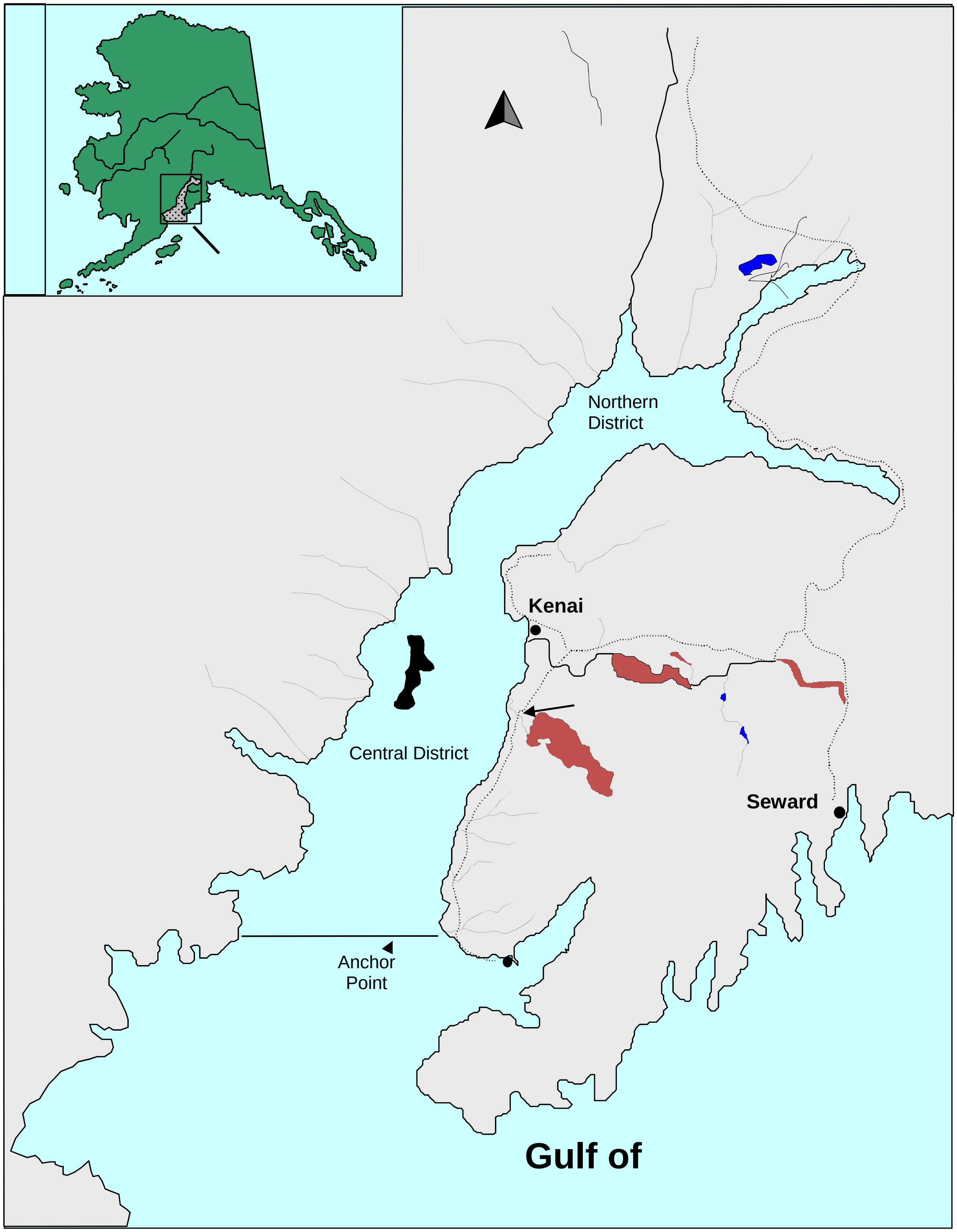

Figure 1. Upper Cook Inlet Management Area showing Northern and Central commercial fishing districts.

Commercial Chum Salmon Harvest

Currently, set (fixed) gillnets are the only gear permitted in the Northern District while both set and drift gillnets are used in the Central District. The use of seine gear is restricted to the Chinitna Bay subdistrict. Drift gillnets have accounted for approximately 88% of the annual chum salmon harvest since 1966. Set gillnets have harvested virtually all of the remainder; however, in the last 10 years (1999-2008), the proportion of the total annual chum salmon harvest taken by drift gillnets has increased. Run-timing and migration routes utilized by all species of salmon overlap to such a large extent that the commercial fishery is largely mixed-stock and mixed-species in nature.

In 2010, approximately 229,000 chum salmon were harvested by UCI commercial fishermen, which represented the second largest catch in the past 15 years. This harvest was nearly 116% more than the previous 10-year average annual harvest of 106,000 fish, yet more than 50% less than the average annual harvest of 458,000 fish taken from 1966-2009. Assessing chum salmon stocks based on recent harvest trends is suspect, at best. For example, the drift gillnet fleet is the primary harvester of chum salmon. Drift gillnet fishing time in the Central District has been significantly altered, primarily to conserve Susitna River sockeye salmon. These restrictions have resulted in a marked reduction of chum salmon harvest (personal communication, Patrick Shields, 2010).

The 2009 UCI commercial harvest of 2.5 million salmon was approximately 40% (1.7 million) less than the 1966-2008 average annual harvest of 4.2 million fish. The 2009 harvest of 82,811 chum salmon represents the largest annual catch in UCI since 2004, yet remained well below the long-term average (1966-2008) harvest of 460,000 chum salmon and approximately 30% less than the recent 10-year average harvest of 115,000 fish (Figure 2). During the 2009 fishing season there were numerous area restrictions or closures in order to conserve both Susitna and Kenai River sockeye salmon, which resulted in significant reductions of chum salmon harvest.

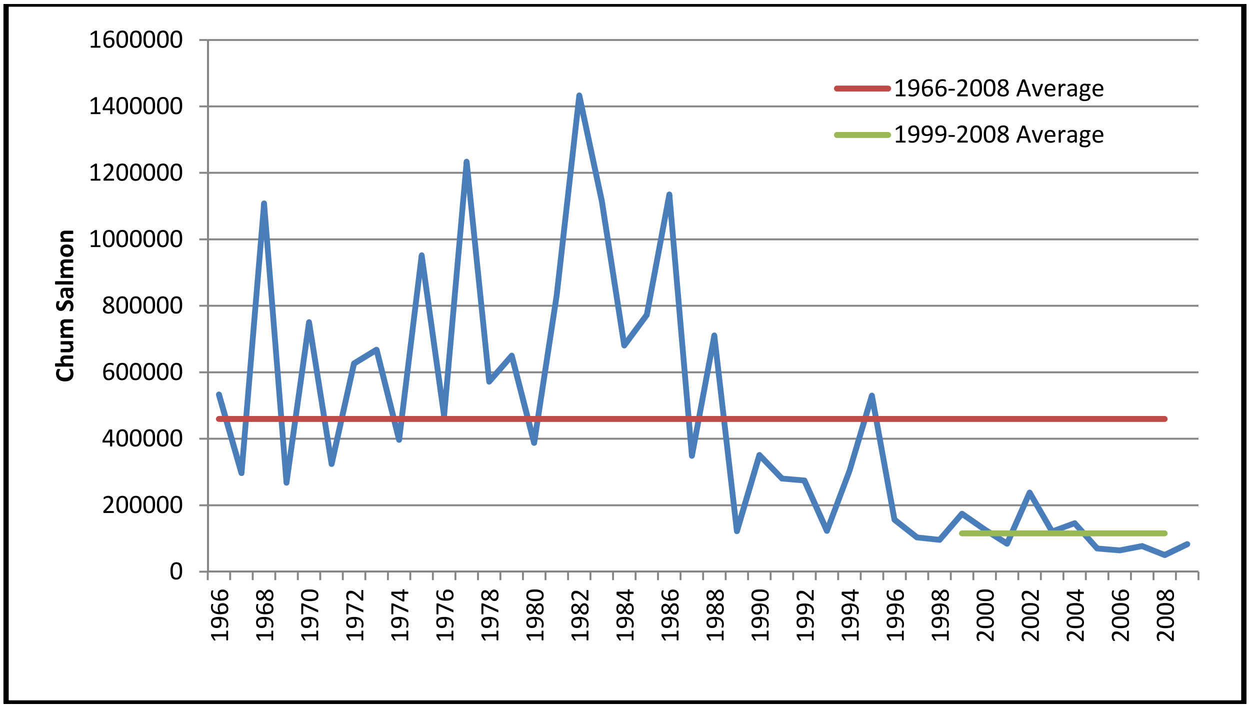

Figure 2. Upper Cook Inlet commercial chum salmon harvest, 1966-2009.

As shown in Table 1, chum salmon returns to UCI are concentrated predominately in the western and northern watersheds, with the most significant harvest coming from the Central District drift gillnet fleet.

Table 1. Upper Cook Inlet commercial chum salmon harvest by district and gear type, 2009.

Gear	District	Subdistrict	Permits	Chum Salmon
Drift	Central	All	405	77,073
Setnet	Central	Upper	328	494
		Kalgin Is.	24	722
		Chinitna	-	-
		Western	27	1,613
		Kustatan	12	4
		All	378	2,833
	Northern	General	58	2,634
		Eastern	35	446
		All	86	3,080
Seine	All		-	-
Total			859	82,986

Chum Salmon Escapement

Evaluation of chum salmon runs in UCI is made difficult because of the lack of information other than commercial harvest data. The only chum salmon escapement goal in all of UCI is an aerial SEG survey in Chinitna Bay (Clearwater Creek) set at 3,800-8,400 fish. This SEG has been met or exceeded every year since it was established in 2002 (Table 4).

While ADF&G lacks long-term quantitative chum salmon escapement information, escapements to streams throughout UCI have benefited by management actions or regulatory changes aimed principally at other species. These actions have included: (1) significant reductions in the offshore drift gillnet and Northern District set gillnet fisheries to conserve Yentna River sockeye salmon; (2) adoption of the Northern District Salmon Management Plan (5 AAC 21.358), which states that its primary purpose is to minimize the harvest of coho salmon bound for the Northern District; (3) the lack of a directed chum salmon fishery in Chinitna Bay; and (4) harvest avoidance by the drift fishery as a result of lower prices being paid for chum salmon than for sockeye salmon. Other than the aerial census counts in Chinitna Bay, most of the sporadic chum salmon data available to assess annual runs can at best be used to make very general conclusions (i.e., the run was below average, average, or above average). Although the commercial harvest in 2009 was better than the past few years, even with commercial fishing restrictions and closures, the 2009 UCI chum salmon run was likely below average. Despite the assumption that the 2009 chum salmon run was below average, the commercial fishery exploitation rate on this stock was also very low and the escapement objective in Chinitna Bay has been consistently achieved.

Subsistence, Educational, and Personal Use Chum Salmon Harvest

The only subsistence fishery that has occurred consistently in Cook Inlet is the Tyonek Subsistence fishery; however, there is also a subsistence salmon fishery allowed in the Yentna River drainage. Subsistence permits for both areas allows for the harvest of 25 salmon per permit holder plus 10 salmon (except Chinook salmon, which must be released) for each additional member. The preliminary subsistence harvest for 2009 from Tyonek was two chum salmon and for the Yentna River drainage was six chum salmon (Table 2).

Educational fisheries in UCI first began in 1989. The total harvest from all salmon species educational fisheries in 2009 was 9,397 fish, which was the largest harvest ever recorded since the educational fisheries began. The average annual educational harvest from 1994 through 2009 has been approximately 6,008 fish. The 2009 education chum salmon harvest in UCI was 36 fish (Table 2).

As with the subsistence fishery, permit holders in the personal use fishery are allowed to harvest 25 salmon with an additional 10 salmon (except Chinook) for each household member. Personal use fishing takes places primarily with dip nets in the Kenai, Kasilof, and Beluga (senior citizens only) Rivers and in some years at Fish Creek. A personal use fishery with set gillnets also takes place in salt water at the mouth of the Kasilof River (Table 2).

Table 2. Upper Cook Inlet subsistence, educational, and personal use chum salmon harvest, 1998-2009.

Year	Chum Salmon Subsistence		Educational	Personal
	Tyonek	Yentna		
1998	2	20	137	220
1999	11	11	75	168
2000	0	7	69	290
2001	6	4	34	276
2002	4	28	112	757
2003	10	13	66	371
2004	0	2	100	52
2005	2	25	79	428
2006	1	27	38	746
2007	2	18	20	614
2008	10	7	23	728
2009	2	6	36	559

2010 Upper Cook Inlet Chum Salmon Forecast[16]

Very little information is available on which to base outlooks for the commercial harvests of chum salmon in UCI. Using recent harvest trends and factoring in the expected intensity of the sockeye-based fishery, ADF&G forecasted a 2010 chum salmon harvest of approximately 70,000 fish.

5.3.1.2 Lower Cook Inlet

Description of Management Area

The Lower Cook Inlet (LCI) management area, comprised of all waters west of the longitude of Cape Fairfield, north of the latitude of Cape Douglas, and south of the latitude of Anchor Point, is divided into five commercial salmon fishing districts (Figure 3). Barren Islands District is the only fishing district where no salmon fishing occurs, with the remaining four districts (Southern, Outer, Eastern, and Kamishak Bay) separated into approximately 40 subdistricts and sections to facilitate management of discrete stocks of salmon.

[16] Harvest data from the 2010 fishery and forecasts for the 2011 fishery are not yet available.

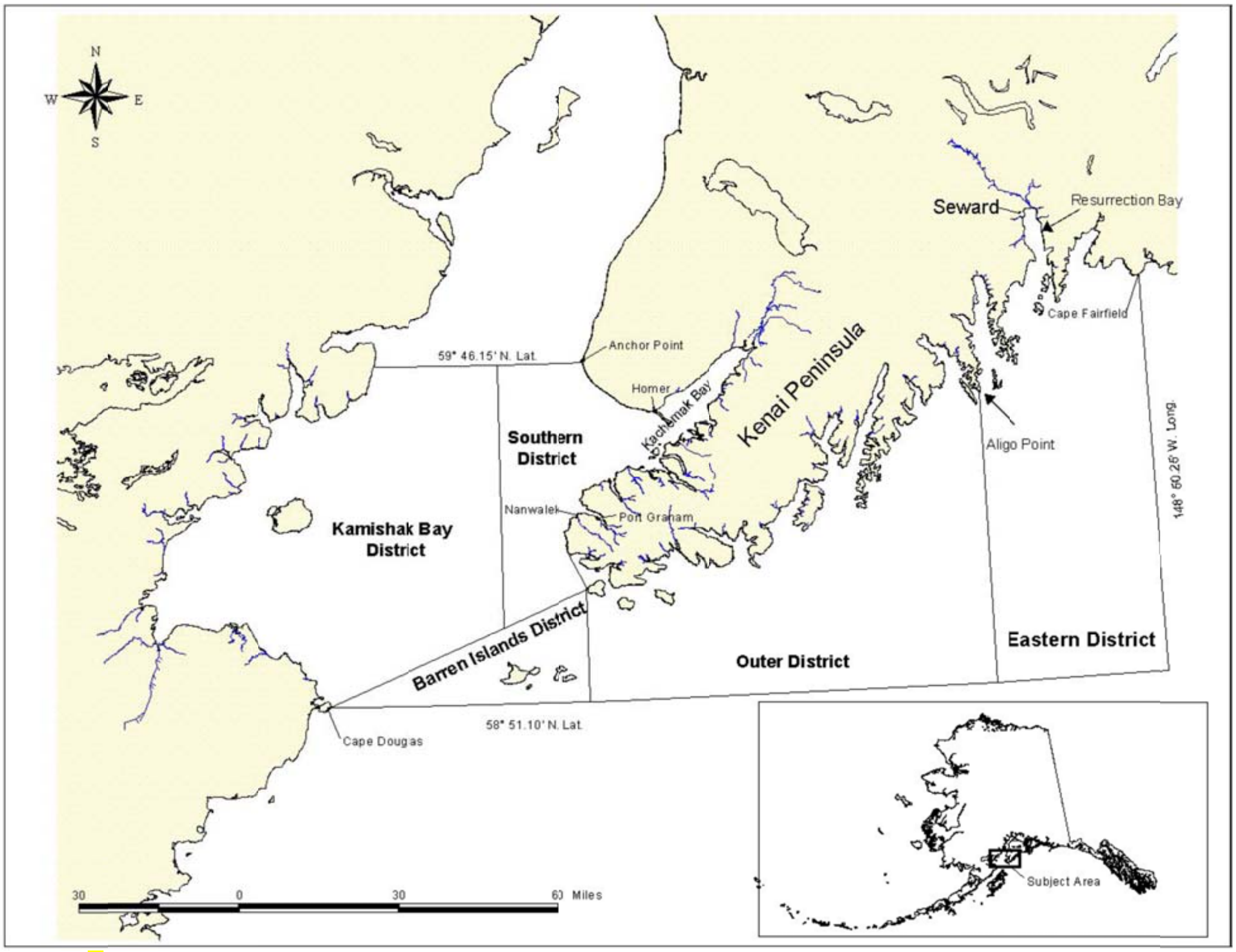

Figure 3. Lower Cook Inlet Management Area showing the five management districts.

Several hatchery facilities occur in Lower Cook Inlet and while salmon fisheries enhancement continues to play a major role in LCI salmon production as it has over the past three decades, chum salmon in this region consists exclusively of natural production fish. At the Tutka Bay Lagoon Hatchery, pink salmon were the primary species produced with chum salmon as a secondary species during the early years of this facility before these efforts were discontinued in favor of experimental efforts directed towards sockeye salmon production.

Commercial Chum Salmon Harvest

The 2009 LCI commercial salmon fishery was the fourth lowest during the past decade (1999-2008) and characterized by below 10-year average harvests of all five salmon species for a total of 1.35 million fish. Commercial harvests in 2009 of chum salmon, at 73,974 fish, were slightly less than the recent 10-year average (80,400 fish) but significantly greater than the 20-year average (10,450 fish) (Figure 4).

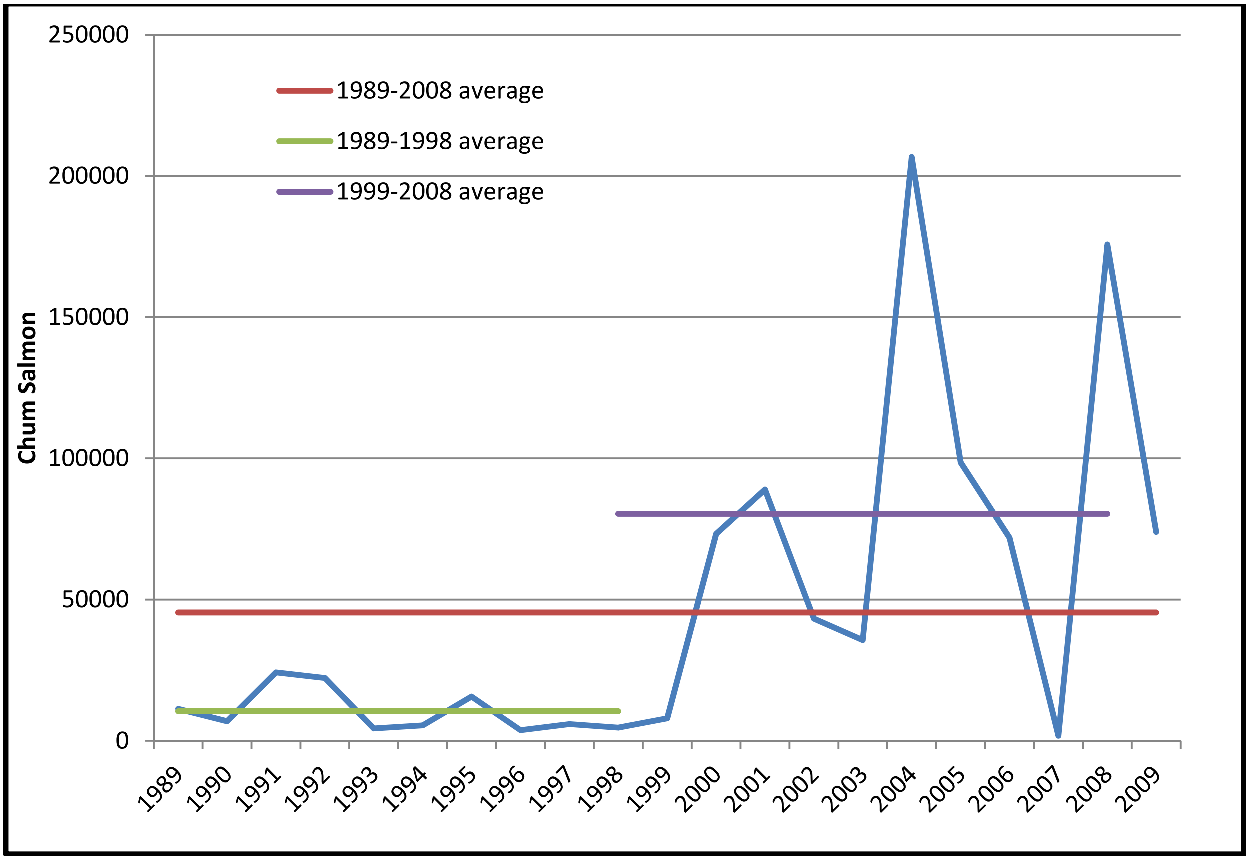

Figure 4. Lower Cook Inlet commercial chum salmon harvest for all gear and harvest types, 1989-2009.

After a disappointingly weak chum salmon season in 2007, chum salmon runs have since rebounded and were a major bright spot for the LCI area in 2009, which marked the ninth season out of the past ten that produced relatively strong chum runs coupled with moderate to good catches. The 2009 chum salmon harvest was the fifth highest for the species in LCI during the past two decades and 92% of the average harvest over the past 10 years. In sharp contrast to years prior to 2008, when Kamishak Bay District totals dominated catches, the LCI area-wide commercial chum salmon harvest for the 2009 season was almost equally divided between Kamishak Bay District on the west side of LCI (49%) and the Outer District (47%), with the Southern District making up the remaining 3% (Table 3).

Table 3. Commercial and hatchery chum salmon catches by district and gear type, 2009.

District	Harvest Type	Gear Type	Chum Salmon
Southern	Commercial	Set Gillnet	2,274
		Purse Seine	-
	Hatchery	Purse Seine	-
		Total	2,274
Outer	Commercial	Purse Seine	35,126
Eastern	Commercial	Purse Seine	-
	Hatchery	Purse Seine	-
		Weir	-
Kamishak Bay	Commercial	Purse Seine	36,574
	Hatchery	Purse Seine	-
		Total	36,574
LCI Total			73,974
1989-2008 Average			45,417

Note: Figures for 2009 do not include a very small number or fish caught during commercial fishing but not sold (i.e., retained for personal use).

Chum Salmon Escapement

Escapement estimates for chum salmon in LCI are derived from periodic ground surveys with stream life factors applied, or from periodic aerial surveys that also incorporate stream life factors. For 2009, escapements into most LCI chum salmon systems were sufficient to achieve SEG goals (Table 4).

Subsistence and Personal Use Chum Salmon Harvest[17]

Subsistence and personal use chum salmon fisheries occur primarily in the Southern District of LCI in Nanwalek/Port Graham, and Seldovia. One of LCI's two subsistence salmon fisheries during 2009 occurred near the villages of Nanwalek (formerly English Bay) and Port Graham, located approximately 21 nautical miles southwest of Homer on the south side of Kachemak Bay. Gear in this fishery is limited to set gillnets. Most fishing occurs within close proximity to the respective villages, primarily targeting Chinook salmon transiting area waters and sockeye salmon returning to the English Bay Lakes system early in the summer, although participants will occasionally target pink salmon returning to Port Graham and English Bay Rivers later in the summer. Some additional fishing also occurs in Koyuktolik ("Dogfish") Bay, located about seven nautical miles south of English Bay, targeting non-local stocks of Chinook salmon as well as local stocks of chum salmon. In 2009, the Port Graham subsistence fishery harvested 69 chum salmon out of a total 2,265 salmon. For the Nanwalek subsistence fishery in 2009, 71 chum salmon were harvested out of a total 2,858 salmon.

[17] There are no reported educational salmon fisheries in Lower Cook Inlet.

2010 Lower Cook Inlet Chum Salmon Forecast[18]

The overall 2010 commercial all-species salmon harvest for LCI was forecast to be approximately 1.02 million fish, approximately 75% of the actual harvest taken during 2009. Based upon average catches since 1989, the total LCI commercial chum salmon harvest is expected to total as much as 47,000 fish during 2010. However, chum salmon runs to LCI in nine of the past ten years were strong, and the resurgence of commercial catches during those seasons resulted in the highest harvest totals for this species since 1988. Such encouraging signs suggest that the potential for a chum salmon harvest could be greater than the forecast.

[18] Harvest data from the 2010 fishery and forecasts for the 2011 fishery are not yet available.

Table 4. Cook Inlet chum salmon escapement goals and escapements, 2001-2009.

Upper Cook Inlet	2009 Goal Range Lower	Upper	Type	Year Implemented	Enumeration Method	Chum Salmon Escapement 2001	2002	2003	2004	2005	2006	2007	2008	2009
Clearwater Creek	3,800	8,400	SEG	2002	Peak Aerial Survey	14,570	8,864	7,200	3,900	n/a	n/a	n/a	4,530	8,300

Lower Cook Inlet	2009 Goal Range Lower	Upper	Type	Year Implemented	Enumeration Method	Chum Salmon Escapement 2001	2002	2003	2004	2005	2006	2007	2008	2009
Port Graham River	1,450	4,800	SEG	2002	Multiple Foot Surveys	6,037	5,253	2,925	1,177	743	2,231	1,882	1,802	1,029
Dogfish Lagoon	3,350	9,150	SEG	2002	Multiple Aerial or Foot Surveys	6,068	10,062	13,287	3,617	2,746	5,394	4,919	6,200	4,380
Rocky River	1,200	5,400	SEG	2002	Multiple Aerial Surveys	2,990	5,655	5,549	17,159	6,060	11,200	1,600	3,763	2,500
Port Dick Creek	1,900	4,450	SEG	2002	Multiple Aerial or Foot Surveys	1,801	12,321	5,595	8,620	4,848	2,786	2,753	11,774	5,592
Island Creek	6,400	15,600	SEG	2002	Multiple Aerial or Foot Surveys	6,270	15,251	16,274	15,135	20,666	5,615	3,092	12,935	9,295
Big Kamishak River	9,350	24,000	SEG	2002	Multiple Aerial Surveys	36,341	17,350	16,357	57,897	25,717	58,173	14,787	4,495	15,026
Little Kamishak River	6,550	23,800	SEG	2002	Multiple Aerial Surveys	27,184	16,400	22,194	45,342	12,066	42,929	15,569	21,265	4,213
McNeil River	24,000	48,000	SEG	2008	Multiple Aerial Surveys	16,856	17,520	29,306	14,613	22,496	17,403	21,629	10,617	18,766
Bruin River	6,000	10,250	SEG	2002	Multiple Aerial Surveys	21,782	9,852	13,080	15,866	21,208	7,000	3,055	17,535	10,071
Ursus Cove	6,050	9,850	SEG	2002	Multiple Aerial Surveys	37,699	17,144	30,410	15,988	12,176	15,663	20,897	6,502	12,946
Cottonwood Creek	5,750	12,000	SEG	2002	Multiple Aerial Surveys	15,868	42,194	72,764	16,277	17,914	13,243	12,522	11,561	19,405
Iniskin Bay	7,850	13,700	SEG	2002	Multiple Aerial Surveys	13,754	28,486	18,709	22,044	16,461	15,640	5,340	20,042	30,821

Note: Red-shaded cells indicate escapement fell below stated goals. Yellow-shaded cells indicate escapement goals were met. Green-shaded cells indicate escapement goals were exceeded. Cells with no color indicate no official escapement goal for that particular year. Shaded cells are based upon the escapement goal in place at the time of enumeration for salmon stocks rather than the most recent escapement goal provided.

5.3.2 Prince William Sound

Description of Management Area

The Prince William Sound (PWS) management area encompasses all coastal waters and inland drainages entering the north central Gulf of Alaska between Cape Suckling and Cape Fairfield (Figure 1 and Figure 2). This area includes the Bering River, Copper River and all of Prince William Sound with a total adjacent land area of approximately 38,000 square miles.

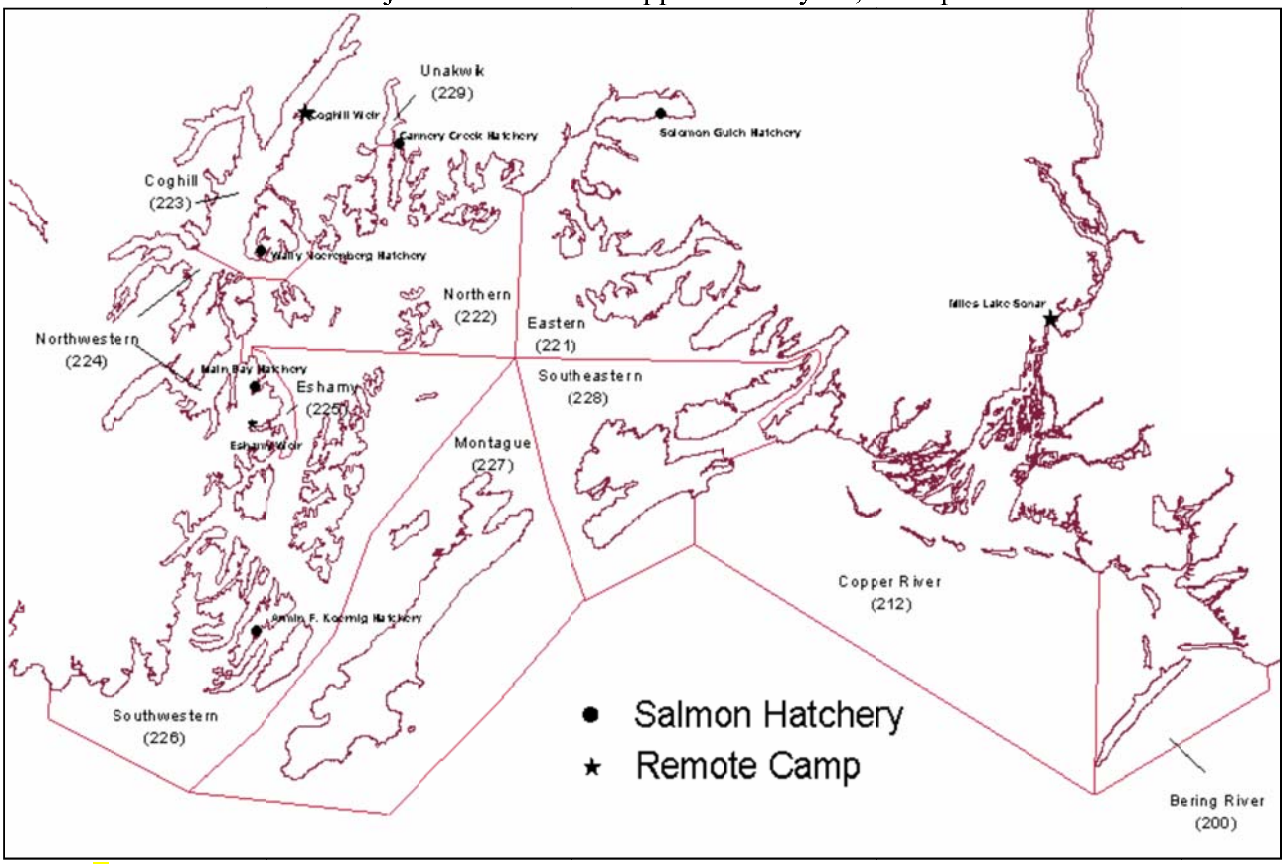

Figure 1. Prince William Sound Management Area showing commercial fishing districts, salmon hatcheries, weir locations, and Miles Lake sonar camp (Copper River district).

The salmon management area is divided into 11 districts (see Figure 1 above) that correspond to local geography and distribution of the five species of salmon harvested by the commercial fishery.

Six hatcheries contribute to the area's fisheries. Prince William Sound Aquaculture Corporation (PWSAC) operates five of the hatcheries: Gulkana Hatchery (GH) in Paxson; Cannery Creek Hatchery (CCH) located on the north shore of PWS; Armin F. Koernig (AFK) Hatchery in southwestern PWS; Wally Noerenberg Hatchery (WNH) in northwestern PWS; and Main Bay Hatchery (MBH) in western PWS. Valdez Fisheries Development Association (VFDA) operates Solomon Gulch Hatchery (SGH) in Port Valdez. Of these six hatcheries, only the Wally Noerenberg Hatchery augments production of chum salmon. Eggs are collected for chum salmon broodstock and fry are released onsite at WNH; dyed eggs are transferred to AFK for release with those fry transferred to Port Chalmers for remote release. PWSAC is the largest producer of hatchery salmon in Alaska, with a permitted capacity of 685 million eggs. They are also the largest producer of enhanced chum salmon in Alaska with a permitted capacity of 165 million eggs. The Armin F.

Koerning Hatchery currently produces only pink salmon, although chum salmon were produced in 1996 and 1997.

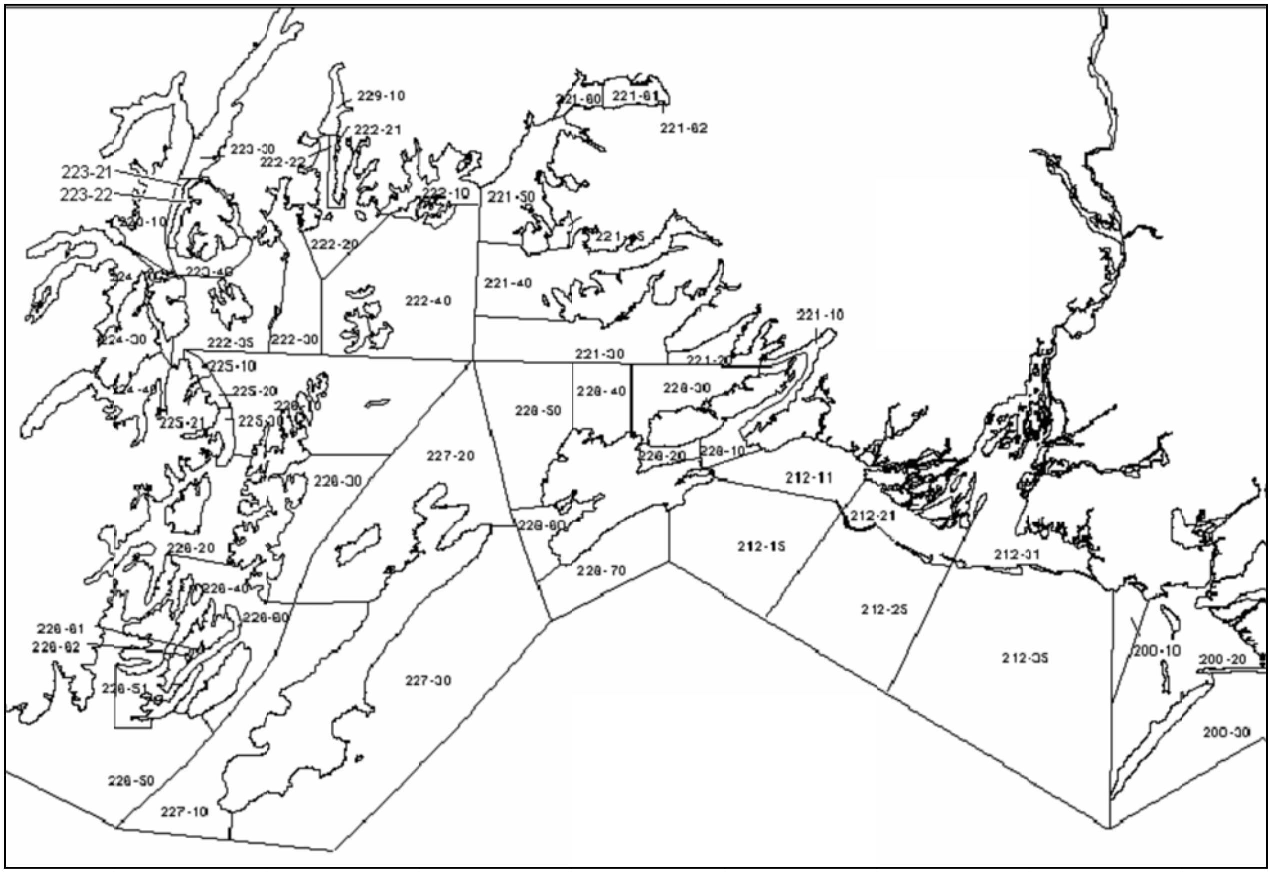

Figure 2. Prince William Sound Area showing commercial fishing districts and statistical reporting areas.

Commercial Chum Salmon Harvest

Gear utilized in the PWS salmon fisheries includes purse seine, drift gillnet, and set gillnet. Drift gillnet permits are the most numerous and are permitted to fish in the Bering River, Copper River, Coghill, Unakwik, and Eshamy Districts. Set gillnet gear is permitted to fish only in the Eshamy District. Purse seine gear is permitted to fish in the Eastern, Northern, Unakwik, Coghill, Northwestern, Southwestern, Montague, and Southeastern Districts.

The 2009 Prince William Sound Area total commercial salmon harvest was 24.0 million fish, of which 3.2 million were chum salmon (Figure 3). Contributions from thermal mark sampling indicate >90% of the 2009 chum salmon commercial harvest was hatchery production from PWSAC. The 2009 preseason forecast for chum salmon in PWS was 4.6 million fish. The chum salmon common property fishery (CPF) harvest was 2.6 million fish, which was 1.1 million fish below the preseason forecast. Based on ADF&G's 2009 wild chum salmon forecast of 376,000 fish, there was a potential CPF harvest of 176,000 wild chum salmon. The 2009 purse seine common property fishery harvest of 269,000 chum salmon was composed of approximately 4% wild and 96% hatchery fish. The drift gillnet common property fishery harvest was 2.3 million chum salmon, which was above the five year average of 1.1 million fish. PWSAC forecasted a 2009 run of 2.8 million chum salmon to Wally Noerenberg Hatchery, 1 million chum salmon to Port Chalmers, and 409,000 chum salmon to Armin F. Koernig Hatchery. For the Port Chalmers subdistrict, 2009 was the first year that drift gillnet gear was given access to this area. Approximately 1% of the chum salmon harvested in Port Chalmers were of wild stock origin. PWSAC harvested 604,625 chum salmon for cost recovery and 151,835 chum salmon for broodstock requirements.

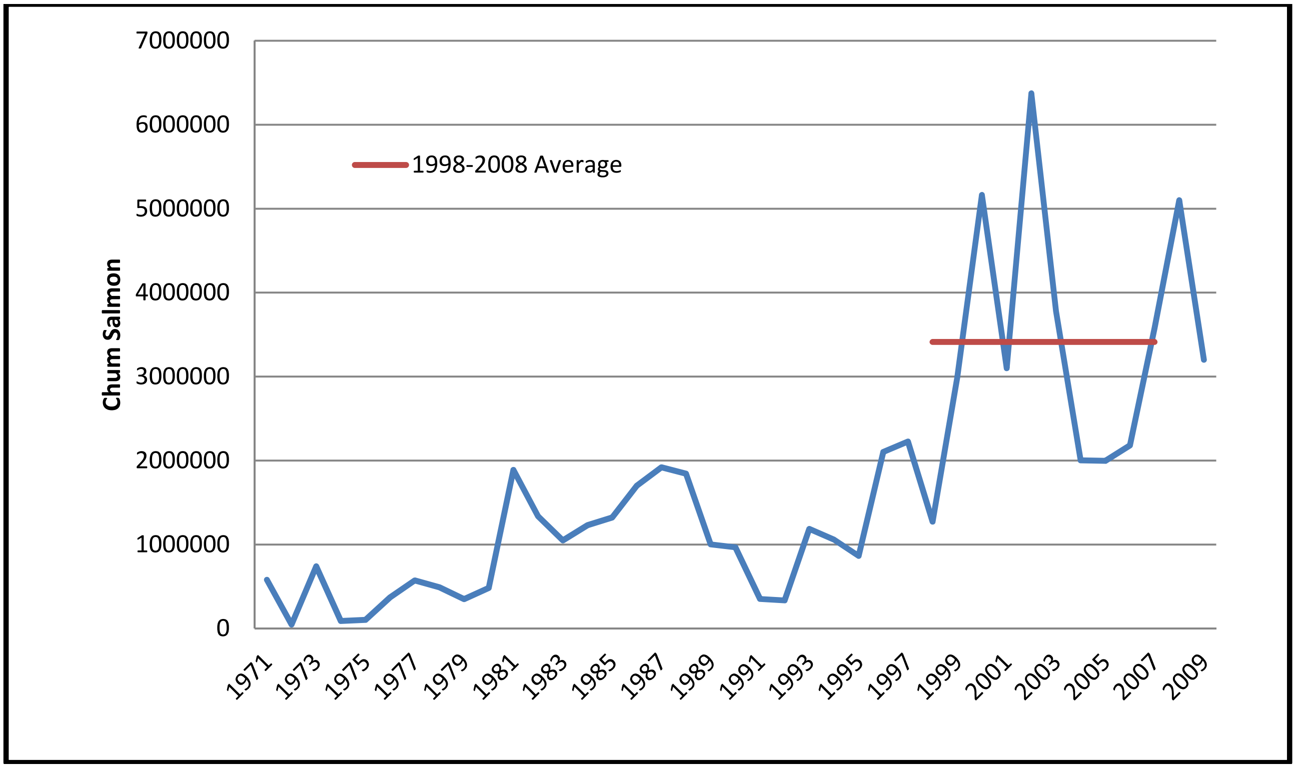

Figure 3. Total commercial chum salmon harvest by all gear types in Prince William Sound, 1971-2009.

The 2008 PWS Area commercial salmon harvest was 49.3 million fish, which included 5.1 million chum salmon. During this season, hatchery runs of chum salmon were above forecast levels. Of the 5.1 million chum salmon harvested, 95% (4.8 million fish) were produced by PWSAC. The 2008 chum salmon total run forecast in Prince William Sound was 3.8 million fish. The majority of the forecast (88%) was expected PWSAC hatchery production. Enhanced chum salmon returns to WNH, Port Chalmers, and AFK were forecast to be 2.3 million fish, 787,000 fish, and 309,000 fish respectively. Of that forecast, PWSAC's projection for cost recovery and broodstock requirements was approximately 842,000 fish (45%) of the 2.3 million, leaving 1.4 million chum salmon for the common property fishery (CPF). Based on ADF&G's wild chum salmon forecast of 446,000 fish, there was a potential common property harvest of 246,000 wild chum salmon. The total CPF chum salmon harvest for all three gear types was 1.7 million fish. Table 1 summarizes the commercial chum salmon harvest for PWS (2007–2009) by gear type and district.

The 2007 PWS Area commercial salmon harvest was 70.6 million fish, which included 3.6 million chum salmon. During this season, hatchery runs of chum salmon were above forecast levels. Of the 3.6 million chum salmon harvested, 96% (3.4 million fish) were produced by PWSAC. The 2007 chum salmon forecast in Prince William Sound was 3.4 million fish. The majority of that forecast

(84%) was expected PWSAC hatchery production. Enhanced chum salmon returns to WNH, Port Chalmers, and AFK were forecast to be 1.9 million fish, 625,000 fish, and 404,000 fish respectively. Of that forecast, PWSAC's projection for cost recovery and broodstock requirements was approximately 844,000 fish (45%) of the 2.9 million, leaving 1.1 million chum salmon for the common property fishery (CPF). Based on ADF&G's wild chum salmon forecast of 454,000 fish, there was a potential common property harvest of 254,000 wild chum salmon. The total CPF chum salmon harvest for all three gear types was 1.5 million fish.

Table 1. Prince William Sound Management Area commercial chum salmon harvest by gear type and district, 2007-2009.

District	2009 Chum Salmon	2008 Chum Salmon	2007 Chum Salmon
Eastern	4,752	20,808	81,077
Northern	15,234	38,525	9,901
Coghill	12,926	9,358	465,448
Southwestern	233,661	517,449	42,445
Montague	-	1,233,909	741,020
Southeastern	2,887	0	13,997
Unakwik	10	0	4
Purse Seine	269,470	1,820,049	1,353,892
Bering River	5	1	1
Copper River	8,629	1,330	9,657
Coghill	1,323,728	2,308,231	1,009,377
Eshamy	286,361	251,493	81,410
Montague	672,918	-	-
Unakwik	374	58	222
Drift Gillnet	2,292,015	2,561,113	1,100,667
Eshamy	50,748	53,627	24,651
Set Gillnet	50,748	53,627	24,651
Solomon Gulch	3,916	-	-
Cannery Creek	-	-	-
Wally Noerenberg	604,625	641,332	920,198
Main Bay	-	-	5,269
Armin F. Koernig	-	-	174,263
Hatchery	608,541	641,332	1,099,730
Educational Permit	-	-	20
Personal Use	67	14	102
Donated Fish	-	-	6
Misc.	67	14	128

Prince William Sound Total	3,220,841	5,076,135	3,579,068

PWSAC amended their initial 2007 WNH chum salmon cost recovery goal from 655,000 fish to 795,000 fish because the average fish weight was smaller than anticipated. PWSAC subsequently reported a chum salmon cost recovery harvest of 920,198 fish and a broodstock harvest of 173,452 fish, exceeding the inseason amended cost recovery goal by approximately 125,000 fish. ADF&G sought explanation as to why the cost recovery goal was exceeded, but did not receive a response from PWSAC staff.

Chum Salmon Escapement

The general purse seine districts are managed to achieve wild chum SEGs by district and allow for the orderly harvest of surplus wild and hatchery stocks. Escapement of chum salmon is monitored through the season by weekly aerial surveys of 208 index streams. Management to achieve hatchery corporate escapement goals is accomplished by opening and closing hatchery subdistricts and terminal harvest areas. Subdistrict and terminal harvest area openings are also utilized to target fishing effort on hatchery stocks when wild salmon escapement is weak.

Aerial survey escapement trends, compared to average historical performance, determine the duration of openings in PWS management districts. Aerial surveys of the index streams occur on a weekly basis, weather permitting. The 2009 total PWS chum salmon escapement of approximately 180,000 fish in districts with SEGs was almost double the SEG lower bound of 91,000. SEGs in PWS were met in each of the districts with established goals each year since 2006 (Table 2). No estimates for chum salmon escapements are included for the Unakwik, Eshamy, Southwestern, or Montague districts because there are no escapement goals for these districts.

Table 2. Prince William Sound chum salmon escapement goals and escapements, 2001-2009.

	2009 Goal Range					Chum Salmon Escapement								
	Lower	Upper	Type	Year Implemented	Enumeration Method	2001	2002	2003	2004	2005	2006	2007	2008	2009
Eastern District	50,000		lower-bound SEG	2006	Multiple Aerial Surveys	198,683	94,046	198,921	108,833	113,135	109,403	123,814	74,740	55,219
Northern District	20,000		lower-bound SEG	2006	Multiple Aerial Surveys	75,473	30,531	44,272	42,456	30,657	52,039	49,669	38,791	37,358
Coghill District	8,000		lower-bound SEG	2006	Multiple Aerial Surveys	13,388	7,430	19,729	9,685	11,979	15,900	14,052	39,660	36,724
Northwestern District	5,000		lower-bound SEG	2006	Multiple Aerial Surveys	6,373	16,194	12,736	10,371	12,696	25,860	10,778	28,051	34,290
Southeastern District	8,000		lower-bound SEG	2006	Multiple Aerial Surveys	37,526	104,906	116,131	42,344	25,547	26,739	60,464	21,614	16,453

Note: Red-shaded cells indicate escapement fell below stated goals. Yellow-shaded cells indicate escapement goals were met. Green-shaded cells indicate escapement goals were exceeded. Cells with no color indicate no official escapement goal for that particular year. Shaded cells are based upon the escapement goal in place at the time of enumeration for salmon stocks rather than the most recent escapement goal provided.

Subsistence Chum Salmon Harvest

Subsistence fishing permits are not required in the PWS Management Area for marine finfish other than salmon. The Subsistence Management Area is divided into two districts: the Prince William Sound District and the Upper Copper River District. The Prince William Sound Management District includes the PWS and Lower Copper River subsistence fisheries and the Tatitlek and Chenega area subsistence fisheries. The Upper Copper River Management District includes the Glenallen subsistence fishery, the Batzulnetas subsistence fishery, and the Chitina personal use fishery.

The Tatitlek and Chenega area subsistence fisheries are the most significant in all of PWS for chum salmon harvest (Table 3). The Chenega area includes the entirety of the Southwestern District as well as a portion of the Montague District along the northwestern shore of Green Island from the westernmost tip to the northernmost tip of the island. The Tatitlek subsistence area is located south of Valdez narrows in portions of the Northern and Eastern districts.

Table 3. Chum salmon harvest and effort in the Tatilek and Chenega subsistence fisheries, 1988-2009.

	Tatitlek				Chenega		
Year	Permits Issued	Chum Salmon	Total	Year	Permits Issued	Chum Salmon	Total
1988	17	245	811	1988	10	294	604
1989	14	43	837	1989	8	180	1,056
1990	13	4	260	1990	7	2	64
1991	17	28	1,439	1991	12	53	638
1992	16	49	891	1992	14	99	962
1993	18	74	1,217	1993	22	124	1,293
1994	14	70	313	1994	16	161	837
1995	15			1995	10	41	329
1996	6	0	38	1996	7	46	315
1997	6	54	206	1997	5	272	649
1998	11	28	355	1998	4	119	331
1999	17	31	947	1999	14	101	887
2000	12	40	688	2000	12	143	646
2001	14	12	416	2001	16	146	454
2002	19	36	575	2002	10	60	418
2003	15	12	298	2003	13	147	677
2004	18	28	713	2004	8	84	722
2005	16	16	600	2005	13	174	908
2006	12	25	81	2006	11	111	299
2007	14	unknown	unknown	2007	4	55	381
2008	2	0	60	2008	15	30	276
2009	12	0	301	2009	4	84	285
2000-2009 average	13	19	415	2000-2009 average	11	103	507

2010 Prince William Sound Chum Salmon Forecast[19]

The 2010 chum salmon total run forecast for the Prince William Sound Management Area was 3.4 million fish, the majority of which (3.0 million) would be from Prince William Sound Aquaculture Corporation hatchery production. The early run of chum salmon to WNH was forecast by PWSAC to be 1.82 million fish, of which PWSAC plans to harvest 693,000 (38%) to meet their cost recovery and broodstock goals. This would leave 1.13 million (62%) chum salmon for the commercial common property fishery (Table 4). PWSAC forecasted 344,000 chum salmon to AFK and 863,000 chum salmon to Port Chalmers. For 2010, the drift gillnet group has exclusive access to the Port Chalmers subdistrict remote release chum salmon fishery. Based upon ADF&G's wild chum salmon forecast of 355,000 fish (range 253,000-457,000), there is a potential common property harvest of 155,000 wild chum salmon (range 53,000-257,000).

Table 4. Prince William Sound chum salmon harvest estimate, 2010.

Natural Stocks	155,000
Hatchery Stocks	
Wally Noerenberg	1,125,000
Armin F. Koernig	344,000
Port Chalmers	863,000
Natural & Hatchery	2,487,000

5.3.3 Kodiak, Chignik, and the Aleutian Islands areas

For purposes of salmon management, the State of Alaska groups the Alaska Peninsula, Aleutian Islands, and Atka-Amlia Management Areas collectively into a single management region. This region is often referred to as Management Areas M & F, which is divided into four subareas: (1) the North Peninsula, consisting of Bering Sea waters extending west from Cape Menshikof to Cape Sarichef on Unimak Island; (2) the South Peninsula, consisting of Pacific Ocean coastal waters extending west of Kupreanof Point to Scotch Cap on Unimak Island; (3) the Aleutian Islands, consisting of the Bering Sea and Pacific Ocean waters of the Aleutian Islands west of Unimak Island and exclusive of the Atka-Amlia Management Area; and (4) the Atka-Amlia Management Area, also known as Area F, consisting of Bering Sea and Pacific Ocean waters extending west of Seguam Pass and east of Atka Pass. In this document, the Aleutian Islands and Atka-Amlia Management Areas (see Section 5.3.3.3 below) are treated separately from the Alaska Peninsula (refer to Section 5.2.7), which is being considered as a separate salmon stock grouping in western Alaska.

[19] Harvest data from the 2010 fishery and forecasts for the 2011 fishery are not yet available.

5.3.4 Kodiak

Description of Management Area

The Kodiak Management Area (KMA) comprises the waters of the western Gulf of Alaska surrounding the Kodiak Archipelago and that portion of the Alaska Peninsula bordering the Shelikof Strait between Cape Douglas and Kilokak Rocks (Figure 1). The archipelago is approximately 150 miles long, extending from northeast to southwest. In season management of the KMA commercial salmon fishery is structured around seven management districts that are further subdivided into 56 sections. Each section defines a traditional geographic harvest area managed for specific stocks or traditional fishing patterns.

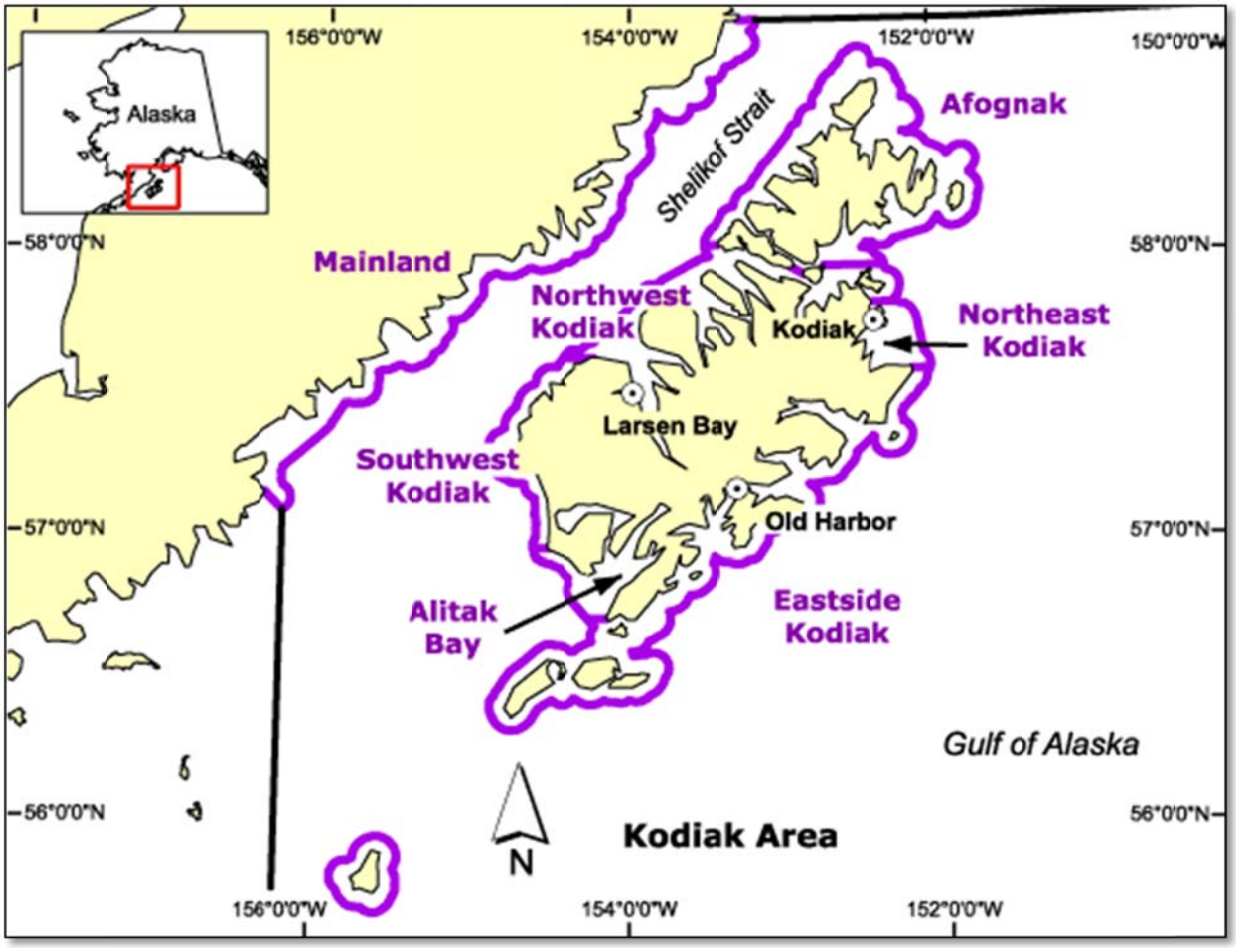

Figure 1. Kodiak Management Area identifying commercial salmon fishing districts.

Salmon migration or spawning has been documented in approximately 750 streams within the KMA. Of these, 415 streams have been documented to support yearly spawning populations of salmon while the remaining 335 are small streams used by pink salmon in years with very large returns. Chum salmon stocks are found in approximately 179 streams within the KMA (Table 1). Of the total number of streams, 97 are located in the Mainland District (on the Alaska Peninsula), while the remainder are located in the Kodiak Archipelago (in the Afognak, Northwest Kodiak, Southwest Kodiak, Alitak, Eastside Kodiak and Northeast Kodiak districts).

Table. 1. Estimated number of streams in the Kodiak Management Area with documented chum salmon production by district.

Management District	Number of Streams	Number of Streams with Chum salmon
Afognak	92	9
Northwest Kodiak	67	22
Southwest Kodiak	11	6
Alitak	30	15
Eastside Kodiak	91	54
Northeast Kodiak	27	12
Mainland	97	61
Total	415	179

The KMA has two hatcheries, the Kitoi Bay and Pillar Creek hatcheries, that currently produce salmon to supplement natural salmon production. Both hatcheries are located on the east side of Afognak Island, are operated by the Kodiak Regional Aquaculture Association (KRAA), and mainly produce pink salmon; however, sockeye, chum, and coho salmon are also cultured.

Commercial Chum Salmon Fishery

Commercial fishing effort was low during the 2009 commercial salmon fishing season (although increased slightly from 2008) with only 291 of 608 eligible permits making commercial landings. In the KMA there are restrictions on which gear types can operate in specific management districts based on historical gear use patterns. The majority of the KMA is open to seine (purse and beach) gear only. Set gillnet and seine gear are allowed in the Central and North Cape sections of the Northwest Kodiak District and the Olga Bay, Moser Bay, and Alitak Bay sections of the Alitak District. All gear types are allowed in the Central and North Cape sections for the entire season, however only set gillnet gear is allowed in the Olga Bay, Moser Bay, and Alitak Bay sections until September 4, after which all gear is allowed. By gear type, a total of 132 set gillnet, 158 purse seine, and one beach seine permit holder(s) fished in 2009. During 2009 set gillnet permit holder participation was lower than in 2008 while purse seine permit holder participation was higher than in 2008; however, participation in both gear types was below the previous 10-year (1999-2008) average. Purse seine fishermen accounted for 93% of the total number of salmon harvested in the KMA while set gillnet fishermen accounted for the remaining 7% of the total (Dinnocenzo et al., 2010).

For 2009, there was a projected all-species salmon harvest of 24,666,992 fish. A total of 30,627,685 salmon were actually harvested in the 2009 KMA commercial salmon fisheries, which included a total of 955,808 chum salmon. Commercial harvests of chum salmon exceeded projections of 623,000 fish and were slightly above the 1999-2008 average of 928,203 fish (Figure 2). Westside fisheries harvested 262,614 chum salmon, which was above the forecast of 197,819 fish; Eastside/North end Kodiak fishery harvest totaled 355,205 chum salmon, well above the forecast of

149,703 fish; and Mainland District catches totaled 121,807 chum salmon, close to the forecast of 104,387 fish (Table 2).

Table 2. Projected versus actual 2009 commercial chum salmon harvest for Kodiak Management Area.

	2009 Harvest	
Fishery	Projection	Actual
Afognak	20,328	50,386
Westside Kodiak	197,819	262,614
Alitak District	32,763	72,497
Eastside/Northend Kodiak	149,703	355,205
Mainland District	104,387	121,807
Total	505,000	862,509

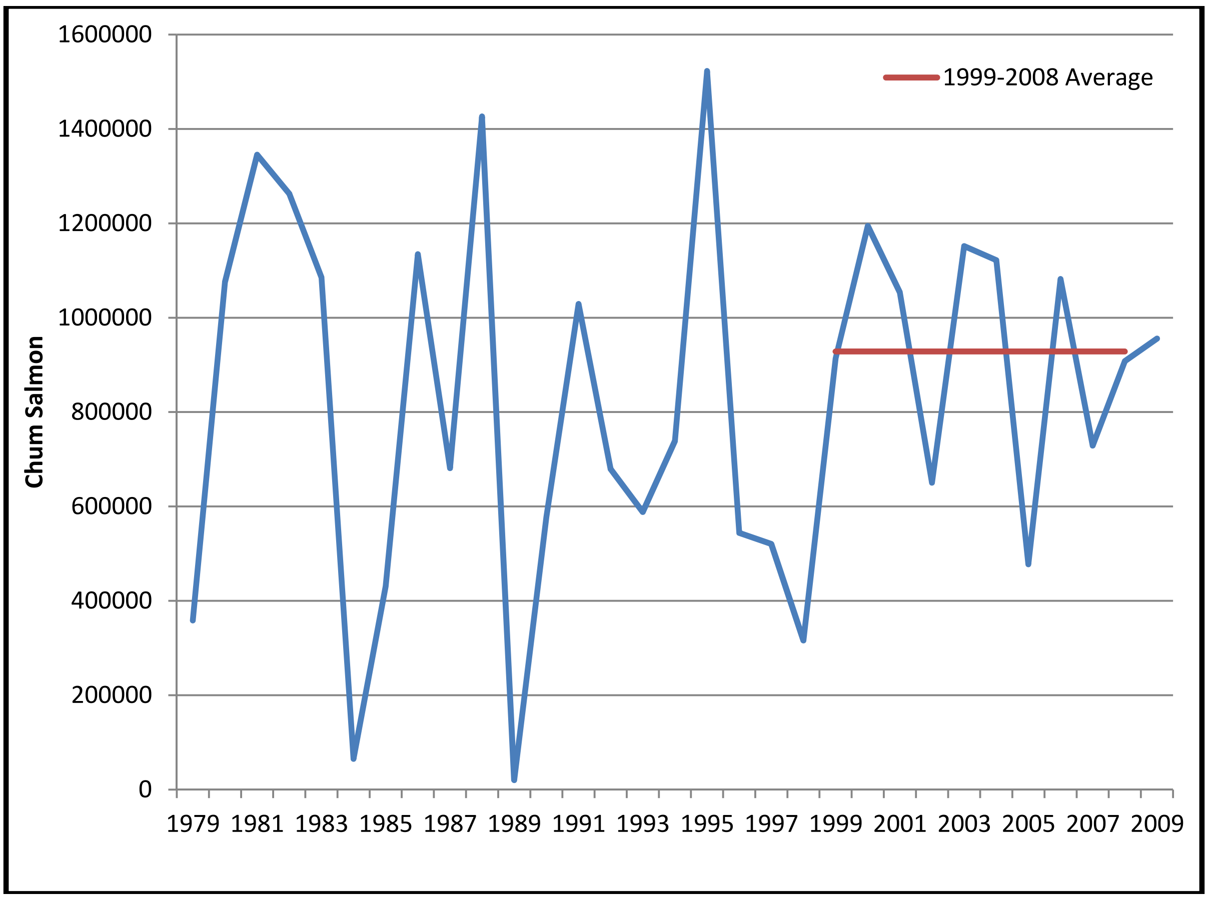

Figure 2. Commercial chum salmon harvest in the Kodiak Management Area, 1979-2009.
Note: Average does not include 1989, when commercial fisheries were severely limited due to the M/V Exxon Valdez oil spill.

The recent ten year (1999-2008) average supplemental production from KRAA has included an estimated 202,857 chum salmon. The commercial chum salmon harvest attributed to the Kitoi Bay Hatchery of 93,299 fish was less than the forecast of 118,000 fish.

Chum Salmon Escapement

Since 2008, the KMA commercial chum salmon fisheries have been managed to exceed the lower bounds of sustainable escapement goals (LB SEGs) for two aggregate stocks, the Mainland District (104,000 chum salmon) and the Kodiak Archipelago (151,000 chum salmon). These two aggregates were designated as a result of the most recent escapement goal review by ADF&G salmon management and research staff in 2007 (Honnold et al. 2007), and replaced the seven district goals that had been in existence prior. In 2008, the LB SEG was met for the Mainland District aggregate stock, but not for the Kodiak Archipelago stock. In 2009, the LB SEG was met for the Kodiak Archipelago aggregate stock, but not for the Mainland District aggregate stock. The 2009 chum salmon escapement in the Mainland District was 83,106 fish, not achieving the minimum goal of 104,000 fish. The chum salmon escapement for the Kodiak Archipelago of 210,039 fish exceeded the minimum goal of 151,000 fish (Table 5). Total 2009 escapement of chum salmon in the KMA was 293,145 fish.

The majority of the 2009 chum salmon escapement was estimated from aerial surveys, with less than 1% counted through weirs. Aerial surveys were conducted on several major KMA chum salmon systems along Kodiak Island's west side and in the Mainland District, mostly surveys of bays and streams from fixed-wing aircraft. Escapement estimates based on aerial surveys are considered minimum estimates of actual escapement. Foot surveys were also conducted on a few streams, primarily along the Kodiak road system. Aerial and foot survey counts were considered indices of actual escapement for use inseason to aid fishery management. Peak indexed escapement was calculated postseason for all systems surveyed and, together with weir escapement data, was used to estimate an area-wide escapement. Peak indexed escapement for chum salmon was defined as the highest daily aerial or foot survey count for each system for each year

Subsistence Chum Salmon Harvest

With few restrictions, the entire KMA has been open to subsistence salmon fishing in recent years. Only the freshwater systems of Afognak Island (which are relatively small, easily accessible, and at risk of over-exploitation) and some areas near heavily exploited salmon systems were closed to subsistence salmon fishing by regulation.

The 2009 reported subsistence harvest of 29,716 salmon included 345 chum salmon. Historically, the most utilized subsistence fishery areas are the north end of Kodiak Island, the Buskin and Pasagshak rivers, and the southeast side of Afognak Island at Litnik. Reported subsistence salmon harvests averaged 36,414 fish annually for the 10-year period 2000-2009 (Table XX). Chum salmon have only accounted for 1% of the recent 10-year average harvest (363 fish per year).

Table XX. Number of subsistence permits issued and estimated subsistence salmon harvest for the Kodiak Management Area, 2000-2009.

Year	Permits Issued	Chum Salmon	Total All Salmon
2000	1,711	375	39,753
2001	2,378	427	41,656
2002	2,277	350	42,622
2003	2,272	388	40,698
2004	2,241	261	38,403
2005	2,290	592	38,743
2006	2,095	441	32,173
2007	2,096	266	32,429
2008	2,037	186	27,947
2009	1,926	345	29,716

2010 Chum Salmon Forecast[20]

The 2010 preseason forecast for the Kodiak Management Area projected a harvest of 1,017,000 chum salmon out of a total all-species salmon harvest of 15,341,360 fish. Of this total, the KRAA forecasted the harvest of chum salmon returning to the Kitoi Bay Hatchery to be approximately 273,668 fish.

Table 3. Projected commercial chum salmon harvest for the Kodiak Management Area, 2010.

Fishery	2010 Projection
Kitoi Bay Hatchery	273,668
Afognak (wild)	30,000
Westside Kodiak	291,000
Alitak District	48,000
Eastside/Northend Kodiak	220,000
Mainland District	154,000
Total	1,016,668

5.3.4.1 Chignik

Description of Management Area

The Chignik Management Area (CMA) encompasses all coastal waters and inland drainages of the northwest Gulf of Alaska between Kilokak Rocks and Kupreanof Point (Figure 3). For management purposes, these waters are divided into five fishing districts: Eastern, Central, Chignik Bay, Western,

[20] Harvest data from the 2010 fishery and forecasts for the 2011 fishery are not yet available.

and Perryville districts. Each district is further broken down into sections and statistical reporting areas. The CMA is also known as Area L.

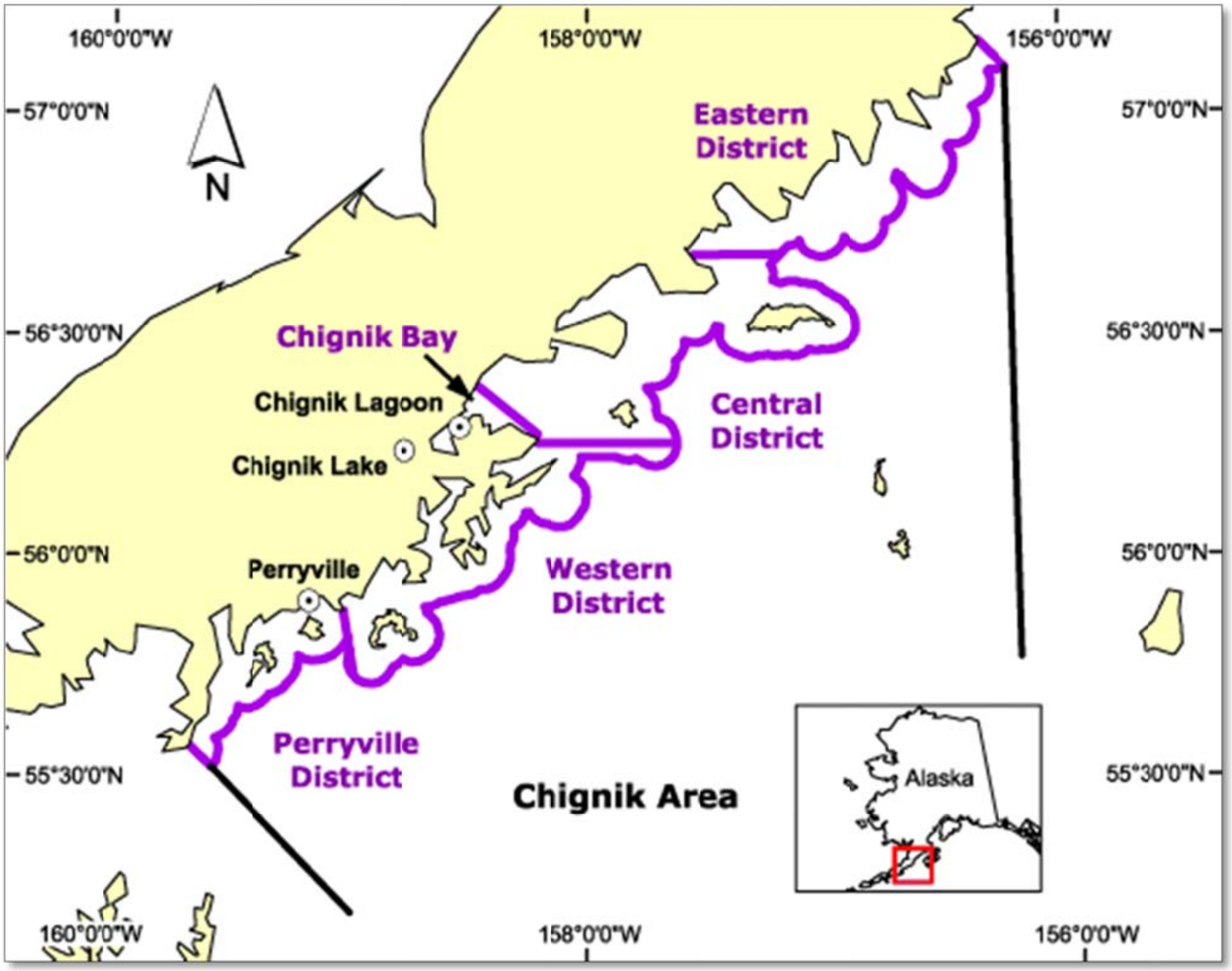

Figure 3. Chignik Management Area identifying the five commercial salmon fishing districts.

All five species of Pacific salmon are commercially harvested in the CMA; however, sockeye salmon are the primary species targeted and the most important commercial and subsistence salmon species in the CMA. The majority of fishing effort is concentrated on salmon returning to the Chignik River watershed.

Commercial Chum Salmon Harvest

A total of 256,425 chum salmon were harvested in 2009, which (as with 2008) was higher than the five and ten year average harvests (Figure 4). The majority of the chum harvest in 2009 took place in the Western District, although the Central and Eastern districts also yielded substantial catches (Table 4). Purse and hand purse seines are the only legal commercial salmon fishing gear within the CMA. A total of 209,325 chum salmon were harvested from the CMA during 2008. The majority of the 2008 chum salmon harvest occurred in the Eastern and Western districts during August.

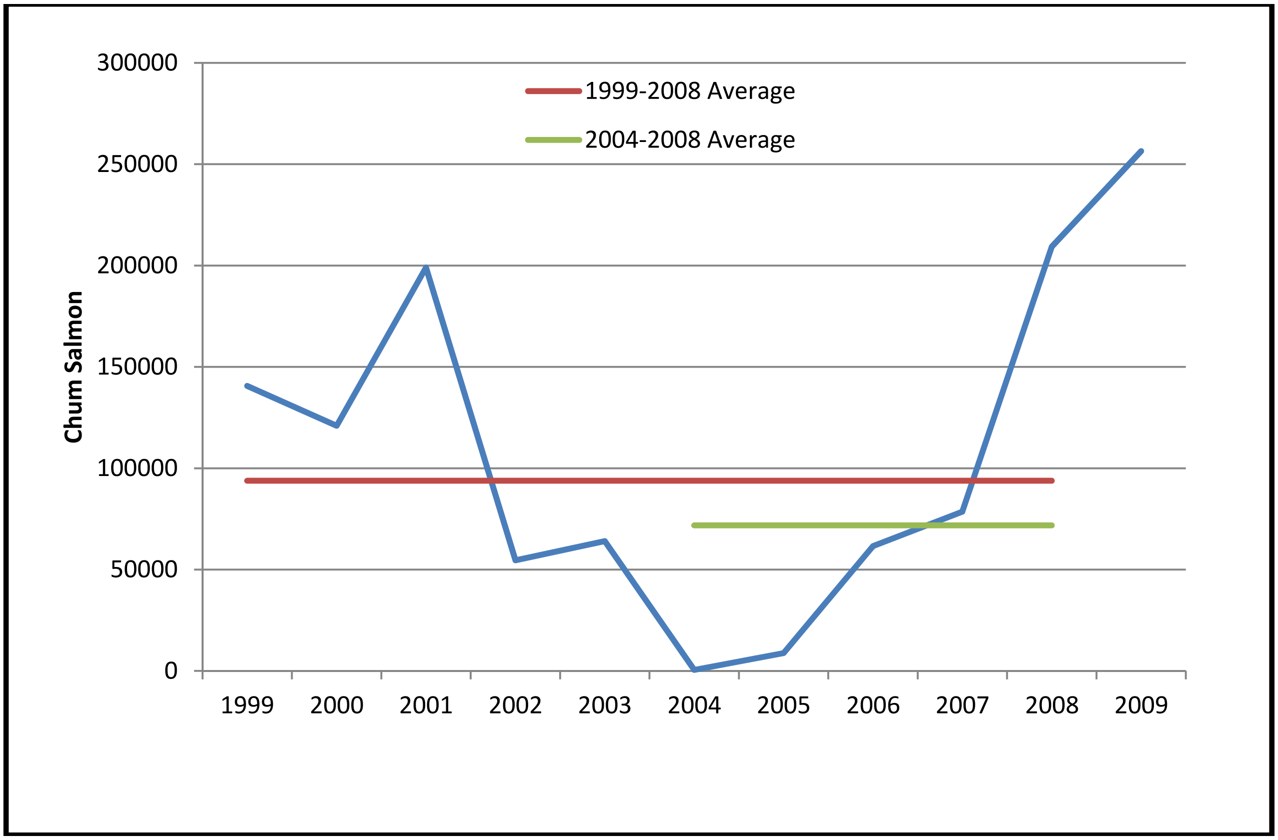

Figure 4. Commercial chum salmon harvest in the Chignik Management Area, 1999-2009.

Table 4. Chignik Management Area commercial chum salmon harvest by district, 1999-2009.

	Chum Salmon Harvested					
Year	Chignik Bay	Central	Eastern	Western	Perryville	Total
1999	12,150	75,495	11,332	37,089	4,531	140,597
2000	8,389	66,904	8,045	34,823	2,796	120,957
2001	11,534	84,132	50,911	37,466	14,960	199,003
2002	3,949	9,643	513	40,337	117	54,559
2003	10,891	11,304	50	39,883	1,916	64,044
2004	499	6	-	-	-	505
2005	2,370	5,329	2	1,054	66	8,821
2006	2,303	9,455	776	49,096	-	61,630
2007	3,829	19,595	7,851	46,943	335	78,553
2008	13,453	40,130	58,925	88,078	8,739	209,325
2009	14,553	62,149	59,800	116,231	3,692	256,425

Chum Salmon Escapement

Salmon escapements in the CMA are enumerated through the use of a weir on the Chignik River, and the escapement goal is an aggregate, area-wide LB SEG. After the latest review of escapement goals for the Chignik Management Area in 2007 (Witteveen et al. 2007), this LB SEG was changed from 50,400 to 57,400, effective beginning in 2008. This LB SEG was exceeded in both 2008 (197,259 chum salmon) and 2009 (214,959 chum salmon).

Table 5. Chignik and Kodiak area chum salmon escapement goals and escapements, 2001-2009.

	2009 Goal Range					Chum Salmon Escapement								
Chignik	Lower	Upper	Type	Year Implemented	Enumeration Method	2001	2002	2003	2004	2005	2006	2007	2008	2009
Entire Chignik Area	57,400		lower-bound SEG	2008	Weir Count and Aerial Survey	550,800	235,634	300,325	349,518	38,700	93,489	238,098	197,259	214,959

	2009 Goal Range					Chum Salmon Escapement								
Kodiak	Lower	Upper	Type	Year Implemented	Enumeration Method	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mainland District	104,000		lower-bound SEG	2008	Weir Count and Aerial Survey	294,700	197,175	114,750	364,395	37,500	346,140	87,350	122,425	83,106
Kodiak Archipelago Aggregate	151,000		lower-bound SEG	2008	Weir Count and Aerial Survey	263,225	333,416	265,773	168,696	206,755	441,409	206,992	101,482	210,039

Note: Red-shaded cells indicate escapement fell below stated goals. Yellow-shaded cells indicate escapement goals were met. Cells with no color indicate no official escapement goal for that particular year. Shaded cells are based upon the escapement goal in place at the time of enumeration for salmon stocks rather than the most recent escapement goal provided.

Subsistence Chum Salmon Harvest[21]

In 2009, ADF&G issued 95 subsistence fishing permits in the CMA. Based on the 82 permits returned to ADF&G Division of Subsistence, the estimated subsistence harvest totaled 8,907 salmon, which included only 137 chum salmon. This harvest was lower than the previous five and 10-year subsistence harvest averages of 264 chum salmon and 223 chum salmon, respectively (Table 6). Sockeye salmon comprise the majority of the subsistence harvest in CMA.

Table 6. Number of subsistence permits issued and estimated subsistence salmon harvest for the Chignik Management Area, 1999-2009.

Year	Permits Issued	Chum Salmon	Total All Salmon
1999	106	136	12,289
2000	130	517	13,228
2001	135	213	13,663
2002	120	23	11,980
2003	146	286	15,395
2004	104	202	10,357
2005	119	353	11,590
2006	113	275	11,186
2007	128	165	13,372
2008	89	57	8,783
2009	95	137	8,907

2010 Chum Salmon Forecast[22]

Harvest projections for chum salmon in the CMA for 2010 were generated by averaging the last four fishery years (2006-2009). The 2010 projected chum salmon harvest was 151,000 fish. Historically, the Western and Perryville districts provided the largest proportion of the commercial harvest.

5.3.5 Aleutian Islands

The Aleutians Islands and Atka-Amlia Management Area

The Aleutian Islands Management Area (AIMA) includes waters west of Cape Sarichef Light and Scotch Cap (both located on Unimak Island), and the Pribilof Islands (Figure 5). The AIMA is one of three subareas comprising Area M, the other two of which are the North and South Alaska Peninsula management areas (Hartill 2009) and are included in the Western Alaska portion of this document. A fourth subarea, the Atka-Amlia Islands Management Area, encompasses Aleutian Islands waters between Seguam Pass and Atka Pass (Figure 5) and is also known as Area F.

[21] There is no reported information on educational or personal use salmon fisheries in the Chignik Management Area.
[22] Harvest data from the 2010 fishery and forecasts for the 2011 fishery are not yet available.

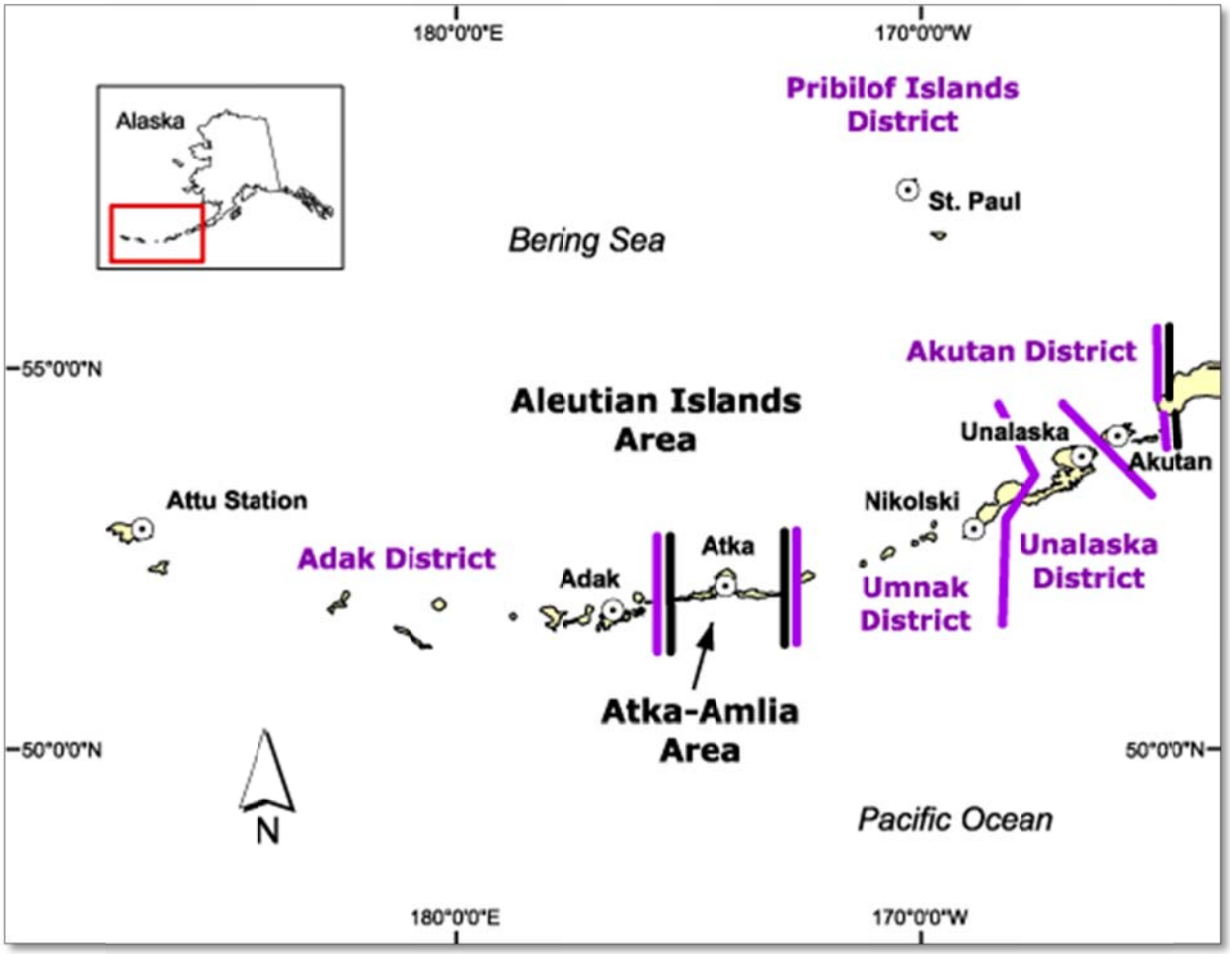

Figure 5. The Aleutian Islands and Atka-Amlia Islands management areas.

Streams in the Aleutian Islands have runs of sockeye, coho, pink, and chum salmon; however, poor salmon markets have generally limited commercial salmon harvests in both the Unalaska Island and Atka-Amlia Island fisheries. Pink salmon are the dominant harvest species in the Aleutian Islands.

Commercial Chum Salmon Harvest

Purse seines, hand purse seines, and beach seines are the only legal gear types allowed to fish for salmon in the Aleutian Islands Management Area. Small commercial harvests occurred in the Atka-Amlia Islands Management Area between 1992 and 1996 with no commercial effort since that time. Interest in this fishery diminished due to lack of markets, high processing costs, and low volumes of fish.

Table 7. Commercial chum salmon harvest in the Aleutian Islands Management Area (excluding Atka-Amlia Islands Area), 1980-2009.

Year	Chum Salmon
1980	4,874
1981	6,553
1982	6,148
1983	11,361
1984	32,025
1985	*
1986	38,819
1987	-
1988	450
1989	-
1990	1,038
1991	*
1992	1,230
1993	-
1994	617
1995	-
1996	-
1997	-
1998	-
1999	-
2000	*
2001	-
2002	-
2003	-
2004	-
2005	-
2006	1,534
2007	*
2008	261
2009	2,005

* Confidentiality rules prohibit the release of information for 1985, 1991, 2000, and 2007.

In total 2,005 chum salmon were harvested in the commercial fishery in the Aleutian Islands Management Area in 2009 (Table 7), along with 1,625,910 pink salmon. All the commercial harvest was around Unalaska Island and most of that harvest occurred in the Makushin Bay area. There was no commercial salmon harvest in the Atka-Amlia Islands Area in 2009 (Table 8).

Table 8. Commercial chum salmon harvest in the Atka-Amlia Islands Area, 1992-2009.

Year	Chum Salmon
1992	308
1993	563
1994	0
1995	0
1996	0
1997	0
1998	0
1999	0
2000	0
2001	0
2002	0
2003	0
2004	0
2005	0
2006	0
2007	0
2008	0
2009	0

Chum Salmon Escapement

There is little salmon escapement information collected for the Aleutian Islands and Atka-Amlia Islands areas. Poor weather, remoteness, unavailability of suitable aircraft, and the high cost of aircraft charters limit surveys.

Subsistence Chum Salmon Harvest[23]

Subsistence salmon fishing is important to Aleutian Islands communities; however, due to the remoteness of most villages in the AIMA, subsistence salmon fishing permits are only required in the larger communities in the Unalaska and Adak districts. Subsequently, Unalaska and Adak are the only communities from which subsistence information (from returned permits) is compiled on an annual basis. Sockeye salmon are the preferred species in the Unalaska subsistence fishery.

A total of 215 subsistence permits were issued for the Unalaska District in 2009, which was 11 permits more than in 2008 and 14 permits more than the average from 2004 through 2008. The total estimated harvest of 4,513 salmon in 2009 was more than the estimated 2008 catch of 3,243 fish, and more than the 2004-2008 average estimated harvest of 4,062 salmon. Chum salmon are not abundant in Unalaska Island waters and account for only a small portion of the subsistence harvest. In 2009, an estimated 182 chum salmon were caught in the Unalaska District subsistence fishery (Table 9).

[23] There is no reported information on educational or personal use salmon fisheries in the Aleutian Islands and Atka-Amlia Management Areas.

Table 9. Estimated chum salmon subsistence harvest in the Aleutian Islands and Atka-Amlia Management Area, 1985-2009.

Year	Permits Issued	Chum Salmon
1985	65	20
1986	121	375
1987	81	151
1988	74	83
1989	70	36
1990	94	100
1991	89	45
1992	144	11
1993	137	136
1994	15	48
1995	159	23
1996	189	49
1997	218	110
1998	206	26
1999	208	13
2000	205	24
2001	201	100
2002	226	63
2003	220	41
2004	207	26
2005	207	15
2006	193	92
2007	171	36
2008	195	115
2009	205	182

5.3.6 Southeast Alaska and Yakutat

Description of Management Area

The Southeast Alaska/Yakutat Region (Region I) consists of Alaska waters between Cape Suckling on the north and Dixon Entrance on the south (Figure 1). Region I is divided into 2 salmon net registration areas. Registration Area A, the Southeast Alaska area, extends from Dixon Entrance to Cape Fairweather. The Southeast Alaska area is divided into 17 regulatory districts, Districts 1 through 16 and the Dixon Entrance District (Figure 2). Registration Area D, the Yakutat area, extends from Cape Fairweather to Cape Suckling. The Yakutat area is further divided into the Yakutat District, extending from Cape Fairweather to Icy Cape, and the Yakataga District extending westward from Icy Cape to Cape Suckling (Figure 3).

Figure 1.–The Southeast Alaska/Yakutat Region (Region I) consists of Alaska waters between Cape Suckling on the north and Dixon Entrance on the south. Troll fisheries are managed regionally, and drift gillnet, set net, and purse seine fisheries are managed by area offices in Ketchikan, Petersburg/Wrangell, Sitka, Juneau, Haines, and Yakutat.

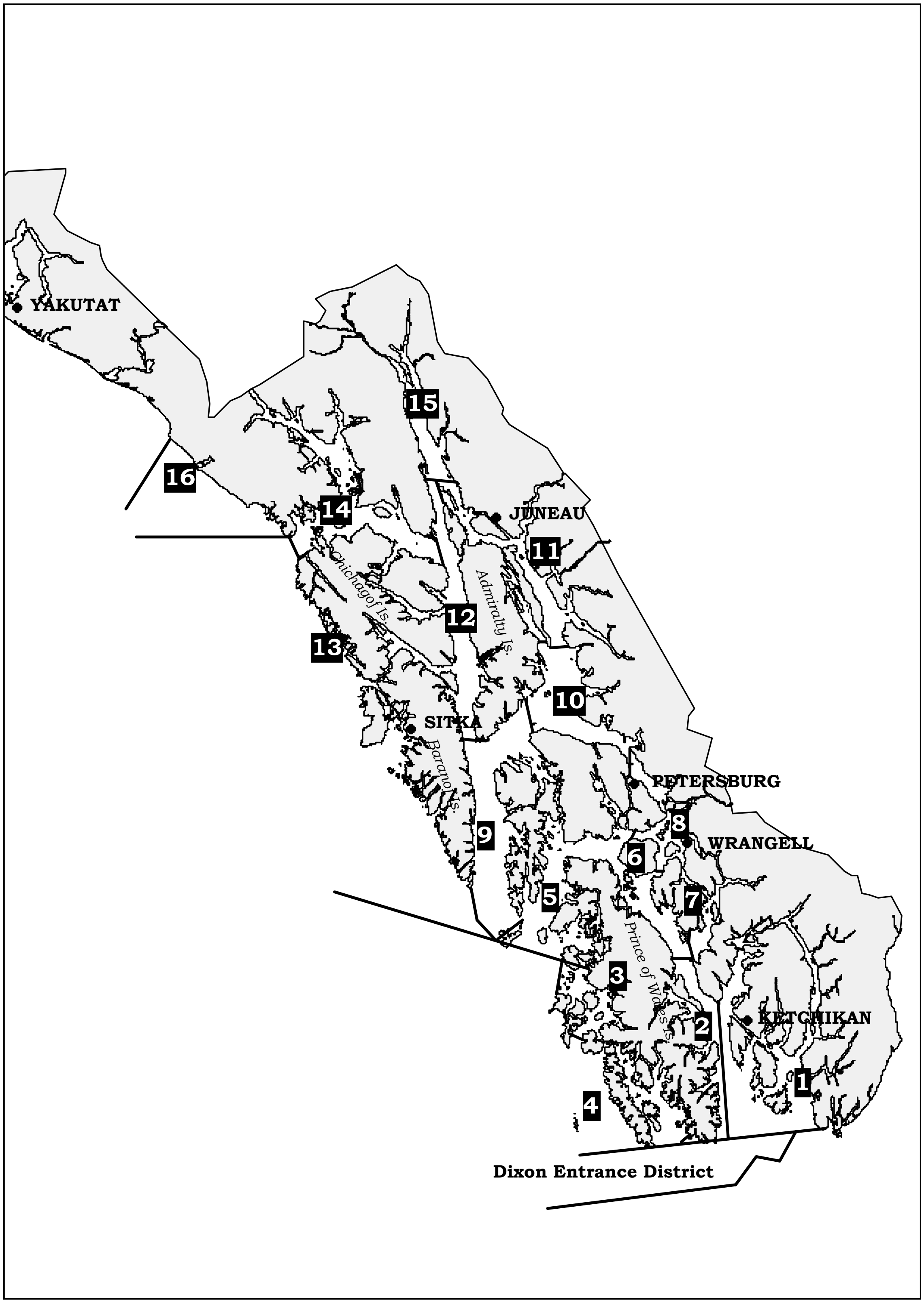

Figure 2. Boundaries for regulatory districts 1 to 16, as well as Dixon Entrance district, within Southeast Alaska.

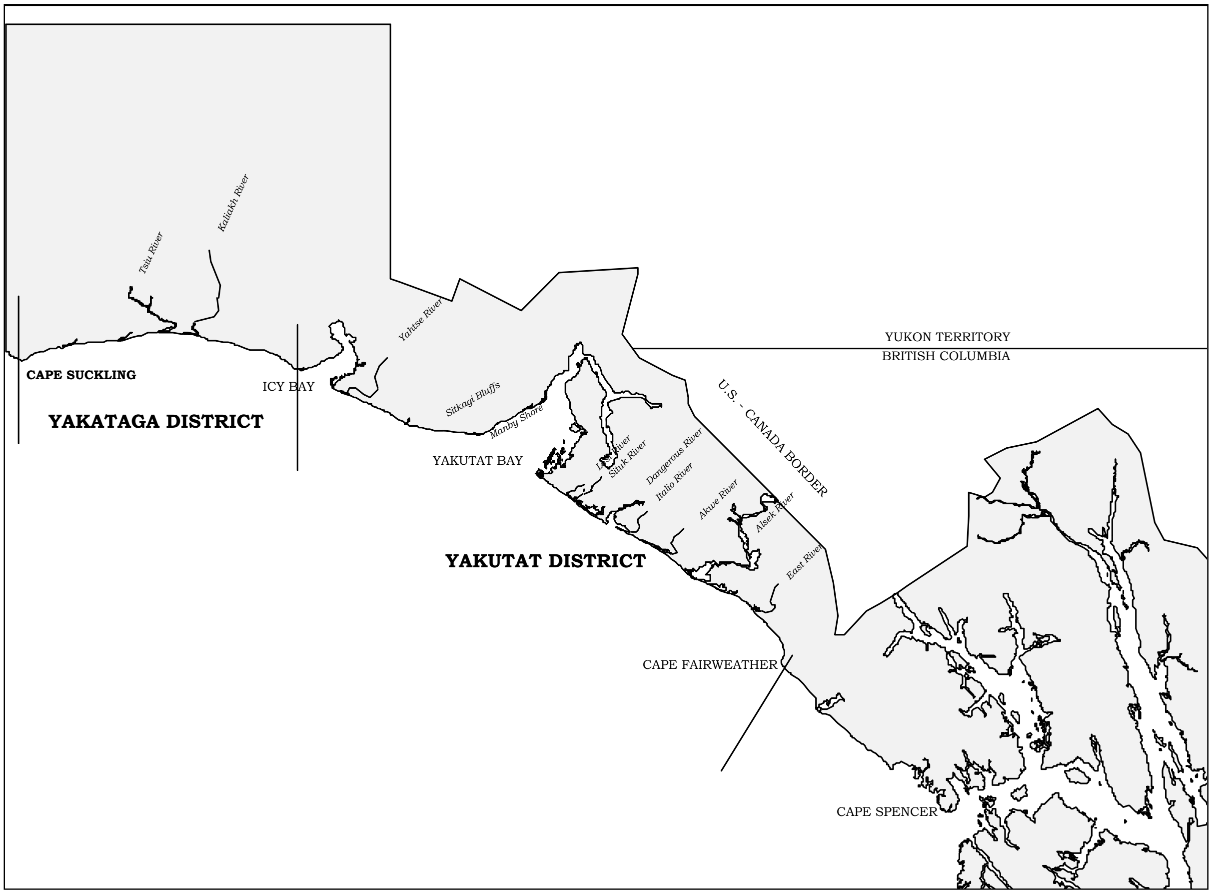

Figure 3. Boundaries for Yakutat and Yakataga regulatory districts, within the Yakutat management area (Registration Area D).

There are seven major hatcheries operating in Southeast Alaska: the Southern Southeast Regional Aquaculture Association (SSRAA); the Northern Southeast Regional Aquaculture Association (NSRAA); Douglas Island Pink and Chum Inc. (DIPAC); the Prince of Wales Hatchery Association (POWHA); the Kake Nonprofit Fishery Corporation (KAKE); Armstrong Keta, Inc. (AKI); and Sheldon Jackson College (SJC).

Commercial Chum Salmon Harvest

For salmon management in Region 1, separate annual management reports are issued, which provide detailed summaries of the Southeast and Yakutat Salmon Troll Fishery, the Yakutat Area Commercial Set Net Fishery, and the Southeast Alaska Purse Seine and Drift Gillnet Fisheries. Prior to 2006 these reports were combined annually into the Commercial, Personal Use, and Subsistence Salmon Fisheries: Report to the Alaska Board of Fisheries.

Salmon are commercially harvested in Southeast Alaska (Registration Area A) with purse seines and drift gillnets; in Yakutat (Registration Area D) with set gillnets; and in both areas with hand and power troll gear. The salmon net fisheries are confined to state waters. The troll fishery operates in both state waters and in the federal waters of the Exclusive Economic Zone (EEZ). Approximately

51.6 million salmon were commercially harvested (including hatchery cost recovery) in the combined Southeast Alaska/Yakutat Region in 2009. The total common property commercial harvest was 45.5 million, 88% of total harvests, excluding cost recovery and Annette Island harvests (fishery data for 2009 were reported by Tingley and Davidson 2010). A total of 1,915 permit holders participated in the common property commercial salmon season in 2009, a slight increase from 2008 effort levels. Salmon harvests (in numbers of fish) by gear type for 2009 included 44.4 million by purse seine, 4.3 million by drift gillnet, 0.3 million by set net, and 2.2 million by hand and power troll.

Since the mid-1970s, salmon harvests in Region I have generally increased with a record harvest of chum salmon occurring in 1996. The various salmon fisheries in the region are well-established and the distribution of harvests between fisheries has changed little comparing the recent year, the recent 10-year average, or the long term average since 1962. The exception is that private hatchery cost recovery harvests, which only began in 1980, now account for a larger proportion of overall harvests. Harvests of chum salmon increased as new hatchery production began in the mid-1980s and in recent years the majority of chum salmon harvests in the region are attributable to hatchery production. In 1980, hatchery operators in Southeast Alaska released 8.7 million chum salmon fry at eight locations; by 2007, this number had risen to 454 million fry released at 22 locations.

The total harvest of 9.7 million chum salmon in 2009 was slightly higher than the preceding year and 89% of the recent 10-year average of 10.8 million (Table 1, Figure 4). Hatchery-produced chum salmon accounted for 88% of the chum harvested in Southeast Alaska common property fisheries (White 2010) and 92% of the total chum salmon harvested in Southeast Alaska (Figure 5). The 2009 chum salmon harvest made up 19% of the all-salmon species harvest and was above the long-term average from 1962-2008. For 2009, purse seiners harvested 3.5 million (36%) chum salmon, drift gillnetters accounted for 2.7 million (28%) chum salmon and 2.9 million (30%) chum salmon were taken in the hatchery cost recovery fisheries (Table 2).

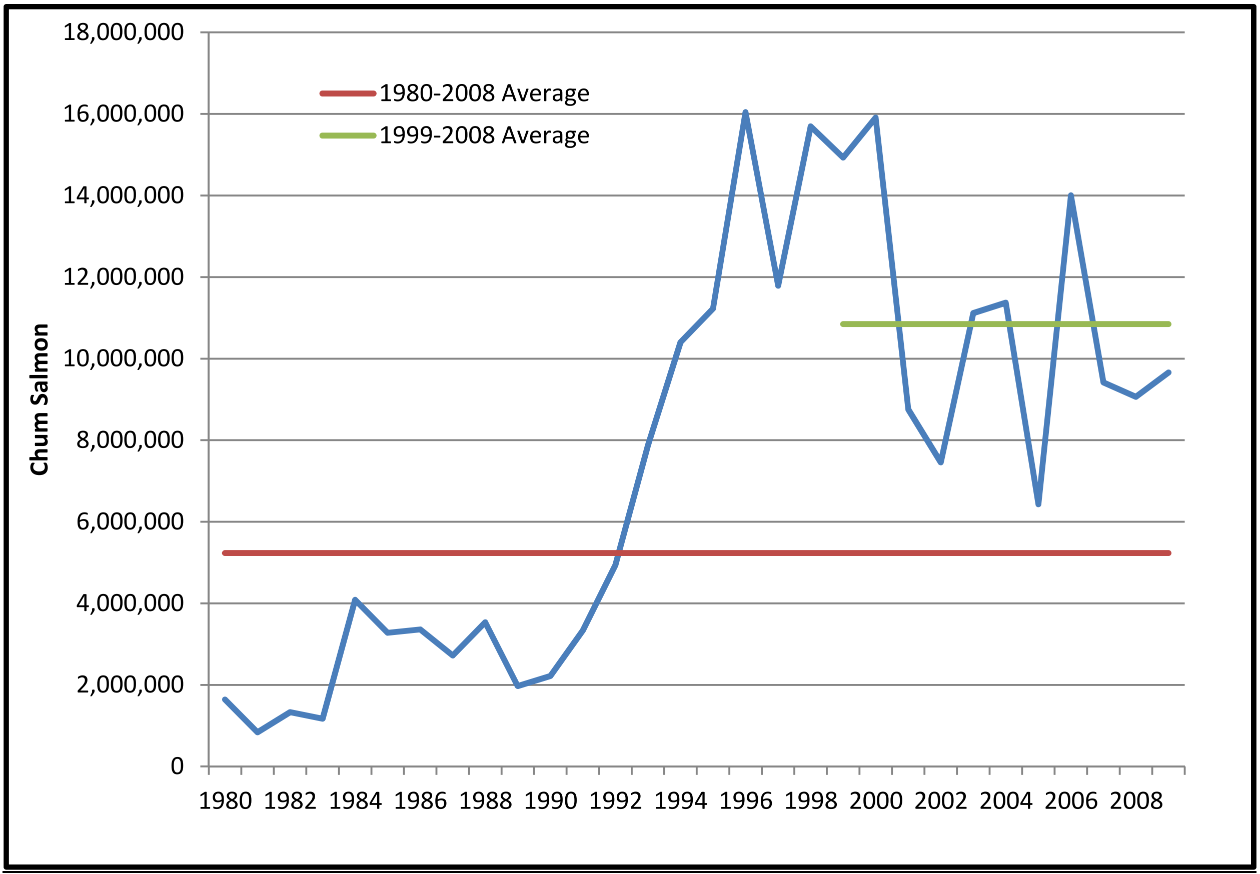

Figure 4. Southeast Alaska and Yakutat Area total chum salmon harvest and percentage of total, 1980-2009.

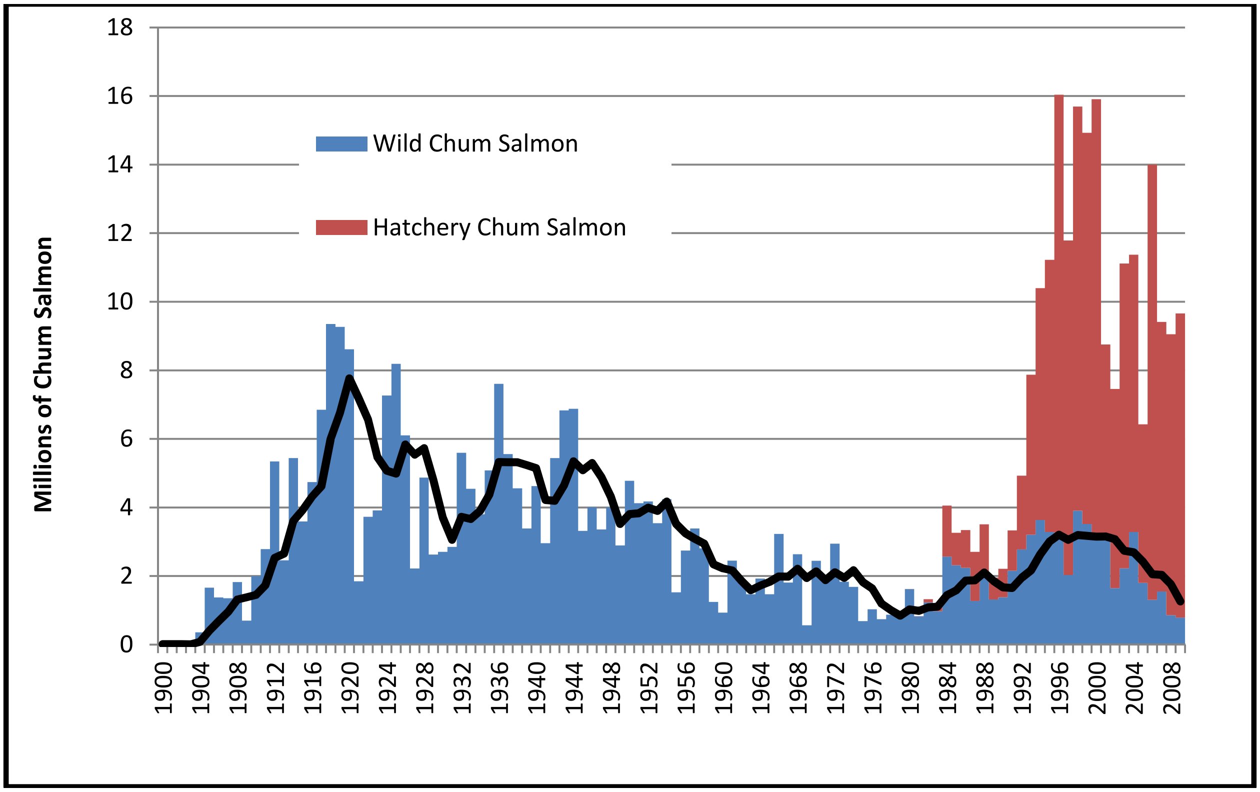

Figure 5. Southeast Alaska total chum salmon harvest including estimated hatchery contribution, 1900-2009.

Table 2. Southeast Alaska and Yakutat Area commercial chum salmon harvest by fishery, 2009.

Fishery	Chum Salmon	Percentage
Purse Seine	3,502,998	36%
Drift Gillnet	2,729,966	28%
Set Gillnet	871	<1%
Troll	342,866	4%
Annette Island	158,637	2%
Hatchery Cost Recovery	2,912,641	30%
Miscellaneous	12,385	<1%
Total	9,660,364	

Note: Miscellaneous fishery includes chum salmon that were confiscated, caught in sport fish derbies, or commercial test fisheries, and sold.

In 2009, of the 51.6 million total all-gear, all-species salmon harvest, 81% were harvested in traditional fisheries, 7% in THA fisheries, and 8% in hatchery cost recovery fisheries. Of the 9.7 million chum harvested in 2009, 38% were harvested in traditional areas, 30% were harvested in hatchery THAs, and 30% were harvested in cost recovery fisheries. The estimated hatchery contribution of chum salmon to the common property seine harvest for 2009 was 87%, or 3.1 million fish. Total combined hatchery contributions estimated by NSRAA, SSRAA, and DIPAC to the common property drift gillnet fisheries was 95%, or 2.6 million chum salmon.

Hatchery cost recovery harvests in 2009 totalled approximately 4.0 million fish (all species combined), 84% of the recent 10-year average harvest of 4.8 million. The harvest included 2.9 million chum salmon. Chum salmon made up 73% of the total cost recovery harvest in the region in numbers of fish and was 15% below the recent 10-year average harvest of 3.4 million. Chum salmon cost recovery harvests were conducted by SSRAA (761,000), DIPAC (1,588,000), NSRAA (446,000), AKI (38,000), and SJC (17,000). No cost recovery harvests were reported by KAKE or MIC.

Southeast Alaska Commercial Purse Seine and Drift Gillnet Fisheries

During the 2009 purse seine fishery, 379 permits were issued and 269 permits were fished. Effort in 2009 increased greatly over the 213 permits fished in 2008 (the second lowest effort on record) and was the greatest since 273 permits were fished in 2002.

In 2009, the total harvest by purse seine gear was 44.4 million salmon (all species combined) of which the total common property purse seine harvest was 39.1 million salmon. Common property fisheries include traditional wild stock fisheries and terminal harvest area (THA) fisheries where fishermen compete to harvest surplus returns. Common property purse seine harvests for 2009 included 36.2 million fish in traditional areas and 2.8 million fish in hatchery terminal areas. The total common property purse seine harvest included approximately 3.5 million chum salmon. On average, the common property purse seine harvests since 1962 account for 69% of chum salmon harvests in the region.

Historically, the total purse seine fishery in Southeast Alaska has accounted for approximately 82% of the total commercial common property salmon harvest (all species combined). Pink salmon is the primary species targeted by the purse seine fleet; therefore, most management actions are based on inseason assessments of the abundance of pink salmon. Other salmon species are harvested incidentally to pink salmon in the purse seine fishery. Common property purse seine harvests for all salmon species (except Chinook salmon) were below the recent 10-year average. The chum salmon harvest for 2009 was 71% of the recent 10-year average harvest of 5.0 million fish. Cost recovery seine harvests to support privately operated salmon enhancement programs totaled 3.6 million, of which 75% were chum salmon. Seine harvests reported by the Annette Island Reservation[24] totaled 1.7 million fish (all species) which included approximately 38,500 chum salmon. Miscellaneous harvests of 41,000 salmon include test fisheries authorized by the department as well as illegally harvested fish, later confiscated by the Alaska Wildlife Troopers.

Of the 44.4 million salmon harvested by purse seine gear in 2009, 28.4 million were harvested in Southern Southeast districts and 16.0 million were harvested in Northern Southeast districts. Purse seine fishing in Northern Southeast Alaska includes the fisheries that occur in Districts 9 through 14. For 2009, traditional and THA purse seine harvests in Northern Southeast Alaska totaled 13.1 million fish, and included 2.4 million chum salmon (Table 3, Figure 6). The harvest of chum salmon was above the long-term average but below the most recent 10-year average harvests. The 2009 harvest of chum salmon in Northern Southeast Alaska was 79% of the recent 10-year average harvest of 3.3 million.

[24] Presidential proclamation established the Annette Island Fishery Reserve in 1916. It provides a 3,000-foot offshore zone wherein the reserve natives have exclusive fishing rights. Salmon are harvested by purse seine, gillnet, and troll gear.

Purse seine fishing in southern Southeast Alaska occurs in Districts 1 through 7. In 2009, the common property purse seine harvest (traditional and THA) in southern Southeast Alaska totaled 25.9 million fish. The harvest included 1.1 million chum salmon (Table 3, Figure 6). The harvest of chum salmon was 65% of the recent 10-year average in 2009.

Table 3. Southeast Alaska annual commercial, common property, purse seine chum salmon harvest (from traditional and terminal areas), 1980-2009.

Year	Total Chum Salmon	Northern Southeast Contribution	Southern Southeast Contribution
1980	1,002,478	415,511	586,967
1981	517,002	282,754	234,248
1982	828,444	162,007	666,437
1983	579,168	271,365	307,803
1984	2,433,749	1,473,603	960,146
1985	1,849,523	1,011,367	838,156
1986	2,198,907	947,510	1,251,397
1987	1,234,552	833,647	400,905
1988	1,625,435	653,809	971,626
1989	1,079,555	336,503	743,052
1990	1,062,522	603,299	459,223
1991	2,125,308	1,063,401	1,061,907
1992	3,193,433	1,948,819	1,244,614
1993	4,606,463	3,004,370	1,602,093
1994	6,376,472	4,781,593	1,594,879
1995	6,600,529	4,310,379	2,290,150
1996	8,918,577	6,246,728	2,671,849
1997	5,863,603	3,534,803	2,328,800
1998	9,406,979	4,800,326	4,606,653
1999	8,944,184	6,148,309	2,795,875
2000	8,306,257	6,232,888	2,073,369
2001	4,436,178	2,203,419	2,232,759
2002	3,110,330	2,057,813	1,052,517
2003	4,336,128	2,864,976	1,471,152
2004	5,684,447	4,098,981	1,585,466
2005	2,817,026	1,835,247	981,779
2006	5,614,232	3,810,988	1,803,244
2007	3,043,032	1,242,118	1,800,914
2008	3,215,231	2,332,622	882,609
2009	3,502,998	2,427,762	1,075,236
1999-2008 Avg.	4,950,705	3,282,736	1,667,968

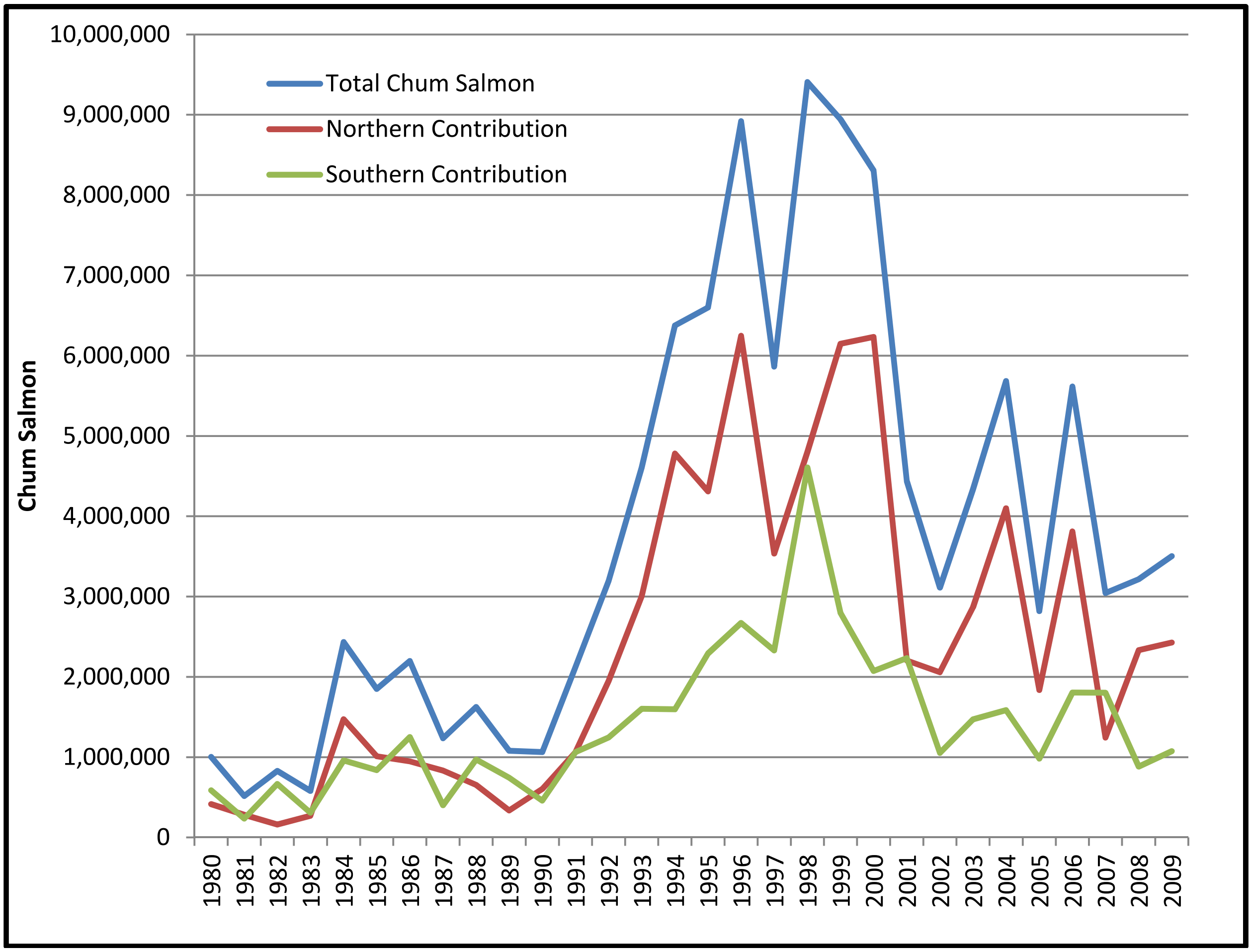

Figure 6. Southeast Alaska annual commercial, common property, purse seine chum salmon harvest (from traditional and terminal areas), 1980-2009.

Drift gillnet fishing is allowed by regulation in District 1 (Sections 1-A and 1-B), District 6 (Sections 6-A, 6-B, 6-C, and 6-D), District 8, District 11 (Sections 11-B and 11-C), and District 15 (Sections 15-A, 15-B, and 15-C). During the 2009 drift gillnet fishery, 474 permits were issued and 408 permits were fished; a slight increase over the 10-year average of 391 permits fished. The 2009 drift gillnet common property fisheries (traditional and THA) harvested 4.0 million salmon (all species combined). The total common property drift gillnet harvest included approximately 2.7 million chum salmon (68% of the harvest) (Table 4, Figure 7). The chum salmon harvest was 31% above the recent 10-year average harvest of 2.1 million fish. Common property harvests included 2.2 million chum salmon in traditional fisheries and 0.5 million fish in hatchery terminal areas. Cost recovery harvests by drift gillnet gear were minimal. Drift gillnet harvests from the Annette Island Reservation were 272,000 salmon (all species combined), which included approximately 120,000 chum salmon.

Table 4. Southeast Alaska total commercial, common property, drift gillnet chum salmon harvest (from traditional and terminal areas), 1980-2009.

Year	Chum Salmon
1980	548,674
1981	270,231
1982	448,332
1983	516,639
1984	1,030,346
1985	1,134,446
1986	815,813
1987	747,363
1988	1,144,856
1989	542,846
1990	616,226
1991	707,277
1992	845,176
1993	1,401,186
1994	1,823,497
1995	2,478,672
1996	2,033,650
1997	1,689,474
1998	1,923,764
1999	2,166,260
2000	2,561,607
2001	1,576,881
2002	1,415,849
2003	1,528,198
2004	1,835,679
2005	1,511,570
2006	3,126,663
2007	2,484,769
2008	2,592,212
2009	2,729,966
1999-2008 Avg.	2,079,969

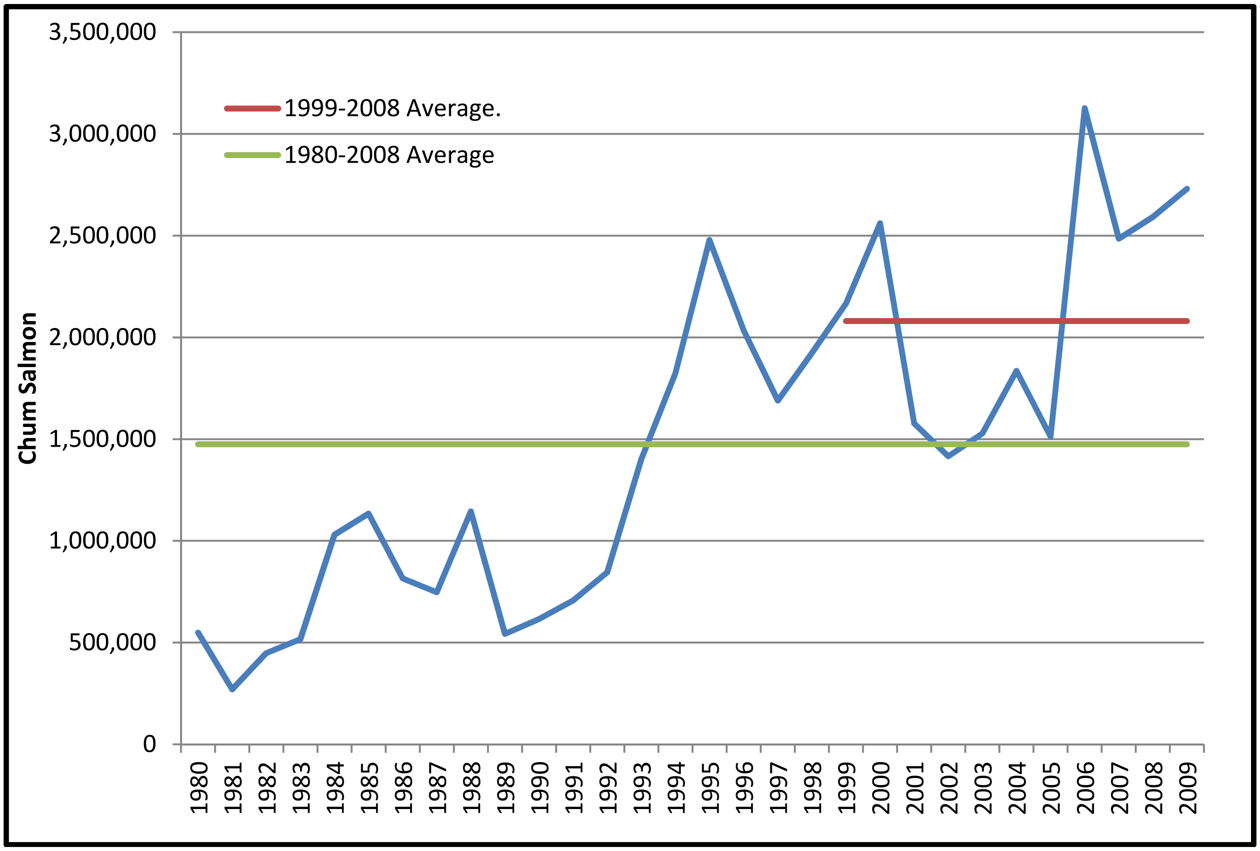

Figure 7. Southeast Alaska total commercial, common property, drift gillnet chum salmon harvest (from traditional and terminal areas), 1980-2009.

Yakutat Set Gillnet Fishery

In Registration Area D, the Yakutat District set gillnet fisheries primarily target sockeye and coho salmon although all five species of salmon are harvested. The Yakataga District fisheries only target coho salmon. Of the 167 Yakutat set gillnet permits, 123 were active for the 2009 season, compared to the recent 10-year average of 114 permits fished.

The Yakutat set gillnet fishery produced a cumulative harvest of 319,000 salmon (all species combined), which was nearly equal to the recent 10-year average of 320,000 salmon. The chum salmon harvest of 871 fish was 88% of the recent 10-year average (Table 5). Chum salmon are a non-target species in the Yakutat Area due to the combination of low abundance and low price, and the harvest is entirely incidental. The East River was the only consistent producer of chum in the Yakutat Area; however, the chum salmon run (as well as the sockeye salmon run) in the East River declined in the early 1990s, probably due to changes in habitat (see Clark et al. 2003). A total of 275 chum salmon were harvested in the East River fishery in 2009. In addition, chum salmon were also harvested in the Situk-Ahrnklin Inlet (147 fish; 89% of the recent 10-year average) and Yakutat Bay (353 fish; 35% of the recent 10-year average).

Table 5. Commercial chum salmon harvest in the Yakutat area set gillnet fishery, 1998-2009.

Year	Chum Salmon
1998	1,351
1999	928
2000	1,185
2001	406
2002	204
2003	542
2004	1,555
2005	525
2006	1,225
2007	2,782
2008	546
2009	871
1999-2008 Avg.	990

Southeast Alaska/Yakutat Troll Fishery

The commercial troll fishery in Southeast Alaska and Yakutat (Region 1) occurs in State of Alaska waters and in the Federal Exclusive Economic Zone (EEZ) east of the longitude of Cape Suckling. All other waters of Alaska are closed to commercial trolling. The commercial troll fleet is comprised of hand and power troll gear types. Approximately 2.1 million salmon were harvested in the 2009 Southeast Alaska/Yakutat troll fishery (common property and terminal areas) by 748 power troll and 367 hand troll permit holders. The harvest included 343,000 chum salmon landed, of which 5,300 chum salmon (1.5%) were taken by hand troll gear and 338,000 chum salmon (98.5%) by power troll gear. A total of 748 chum salmon were reported as harvested outside state waters in the EEZ.

Historically, chum salmon were harvested incidentally in the general summer troll fishery and were not targeted until the Cross Sound pink and chum fishery was established in 1988 as an indicator of pink and chum salmon abundance in inside waters. The troll chum harvest increased significantly in 1992, when for the first time over 1 million chum salmon returned to the NSRAA Hidden Falls hatchery, located on eastern Baranof Island. In 1993, the NSRAA Medvejie/Deep Inlet facility near Sitka saw a return of over 1.0 million chum and the troll chum salmon harvest increased to over 500,000 fish. Since that time, trollers have targeted chum and, with the exception of 1999 and 2008, the annual troll harvest of chum salmon outside of terminal harvest areas has been consistently greater than 100,000 fish (Table 6, Figure 8). In 2009, trollers harvested a total of 109,000 chum salmon in Sitka Sound. The majority (66,000) were harvested during the general summer fishery in Sitka Sound/Eastern Channel, with peak harvests occurring during the first 2 weeks of August. Trollers also harvested 40,300 chum salmon in Eastern Channel during the August troll closure and 2,700 chum salmon in the Deep Inlet THA.

Currently, trollers are allowed to fish in the Neets Bay THA only in years in which a surplus above SSRAA's broodstock and cost recovery needs is identified. In 2009, trollers harvested 186,000 chum salmon in the Neets Bay THA from July 1–17. Trollers also harvested 26,000 chum salmon in

West Behm Canal, adjacent to the Neets Bay THA, with the majority taken during the two weeks following the closure of the THA. A total of 213,000 chum salmon were harvested by trollers in Neets Bay and West Behm Canal.

Table 6. Southeast Alaska/Yakutat Region commercial troll (common property) chum salmon harvest, 1980-2009.

Year	Total Chum Salmon	Hand Troll Contribution	Power Troll Contribution
1980	12,048	4,532	7,516
1981	8,680	2,582	6,098
1982	5,700	1,187	4,513
1983	20,309	2,777	17,532
1984	28,052	4,894	23,158
1985	52,787	9,746	43,041
1986	51,389	6,687	44,702
1987	12,846	3,016	9,830
1988	88,261	14,536	73,725
1989	68,988	6,578	62,410
1990	62,818	6,489	56,329
1991	28,438	3,839	24,599
1992	85,013	6,023	78,990
1993	525,138	34,449	490,689
1994	330,376	32,061	298,315
1995	277,453	21,282	256,171
1996	406,244	53,646	352,598
1997	312,042	20,042	292,000
1998	117,642	2,051	115,591
1999	74,672	583	74,089
2000	478,144	6,427	471,717
2001	467,830	12,480	455,350
2002	117,672	578	117,094
2003	286,410	3,095	283,315
2004	161,070	861	160,209
2005	165,393	418	164,975
2006	143,030	437	142,593
2007	185,800	1,385	184,415
2008	56,175	735	55,440
2009	299,593	4374	295,219
1999-2008 Avg.	213,620	2,700	210,920

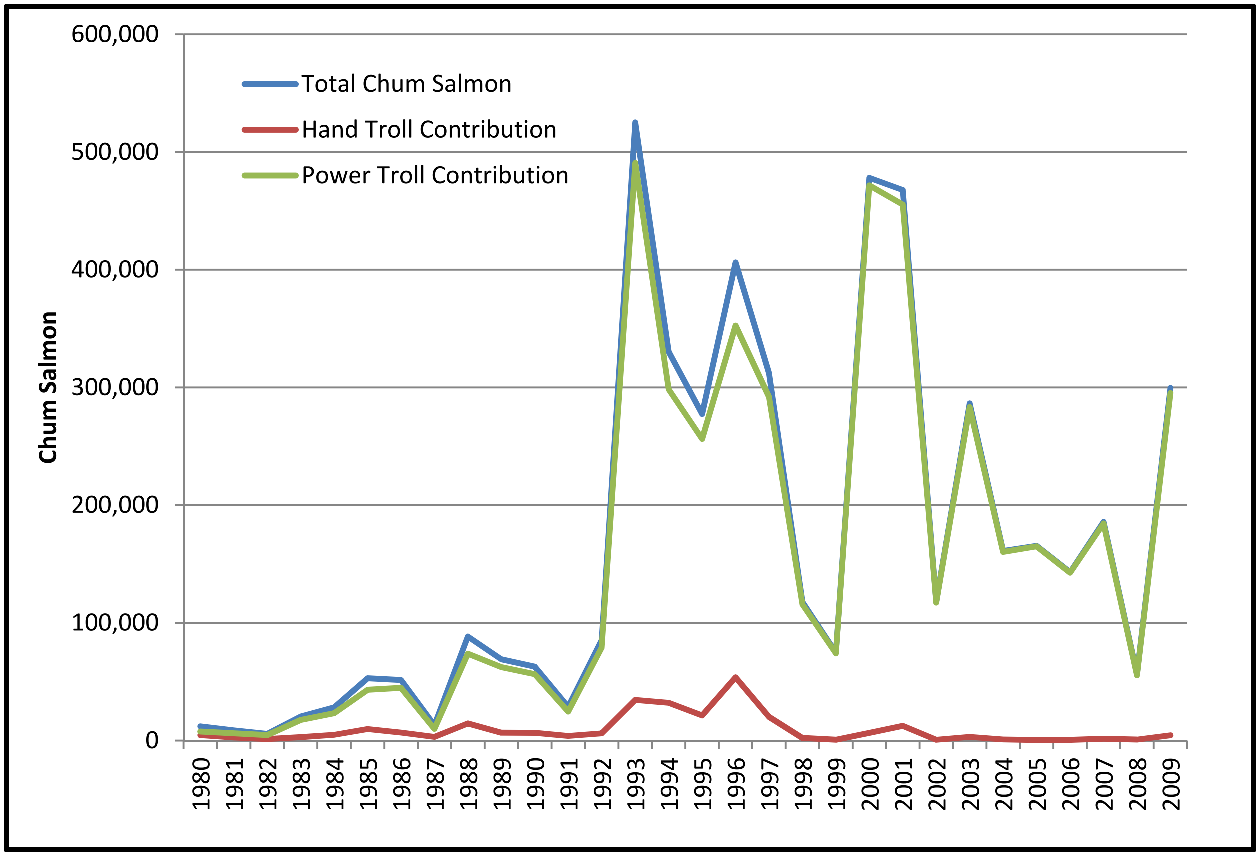

Figure 8. Southeast Alaska/Yakutat Region commercial troll (common property) chum salmon harvest, 1980-2009.

Southeast Alaska Chum Salmon Escapement

Chum salmon are known to spawn in more than 1,200 streams in Southeast Alaska. The vast majority of those streams do not have a long time series of survey information—probably because most are not significant producers of chum salmon, and survey effort has been directed at the more productive chum salmon streams. Of the chum salmon populations that have been monitored, most have been monitored through aerial surveys, although several have been monitored annually by foot surveys, and in-river fish wheel counts have been used to monitor salmon escapements to the Taku and Chilkat rivers, two large, glacial, mainland river systems. ADF&G completed work in 2009 to establish sustainable escapement goals for chum salmon in Southeast Alaska. Survey information from 88 Southeast Alaska chum salmon index streams was divided into appropriate stock groups by area and migration run-timing (summer or fall). Summer-run fish generally peak during the period mid-July to mid-August and fall-run fish peak in September or later. For summer runs, which are typically harvested in mixed-stock fisheries, stocks were divided into three aggregates of streams in Southern Southeast, Northern Southeast Inside, and Northern Southeast Outside subregions. The abundance of summer-run chum salmon has increased since the early 1970s and escapement indices have been stable or increasing since 1980. However, the 2008 and 2009 summer chum salmon runs in Southeast Alaska were generally weak, with observed escapements below the recommended goals for the Northern Inside and Southern aggregates. Summer chum salmon runs were notably poor over most of the region in 2009.

For fall runs that support, or have supported, a directed fishery, stocks were divided into five aggregates in Cholmondeley Sound, Port Camden, Security Bay, Excursion Inlet, and Chilkat River areas. The abundance of fall-run chum salmon has decreased from the high levels observed from the 1960s to the early 1970s; however, fall-run chum salmon escapement indices have been relatively stable for two decades and have increased since the mid 1990s for the Chilkat River. Escapement indices for fall chum salmon for 2008 were generally within or above escapement goals. In 2009, with the exception of Port Camden and Excursion Inlet, fall runs performed better with respect to escapement goals than summer runs, particularly in the Chilkat River. It should be noted that allozyme studies by Kondzela et al. (1994), Phelps et al. (1994), and Wilmot et al. (1994) suggested that run-timing is an isolating mechanism for chum salmon populations: "reproductive isolation between summer-run and fall-run chum salmon is an important component of the genetic diversity of this species" (Phelps et al. 1994).

Table 7. Southeast Alaska chum salmon escapement goals and escapements, 2001-2009.

	2009 Goal Range					Chum Salmon Escapement								
	Lower	Upper	Type	Year Implemented	Enumeration Method	2001	2002	2003	2004	2005	2006	2007	2008	2009
Southern Southeast Summer	68,000		lower-bound SEG	2009	Aerial Survey	125,000	55,000	66,000	74,000	66,000	76,000	132,000	13,000	41,000
Northern Southeast Inside Summer	149,000		lower-bound SEG	2009	Aerial Survey	229,000	397,000	210,000	242,000	185,000	282,000	149,000	99,000	107,000
Northern Southeast Outside Summer	19,000		lower-bound SEG	2009	Aerial Survey	58,000	19,000	30,000	86,000	77,000	57,000	34,000	46,000	15,000
Cholmondeley Sound Fall	30,000	48,000	SEG	2009	Aerial Survey	45,000	39,000	75,000	60,000	15,000	54,000	18,000	49,500	39,000
Port Camden Fall	2,000	7,000	SEG	2009	Aerial Survey	n/a	450	676	3,300	2,110	2,420	505	1,400	1,711
Security Bay Fall	5,000	15,000	SEG	2009	Aerial Survey	3,500	6,000	8,700	13,100	2,750	15,000	54,000	11,700	5,100
Excursion River Fall	4,000	18,000	SEG	2009	Aerial Survey	17,750	4,680	6,300	5,200	1,100	2,203	6,000	8,000	1,400
Chilkat River Fall	75,000	170,000	SEG	2009	Mark-recapture, fish wheel	312,000	206,000	166,000	310,000	202,000	704,000	331,000	451,000	337,000

Note: Red-shaded cells indicate escapement fell below stated goals. Yellow-shaded cells indicate escapement goals were met. Green-shaded cells indicate escapement goals were exceeded. Cells with no color indicate no official escapement goal for that particular year. Shaded cells are based upon the escapement goal in place at the time of enumeration for salmon stocks rather than the most recent escapement goal provided.

Subsistence Chum Salmon Harvest

A total of 3,427 subsistence permits were issued in Southeast Alaska in 2009: 3,294 in Registration Area A, and 133 subsistence permits in the Yakutat area, Registration Area D. Of that total, 3,107 permits were returned, with a total reported subsistence harvest of 52,550 fish, of which only 1,714 (3%) were chum salmon. Those numbers are slightly below the 10-year average of 2,356 chum salmon (average 4% of total harvest). Sockeye salmon make up 85% of the annual subsistence harvest in Southeast Alaska.

Table 8. Number of subsistence permits issued and returned, and reported chum salmon subsistence harvest in Southeast Alaska, 1999–2009.

Year	Permits Issued	Permits Returned	Total Fish Harvested	Reported Chum Harvest	Proportion Chum
1999	4,308	3,709	59,766	4,356	7%
2000	3,771	3,198	54,384	2,981	5%
2001	3,609	3,122	59,340	3,308	6%
2002	3,328	2,785	58,142	1,846	3%
2003	3,597	2,956	67,156	3,207	5%
2004	3,703	3,294	63,105	2,748	4%
2005	3,315	2,799	42,836	1,636	4%
2006	3,406	2,810	53,941	1,526	3%
2007	3,161	2,802	41,863	628	2%
2008	3,153	2,823	43,482	1,325	3%
2009	3,427	3,107	52,550	1,714	3%
1999-2008 Avg.	3,535	3,030	54,402	2,356	4%

2010 Chum Salmon Forecast

The projection for chum salmon harvest in 2010 was for a total of 9.4 million chum salmon, of which 7.3 million were hatchery fish and 2.1 million were wild fish (Eggers et al. 2010). The projection for hatchery fish are provided by the hatchery operators, while the projection for wild fish is simply the 5-year running average of past harvests of wild chum salmon.

5.3.7 Statewide summary for other Alaska stocks

Chum salmon stocks in areas outside of western Alaska include those found in the Aleutian Islands, Kodiak, Chignik, Upper Cook Inlet, Lower Cook Inlet, Prince William Sound, and Southeast Alaska. Escapement goals are generally comprised of stock-aggregate goals from several individual index streams. There is no escapement goal or chum salmon escapement surveys in the Aleutian Islands area.

In 2010, average escapement was achieved in Chignik, Prince William Sound, and Lower Cook Inlet areas. Below average escapement occurred in Kodiak and Southeast Alaska. There is only one chum salmon escapement goal in Upper Cook Inlet and the upper range of that goal was exceeded in 2010. Although spawning escapement goals were met in most of the Lower Cook Inlet streams, escapement into McNeil River failed to reach the lower goal for the sixteenth time in the past 21 years despite the continued ban on targeted commercial fishing.

Commercial fisheries occurred in all areas with above average harvests for chum salmon in Chignik, Upper Cook Inlet, Lower Cook Inlet, and Prince William Sound areas. Kodiak chum salmon harvests were below the most recent 10-year average.

Table 9. Over view of Alaskan chum salmon stock performance, 2010.

Chum salmon stock	Total run size?	Escapement goals met?[1]	Subsistence fishery?	Commercial fishery?	Sport fishery?	Stock of concern?
Bristol Bay	Above average	1 of 1	Yes	Yes	Yes	No
Kuskokwim Bay	Above average	2 of 2	Yes	Yes	Yes	No
Kuskokwim River	Average	2 of 2	Yes	Yes	Yes	Yield concern discontinued 2007
Yukon River summer run	Average	2 of 2	Yes	Yes, but limited by low Chinook	Yes	Management concern discontinued 2007
Yukon River fall run	Below average	6 of 8	Restrictions	Limited late season (Tanana River)	No	Yield concern discontinued 2007
Eastern Norton Sound	Above average	1 of 1	Yes	Yes	Yes	No
Northern Norton Sound	Above average	7 of 7	Yes	Yes	Yes, except for Nome Subdistrict	Yield concern (since 2000)

continued

Table 9. continued

Chum salmon stock	Total run size?	Escapement goals met?[1]	Subsistence fishery?	Commercial fishery?	Sport fishery?	Stock of concern?
Kotzebue	Above average	6 of 6	Yes	Yes	Yes	No
North Peninsula	Average	2 of 2	Yes	Yes	Yes	No
South Peninsula	Below average	2 of 4	Yes	Yes	Yes	No
Aleutian Islands	n/a	n/a	Yes	Yes	Yes	No
Kodiak	Below average	2 of 2	Yes	Yes	Yes	No
Chignik	Average	1 of 1	Yes	Yes	Yes	No
Upper Cook Inlet	Above average	1 of 1	Yes	Yes	Yes	No
Lower Cook Inlet	Average	9 of 12	Yes	Yes	Yes	No
Prince William Sound	Average	5 of 5	Yes	Yes	Yes	No
Southeast	Below average	6 of 8	Yes	Yes	Yes	No

[1] Some aerial survey-based escapement goals were not assessed due to inclement weather or poor survey conditions.

5.4 Impacts on chum salmon

5.4.1 Pollock fishery bycatch of Chum salmon under Alternative 1

The majority of non-Chinook bycatch in the Bering Sea occurs in the pollock fishery. Historically, the contribution of non-Chinook bycatch from the pollock trawl fishery has ranged from a low of 88% of all bycatch to a high of >99.5% in 1993. Since 2002 bycatch of non-Chinook salmon in the pollock fishery has comprised over 95% of the total. Total catch of non-Chinook salmon in the pollock fishery reached an historic high in 2005 at 705,963 fish (Table 5-6.). Bycatch of non-Chinook salmon in this fishery occurs almost exclusively in the B season.

Table 5-6 Non-Chinook (chum) salmon mortality in BSAI pollock directed fisheries 1991-2010. Note 2010 updated 1/14/11.

Year	Annual with CDQ	Annual without CDQ	Annual CDQ only	A season with CDQ	B season with CDQ	A season without CDQ	B season without CDQ	A season CDQ only	B season CDQ only
1991	Na	28,951	na	na	na	2,850	26,101	na	na
1992	Na	40,274	na	na	na	1,951	38,324	na	na
1993	Na	242,191	na	na	na	1,594	240,597	na	na
1994	92,672	81,508	11,165	3,991	88,681	3,682	77,825	309	10,856
1995	19,264	18,678	585	1,708	17,556	1,578	17,100	130	456
1996	77,236	74,977	2,259	222	77,014	177	74,800	45	2,214
1997	65,988	61,759	4,229	2,083	63,904	1,991	59,767	92	4,137
1998	64,042	63,127	915	4,002	60,040	3,914	59,213	88	827
1999	45,172	44,610	562	362	44,810	349	44,261	13	549
2000	58,571	56,867	1,704	213	58,358	148	56,719	65	1,639
2001	57,007	53,904	3,103	2,386	54,621	2,213	51,691	173	2,930
2002	80,782	77,178	3,604	1,377	79,404	1,356	75,821	21	3,583
2003	189,185	180,783	8,402	3,834	185,351	3,597	177,186	237	8,165
2004	440,459	430,271	10,188	422	440,037	395	429,876	27	10,161
2005	704,586	696,876	7,710	595	703,991	563	696,313	32	7,678
2006	309,644	308,430	1,214	1,326	308,318	1,260	307,170	66	1,148
2007	93,786	87,317	6,469	8,523	85,263	7,368	79,949	1,155	5,314
2008	15,142	14,717	425	319	14,823	246	14,471	73	352
2009	46,129	45,179	950	48	46,081	48	45,131	0	950
2010	13,306	12,789	517	48	13,258	48	12,741	0	517

Non-CDQ data for 1991-2002 from bsahalx.dbf Non-CDQ data for 2003-2009 from akfish_v_gg_pscnq_estimate CDQ data for 1992-1997 from bsahalx.dbf
CDQ data for 1998 from boatrate.dbf
CDQ data for 1999-2007 from akfish_v_cdq_catch_report_total_catch
CDQ data for 2008-2009 from akfish_v_gg_pscnq_estimate_cdq
A season - January 1 to June 10
B season - June 11 to December 31

Bycatch rates for chum salmon (chum salmon/mt of pollock) from 1991-2007 are shown in Figure 13. Currently the Chum Salmon Savings Area as shown in Figure 13 is invoked in the month of August annually and when triggered in September. However, starting in 2008, the fleet has been exempt from these closures because of their participation in the salmon bycatch reduction intercooperative agreement, which was implemented in 2007 under Amendment 84.

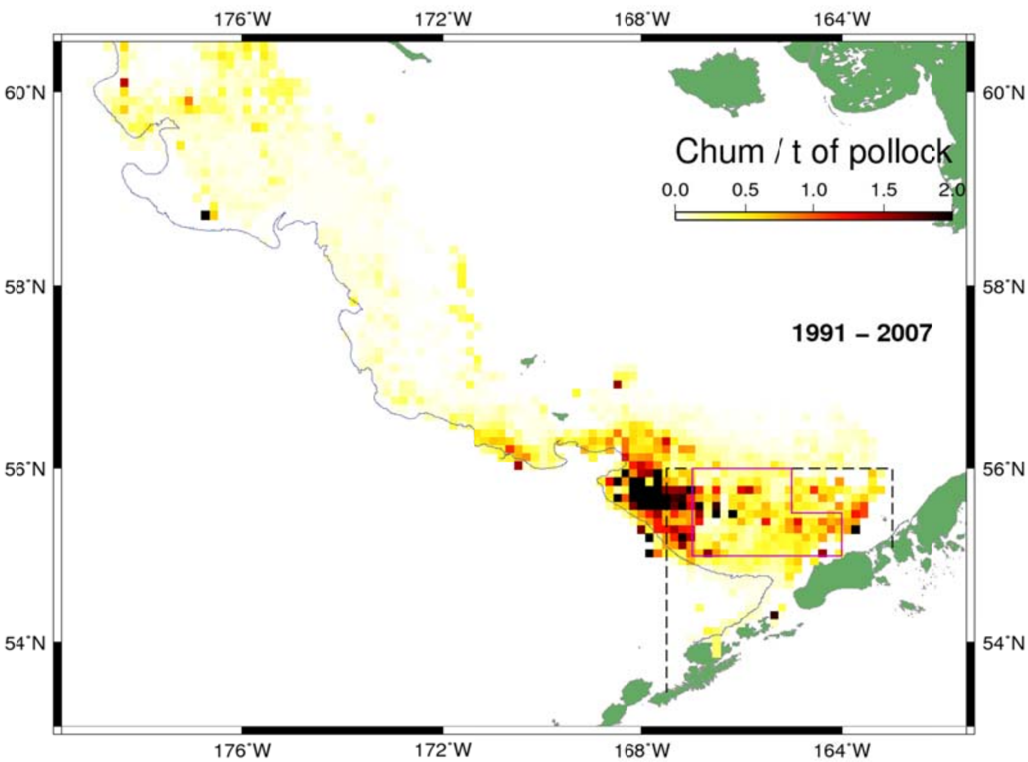

Figure 13. Historical chum B-season bycatch rates 1991-2007. Note the Chum Salmon Savings Area closure (solid line) and the Catcher Vessel Operational Area (dotted line).

Bycatch by sector from 1997-2009 is summarized in Table 5-7. Annual percentage contribution to the total amount by year and sector (non-CDQ) from 1997-2009 is summarized in Table 5-8.

Table 5-7 Non-Chinook bycatch in the EBS pollock trawl fishery 1997-2009 by sector. CP = catcher processor, M= Mothership, S = Shoreside catcher vessel fleet. CDQ where available is listed separately by the sector in which the salmon was caught. For confidentiality reasons CDQ catch by sector since 2008 cannot be listed separately. 2009 data through 10/10/09 Source NMFS catch accounting

Year	CP	M	S	CDQ(total)	Total
1997	23,131	15,018	23,610	4,229	65,988
1998	8,119	6,750	49,173	0	64,042
1999	2,312	212	42,087	661	45,271
2000	4,930	509	51,428	1,704	58,571
2001	20,356	8,495	25,052	3,103	57,007
2002	9,303	13,873	54,002	3,474	80,652
2003	22,831	11,895	152,053	8,356	195,135
2004	76,159	13,330	347,940	10,197	447,626
2005	63,266	15,314	619,691	7,693	705,963
2006	18,180	2,013	289,150	1,202	310,545
2007	27,245	5,427	54,920	6,480	94,071
2008	1,562	641	12,512	425	15,140
2009	3,878	1,733	39,412	950	45,973

Table 5-8 Percent of total annual non-Chinook salmon catch by sector by year 1997-2009 (CDQ not included in sector totals) CP = catcher processor, M= Mothership, S = Shoreside catcher vessel fleet.

Year	CP	M	S
1997	35%	23%	36%
1998	13%	11%	77%
1999	5%	0%	93%
2000	8%	1%	88%
2001	36%	15%	44%
2002	12%	17%	67%
2003	12%	6%	78%
2004	17%	3%	78%
2005	9%	2%	88%
2006	6%	1%	93%
2007	29%	6%	58%
2008	10%	1%	83%
2009	8%	2%	86%

5.4.1.1 Pollock fishery bycatch potential under Amendment 91

[PLACEHOLDER-this section will be available at the February Council meeting]

5.4.2 River of origin AEQ impacts under Alternatives

Applying the AEQ results to the available genetics data requires careful consideration of time and area of genetics sampling relative to actual bycatch. For example, should genetics sampling under-represent an area of high bycatch, then the appropriate ratios must be applied to obtain an unbiased representation of the bycatch by stock of orgin. At the time of writing, this analytical part is incomplete. Preliminary results of the bycatch stock composition are presented in section 3.2.

5.5 Considerations of future actions

6 Chinook salmon

[Placeholder]

7 Other groundfish, other prohibited species & forage fish

8 Other Marine Resources

9 Preparers and persons consulted

10 References

[Note this section is incomplete and will be revised for the initial review draft]

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Non-Chinook ICA Representative
United Catcher Boats
4005 20th Ave. West
Suite 116
Seattle, WA 98199

December 1, 2010

Dr. James Balsiger
Regional Administrator, Alaska Region
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska, 99802

Dear Dr. Balsiger,

Enclosed with this letter is an amended and restated Intercooperative Agreement (ICA) for non-Chinook salmon bycatch reduction. This revised Agreement has been written to replace the previous ICA for both Chinook and non-Chinook salmon bycatch reduction as required to qualify for an exemption to the regulatory salmon savings areas (CSSA and CHSSA) under Amendment 84. With the implementation of Amendment 91 the previous regulatory Chinook Salmon Savings Area (CHSSA) has been eliminated and therefore the ICA has been amended and restated to remove all Chinook salmon obligations previously included in the Agreement. This ICA has also been modified to meet all regulatory revisions included in the ICA requirements found at 679.21(g) "Bering Sea Non-Chinook Bycatch Management".

This Amended and Restated ICA has been signed by all nine AFA Cooperatives and each of the six CDQ groups fishing pollock in the Bering Sea. Also included are signatures for Sea State, the entity retained to facilitate vessel bycatch avoidance behavior and information sharing, and for United Catcher Boats, serving as the ICA Representative. I have not included a participating vessel list as it remains the same as the list submitted with the original ICA.

Thank you for considering this ICA for an exemption to the current Chum Salmon Savings Area regulations.

Regards,

John Gruver
Non-Chinook ICA Representative
United Catcher Boats

AMENDED AND RESTATED
BERING SEA POLLOCK FISHERY ROLLING HOT SPOT CLOSURE
NON-CHINOOK SALMON BYCATCH MANAGEMENT AGREEMENT

This AMENDED AND RESTATED BERING SEA POLLOCK FISHERY ROLLING HOT SPOT CLOSURE NON-CHINOOK SALMON BYCATCH MANAGEMENT AGREEMENT is entered into by and among POLLOCK CONSERVATION COOPERATIVE ("PCC"), the HIGH SEAS CATCHERS COOPERATIVE ("High Seas"), MOTHERSHIP FLEET COOPERATIVE ("MFC"), the "Inshore Coops", i.e., AKUTAN CATCHER VESSEL ASSOCIATION, NORTHERN VICTOR FLEET COOPERATIVE, PETER PAN FLEET COOPERATIVE, UNALASKA FLEET COOPERATIVE, UNISEA FLEET COOPERATIVE and WESTWARD FLEET COOPERATIVE, and the "CDQ Groups", i.e., ALEUTIAN PRIBILOF ISLAND COMMUNITY DEVELOPMENT ASSOCIATION, BRISTOL BAY ECONOMIC DEVELOPMENT CORPORATION, CENTRAL BERING SEA FISHERMEN'S ASSOCIATION, COASTAL VILLAGES REGION FUND, NORTON SOUND ECONOMIC DEVELOPMENT CORPORATION and YUKON DELTA FISHERIES DEVELOPMENT ASSOCIATION, and SEA STATE, INC. ("Sea State") and UNITED CATCHER BOATS ASSOCIATION ("UCB") as of Dec. 1, 2010. PCC, High Seas, MFC, and the Inshore Coops are hereafter collectively referred to as the "Coops".

This Agreement is entered into with respect to the following facts:

RECITALS

Western Alaskans have expressed conservation and allocation concerns regarding the incidental catch of non-Chinook salmon in the Bering Sea pollock fishery. While such bycatch is regulated by the North Pacific Fishery Management Council (the "Council") and the National Marine Fisheries Service ("NMFS"), the Coops desire to address this issue by inter-cooperative agreement, out of respect for the concerns of Western Alaskans, to avoid unnecessary incidental catch of non-Chinook salmon and to obviate the need for regulatory salmon savings areas.

Now, therefore, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

AGREEMENT

1. Purpose of Agreement. This Amended and Restated Non-Chinook Salmon Bycatch Management Agreement amends and supersedes that certain Salmon Bycatch Management Agreement entered into among the parties set forth above as of December 1, 2007. The purpose of this Agreement is to implement a private, contractual inter-cooperative program to reduce non-Chinook salmon bycatch in the Bering Sea directed pollock fishery, inclusive of both the Community Development Quota ("CDQ") and non-CDQ allocations (the "Fishery"). Each party to this Agreement agrees exercise all commercially reasonable efforts to achieve that purpose.

2. Monitoring and Management. The Coops shall retain Sea State to facilitate vessel bycatch avoidance behavior, information sharing, data gathering, analysis, and fleet monitoring necessary to implement the bycatch management program contemplated under this Agreement. The Coops shall retain United Catcher Boats (UCB) as the ICA representative. UCB will provide day-to-day management of inter-cooperative matters related to the performance of this Agreement.

3. Bycatch Management. The parties agree that because the bycatch of non-Chinook salmon is typically very low during the Fishery "A" season, the bycatch management of non-Chinook salmon by this Agreement will occur during the Fishery "B" season. Therefore, non-Chinook salmon bycatch in the Fishery "B" season shall be managed on an inter-cooperative basis as follows. Sea State shall use a bycatch rate (the "Base Rate") as a trigger for identifying areas to be closed to pollock fishing by certain Coops ("Chum Salmon Savings Areas"), and as a basis for determining each Coop's tier status, which in turn shall govern whether, and if so, when, each Coop's members may harvest pollock inside of a Savings Area. During "B" seasons, Sea State shall monitor non-Chinook salmon bycatch, and may announce Chum Salmon Savings Areas for non-Chinook salmon, and Sea State shall assign each Coop a bycatch tier status. In addition, Sea State shall have the authority to declare up to two Chum Salmon Savings Areas in the Bering Sea region east of 168 degrees West longitude (the "East Region") and up to two Chum Salmon Savings Areas in the Bering Sea/Aleutian Islands region west of 168 degrees West longitude (the "West Region"). The non-Chinook salmon Base Rate shall be adjusted during each "B" season in response to non-Chinook bycatch rates, to take into account fluctuations in non-Chinook salmon encounters.

a. Initial non-Chinook Base Rate. The initial "B" season non-Chinook salmon Base Rate shall be 0.19 non-Chinook salmon per metric ton of pollock.

b. Non-Chinook Base Rate In-Season Adjustment. Commencing on July 1 of each year that this Agreement is in effect, and on each Thursday through the duration of each "B" season thereafter, Sea State shall recalculate the "B" season non-Chinook salmon Base Rate. The recalculated Base Rate shall be the three week rolling average of the Fishery "B" season non-Chinook bycatch rate for the then-current year. The recalculated Base Rate shall be the governing non-Chinook salmon Base Rate for purposes of each "Thursday Announcement" of a "Friday Closure" (as defined below) following recalculation.

c. Implementation of Salmon Savings Measures. Sea State shall use Fishery "B" season bycatch data from fishing activity after June 10 of each year to provide Coops with preliminary information regarding the location and concentration of non-Chinook salmon, and to determine initial Chum Salmon Savings Area closures and Coop Tier assignments (as defined below). Sea State shall implement Chum Salmon Savings Area closures as appropriate upon non-Chinook bycatch rates exceeding the Base Rate, and thereafter through the balance of each Fishery "B" season.

d. Cooperative Tier Assignments. Rate calculations for purposes of tier assignments shall be based on each Coop's pollock catch in the Fishery for the prior two weeks (the denominator) and the aggregate amount of associated bycatch of non-Chinook salmon taken by its members (the numerator). For purposes of this Section, a Coop's non-Chinook salmon bycatch amount shall be based on observer data.

- Coops with non-Chinook salmon bycatch rates of less than 75% of the applicable Base Rate shall be assigned to "Tier 1.
- Coops with non-Chinook salmon bycatch rates equal to or greater than 75% of the applicable Base Rate but equal to or less than 125% of the Base Rate shall be assigned to "Tier 2".
- Coops with non-Chinook salmon bycatch rates greater than 125% of the applicable Base Rate shall be assigned to "Tier 3".

e. Bycatch Hot Zone Identification. When the Fishery "B" season is open to any of the inshore, catcher/processor or mothership components, on an ongoing basis Sea State shall calculate the non-Chinook bycatch rates for each Alaska Department of Fish and Game ("ADF&G") statistical area for which Sea State receives a non-Chinook salmon bycatch report, and when feasible, for each lateral half of each such statistical area. Bycatch rates shall be recalculated and updated every four (4) or seven (7) days during the season, immediately proceeding the closure announcements described in Section 4.g., below, as Sea State determines appropriate given the quality of data available for the area. The non-Chinook bycatch rates shall be calculated on the basis of reports Sea State determines to be adequately accurate, including reliable tow-by-tow estimates from the fishing grounds. In every case, rates calculated on the basis of the actual number of salmon observed per tow shall be given priority over rates based on sampling and extrapolation.

f. Chum Salmon Savings Areas. On each Thursday and on each Monday following June 10, for the duration of the Fishery "B" season, Sea State shall, subject to the criteria set forth below, provide notice to the Coops identifying one or more areas designated as "Chum Salmon Savings Areas", within which pollock fishing shall be restricted on the basis of each Coop's Tier status.

(i) Savings Area Designation Criteria. To qualify as a Chum Salmon Savings Area, (a) an amount of pollock that Sea State in its sole discretion determines to be substantial must have been taken in the Savings Area during the period on which its designation as a Savings Area is based, or the area must have been designated a Savings Area for the prior notification period and there must be evidence satisfactory to Sea State in its sole discretion that suggests that non-Chinook salmon bycatch rates in the area are not likely to have changed, and (b) the salmon bycatch rate in the area for the period on which its definition as a Chum Salmon Savings Area is based must exceed the Base Rate. For purposes of (a), above, Sea State shall consider a pollock harvest of two percent (2%) of the total amount of pollock harvested in the Fishery during the period on which a Chum Salmon Savings Area designation is based to be indicative of, but not dispositive of, whether a substantial amount of pollock has been harvested in an area.

(ii) Savings Area Boundaries and Limitations. Subject to the limits set forth in this Section, Savings Areas shall be defined by a series of latitude/longitude coordinates as Sea State determines appropriate to address salmon bycatch. Notwithstanding the foregoing, the following limits shall apply to designations of "B" season Savings Areas: (i) Chum Salmon Savings Area closures in the East Region may not exceed three thousand (3,000) square miles in total area during any single closure period; (ii) Chum Salmon Savings Areas in the West Region may not exceed one thousand (1,000) square miles in total area during any single closure period; (iii) there may be up to two (2) Savings Areas per Region per closure period.

g. Savings Area Closure Announcements. Fishery "B" season Savings Area closures announced on Thursdays (the "Thursday Announcement" of the "Friday Closures") shall be effective from 6:00 pm the following Friday through 6:00 pm the following Tuesday, and Savings Area closures announced on Mondays (the "Monday Announcement" of "Tuesday Closures") shall be effective from 6:00 pm the following Tuesday through 6:00 pm the following Friday. Upon a Chum Salmon Savings Area closure taking effect, fishing by Coop vessels participating in the Fishery shall be restricted pursuant to Subsection 4.i., below. Each Thursday Announcement shall include the following information: (i) season update on pollock harvest and non-

Chinook salmon bycatch by pollock fishery sector and in total; (ii) each Coop's updated rolling two week non-Chinook salmon bycatch rate, associated Tier status, and Savings Area closure dates, times and days; (iii) the coordinates describing each Chum Salmon Savings Area, and a map of the Area; (iv) non-Chinook salmon bycatch rates for each Alaska Department of Fish and Game statistical area in which there was directed pollock fishing during the previous week; and (v) updated vessel performance lists, as defined in 4.j., below. Each Monday Announcement shall include the information described in clauses (i), (iii), (iv), and a reminder to each Coop of its chum bycatch Tier status.

h. Savings Area Implementation. During the Fishery "B" seasons, Savings Area closures shall apply to Coop member vessels as follows. Chum Salmon Savings Areas announced as Friday Closures and as updated by Tuesday Closures shall be closed to fishing by Tier 3 Coop vessels for seven days. Chum Salmon Savings Areas announced as Friday Closures shall be closed to fishing by Tier 2 Coop vessels through 6:00 pm the following Tuesday. Tier 1 Coop vessels may fish in Chum Salmon Savings Areas closed to the Tier 2 and Tier 3 Coop vessels.

i. Vessel Performance Lists. On a weekly basis, Sea State shall provide salmon bycatch performance lists to the Coops calculated on the basis of non-Chinook bycatch.

i. A list of the 20 vessels with the highest non-Chinook bycatch rates for the previous 2 weeks in excess of the Base Rate.

ii. A list of the 20 vessels with the highest non-Chinook bycatch rates for the previous week in excess of the Base Rate.

j. Throughout the Fishery "B" season, Sea State shall provide salmon "hot spot" advisory notices concerning areas of high non-Chinook salmon bycatch that do not fall within Savings Area closures.

4. Data Gathering and Reporting. The Coops acknowledge that the effectiveness of the bycatch management program being implemented under this Agreement depends on rapidly gathering, analyzing and disseminating accurate data concerning non-Chinook salmon bycatch in the Fishery. The Coops therefore agree as follows.

a. Each Coop shall require its members to take all actions necessary to release their vessels' NMFS observer reports and official landing records to Sea State as soon as commercially practicable after such documents are completed. Each Coop shall request its members' vessels to exercise commercially reasonable efforts to report to Sea State within 24 hours the location of, estimated pollock tonnage of and estimated number of non-Chinook salmon in each trawl tow. PCC may satisfy its obligation under this section 6.a. by arranging to have its members' vessels' observer reports concerning non-Chinook salmon bycatch transmitted to Sea State. MFC and High Seas may satisfy their obligations under this Section by arranging to have the pollock amounts and non-Chinook salmon counts for their members' vessels reported to Sea State by the observers on the processing vessels to which their members' vessels deliver. The Inshore Coops shall arrange for their vessels to report the crew's best estimate of the amount of pollock and the number of non-Chinook salmon in the tow when reporting its location. Each Inshore Coop shall develop its own methods and means to accurately calculate (when feasible) or estimate the amount of pollock and the number of salmon contained in each tow by its members' vessels, and to rapidly and accurately report that information to Sea State.

b. Sea State shall from time to time announce a non-Chinook bycatch rate that shall trigger an incident reporting requirement. Each Coop shall require its members' vessels to notify their coop manager (if applicable), the intercooperative manager and, if feasible, Sea State as soon as possible of any tow with a non-Chinook salmon bycatch rate that the crew estimates to be equal to or greater than the incident reporting rate threshold.

5. <u>Savings Area Closure Enforcement</u>. Upon a Coop receiving a Savings Area closure notice which has the effect of closing one or more Savings Areas to fishing by its members' vessels under this Agreement, the Coop shall timely notify its members. Each Coop agrees to take enforcement action with respect to any violation of a Savings Area closure notice, and to collect the assessments set forth below in cases where a vessel is found to have violated a closure.

a. Sea State shall monitor the fishing activities of all Coops' members' vessels, and shall promptly report all apparent Savings Area violations to all Coops. For purposes of this Agreement, "fishing" shall mean all activity of a vessel between the time of initial gear deployment and final gear retrieval. For purposes of this Section 5.a., "gear deployment" and "gear retrieval" shall have the meanings given them in 50 C.F.R. 679.2 or its successor, as the same may be amended from time to time. Initial gear deployment shall mean setting trawl gear with an empty codend, and final gear retrieval shall mean retrieving trawl gear to either pull a codend aboard the vessel or to deliver the codend to another vessel.

b. Upon receiving notice of an apparent violation from Sea State, the Board of Directors of the Coop to which the vessel belongs shall have one hundred and eighty (180) days to take action in connection with the apparent violation, and to provide a report of the action taken and a copy of the record supporting that action to all other Coops. When the Board of Directors to which the vessel belongs provides its report, or if the Coop Board of Directors fails to provide its report within such 180 day period, then Sea State and/or UCB shall provide each other Coop, the CDQ Groups, the Association of Village Council Presidents ("AVCP"), Bering Sea Fishermen's Association ("BSFA"), Tanana Chiefs' Conference ("TCC") and Yukon River Drainage Fishermen's Association ("YRDFA") with the Coop's report (if provided) and the record developed by Sea State in connection with the apparent violation, and each of such parties shall have standing to pursue Savings Area closure enforcement actions equivalent to such Coop's own rights with respect to its members.

c. The Coops hereby adopt a uniform assessment for a skipper's first annual violation of a Savings Area closure of Ten Thousand Dollars ($10,000.00), a uniform assessment for a skipper's second annual violation of a Savings Area closure of Fifteen Thousand Dollars ($15,000.00), and a uniform assessment of Twenty Thousand Dollars ($20,000.00) for a skipper's third and subsequent violations in a year. The Coops acknowledge that the damages resulting from violating a Savings Area closure are difficult to estimate, and that the foregoing assessment amounts are therefore intended to be a substitute in all cases for direct, indirect and consequential damages. Therefore, the Coops agree that the assessment amounts established under this Subsection 5.c are liquidated damages, the payment of which (together with reasonable costs of collection) shall satisfy a Coop's and its members' obligations related to a Savings Area closure violation. The Coops hereby waive any and all claims to direct, indirect or consequential damages related to such violation.

d. The Coops agree that any funds collected in connection with a violation of this agreement, in excess of those necessary to reimburse the prevailing party for its costs and attorneys fees, shall be used to support research concerning salmon taken incidentally in the Fishery. The Coops agree to consult with the CDQ Groups, AVCP, BSFA, TCC and YRDFA regarding the most appropriate use of such funds.

e. For purposes of this Section 5, State and Federal landing reports, observer data, VMS tracking data, vessel log books and plotter data and Coop catch data produced by the Sea State in conformance with NMFS catch accounting and bycatch estimation procedures shall be presumed accurate and sufficient for determining whether a vessel violated a Savings Area closure, absent a clear and compelling demonstration of manifest error. The Coops agree to take all actions and execute all documents necessary to give effect to this provision.

f. The Coops agree to require their members to obtain and maintain an operational VMS unit approved by Sea State on their vessels, provided that such units are available on a commercially reasonable basis. The Coops agree to cause their members to release their VMS tracking data to Sea State. Sea State agrees not to disclose any such information, other than as specifically authorized under this Agreement, as necessary to fulfill the intents and purposes of this Agreement, or with prior consent from the affected vessel owner. The Coops agree that the damages resulting from vessels operating in non-compliance with this subsection are difficult to estimate, and the Coops therefore hereby adopt a uniform assessment of One Thousand Dollars ($1,000.00) per day for each consecutive day over thirty (30) consecutive days that a Coop member's vessel is employed in the Fishery without an operational VMS unit approved by Sea State, provided such unit is available on a commercially reasonable basis.

6. Release and Waiver of All Claims Against SeaState and United Catcher Boats; Indemnification and Hold Harmless. The parties acknowledge that the effectiveness of this Agreement depends to a significant extent on Sea State's and UCB's discretion and judgment in designating and defining Savings Areas, determining each Coop's Tier status, monitoring compliance with Savings Area closures, and initiating and supporting enforcement actions under circumstances where a Coop member appears to have violated this Agreement. The parties further acknowledge that if Sea State or UCB were potentially liable for simple negligence in connection with such actions, it would be necessary for Sea State and UCB to charge a substantially larger fee for the services they provide in connection with this Agreement, to offset that potential liability. It is therefore in the parties' interest to reduce Sea State's and UCB's potential liability under this Agreement. Therefore, the Coops and the CDQ Groups hereby waive and release any and all claims against Sea State and UCB arising out of or relating to Sea State's or UCB's services in connection with this Agreement, other than those arising out of gross negligence or willful misconduct by Sea State or UCB. Further, the Coops jointly and severally agree to indemnify, defend and hold Sea State and UCB harmless against any third party claims asserted against Sea State or UCB arising out of or relating to Sea State's or UCB's services in connection with this Agreement, other than those arising out of gross negligence or willful misconduct by Sea State or UCB.

7. ICA Representative contact information:

United Catcher Boats
4005 20th Ave. West, Suite 116
Seattle, WA 98199
Phone: 206-282-2599
Fax: 206-282-2414
E-mail: penguin@ucba.org

8. Coop Membership Agreement Amendments. To give effect to this Agreement, the Coops agree to cause each of their Membership Agreements to include the following provisions.

a. Each member shall acknowledge that its vessel's operations are governed by this Agreement, and shall agree to comply with its terms.

b. Each member shall authorize its Coop's Board of Directors to take all actions and execute all documents necessary to give effect to this Agreement.

c. Each member shall authorize its Coop Board of Directors to enforce this Agreement, and if the Board fails to do so within one hundred eighty (180) days of receiving notice from Sea State that a cooperative member may have failed to comply with the Agreement, each member shall authorize each other Coop, each of the CDQ groups, AVCP, BSFA, TCC and YRDFA to individually or collectively enforce this Agreement.

d. Each member shall agree to maintain an operational VMS unit approved by Sea State on its vessel at all times that its vessel is participating in the Fishery, provided such VMS unit is available on a commercially reasonable basis, and shall agree to cause its vessel's VMS tracking data to be released to Sea State on a basis that permits Sea State to determine whether the member's vessel has operated in compliance with this Agreement. Each Coop member shall release to Sea State its State and Federal landing reports, observer data, VMS tracking data, and vessel log books and plotter data for purposes of determining its compliance with this Agreement, and agrees that in the event Sea State concludes that its vessel may have violated a hot spot closure, Sea State may release such data as Sea State in its sole discretion determines appropriate to facilitate enforcement of this Agreement.

e. Each member shall agree that the information contained in the records identified in d., above, shall be presumed accurate absent a clear and compelling demonstration of manifest error, and shall be presumed sufficient to determine its compliance with this Agreement.

f. Each member shall agree that the damages resulting from violating a Savings Area closure are difficult to estimate, and that the assessment amounts provided under this Agreement are therefore intended to be a substitute in all cases for direct, indirect and consequential damages. Each member shall agree that its Coop Board of Directors may modify Savings Area violation assessment amounts from time to time, as necessary to maintain an effective deterrent to Savings Area violations. Each member shall agree that each trawl tow during which the member's vessel fishes in a Savings Area in violation of this Agreement shall constitute a separate violation for purposes of assessment calculation. Each member shall agree that damages for violating this Agreement shall apply on a strict liability basis, regardless of a member's lack of knowledge of the violation or intent to violate the agreement. Each member shall agree that actual damages for violating this Agreement would be difficult to calculate, and shall therefore agree to pay the assessment amounts established under this Agreement, as amended from time to time, as liquidated damages. Each member agrees to modify its skipper contracts to make its skipper(s) fully responsible for the assessments levied in connection with a breach of the agreement. Further, each member agrees that in the event a skipper fails to assume such assignment of liability, or in the event such assumption of liability is deemed invalid, the member shall be liable for the full amount of such assessment, and all related costs and attorneys' fees.

g. Each member shall agree that in connection with any action taken to enforce this Agreement, the prevailing party shall be entitled to the costs and fees it incurs in connection with such action, including attorneys' fees.

h. Each member shall agree that in addition to legal remedies, the Board of Directors of each cooperative, each of the CDQ groups, BSFA and YRDFA shall be entitled to injunctive relief in connection with the second and subsequent violations of this Agreement.

i. Each member shall agree to waive and release any and all claims against Sea State and UCB arising out of or relating to Sea State's or UCB's services in connection with this Agreement, other than those arising out of gross negligence or willful misconduct by Sea State or UCB.

j. Each member shall acknowledge that, notwithstanding the definition of "fishing" used in this Agreement (which is the consistent with the definition used by NMFS for logbook entries and observer reporting purposes), it is the Coops' policy that no member's vessel will be present in a Savings Area that is closed to fishing by such Coops' members' vessels unless and until such vessel's trawl doors have been fully retrieved or stored. Further, each member shall agree that, absent extenuating circumstances, such member exercise its best efforts to comply with this policy.

9. <u>Term</u>. This Agreement shall take effect as of November 30, 2010. The initial term of this Agreement shall extend through November 1, 2013. The term of this Agreement shall be automatically extended for an additional year as of September 15 each year it remains in effect, i.e., as of September 15, 2011, the new expiration date of this Agreement shall be November 1, 2014, and so on. A party to this Agreement may terminate its status as a party by providing written notice to all other parties to this Agreement to that effect, provided that the effective date of such party's termination shall be the expiration date of this Agreement in effect at the time the termination notice is delivered. For example, if a Coop provides termination notice on August 15, 2011, its termination shall not be effective until November 1, 2013. If a Coop provides termination notice on October 1, 2011, its termination shall not be effective until November 1, 2014. Notwithstanding any party's termination of its participation in this Agreement or the expiration of its term, the enforcement provisions of Section 7, above, shall survive with full force and effect.

10. <u>Breach and Termination of Exemption</u>. Each Coop acknowledges that, as of the opening of the 2011 "B" season Fishery, NMFS is expected to issue an annual

exemption to the regulatory salmon savings closures (the "Exemptions") to each Coop that is a party to and complies with this Agreement. Further, each Coop acknowledges that a Coop's material breach of this Agreement that is not timely cured shall result in forfeiture of such Coop's right to retain its Exemption. The following shall constitute material breaches of this Agreement:

(i) a Coop failing to take enforcement action within one hundred eighty (180) days of being notified by Sea State of an apparent violation of a Savings Area closure by one or more of its members, as provided in Section 5.b, above;

(ii) a Coop failing to collect and/or disburse an assessment in compliance with this Agreement within one hundred eighty (180) days of a determination that its member(s) violated a Savings Area closure, as provided in Sections 5.c and 5.d, above;

(iii) a Coop failing to collect and/or disburse an assessment in compliance with this Agreement within one hundred eighty (180) days of a determination that a member of the Coop failed to maintain an available, operational VMS unit approved by Sea State on its vessel as provided in Section 5.f of this Agreement and/or failed to cause such vessel(s) to release their VMS tracking data to Sea State as provided in Section 5.f of this Agreement.

In the event of a material breach of this Agreement by a Coop that is not cured within thirty (30) days of such Coop's authorized representative receiving written notice of such breach from one or more other Coop(s), a CDQ Group, AVCP, BSFA, TCC or YRDFA, any one of such parties may demand that the breaching Coop tender its Exemption to NMFS, and such Coop shall do so within ten (10) days. If a Coop fails to timely tender its Exemption, any of such parties may seek injunctive relief requiring such Coop to tender its Exemption.

11. Annual Compliance Audit. The Coops shall annually retain an entity that is not a party to this Agreement (the "Compliance Auditor") to review and prepare a report concerning Sea State's performance of its monitoring and notification obligations under this Agreement and actions taken by the Coops in response to all notifications from Sea State to the Coops regarding potential violations of this Agreement. All parties to this Agreement will be provided an opportunity to participate in selecting the non-party Compliance Auditor. Sea State and the Coops shall cooperate fully with the Compliance Auditor, and shall provide any information the Compliance Auditor requires to complete its review and report. If the Compliance Auditor identifies a failure to comply with this Agreement as part of its review, the Compliance Auditor shall notify all parties to this Agreement of the failure to comply, shall distribute to all parties to this Agreement the information used to identify the failure to comply, and shall provide notice of any such failures in the Compliance Auditor's final report.

12. Miscellaneous.

a. No amendment to this Agreement shall be effective against a party hereto unless in writing and duly executed by such party. The parties agree to amend this Agreement as reasonably necessary to conform with changes in law or circumstances.

b. This Agreement shall be governed by and construed in accordance with applicable federal law and the laws of the State of Washington.

c. This Agreement may be executed in counterparts which, when taken together, shall have the same effect as a fully executed original. Delivery of a signed copy of this Agreement by telefacsimile shall have the same effect as delivering a signed original.

d. The parties agree to execute any documents necessary or convenient to give effect to the intents and purposes of this Agreement.

e. All notices required to be given under this Agreement shall be deemed given five (5) days following deposit in certified first class U.S. mail, postage prepaid, with the correct address, or upon the first business day following confirmed telefacsimile or e-mail transmission to the recipient. Each party to this Agreement agrees to provide the name, postal address, telefacsimile number and e-mail address of its duly authorized representative(s) for purposes of receiving notices under this Agreement within three (3) days of executing this Agreement.

f. In the event that any provision of this Agreement is held to be invalid or unenforceable, such provision shall be deemed to be severed from this Agreement, and such holding shall not affect in any respect whatsoever the validity of the remainder of this Agreement.

g. Each Coop agrees to use its best efforts to resolve any disputes arising under this Agreement through direct negotiations. Breaches of this Agreement for which a party seeks a remedy other than injunctive relief that are not resolved through direct negotiation shall be submitted to arbitration in Seattle, Washington upon the request of any party to this Agreement. The party's written request will include the name of the arbitrator selected by the party requesting arbitration. The other party will have ten (10) days to provide written notice of the name of the arbitrator it has selected, if any. If the other party timely selects a second arbitrator, the two arbitrators will select a third arbitrator within ten (10) days. If the other party does not timely select the second arbitrator, there shall be only the one arbitrator. The single arbitrator or the three (3) arbitrators so selected will schedule the arbitration hearing as soon as possible thereafter. Every arbitrator, however chosen, must have no material ties to any Coop or

Coop member. The decision of the arbitrator (or in the case of a three (3) arbitrator panel, the decision of the majority) will be final and binding. The arbitration will be conducted under the rules of (but not by) the American Arbitration Association. The parties will be entitled to limited discovery as determined by the arbitrator(s) in its or their sole discretion. The arbitrator(s) will also determine the "prevailing party" and that party will be entitled to its reasonable costs, fees and expenses, including attorneys' and arbitrator fees, incurred in the action by said party. In no event will arbitration be available pursuant to this paragraph after the date when commencement of such legal or equitable proceedings based on such claim, dispute, or other matter in question would be barred by the applicable statue of limitations.

Entered into as of the date first set forth above.

Pollock Conservation Cooperative

By Stephanie D. Madsen
Its Authorized Agent

High Seas Catchers Cooperative

By [signature]
Its Executive Director

Mothership Fleet Cooperative

By [signature]
Its President

Akutan Catcher Vessel Association

By [signature]
Its VP/MGR

Northern Victor Fleet Cooperative

By Pat Hardina
Its President

Peter Pan Fleet Cooperative

By Michael Mart
Its President

Unalaska Fleet Cooperative

By [signature]
Its Vice President

Unisea Fleet Cooperative

By [signature]
Its President

Westward Fleet Cooperative

By ______________________

Its EXECUTIVE DIRECTOR

Aleutian Pribilof Island Community Development

By ______________________

Its CEO

Bristol Bay Economic Development Corporation

By ______________________

Its President/CEO

Central Bering Sea Fishermen's Association

By ______________________

Its President

Coastal Villages Region Fund

By ______________________

Its executive director

Norton Sound Economic Development Corporation

By ______________________

Its CEO

Yukon Delta Fisheries Development Association

By ______________________

Its EXECUTIVE DIRECTOR

Sea State Inc.

By ______________________

Its PRESIDENT

United Catcher Boats Association

By ______________________

Its EXECUTIVE DIRECTOR

2008 AMENDMENT 84 VESSEL LIST

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
AKUTAN	ALDEBARAN	901	664363
AKUTAN	ARCTIC EXPLORER	3388	936302
AKUTAN	ARCTURUS	533	655328
AKUTAN	BLUE FOX	4611	979437
AKUTAN	BRISTOL EXPLORER	3007	647985
AKUTAN	CAPE KIWANDA	1235	618158
AKUTAN	COLUMBIA	1228	615729
AKUTAN	DOMINATOR	411	602309
AKUTAN	EXODUS EXPLORER	1249	598666
AKUTAN	GLADIATOR	1318	598380
AKUTAN	GOLDEN DAWN	1292	604315
AKUTAN	GOLDEN PISCES	586	599585
AKUTAN	HAZEL LORRAINE	523	592211
AKUTAN	LESLIE LEE	1234	584873
AKUTAN	LISA MELINDA	4506	584360
AKUTAN	MAJESTY	3996	962718
AKUTAN	MARCY J	2142	517024
AKUTAN	MARGARET LYN	723	615563
AKUTAN	MARK I	1242	509552
AKUTAN	NORDIC EXPLORER	3009	678234
AKUTAN	NORTHERN PATRIOT	2769	637744
AKUTAN	NORTHWEST EXPLORER	3002	609384
AKUTAN	OCEAN EXPLORER	3011	678236
AKUTAN	PACIFIC EXPLORER	3010	678237
AKUTAN	PACIFIC RAM	4305	589115
AKUTAN	PACIFIC VIKING	422	555058
AKUTAN	PEGASUS	1265	565120
AKUTAN	PEGGY JO	979	502779
AKUTAN	PERSEVERANCE	2837	536873
AKUTAN	PREDATOR	1275	547390
AKUTAN	RAVEN	1236	629499
AKUTAN	ROYAL AMERICAN	543	624371
AKUTAN	SEEKER	2849	924585
AKUTAN	SOVEREIGNTY	2770	651752
AKUTAN	TRAVELER	3404	929356
AKUTAN	VIKING EXPLORER	1116	605228

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
ARCTIC	INTREPID EXPLORER	4993	988598

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
NORTHERN VICTOR	AMERICAN EAGLE	434	558605
NORTHERN VICTOR	ANITA J	1913	560532
NORTHERN VICTOR	COLLIER BROTHERS	2791	593809
NORTHERN VICTOR	COMMODORE	2657	914214
NORTHERN VICTOR	EXCALIBUR II	410	636602
NORTHERN VICTOR	GOLD RUSH	1868	521106
NORTHERN VICTOR	HALF MOON BAY	249	615796
NORTHERN VICTOR	MISS BERDIE	3679	913277
NORTHERN VICTOR	NORDIC FURY	1094	542651
NORTHERN VICTOR	PACIFIC FURY	421	561934
NORTHERN VICTOR	POSEIDON	1164	610436
NORTHERN VICTOR	ROYAL ATLANTIC	236	559271
NORTHERN VICTOR	STORM PETREL	1641	620769
NORTHERN VICTOR	SUNSET BAY	251	598484

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
PETER PAN	AJ	3405	599164
PETER PAN	AMERICAN BEAUTY	1688	613847
PETER PAN	ELIZABETH F	823	526037
PETER PAN	MORNING STAR	6204	1037811
PETER PAN	OCEAN LEADER	1229	561518
PETER PAN	OCEANIC	1667	602279
PETER PAN	PACIFIC CHALLENGER	657	518937
PETER PAN	PROVIDIAN	6308	1062183
PETER PAN	TOPAZ	405	575428
PETER PAN	WALTER N	825	257365

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
UNALASKA	ALASKA ROSE	515	610984
UNALASKA	BERING ROSE	516	624325
UNALASKA	DESTINATION	3988	571879
UNALASKA	GREAT PACIFIC	511	608458
UNALASKA	MESSIAH	6081	610150
UNALASKA	MORNING STAR	208	610393
UNALASKA	MS AMY	2904	920936
UNALASKA	PROGRESS	512	565349
UNALASKA	SEA WOLF	1652	609823
UNALASKA	VANGUARD	519	617802
UNALASKA	WESTERN DAWN	134	524423

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
UNISEA	ALSEA	2811	626517
UNISEA	ARGOSY	2810	611365
UNISEA	AURIGA	2889	639547
UNISEA	AURORA	2888	636919
UNISEA	DEFENDER	3257	554030
UNISEA	FIERCE ALLEGIANCE	4133	588849
UNISEA	GUN-MAR	425	640130
UNISEA	MAR-GUN	524	525608
UNISEA	NORDIC STAR	428	584684
UNISEA	PACIFIC MONARCH	2785	557467
UNISEA	SEADAWN	2059	548685
UNISEA	STAR FISH	1167	561651
UNISEA	STARLITE	1998	597065
UNISEA	STARWARD	417	617807

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
WESTWARD	ALASKAN COMMAND	3391	599383
WESTWARD	ALYESKA	395	560237
WESTWARD	ARCTIC WIND	5137	608216
WESTWARD	CAITLIN ANN	3800	960836
WESTWARD	CHELSEA K	4620	976753
WESTWARD	DONA MARTITA	2047	651751
WESTWARD	HICKORY WIND	993	594154
WESTWARD	OCEAN HOPE 3	1623	652397
WESTWARD	PACIFIC KNIGHT	2783	561771
WESTWARD	PACIFIC PRINCE	4194	697280
WESTWARD	VIKING	1222	565017
WESTWARD	WESTWARD I	1650	615165

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
MOTHERSHIP	ALEUTIAN CHALLENGER	1687	603820
MOTHERSHIP	ALYESKA	395	560237
MOTHERSHIP	AMERICAN BEAUTY	1688	613847
MOTHERSHIP	CALIFORNIA HORIZON	412	590758
MOTHERSHIP	MARGARET LYN	723	615563
MOTHERSHIP	MAR-GUN	524	525608
MOTHERSHIP	MARK I	1242	509552
MOTHERSHIP	MISTY DAWN	5946	926647
MOTHERSHIP	MORNING STAR	7270	618797
MOTHERSHIP	NORDIC FURY	1094	542651
MOTHERSHIP	OCEAN LEADER	1229	561518
MOTHERSHIP	OCEANIC	1667	602279
MOTHERSHIP	PACIFIC CHALLENGER	657	518937
MOTHERSHIP	PACIFIC FURY	421	561934
MOTHERSHIP	POPADO II	2087	536161
MOTHERSHIP	TRAVELER	3404	929356
MOTHERSHIP	VESTERAALEN	517	611642
MOTHERSHIP	VANGUARD	519	617802
MOTHERSHIP	WESTERN DAWN	134	524423

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
HSCC	AMERICAN CHALLENGER	4120	633219
HSCC	FORUM STAR	4245	925863
HSCC	MUIR MILACH	480	611524
HSCC	NEAHKAHNIE	424	599534
HSCC	OCEAN HARVESTER	5130	549892
HSCC	SEA STORM	420	628959
HSCC	TRACY ANNE	2823	904859

COOP NAME	VESSEL NAME	Federal Fisheries Permit Number	Coast Guard Number
PCC	ALASKA OCEAN	3794	637856
PCC	AMERICAN DYNASTY	3681	951307
PCC	AMERICAN ENTERPRISE	2760	594803
PCC	AMERICAN TRIUMPH	4055	646737
PCC	ARCTIC FJORD	3396	940866
PCC	ARCTIC STORM	2943	903511
PCC	HIGHLAND LIGHT	3348	577044
PCC	ISLAND ENTERPRISE	3870	610290
PCC	KATIE ANN	1996	518441
PCC	KODIAK ENTERPRISE	3671	579450
PCC	NORTHERN EAGLE	3261	506694
PCC	NORTHERN GLACIER	661	663457
PCC	NORTHERN HAWK	4063	643771
PCC	NORTHERN JAEGER	3896	521069
PCC	OCEAN ROVER	3442	552100
PCC	PACIFIC GLACIER	3357	933627
PCC	SEATTLE ENTERPRISE	3245	904767
PCC	STARBOUND	3414	944658
PCC	U.S. ENTERPRISE	3004	921112