AGENDA D-1(b)
DECEMBER 2004

MEMORANDUM

TO: Council, SSC and AP Members

FROM: Chris Oliver
Executive Director

ESTIMATED TIME
8 HOURS
(all D-1 items)

DATE: December 1, 2004

SUBJECT: BSAI Salmon Bycatch

ACTION REQUIRED

Develop a problem statement and alternatives for analysis.

BACKGROUND

In October 2004, the Council tasked staff to develop a draft problem statement relative to current fishery conditions in the Chinook and chum salmon savings areas of the Bering Sea. Compared to the 1990-2001 annual bycatch average of 37,819 Chinook salmon and 69,322 'other' salmon (nearly all chum salmon), the 2003 bycatch amounts were high, and the 2004 amounts were the highest on record (see below).

	Chinook	Chum
2003	54,911	197,091
2004 (thru 11/15)	62,471	456,885

A short issue paper on this issue, including a draft problem statement, is attached as Item D-1(b)(1). Background information on salmon bycatch taken in Alaska groundfish fisheries is attached as Item D-1(b)(2).

At this meeting, the Council may initiate a plan amendment to improve salmon bycatch controls. Specifically, the Council will develop a problem statement and propose alternative management measures for analysis.

Issue Briefing Paper: Salmon Bycatch Controls in the BSAI
Prepared by Council staff

Background: In October 2003, representatives from the Bering Sea pollock trawl fleet testified to the Council that the closure of the Chum Salmon Savings Area in August had forced the fleet to fish in areas with higher chum salmon bycatch rates. Consequently, chum salmon bycatch had increased substantially in 2003. They requested that the Council intiate a discussion paper that evaluates the regulatory salmon bycatch closures and considers the hotspot avoidance program initiated by the trawl fleet to avoid areas of high salmon bycatch. The Council decided to put the issue on the tasking list, and discuss it further and prioritize analytical tasking in December. In December 2003, representatives from the BSAI pollock fishery co-ops testified about the fleets use of salmon bycatch monitoring. At that meeting, Council member John Bundy made a motion to immediately initiate an analysis of BSAI salmon bycatch controls (the motion included a draft problem statement and alternatives), but a substitute motion to postpone the decision and discuss the issue in February passed. In February 2004, the Council decided to keep the salmon bycatch issue on the tasking list, but put a hold on developing a problem statement and alternatives pending other workload priorities. In October 2004, a representative for the pollock fishery co-ops testified to the Council about the adverse effects of the salmon closure regulations on bycatch rates, and the resulting high levels of salmon bycatch again observed in 2004.

In October 2004, the Council tasked staff to develop a problem statement relative to current fishery conditions in the Chinook and chum salmon savings areas of the Bering Sea, where high bycatch of salmon has recently occurred. The Council plans to review this issue in December, propose alternative management measures, and likely initiate a plan amendment to address this issue.

Problem Overview: Bycatch of salmon (particularly chum salmon) was unusually high in 2003 and 2004. Existing regulations may have contributed to this problem by preventing the fleet from fishing in areas with lower bycatch rates. Reports from the fleet indicate that CDQ boats operating within the closure zones encountered low bycatch rates, whereas the rest of the fleet fishing outside of the zones were unable to find areas without high salmon bycatch rates (Haflinger pers comm.).

Existing Measures:

The Chum Salmon Savings Area, established in 1994, closes to all trawling from August 1 through August 31. Further, the area remains closed if 42,000 'other salmon' are caught in the CVOA during the period August 15-October 14.

The Chinook Salmon Savings Areas, established in 1996, close to Pollock trawling if 29,000 chinook salmon are taken. The timing of the closure depends on when the limit is reached:

1) If the limit is triggered before April 15, the areas close immediately through April 15. After April 15, the areas re-open, but are again closed from September 1 – December 31.
2) If the limit is reached after April 15, but before September 1, the areas would close on September 1 through the end of the year.
3) If the limit is reached after September 1, the areas close immediately through the end of the year.

Review of Data: A historical overview of salmon bycatch in groundfish fisheries is provided by Witherell et al. (2002). Relative to average historical bycatch amounts, chum salmon bycatch in BSAI groundfish fisheries during 2003 and 2004 was high (see below; amounts include CDQ catch). Recent chum salmon bycatch amounts are the highest since the chum salmon bycatch controls were implemented in 1994.

	Chinook	Chum
1990-2001 average	37,819	69,332
2002	36,385	81,470
2003	54,911	197,091
2004 (thru 11/15)	62,471	456,885

A 'quick and dirty' analysis of NMFS data from the website indicates that bycatch rates did jump with the implementation of the Chum Salmon Savings Area closure on August 1. Note that the Chum Salmon Savings Area is predominantly (4 'blocks') in Area 517, with one 'block' in Area 509.

2003	**509**	**517**
July	0.30	0.08
August	0.19	0.28
September	0.27	0.56

2004	**509**	**517**
July	0.12	0.16
August	0.81	1.72
September	0.20	2.80

Strawman Problem Statement: In the mid-1990's , the Council and NMFS implemented regulations to control the bycatch of Chum salmon and Chinook salmon taken in BSAI trawl fisheries. These regulations established closure areas in areas and at times when salmon bycatch had been highest based on historical observer data. Unfortunately, these regulations did not appear to have been effective in 2003 and 2004, when record amounts of salmon bycatch were taken. Information from the fishing fleet indicates that bycatch was exacerbated by the regulations, as much higher salmon bycatch rates were encountered outside of the closure areas. To address this problem, the Council will examine and consider other means to control salmon bycatch.

Alaska Fishery Research Bulletin 9(1):53–64. 2002.

An Overview of Salmon Bycatch in Alaska Groundfish Fisheries

David Witherell, David Ackley, and Cathy Coon

ABSTRACT: Chinook salmon *Oncorhynchus tshawytscha* and chum salmon *O. keta* are caught incidentally in Alaska groundfish fisheries, primarily in the walleye pollock *Theragra chalcogramma* trawl fishery. From 1990-2001, an average of 37,819 chinook salmon and 69,332 other salmon species (> 95% are chum salmon) were incidentally caught annually in the Bering Sea and Aleutian Islands groundfish trawl fisheries, and 20,799 chinook salmon and 20,496 other salmon were incidentally caught annually in the Gulf of Alaska trawl fisheries. In 1999 and 2000, chinook salmon bycatch was reduced in the Bering Sea, but increased in the Gulf of Alaska. Chum salmon bycatch has remained relatively stable in recent years. Bycatch is primarily juvenile salmon that are one or two years away from returning to the river of origin as adults. The origin of salmon taken as bycatch includes rivers in western Alaska, Southcentral and Southeast Alaska, Asia, British Columbia, and Washington. Analysis indicates that an incidental catch of 30,000 chinook salmon in Bering Sea and Aleutian Islands groundfish trawl fisheries equates to about 14,581 adult chinook salmon from western Alaska. Similarly, a bycatch of 60,000 chum salmon in Bering Sea and Aleutian Islands groundfish trawl fisheries equates to about 13,120 adult chum salmon from western Alaska. We estimated that, on average, salmon bycatch in Bering Sea and Aleutian Islands groundfish trawl fisheries reduced the western Alaska chum salmon run by less than 0.2%, and reduced the western Alaska chinook salmon run by less than 2.7%. Impacts of salmon bycatch from the Gulf of Alaska groundfish trawl fisheries cannot be estimated at this time.

INTRODUCTION

Pacific salmon, including pink salmon *Oncorhynchus gorbuscha*, sockeye salmon *O. nerka*, coho salmon *O. kisutch*, chum salmon *O. keta*, and chinook salmon *O. tshawytscha* support large commercial, recreational, and subsistence fisheries throughout Alaska. Salmon are also taken incidentally as bycatch in commercial groundfish fisheries.

Chinook salmon and chum salmon runs in western Alaska (Arctic, Yukon, Kuskokwim, and Bristol Bay drainages as shown in Figure 1), as well as sockeye salmon runs in Bristol Bay, are currently at low levels relative to run strengths observed over the last 20 years. By 2000, salmon returns throughout the Yukon and Kuskokwim River drainages and the entirety of Norton Sound were less than 50% of the 20-year average (D. Eggers, Alaska Department of Fish and Game, Juneau, personal communication). These run declines resulted in severe constraints on commercial, recreational, and subsistence harvests (ADF&G 2000). In 1998, 2000, and 2001, the Alaska governor declared that an emergency disaster existed in western Alaska as a result of collapsed salmon runs. Although these reduced salmon runs appear to be attributable, at least in part, to changes in ocean conditions (Hare and Francis 1995; Kruse 1998), the governor requested fisheries managers to reexamine any and all factors that may have contributed to the decline. One factor that may have influenced the decline is the bycatch of salmon in groundfish fisheries.

This paper reviews available information regarding salmon taken incidentally in the U.S. North Pacific groundfish fisheries of the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) areas. The groundfish fisheries are prosecuted by a fleet of approximately 250 trawl vessels, 1,000 longline vessels, 250 vessels using pot gear, and 50 vessels using jig

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Acknowledgments: We thank D. Eggers at the Alaska Department of Fish and Game for providing salmon run estimates for western Alaska, and C. Pautzke, C. Oliver, and three anonymous reviewers for their helpful comments and suggestions to improve the paper. We also thank the National Marine Fisheries Service Observer Program for collecting the salmon bycatch data, and M. Furuness of the National Marine Fisheries Service for providing annual salmon bycatch numbers.

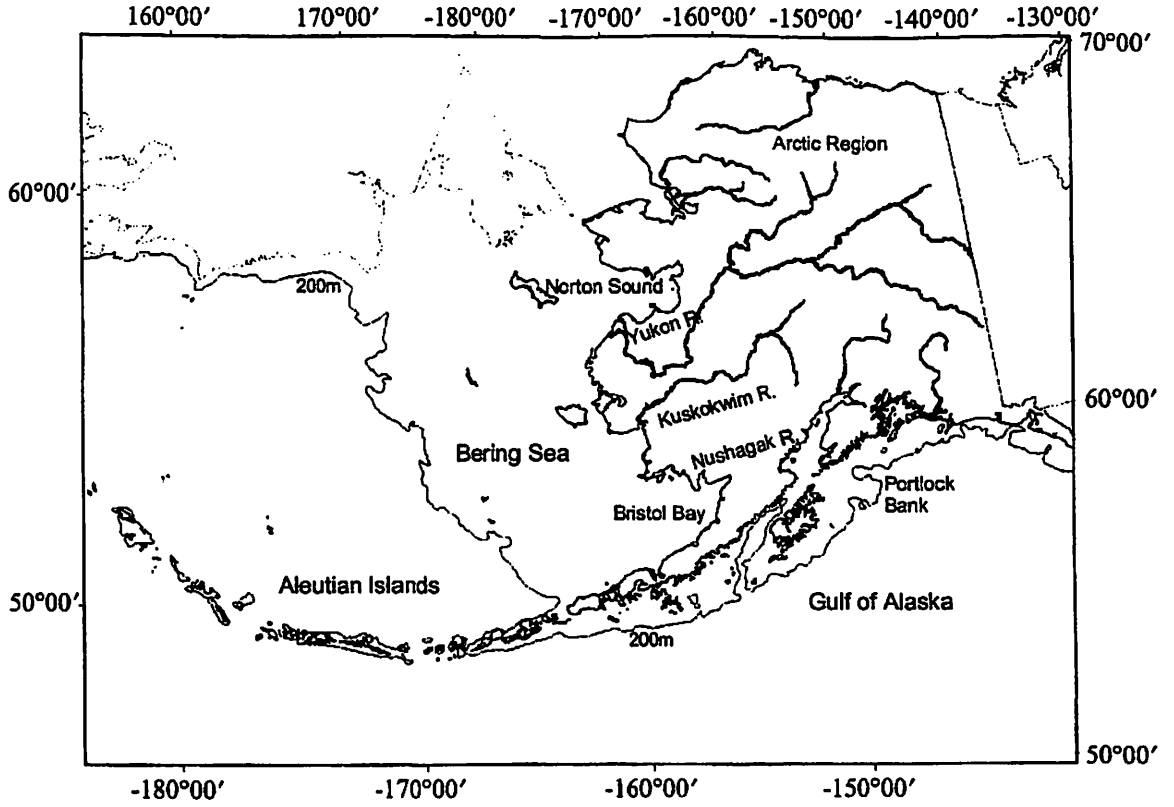

Figure 1. Map of Alaska showing locations of major river drainages in western Alaska.

gear (Hiatt et al. 2001). In general, most of the smaller vessels (<60 ft length overall) fish only in the GOA. The fleet catches about 1.8 million metric tons (mt) of groundfish per year, consisting of walleye pollock *Theragra chalcogramma*, Pacific cod *Gadus macrocephalus*, flatfish, rockfish, sablefish *Anoplopoma fimbria*, Atka mackerel *Pleurogrammus monopterygius*, and other species (Hiatt el al. 2001). A portion of the total allowable quota for target species (10% for walleye pollock and 7.5% for other groundfish) is allocated to the Community Development Quota program to increase economic opportunities for rural western Alaska communities (National Research Council 1999). Additional details regarding the North Pacific groundfish fisheries and the environmental impacts associated with these fisheries can be found in National Marine Fisheries Service (NMFS) (2001a).

The objectives of this paper are to synthesize information on salmon bycatch (amount caught, species composition, timing and location of bycatch), to provide estimates on the impacts of bycatch on salmon stocks of western Alaska, and to review existing management measures to control salmon bycatch.

METHODS

Pacific salmon bycatch data, provided by the NMFS groundfish fishery observer program, were examined to gain insight into the amount, species composition, timing, and location of salmon caught incidentally in Alaska groundfish fisheries. Since 1990, all vessels larger than 60 ft (length overall) participating in the groundfish fisheries have been required to have observers onboard at least part of the time. Observer coverage is based on vessel length, with 30% coverage required on vessels 60 ft to 125 ft, 100% coverage on vessels larger than 125 ft, and 100% coverage at shore-based processing facilities. Observers estimate catch and bycatch by randomly selecting hauls to be sampled, and then determine species composition and weight of the catch by sampling the entire haul, a portion of the haul, or employ subsampling techniques using baskets or other means (Volstad et al. 1997). Observer data are combined with weekly production reports from processors to provide weekly total estimates of catch and bycatch. The combined data provide for accurate and relatively precise estimation of

groundfish catch, particularly on fleets with high levels of observer coverage (Volstad et al. 1997). The precision of the salmon bycatch estimates depend upon the number of vessels observed and the fraction of hauls sampled within vessels (Karp and McElderry 1999). Because a high percentage of hauls are sampled in the larger fisheries (e.g., 60–70% in the BSAI walleye pollock fishery), which account for most of the salmon bycatch, fleet wide estimates of salmon bycatch are thought to be reasonably accurate for management purposes (NPFMC 1995a, 1995b, 1999).

We reviewed scientific literature on age composition, stock composition, and management of salmon caught incidentally in fisheries off Alaska, and estimated the impacts of the BSAI groundfish fisheries on salmon stocks of western Alaska. To estimate impacts of bycatch on salmon stocks, we adjusted bycatch numbers to account for mortality associated with age at incidental capture. Thus, we can express bycatch as adult equivalents that would have returned to their natal river drainages. We based our calculations of adult equivalents on an annual BSAI groundfish trawl bycatch of 30,000 juvenile chinook salmon and 60,000 juvenile chum salmon, which are the bycatch amounts projected to result from implementation of the Steller sea lion *Eumetopias jubatus* protection measures in 2002 (NMFS 2001b). To estimate the impacts of bycatch on mature chum salmon in western Alaska, we used the proportion of bycatch estimated to originate from western Alaska (27% based on Wilmot et al. 1998; Kondzela et al. 1999), and adjusted for natural mortality based on adjustments calculated for chinook salmon, as discussed below.

For chinook salmon, we first estimated the number of juvenile salmon from western Alaska taken as bycatch, based on Myers and Rogers (1988) estimate data indicating that 60% of the bycatch originated from western Alaska. Further, according to Myers and Rogers (1988), within the western Alaska component of intercepted chinook salmon, 17% were from the Yukon River and 29% were from Bristol Bay. Since the available age-at-return information is primarily from the Yukon River and Bristol Bay systems, it was assumed for purposes of this paper that all western Alaska chinook salmon were from these two systems only. Adjusting the percentages resulted in 37% of the western Alaska chinook salmon from the Yukon River and 63% from Bristol Bay.

We then adjusted the regional numbers based on age at return and natural mortality. Using fairly general assumptions based on chinook salmon return information to the Yukon River (Brannian 1990) and Bristol Bay (using the Nushagak drainage as a proxy, based on data from Minard et al. 1992), and assuming that all fish return as age 1.3 or 1.4 (years in fresh water, years in salt water), a rough approximation was made that 30% and 43% of chinook salmon return to the Yukon River and Bristol Bay, respectively, as age 1.3, and approximately 70% and 57% return at age 1.4 to the Yukon River and Bristol Bay, respectively. These proportions were used to allocate salmon bycatch to stream of origin across several years from time of incidental capture.

We adjusted for natural mortality, from the time the fish were incidentally caught to the year that the fish would have returned to their natal streams in western Alaska, using age at capture information from the BSAI groundfish fisheries provided by Myers and Rogers (1988). They estimated that 56% of the chinook salmon included in their analysis were age 1.2 fish and that 26% of the chinook salmon were age 1.3. If we assume that all bycatch is age 1.2 or 1.3, then the numbers are adjusted accordingly such that 68.3% are age 1.2 and 31.7% are age 1.3. Incorporating the above assumptions about the ages of return to western Alaska systems, the annual at-sea natural mortality rates between ages 1.2 and 1.3 were assumed to be 20%, and the natural mortality rate over the year between ages 1.3 and 1.4 was assumed to be 10% (Pacific Salmon Commission 1988). Of the 1.2 age fish, some will return the next year (with a 20% mortality) and some in 2 years with an additional 10% mortality. Some of the 1.3 age fish will return the same year and some in another year with a 10% mortality.

RESULTS

Amount of Bycatch

From 1990-2001, an average of 37,819 chinook salmon and 69,332 other salmon were incidentally caught annually in the BSAI groundfish fisheries, and 20,799 chinook salmon and 20,496 other salmon in the GOA groundfish fisheries (Table 1). Chinook salmon bycatch in the 1999 and 2000 BSAI groundfish fisheries was relatively low, but increased to 40,303 salmon in 2001. In both the BSAI and GOA groundfish fisheries, about 95% of other salmon bycatch is chum salmon (Table 1). Bycatch of coho, pink, and sockeye salmon is relatively small. Chum salmon bycatch in the BSAI has been fairly consistent over the last few years. In the GOA, chinook salmon and chum salmon bycatch has fluctuated in recent years.

Nearly all (>99%) of the salmon bycatch is attributable to trawl fisheries. Most salmon are incidentally

Table 1. Bycatch of Pacific salmon in Alaska groundfish trawl fisheries, by management area and species, 1990-2001. Bycatch includes salmon caught incidentally in the 1999-2001 Community Development Quota Program groundfish fisheries.

	Number of Fish										
Year	Chinook	Chum	Coho	Sockeye	Pink	Year	Chinook	Chum	Coho	Sockeye	Pink
Bering Sea and Aleutian Islands Area						**Gulf of Alaska Area**					
1990	14,085	16,202	153	30	31	1990	16,913	2,541	1,482	85	64
1991	48,873	29,706	396	79	79	1991	38,894	13,713	1,129	51	57
1992	41,955	40,090	1,266	14	80	1992	20,462	17,727	86	33	0
1993	45,964	242,895	321	22	8	1993	24,465	55,268	306	15	799
1994	44,380	95,978	231	20	202	1994	13,973	40,033	46	103	331
1995	23,079	20,901	858	0	21	1995	14,647	64,067	668	41	16
1996	63,205	77,771	218	5	1	1996	15,761	3,969	194	2	11
1997	50,218	67,349	114	3	69	1997	15,119	3,349	41	7	23
1998	58,966	69,237[a]				1998	16,941	13,539[a]			
1999	14,586	47,204[a]				1999	30,600	7,529[a]			
2000	8,219	59,306[a]				2000	26,706	10,996[a]			
2001	40,303	60,460[a]				2001	14,946	5,995[a]			
Average	37,819	69,332[b]				Average	20,799	20,496[b]			

[a] Coho, sockeye, and pink salmon are combined with chum salmon.
[b] Average chum salmon bycatch includes chum, coho, sockeye, and pink salmon.

caught in the walleye pollock trawl fishery and, to a lesser extent, in trawl fisheries for Pacific cod and other target species (Table 2). In the 1993 BSAI trawl fisheries, the average size of salmon taken as bycatch was 2.1 kg (56 cm fork length) for chum salmon and 2.9 kg (58 cm fork length) for chinook salmon (NPFMC 1995a, 1995b). The chinook salmon are generally one to two years away from returning to their streams of origin to spawn (Myers and Rogers 1988).

Table 2. Bycatch of Pacific salmon in Alaska groundfish trawl fisheries, by area and target fishery, 2000 and 2001. Bycatch does not include salmon taken incidentally in Community Development Quota fisheries.

	Number of Chinook Salmon		Number of Other Salmon	
Fishery	2000	2001	2000	2001
Bering Sea and Aleutian Islands Area				
Walleye pollock	3,968	30,130	56,715	52,690
Pacific cod	2,688	3,529	128	1,835
Flatfish	536	2,702	297	1,044
Other targets[a]	278	1,381	460	1,600
Total BSAI	7,470	37,742	57,600	57,169
Gulf of Alaska Area				
Walleye pollock	18,413	9,421	7,450	2,741
Pacific cod	2,747	2,796	0	677
Flatfish	4,386	2,295	2,979	1,857
Other targets[a]	1,160	434	567	720
Total GOA	26,706	14,946	10,996	5,995

[a]Other targets include rockfish, sablefish, and Atka mackerel.

Location and Timing of Bycatch

Chinook salmon are caught incidentally in trawl fisheries in areas with bottom depths of 100 m to 200 m. In the Bering Sea, chinook salmon are taken throughout the area, whereas in the GOA, bycatch appears to occur in more discrete locations (Figures 2 and 3). The lower observer coverage in the GOA trawl fisheries limits the amount of data available for interpretation (a greater number of small vessels fish in the GOA relative to the BSAI). However, it appears that the highest bycatch in the GOA occurs along the outer margins of Portlock Bank. In the eastern Bering Sea, areas of high bycatch rates, or hot spots, can occur in any location, not just within the eastern section of the Chinook Salmon Savings Areas. The Chinook Salmon Savings Areas are closed to trawling when annual chinook salmon bycatch limits are reached by trawl fisheries (Witherell and Pautzke 1997). No chinook salmon were caught incidentally in the western section of the Chinook Salmon Savings Areas in 2000 and 2001 due to the closure of the Aleutian Islands walleye pollock fishery during those years.

The locations of chum salmon bycatch closely mirror bycatch locations for chinook salmon (Figures 4 and 5), although there is little temporal overlap between the two, as discussed below. This is not surprising since both chum salmon and chinook salmon are caught incidentally by fisheries in similar proportions, with the exception of the Pacific cod fishery that incurs some incidental catch of chinook salmon but almost no chum

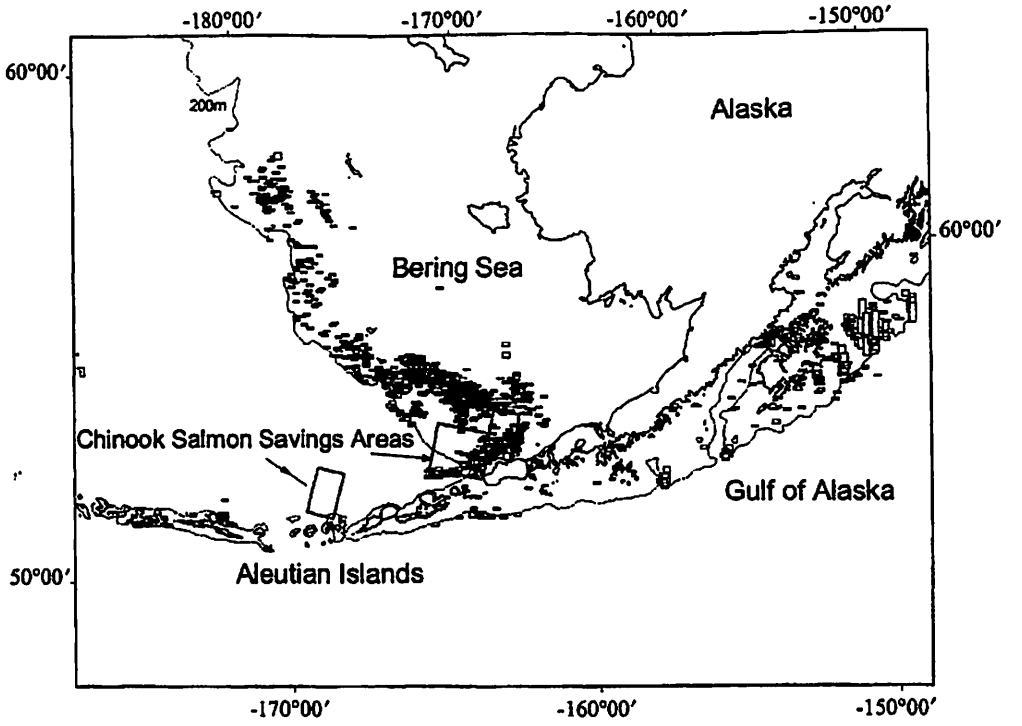

Figure 2. Locations of chinook salmon bycatch in the 2000 trawl fisheries. Bar height indicates relative number observed with hauls summed over a 25 km² area. The 200 m depth contour and the Chinook Salmon Savings Areas are also shown.

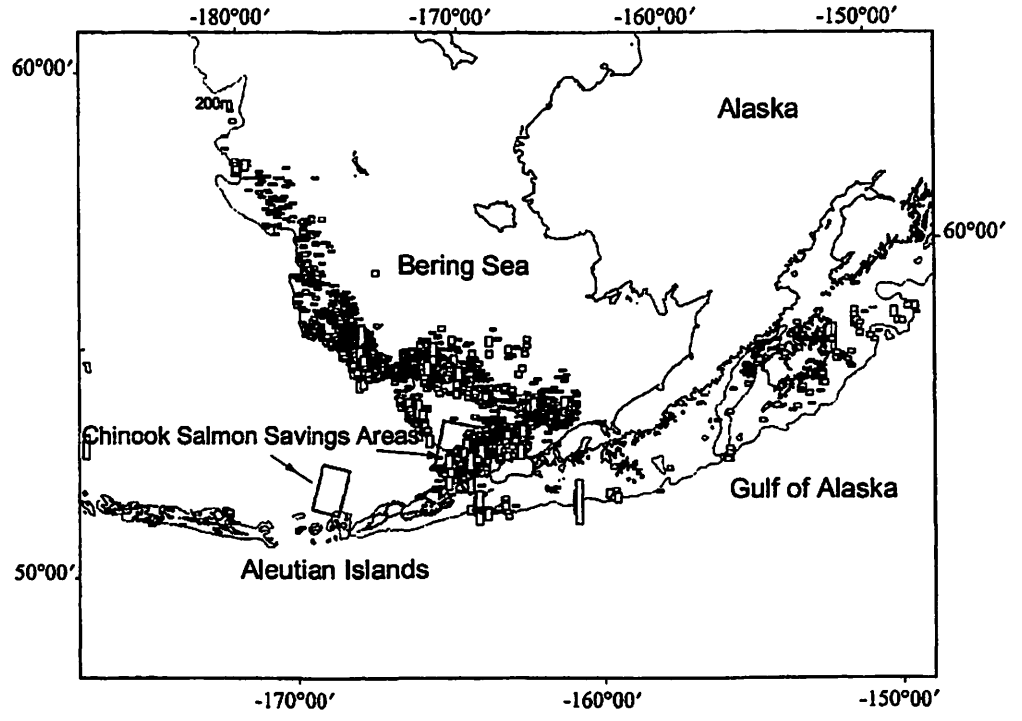

Figure 3. Locations of chinook salmon bycatch in the 2001 trawl fisheries. Bar height indicates relative number observed with hauls summed over a 25 km² area. The 200 m depth contour and the Chinook Salmon Savings Areas are also shown.

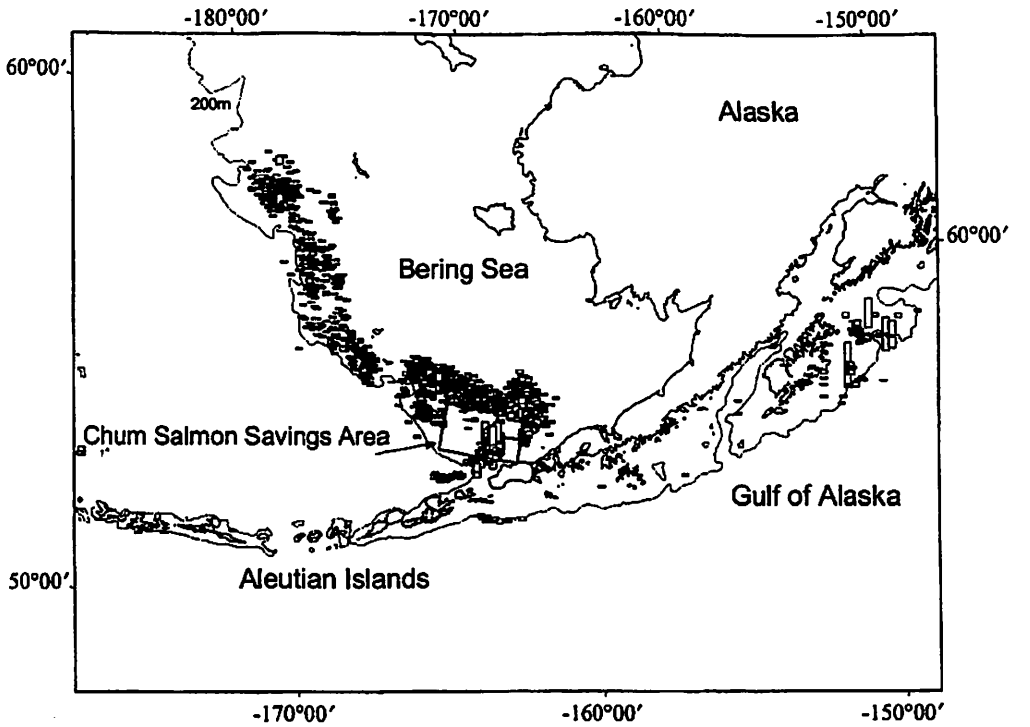

Figure 4. Locations of chum salmon bycatch in the 2000 trawl fisheries. Bar height indicates relative number observed with hauls summed over a 25 km² area. The 200 m depth contour and the Chum Salmon Savings Area are also shown.

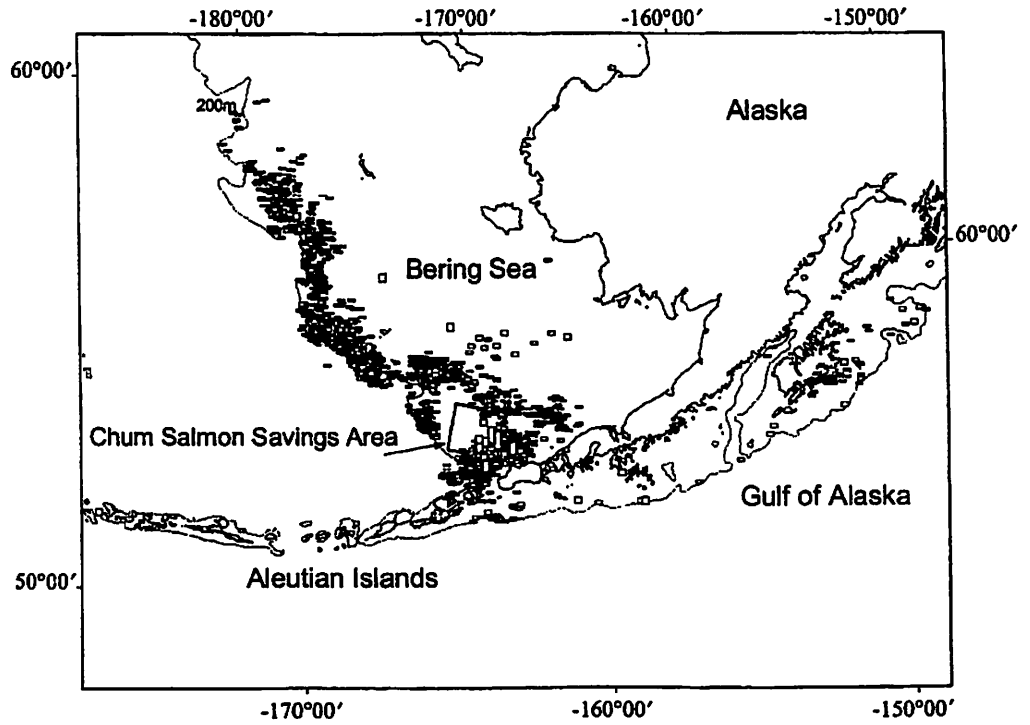

Figure 5. Locations of chum salmon bycatch in the 2001 trawl fisheries. Bar height indicates relative number observed with hauls summed over a 25 km² area. The 200 m depth contour and the Chum Salmon Savings Area are also shown.

salmon (Table 2). By design, the Chum Salmon Savings Area encompasses nearly all the hot spot locations of chum salmon bycatch in the Bering Sea. The Chum Salmon Savings Area, located in the eastern Bering Sea, is closed to trawl fishing during the month of August, and remains closed through October 14 if annual chum salmon bycatch limits are reached by trawl fisheries (Witherell and Pautzke 1997). Bycatch locations of chum salmon in the GOA are similar to chinook salmon bycatch locations, except that almost no chum salmon are taken in Shelikof Strait.

The timing of salmon bycatch in the Bering Sea follows a predictable pattern (Figures 6 and 7). For 2000 and 2001, chinook salmon bycatch occurred during October and November, and January through April (weeks 1-16, 38-44). Chum salmon bycatch was taken during the months of July through October (weeks 26-44). Our results are consistent with previous temporal analyses of BSAI salmon bycatch taken in the mid-1990s (NPFMC 1995a, 1995b, 1999).

In the GOA groundfish fisheries, salmon bycatch does not appear to occur in discrete time periods. In 2000 and 2001, both chinook and chum salmon were taken in every week the GOA groundfish fishery was prosecuted (Figures 8 and 9). Bycatch of chinook salmon was generally higher in the winter, and bycatch of chum salmon was higher in the summer. The spike of salmon bycatch observed in weeks 32 and 33 of the 2000 fishery was due to increased bycatch in the walleye pollock fishery when the fleet was forced to fish outside of Steller sea lion critical habitat, per order of the U.S. District Court.

Stock Composition of Bycatch

Information on the origins of chinook salmon caught incidentally in the BSAI groundfish fisheries comes from scale pattern analysis. Scale pattern analysis of chinook salmon bycatch in the 1979–1982 foreign and joint venture trawl fisheries indicated that about 60% of the chinook salmon bycatch originated from western Alaska, 17% from Southcentral Alaska, 14% from Asia, and 9% from Southeast Alaska and Canada (Myers and Rogers 1988). These results should be interpreted with some caution, however, as the information comes from fisheries that were prosecuted over 20 years ago; many changes in groundfish fisheries and salmon stocks have since occurred.

Future studies of chinook salmon bycatch will likely utilize allozyme methodology because the allozyme baseline is complete enough to discriminate chinook salmon stocks in Bering Sea stock mixtures (Teel et al. 1999). Allozymes have been successfully applied to chinook salmon mixtures from confiscated high seas chinook salmon catches (R. Wilmot, National Marine Fisheries Service, Juneau, personal communication). Attempts are underway to obtain further tissue collections from Russian stocks that would improve the accuracy of allozyme methods for delineating stock origins. However, funds to collect and analyze chinook salmon samples from trawl bycatch are limited. Additional research on stock discrimination is being conducted using microsatellite DNA, but the microsatellite DNA baseline is not complete enough at present to be used for analysis of chinook salmon mixtures that po-

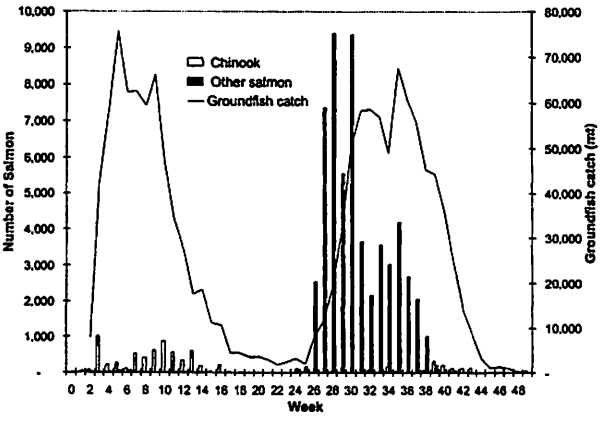

Figure 6. Bycatch of chinook salmon, other salmon (primarily chum salmon), and groundfish catch in the BSAI trawl fisheries, by week, 2000.

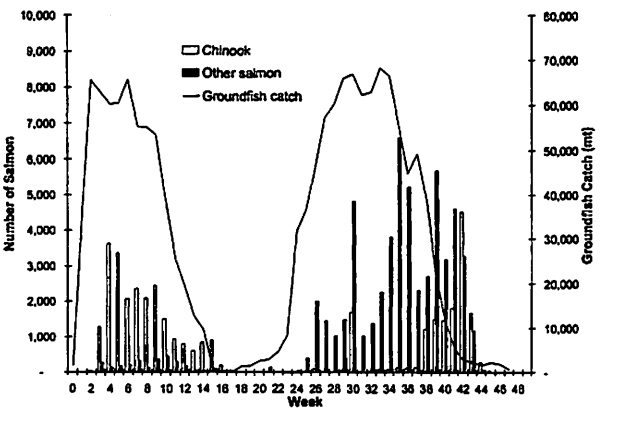

Figure 7. Bycatch of chinook salmon, other salmon (primarily chum salmon), and groundfish catch in the BSAI trawl fisheries, by week, 2001.

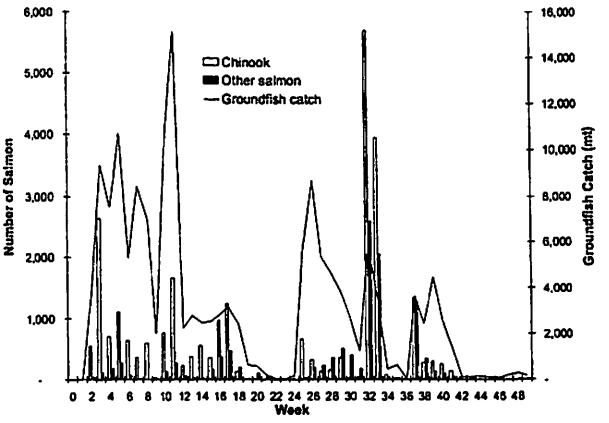

Figure 8. Bycatch of chinook salmon, other salmon (primarily chum salmon), and groundfish catch in the GOA trawl fisheries, by week, 2000.

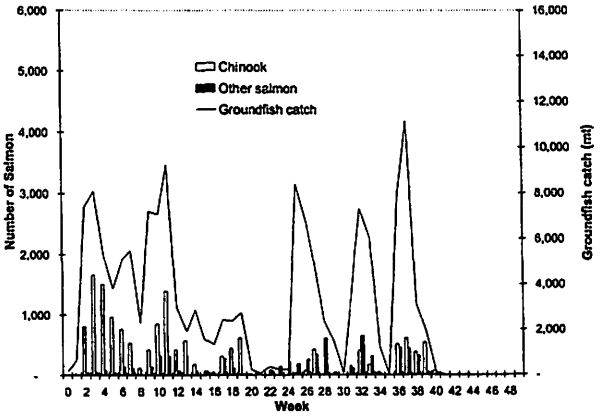

Figure 9. Bycatch of chinook salmon, other salmon (primarily chum salmon), and groundfish catch in the GOA trawl fisheries, by week, 2001.

tentially include chinook salmon throughout the Pacific Rim (A. Gharrett, University of Alaska Fairbanks, Juneau, personal communication).

More recent studies have examined the stock composition of chum salmon taken as bycatch in Bering Sea fisheries. Scale pattern analysis of 1994 bycatch data resulted in a regional composition as follows: 18.6% from western and central Alaska, 49.7% from Asia, 28.6% from Southeast Alaska and Canada, and 3.1% from Washington (Patton et al. 1998). Wilmot et al. (1998) and Kondzela et al. (1999) examined allozyme allele frequencies of chum salmon taken in the 1994, 1995, and 1996 Bering Sea trawl fisheries. They found that, on average, about 27% of the chum salmon bycatch originated from western Alaska, 5% from Southcentral Alaska, 38% from Asia, 12% from Southeast Alaska, and 18% from Canada and Washington.

No studies have examined the stock composition of salmon bycatch from GOA trawl fisheries. However, the allozyme methodology has been applied to chum salmon samples collected by research gillnets in the high seas (Urawa et al. 2000). Results indicate that Alaska stocks were common in the eastern and central GOA (15% western Alaska, 25% Alaska Peninsula and Kodiak, 28% Southeast Alaska, and 18% from Canada), and Asian chum salmon were predominant in the western GOA (25% Japan, 53% Russia, 13% western Alaska, 10% elsewhere).

Impacts of Bycatch to Western Alaska Salmon

Western Alaska chinook and chum salmon runs have declined over the last 20 years, with runs in the two most recent years being the lowest in the time series (Table 3). Because escapement estimates are not available for all populations, total run estimates are incomplete (D. Eggers, Alaska Department of Fish and Game, Juneau, personal communication). The total salmon run estimates do not include populations of chum salmon in

Table 3. Total minimum run estimates (numbers of fish) of chum salmon and chinook salmon in western Alaska, 1980-2000. Run estimates include commercial, subsistence, sport, and personal use catch plus escapement estimates if available[a].

Year	Chum	Chinook
1980	9,508,189	[b]
1981	9,846,452	[b]
1982	5,831,092	828,827
1983	6,613,306	859,578
1984	9,045,035	620,088
1985	7,736,404	650,884
1986	7,446,330	476,393
1987	7,192,637	574,037
1988	9,706,599	498,619
1989	7,494,325	511,362
1990	5,185,707	536,699
1991	6,810,977	522,983
1992	5,331,200	556,947
1993	3,869,983	601,789
1994	6,231,791	704,798
1995	8,323,800	674,555
1996	6,809,532	501,758
1997	3,639,176	611,377
1998	3,713,143	531,029
1999	[b]	391,533
2000	[b]	282,309

[a] Data provided by D. Eggers, Alaska Department of Fish and Game, Juneau.
[b] Data not available.

Subdistricts 2, 4, 5, and 6 of the Norton Sound area, the Yukon River summer run chum salmon above the Anvik River, several important spawning populations of Yukon River chinook salmon in the lower and middle river tributaries, or any spawning population estimate for chum salmon or chinook salmon in the Kuskokwim Area (i.e., the Kuskokwim River, Kanectoc River drainage, and the Goodnews River). Therefore, the actual run sizes of chum salmon and chinook salmon to western Alaska are likely to be substantially higher than reported in Table 3.

Based on Myers and Rogers (1988) estimate that 60% of the chinook salmon bycatch originated in western Alaskan systems, a BSAI trawl bycatch of 30,000 juvenile chinook salmon would be comprised of about 18,000 fish from western Alaska. When adjusted for natural mortality, we have calculated that 14,581 chinook would have been removed as adult equivalents (Table 4). Details of the calculation are provided in Table 4. For comparison, an adult equivalent bycatch of 14,581 adult chinook salmon equates to about 2.7% of a 540,000 fish minimum run size estimate for western Alaska (1990-2000 rounded average).

Age-specific information for chum salmon was not available for this paper, however, the impacts of bycatch appear to be smaller on chum salmon runs due to the larger population size and lower bycatch composition from western Alaska. As previously mentioned, about 27% of the chum salmon bycatch in the BSAI trawl fisheries are from stocks that originate from western Alaskan systems. Applying this percentage, an average BSAI trawl bycatch of 60,000 juvenile chum salmon results in a total of about 16,200 fish from western Alaska. If we assume the same mortality as calculated for chinook salmon, this would equate to about 13,120 mature chum salmon from western Alaska. An adult equivalent bycatch of 13,120 adult chum salmon equates to about 0.24% of the minimum run size estimate of 5.5 million chum salmon for western Alaska (1990-1998 rounded average).

It is not known at this time what proportion, if any, of the chinook salmon or chum salmon caught incidentally in GOA groundfish fisheries originate from western Alaska. Hence, we are unable to estimate the impacts of GOA groundfish fisheries on western Alaska salmon stocks or other stocks of Pacific salmon.

Bycatch Control Measures

The North Pacific Fishery Management Council has adopted measures over the years to control the bycatch of salmon in trawl fisheries (Witherell and Pautzke 1997). Salmon are listed as a prohibited species in the groundfish fishery management plans, meaning that they cannot be retained and sold. However, regulations implemented in 1994 prohibit the discard of salmon

Table 4. Adult equivalent bycatch of chinook salmon from western Alaska stocks taken incidentally in the BSAI trawl fisheries, based on a bycatch of 30,000 salmon, adjusted for proportion from western Alaska, age composition by region, and natural mortality.

Region and Age at Capture	Percent	Survival Rate (%)	Number of Fish
BSAI trawl bycatch:			30,000
Western Alaska component of intercepted chinook	60.0		18,000
Arctic/Yukon/Kuskokwim component	37.0		6,652
Age 1.2	68.3		4,543
Age 1.3	31.7		2,109
Age 1.2 returning next year as 1.3	30.0	80.0	1,090
Age 1.2 returning 2 years later as 1.4	70.0	90.0	2,290
Age 1.3 returning same year	30.0	100.0	633
Age 1.3 returning next year as 1.4	70.0	90.0	1,329
Total contribution to Arctic/Yukon/Kuskokwim region			5,342
Bristol Bay component	63.0		11,348
Age 1.2	68.3		7,750
Age 1.3	31.7		3,598
Age 1.2 returning next year as 1.3	43.0	80.0	2,666
Age 1.2 returning 2 years later as 1.4	57.0	90.0	3,180
Age 1.3 returning same year	43.0	100.0	1,547
Age 1.3 returning next year as 1.4	57.0	90.0	1,846
Total contribution to Bristol Bay region			9,239
Total annual contribution to western Alaska from intercepted chinook salmon			14,581

taken as bycatch in the BSAI groundfish trawl fisheries until the number of salmon has been determined by a NMFS certified observer. Subsequent regulations have allowed for voluntary retention and processing of salmon bycatch for donation to foodbanks.

Several bycatch hot spot areas have been closed to trawl fishing (salmon savings areas) if too many salmon are encountered. Beginning in 1994, the Chum Salmon Savings Area has been closed to all trawling from August 1 through August 31. Additionally, the area remains closed through October 14 if a bycatch limit of 42,000 chum salmon is caught incidentally in the southeastern part of the Bering Sea. Although more than 42,000 chum salmon were caught incidentally over the course of a year from 1995 through 2001, additional closures were not triggered because the bycatch limit was not attained within the designated area during the accounting period (August 15 to October 14). From 1996 through 1999, regulations were in place to prohibit trawling in the Chinook Salmon Savings Areas through April 15 if and when a bycatch limit of 48,000 chinook salmon was attained in the BSAI trawl fisheries. More than 48,000 chinook salmon were taken as bycatch annually from 1996 through 1998, but closures were not triggered because bycatch limits were not exceeded before April 15.

In 2000, new regulations to reduce chinook salmon bycatch in BSAI trawl fisheries were implemented (NPFMC 1999). The regulations incrementally reduced the chinook salmon bycatch limit from 48,000 to 29,000 chinook salmon over a 4-year period, implemented year-round accounting of chinook salmon bycatch in the walleye pollock fishery, revised the boundaries of the Chinook Salmon Savings Areas, and set more restrictive closure dates. In the event the limit is triggered before April 15, the Chinook Salmon Savings Area closes immediately. The closure would be removed on April 16, but would be reinitiated September 1 and continue through the end of the year. If the limit were reached after April 15, but before September 1, then the areas would close on September 1. If the limit were reached after September 1, the areas would close immediately through the end of the year. The bycatch limit for 2002 BSAI walleye pollock fisheries was 33,000 chinook salmon.

Regulations have not yet been implemented to control salmon bycatch in the GOA groundfish fisheries for several reasons. First, salmon bycatch has historically been much lower in GOA groundfish trawl fisheries, and thus has been of lower concern to managers. In recent years, chinook salmon bycatch is about 50% less in GOA groundfish trawl fisheries as compared to BSAI groundfish trawl fisheries, and chum salmon bycatch in GOA groundfish trawl fisheries is about one tenth of the BSAI groundfish trawl fisheries. Second, fewer hauls are observed in the GOA trawl fisheries, so a majority of the salmon bycatch is not observed and enumerated until it is delivered to a shoreline processor. This would make it more difficult for the GOA trawl fleet to monitor bycatch hot spots as is done for the BSAI trawl fleet. Lastly, there have not been any studies to date on the origins of salmon taken as bycatch in GOA groundfish fisheries, and thus the impact on Alaska salmon stocks and other salmon stocks remains unknown. Nevertheless, in February 2002, the Council initiated a process to implement salmon bycatch control measures for GOA groundfish trawl fisheries. These measures may include bycatch limits that, when attained, would trigger closures in areas with the historically highest bycatch rates.

DISCUSSION

Our analysis suggests that chum salmon bycatch in the BSAI groundfish fisheries has negligible impacts on western Alaska salmon runs. This was also the conclusion of Patton et al. (1998), who examined the high chum salmon bycatch levels of 1993 and 1994, and determined that bycatch was in no way responsible for the simultaneous drop in salmon catches. Based on our findings, the impacts of incidental catch in the BSAI groundfish fisheries would be small (<0.4%), even at the lowest minimum run size estimated for chum salmon in western Alaska (3.6 million in 1997). Although additional information on age at incidental capture, age at return, natural mortality, and total run size for chum salmon would improve the precision of our estimates, we believe that salmon bycatch in BSAI groundfish fisheries is not a conservation issue for western Alaska chum salmon stocks.

Our results indicate that the BSAI groundfish fisheries have larger impacts on chinook salmon stocks. Although we estimated that bycatch reduced western Alaska chinook salmon runs by 2.7%, actual impacts are likely much lower for two reasons. First, escapements are unknown for many populations of chinook salmon from western Alaska, so total run size has been underestimated. Second, the stock composition study of chinook salmon bycatch (Myers and Rogers 1988) was based on data collected over 20 years ago during foreign and joint venture fisheries, at a time when western Alaska chinook salmon were much more abundant. Application of those stock composition estimates would likely overestimate the contribution of western Alaska chinook salmon. Although bycatch does not

appear to be responsible for the decline in western Alaska chinook salmon stocks, fishery managers should remain concerned about the possibility that bycatch could have disproportional impacts on small chinook salmon populations in western Alaska and elsewhere.

Bycatch of salmon in the BSAI trawl fisheries has fluctuated over the years. Changes in annual bycatch amounts are attributable to changes in salmon abundance, establishment of salmon bycatch limits and other regulatory changes (particularly those associated with Steller sea lion protection measures), bycatch avoidance measures by the fleet, and changes in fishery operations due to the formation of cooperatives allowed under the American Fisheries Act of 1998. For example, the amount of chinook salmon taken in the 2000 BSAI walleye pollock fishery was unusually low, primarily due to a U.S. District Court order which closed all Steller sea lion critical habitat (including the offshore foraging areas) to trawling from August 8 through December 14, 2000. This injunction prevented the walleye pollock fishery from being prosecuted in the Bering Sea Steller sea lion foraging area, which historically had the highest chinook salmon bycatch rates.

The impacts of groundfish fisheries on western Alaska chum salmon appear to be consistent with the bycatch levels established for other prohibited species. For example, the prohibited species catch limits for 1998 equated to 0.1% of the red king crab *Paralithodes camtschaticus* population, 0.1% of the snow crab *Chionoecetes opilio* population, 1.8% of the Tanner crab *C. bairdi* population, 1.0% of the Pacific herring *Clupea pallasi* biomass, and 1.3% of the Pacific halibut *Hippoglossus stenolepis* biomass (Witherell et al. 2000). Our results suggest that the impacts of bycatch on western Alaska chinook salmon may higher than the other prohibited species, and managers should continue to explore ways to reduce the impacts of the BSAI trawl fisheries on these chinook salmon stocks.

Measures to control salmon bycatch were developed primarily to address allocation concerns from competing users of the salmon resources, and to a lesser extent to address conservation concerns for western Alaska salmon stocks. Managers have attempted to create a balance by developing regulations that allow maximum groundfish catches with a minimum of bycatch. The BSAI groundfish trawl fisheries generate about $300 million exvessel value annually (Hiatt et al. 2001). In contrast, the BSAI trawl bycatch of chinook salmon originating in western Alaska (14,581 adult equivalents with average fish weight of 7.3 kg, worth $3.30/kg; ADF&G data) and similar bycatch of chum salmon (approximately 13,120 adult equivalents with average fish weight of 3.6 kg, worth $0.66/kg; ADF&G data) would have a total exvessel value of only about $382,000. The relative economic impacts of salmon bycatch to subsistence and recreational users have not been estimated, nor have the impacts of relatively small removals on populations considered to be at critically low stock sizes been assessed. The trawl fisheries also generate millions of dollars in State of Alaska fish taxes, and provide direct and indirect employment to thousands of people (NMFS 2001a). The economic impact of closing the BSAI groundfish trawl fisheries to eliminate salmon bycatch would result in significant costs at the national, state, and community level.

This paper highlights the need for additional research on salmon bycatch. We currently have no information on the stock composition of salmon taken as bycatch in the GOA trawl fisheries. Additionally, the stock composition estimates from chinook salmon caught incidentally in the BSAI trawl fisheries are over 20 years old. Given the importance of salmon to all of the user groups in Alaska, together with international mixing of salmon stocks in the North Pacific, stock composition studies should be a high priority area of research.

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PUBLIC TESTIMONY SIGN-UP SHEET FOR AGENDA ITEM D-1(b) Salmon Bycatch

	NAME (PLEASE PRINT)	AFFILIATION
1	JOHN GRUVER	UNITED CATCHER BOATS
2	Jill Klein	Yukon River Drainage Fisheries Assoc.
3	Bob Storrs + Dave Fulton	Unalaska Native Fisherman's Assoc.
4	Paul Ryton	BSFDC
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NOTE to persons providing oral or written testimony to the Council: Section 307(1)(I) of the Magnuson-Stevens Fishery Conservation and Management Act prohibits any person " to knowingly and willfully submit to a Council, the Secretary, or the Governor of a State false information (including, but not limited to, false information regarding the capacity and extent to which a United State fish processor, on an annual basis, will process a portion of the optimum yield of a fishery that will be harvested by fishing vessels of the United States) regarding any matter that the Council, Secretary, or Governor is considering in the course of carrying out this Act.

D-1 (b) Supplemental
December 2004

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

December 1, 2004

MEMORANDUM FOR: Robert Lohn
Administrator, Northwest Region

FROM: James W. Balsiger
Administrator, Alaska Region

SUBJECT: Request to reinitiate consultation on Bering Sea and Aleutian Islands (BSAI) groundfish fishery incidental catches of Chinook salmon

We are requesting reinitiation of formal consultation pursuant to Section 7 of the Endangered Species Act (ESA) for the BSAI groundfish fishery and ESA listed Chinook salmon. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if the amount or extent of incidental take is exceeded. In instances where the amount or extent of incidental take is exceeded, the action agency must immediately reinitiate formal consultation. Because the amount of incidental take of Chinook salmon in the 2004 BSAI groundfish fishery exceeded the amount authorized in the incidental take statement in the 1999 biological opinion, the Alaska Region requests immediate reinitiation of formal consultation.

The attached document provides the latest information available regarding the incidental take of Chinook salmon in the BSAI groundfish fisheries for consideration in the consultation.

Attachment

Chinook Salmon Incidental Take in the 2004 BSAI Groundfish Fisheries
Prepared by NMFS Alaska Region, Sustainable Fisheries Division

Background

The BSAI groundfish fishery takes Chinook salmon incidentally to the harvest of groundfish. Evidence suggests that these Chinook salmon are derived from stocks from many areas. For example, Myers, *et al.* found, on the basis of scale analysis of BSAI observer samples, "stock composition estimates for the five brood-year strata (1991-1995) averaged 56% Western Alaska, 31% Cook Inlet, 8% Southeast Alaska-British Columbia, and 5% Kamchatka Chinook salmon." Pacific Northwest Chinook salmon would have been included in the Southeast Alaska-British Columbia grouping.[1]

As noted in the following section, small numbers of salmon from some listed Pacific Northwest evolutionarily significant units (ESUs) have been taken in BSAI groundfish fishery. However, the available evidence suggests that this is an unusual event. The recently completed Alaska groundfish programmatic supplemental environmental impact statement (PSEIS), Citing Healy, 1991, states that, "Chinook stocks from southeastern Alaskan/British Columbia, as well as those from Washington, Oregon, and California, are rare in the Bering Sea and western North Pacific. Their main oceanic distribution is thought to be in the eastern North Pacific, with the greatest concentrations occurring over the continental shelf waters." (NMFS, 2004, 3.5-186).

The 1999 BiOp and incidental take statement

In 1999, NMFS/NWR concluded an ESA section 7 consultation on the effects of the BSAI and GOA groundfish fisheries on the following listed ESUs: Snake River fall Chinook, Snake River spring/summer Chinook, Puget Sound Chinook, Upper Columbia River spring Chinook, Upper Willamette River Chinook, Lower Columbia River Chinook, Upper Columbia river steelhead, Upper Willamette River steelhead, Middle Columbia River steelhead, Lower Columbia River steelhead, and Snake River Basin steelhead. (NMFS, 1999, page 7)

That consultation found that Chinook salmon originating from these stocks were found in small numbers in the BSAI. The conclusions primarily were based on coded wire tag (CWT) returns for surrogates of two listed Chinook salmon stocks, Lower Columbia River and Upper Willamette River. Historical actual and estimated CWT returns are in Tables 1 and 2 below. Very few CWT Chinook salmon have been taken in the past in the BSAI groundfish fishery, and preliminary data indicate that no CWT returns occurred in the BSAI in 2004.

[1] Meyers, Katherine W. School of Aquatic and Fisheries Science, University of Washington. Personal communication, 11-16-04.

Table 1. Actual Number of Coded Wire Tag (CWT) Recoveries of Two ESA-Listed Chinook Salmon ESUs from 1984-2004 from the BSAI groundfish fishery. LCR=Lower Columbia River Chinook Salmon ESU, and UWR=Upper Willamette River Chinook Salmon ESU.

	Bering Sea-Aleutian Islands	
Year	LCR	UWR
2004 (preliminary)	0	0
2003	0	0
2002	1	1
2001	1	0
2000	0	1
1999	0	1
1998	0	0
1997	0	0
1996	0	1
1995	0	0
1994	0	0
1993	0	0
1992	0	0
1991	0	0
1990	0	0
1989	0	0
1988	0	0
1987	0	0
1986	0	0
1985	0	0
1984	0	0

Source of data: NMFS, Auke Bay Laboratory, CWT database, Adrian Celewycz, pers. comm. 11/04. Fisheries before 1990 were foreign joint-venture not under management of Magnuson-Stevens Fishery Conservation Management Act.

Table 2. Approximate Number of Coded Wire Tags (CWTs) of Two ESA-Listed Chinook Salmon ESUs in the Total Bycatch from the BSAI groundfish fisheries from 1984 -2004. LCR=Lower Columbia River Chinook Salmon ESU, and UWR=Upper Willamette River Chinook Salmon ESU. Approximate numbers were adjusted from the actual number of CWTs recovered by multiplying the actual number of CWTs recovered (of each ESU by fishery by year) by the ratio (total number of Chinook captured by fishery by year)/(total number of Chinook examined for CWTs by fishery by year).

	Bering Sea-Aleutian Islands	
Year	LCR	UWR
2004 (preliminary)	0	0
2003	0	0
2002	2	2
2001	3	0
2000	0	2
1999	0	2
1998	0	0
1997	0	0
1996	0	3
1995	0	0
1994	0	0
1993	0	0
1992	0	0
1991	0	0
1990	0	0
1989	0	0
1988	0	0
1987	0	0
1986	0	0
1985	0	0
1984	0	0

Source of data: NMFS, Auke Bay Laboratory, CWT database, Adrian Celewycz, pers. comm. Fisheries before 1990 were foreign joint-venture not under management of Magnuson-Stevens Fishery Conservation Management Act.

The following table summarizes key remarks from the 1999 BiOp regarding the incidental take of salmon ESUs.

Table 3 Summary of 1999 Biological Opinion Statements Regarding ESU Salmon Stocks and the Alaska Groundfish Fisheries.

Snake River Fall Chinook	"...existing information continues to suggest that it is unlikely that Snake River fall chinook will be caught in the BSAI fisheries."	Page 42
Upper Whillamette River	""About 33 UWR CWTs, have been recovered from GOA groundfish fisheries and one in BSAI groundfish fisheries since 1986...NMFS believes that the take of UWR chinook is a relatively rare event."	Page 43
Lower Columbia River Chinook	With respect to spring stocks: "Since 1984, there have only been 9 LCR CWT recoveries in GOA groundfish fisheries, indicating that it is a relatively rare event..." With respect to tule stocks, "Since 1984, there have no reported CWT recoveries in BSAI or GOA groundfish fisheries for this ESA component." For three bright stocks, "Since 1984, there have no reported CWT recoveries in BSAI or GOA groundfish fisheries for this ESU component."	Page 44
Puget Sound Chinook	With respect to spring stocks, "There have been no reported CWT recoveries from the PS ESU in BSAI or GOA groundfish fisheries." With respect to fall stocks, "The ocean distribution of fall stocks are similar to the PS spring stocks in that they are harvested primarily in Canadian and Puget Sound fisheries with little catch occurring in Alaska."	Page 45
Snake River Spring/Summer and Upper Columbia River Spring Chinook	"The were no CWT recoveries or other information to suggest that SR spring/summer chinook are caught in the Alaskan fisheries...The State agencies concluded that there is almost no harvest of UCRS chinook in ocean fisheries...The available information suggests that UCRS chinook are rarely caught in the proposed BSAI and GOA groundfish fisheries."	Pages 45-46.
California Chinook salmon	"California chinook stocks are presumed to reside primarily off California and not migrate to British Columbia or Alaska waters..."	Page 46
Source: NMFS, Protected Resources Division, Pacific Northwest Region. 1999.		

The 1999 BiOp included an incidental take statement for the BSAI groundfish fishery of 55,000 Chinook salmon per year and provided for reasonable and prudent measures (RPMs) to minimize and reduce the anticipated level of incidental take associated with the BSAI groundfish fishery. The RPMs are:

1 The North Pacific Fishery Management Council (NPFMC) and NMFS, Alaska Region shall ensure there is sufficient NMFS-certified observer coverage such that the bycatch of Chinook salmon and "other" salmon in the BSAI and GOA groundfish fisheries can be monitored on an inseason basis.

2 The NPFMC and NMFS, Alaska Region shall monitor bycatch reports inseason to ensure that the bycatch of Chinook salmon does not exceed 55,000 fish per year in the BSAI fisheries and 40,000 fish per year in the GOA fisheries." (NMFS, 1999, page 50)

During the four years preceding the BiOp (1995-1998) Chinook takes in the BSAI groundfish fisheries exceeded 55,000 salmon in two years, and fell below in two years (NMFS, 1999, Table 1).

BSAI groundfish fisheries incidental Chinook salmon catches

In recent years, BSAI Chinook salmon incidental catch amounts have been below the amount in the incidental take statement. Table 4 updates Table 1 in the 1999 BiOp. Table 1 in the 1999 BiOp covers the years 1995 to 1999 (thru October). Table 4 below provides Chinook salmon catch amounts for the years 1999-2004 in the BSAI (thru November 22, 2004).

Table 4 BSAI Chinook Salmon Incidental Catch Amounts 1999-2004

Year	Gear Type	Groundfish (mt)	Chinook salmon (#'s)
2004*	Trawl	1,816,853	62,408
	Hook and Line	124,077	56
	Pot Gear	18,356	0
	Jig	215	0
	TOTAL	1,959,501	62,464
2003	Trawl	1,807,391	54,898
	Hook and Line	138,441	13
	Pot Gear	23,594	0
	Jig	156	0
	TOTAL	1,969,582	54,911
2002	Trawl	1,787,189	36,360
	Hook and Line	131,365	25
	Pot Gear	16,398	0
	Jig	0	0
	TOTAL	1,934,952	36,385
2001	Trawl	1,658,935	40,531
	Hook and Line	137,128	17
	Pot Gear	17,858	0
	Jig	0	0
	TOTAL	1,813,921	40,548
2000	Trawl	1,461,212	8,219
	Hook and Line	126,200	4
	Pot Gear	20,136	0
	Jig	0	0
	TOTAL	1,607,548	8,223
1999	Trawl	1,295,548	14,583
	Hook and Line	112,107	7
	Pot Gear	17,096	9
	Jig	0	0
	TOTAL	1,424,751	14,599

*Data up to November 15, 2004. Numbers were generated using blend reports, CDQ catch reports, and queries on the catch accounting data bases. Estimates prepared by NMFS, Sustainable Fisheries, Alaska Region, 11-16-04.

In 2004, the BSAI groundfish fishery exceeded the ITS amount as established by the 1999 consultation by 7,471 salmon between October 23 and Oct 30. As of November 22, the incidental take of chinook was 62,464 salmon. (NMFS, Alaska Region, Catch Accounting System (CAS), query 11-22-04). The overage was identified on November

12, by which time the pollock mid-water trawl fishery, in which the greatest proportion of Chinook salmon were taken, was closed.

Present and future actions for consideration

Because of the closure of trawl fisheries on November 1, the Alaska Region does not expect significant BSAI groundfish fishery incidental Chinook salmon catches during the remainder of 2004. BSAI Chinook salmon incidental catch in November and December will be very small due to the nature of the fixed gear fisheries open during this time period. Incidental catches for these gears can be seen in Table 4 above. In 2004, the only fisheries open at this time are pot and hook-and-line fisheries for Pacific cod. Chinook salmon are rarely taken with these gears. In 2003, there were no Chinook salmon caught with pot or hook-and-line gear during the months of November and December, according to the prohibited species tables of the catch accounting system.

We are unable to predict with precision the level of incidental take that will occur in these fisheries. However, given that Chinook salmon take in the BSAI groundfish fishery has been under 55,000 animals for 5 of the last 6 years, we believe that the 2005 fishery is likely to take fewer than 55,000 Chinook salmon.

Starting in 2003, NMFS implemented a new catch accounting system for the groundfish fisheries. The new system replaced the Blend system that had been used for quota accounting for about 10 years. The Blend system which was in place at the time of the 1999 BiOp was based on weekly data from processors and was not capable of accounting for some management programs implemented in recent years - including pollock cooperatives, American Fisheries Act sideboards, complex seasonal allocations, Harvest Limit Area quotas, and quotas assigned to vessels of a particular size class.

The new groundfish catch accounting system utilizes the same data sources as the Blend - observer data, shoreside processor landings data, and processor weekly production report data, but where the Blend aggregated all data to the level of processor and week, the new system accounts for data at the haul (observer) and delivery (shoreside landings) level and can track all the current quotas, including the salmon incidental catch. The new system is also more adaptable for anticipated future changes.

In December 2004, the NPFMC will review a discussion paper on salmon bycatch controls in the BSAI. Concerns exist regarding the effectiveness of the current Chinook salmon savings areas closures, as recent bycatch rates appear to be higher outside of the closure areas than within the closure areas (K. Haflinger, 2004). The current Chinook salmon bycatch amount triggering closure of the Chinook salmon savings areas is 29,000 fish which was exceeded in 2003 and 2004.

The pollock trawl industry experiences the majority of the salmon incidental catch. Working with the fishing industry to reduce the amount of salmon incidentally taken, NMFS has issued an exempted fishing permit in 2003 and 2004 to support the development of a salmon excluder device for pollock trawl gear. The device was developed in 2003 and has been tested in 2004 with some success. Additional testing is

needed to develop a commercially viable excluder device. The testing likely may occur in 2005 under one or more exempted fishing permits. The pollock trawl industry is very interested in lowering its incidental catch of salmon, especially Chinook salmon, to avoid the closure of the Chinook salmon savings area in the Bering Sea which is an important pollock fishing location.

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D-1b Pub Test handout
John Gruver 12.14.04
11:02 am

Bering Sea Salmon Bycatch Management
Problem Statement and Preliminary Alternatives

1. Recent Increases in Chinook and Other Salmon Bycatch and Current Management Measures.

In recent years, bycatch of salmon in the pollock fisheries has increased dramatically. The table below shows bycatch of both chinook and "non-chinook" salmon, primarily chums, going back to 1990. It is clear from this table that chum bycatch especially has reached unprecedented levels. Although the increase in chinook bycatch is less dramatic, it is approaching the highest levels seen in the last 15 years. While this is encouraging because it cannot have occurred without large increases in oceanic salmon abundance, it is clearly a problem for the fisheries involved in trying to reduce salmon bycatch and also represents a potential conservation problem.

Table 1. All trawl salmon catch, BSAI

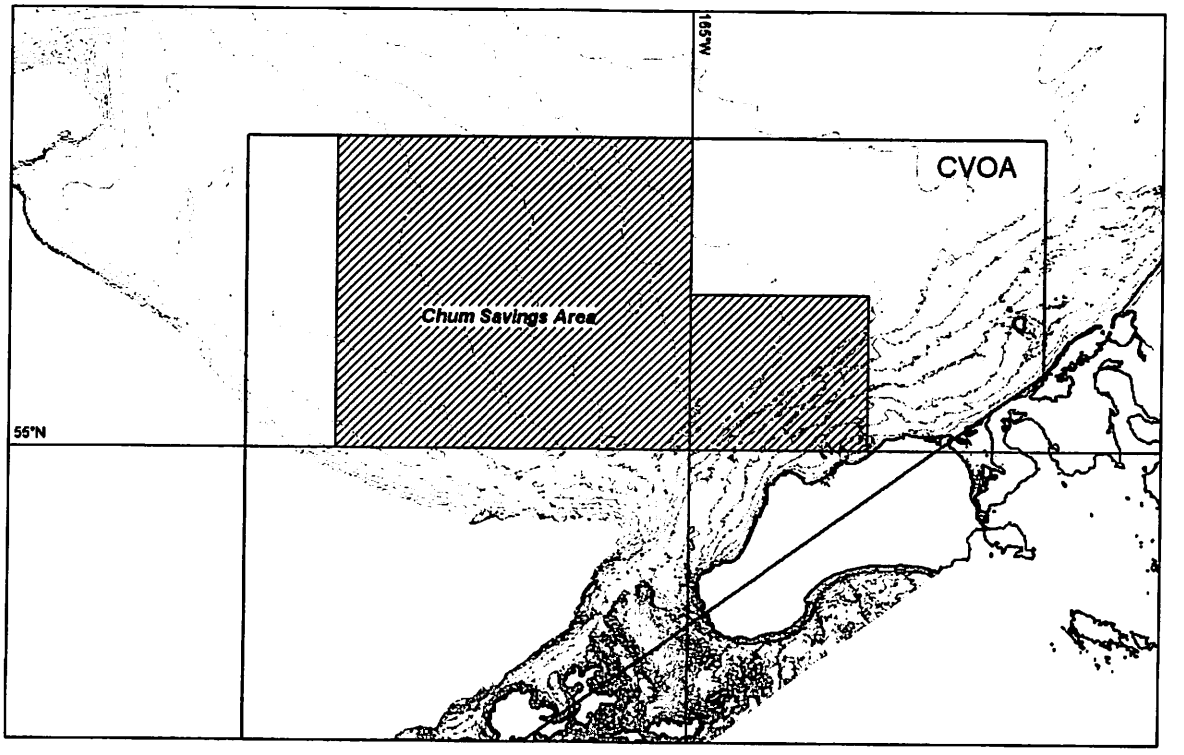
Year	Chinook	Non-chinook
1990	14,085	16,202
1991	48,873	29,706
1992	41,955	40,090
1993	45,964	242,895
1994	44,380	95,978
1995	23,079	20,901
1996	63,205	77,771
1997	50,218	67,349
1998	58,966	69,237
1999	14,586	47,204
2000	8,219	59,306
2001	40,303	60,460
2002	37,555	78,767
2003	52,429	189,365
2004	59,473	445,766

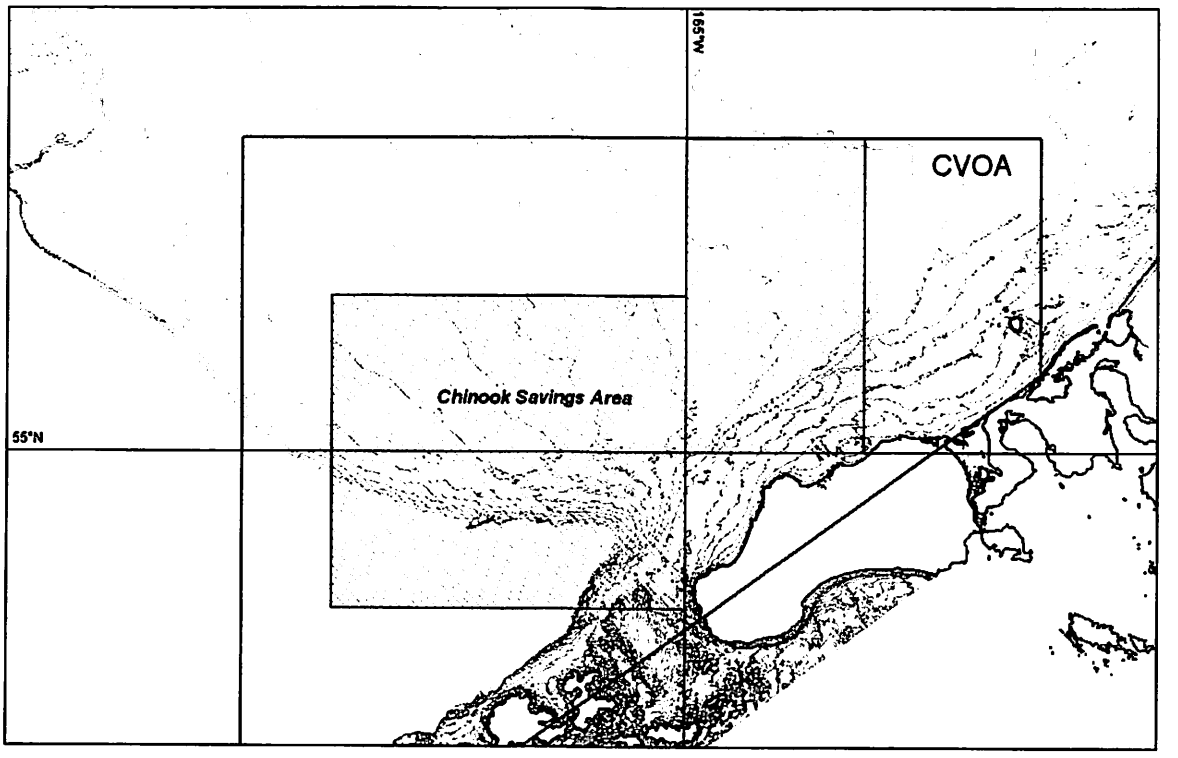
The position of the trawl fishermen involved in the pollock fishery is very simple: current management measures that were designed to reduce salmon bycatch are not working, and instead are actually increasing bycatch.

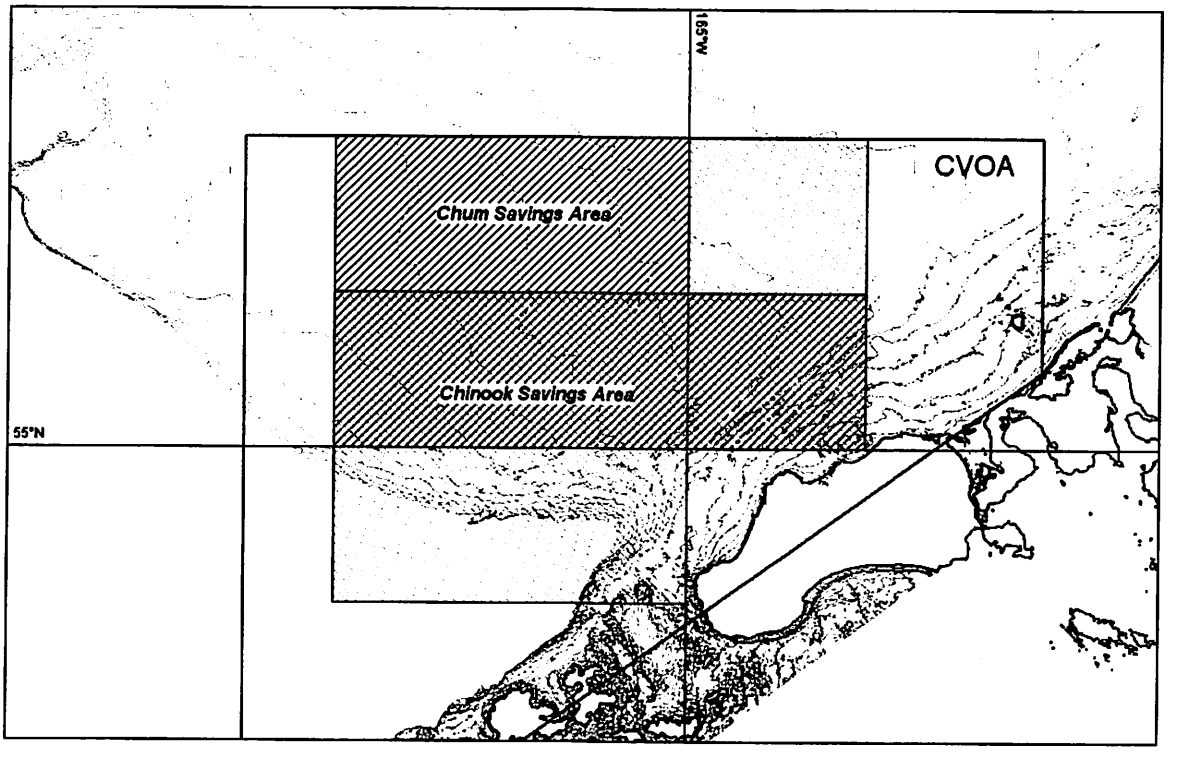
The management measures in question were put in place by the North Pacific Fisheries Management Council (NPFMC) in 1994, in response to high chum bycatch in 1993. These measures were aimed at both chinook and chum bycatch, and for both species protection was supposed to result from time and area closures based on analysis of historic bycatch patterns. The time/area closures are as follows:

1. Chum salmon savings area closes automatically, August 1 – August 31
2. Chum salmon savings area closes through October 14 any time non-chinook bycatch exceeds 38,850 salmon. Only salmon caught in non-CDQ trawl fisheries inside the CVOA after August 15th count towards the 38,850 fish cap.
3. Chinook salmon savings areas close when a cap of 26,825 chinook salmon is reached in the non-CDQ pollock fishery. If the cap is reached before April 15th, the chinook area closes until April 15th, reopens April 15 – September 1, and then closes again from September 1 through the end of the year. From 2000 onward, only chinook from the directed pollock fishery have been counted towards the cap. Also since 2000 the cap for the entire pollock fishery (CDQ and non-CDQ) was reduced from 41,000 to 29,000, in increments of 4,000 fish per year.

Maps of the savings areas are shown below.




165°W
CVOA
Chinook Savings Area
55°N


165°W
CVOA
Chum Savings Area
Chinook Savings Area
55°N

2. Weaknesses of the Current Regulatory Regime.

Although these caps were enacted in 1994, salmon abundance was so low in the late 1990s that the chum and chinook bycatch triggers were never reached and the only closure that occurred was the automatic chum closure in August. This closure had little effect because from 1996 – 1998 the pollock season did not begin until September 1. Also, in 1999 and 2000, sea lion protection measures and an injunction against trawling in critical habitat forced the fleet into non-traditional waters. Thus only from 2001 onward have we been able to see the real effect of the salmon closures on bycatch rates.

Starting in 2001 there have been vessels actively fishing for pollock from early July onward and in 2003, 2003 and 2004 the fleet reached the threshold catch that triggers the Chum Savings area closure after September 1. Additionally, in 2003 and 2004 the chinook threshold was reached and the Chinook Savings Area closed in September. In 2003 and again in 2004, when both closures were in effect, it was clear that higher bycatch rates for salmon were found outside of the savings areas than inside the savings areas. Table 2 compares chinook and chum bycatch rates from 7/25 onward in the 2003 and 2004 seasons. The rightmost columns show how many times higher the bycatch rates were outside of the combined chinook and chum savings areas compared with inside the chum savings area. For example, in 2004 the chum rate outside the combined savings areas was 2.14 salmon per mt, but only 0.40 salmon per mt for pollock caught inside the combined savings areas during this time frame. Thus, bycatch rates were 5.3 times higher outside (where the fleet was forced to fish), than inside. Overall bycatch was thus likely as much as 5x higher than it could have been had the fleet been able to prosecute the fishery freely.

Table 2. Bycatch rate comparison inside and outside combined chinook and chum savings area for shoreside catcher vessel deliveries from 7/25 onward, in 2003 and 2004.

	Pollock (mt)	Chinook (N)	Other salmon (N)	Chinook rate (N/mt)	Other salmon rate (N/mt)	Chinook rate Outside / Inside	Other salmon rate Outside / Inside
Inside 2004	130,770	2,884	52,812	0.022	0.404		
Outside 2004	125,991	19,673	269,903	0.156	2.142	7.1	5.3
Inside 2003	179,502	829	49,506	0.005	0.276		
Outside 2003	102,214	6,517	72,547	0.064	0.710	13.8	2.6

We estimate that in 2004 alone, the imposition of these salmon savings area increased bycatch by at least 200,000 chums. Simply removing the savings area closures would likely have averted this extra take in 2004, although such a response could not be guaranteed in the future. The important lesson to take home is that there is considerable variation in *where* the salmon will be found, and this variation is both between years and within years, on the scale of weeks or even days. It is thus important to realize that no system of time/area closures can be successful unless both the times and areas can be adaptable.

3. American Fisheries Act and the Pollock Cooperatives' Management Plan.

In 1998 the U.S. Congress passed the American Fisheries Act (AFA) allowing the Bering Sea open access pollock fishery to end its race for fish and rationalize the fishery. The AFA limited the pollock fishery to a specific group of vessels and allowed those vessels to form cooperatives. Each cooperative receives an annual pollock quota which is distributed among its members for harvest. In all there are ten AFA cooperatives: one for the offshore catcher/processors, one for catcher vessels that delivered to the offshore catcher/processors, one for the offshore mothership/catcher vessel operations, and seven inshore cooperatives for catcher vessels delivering to shore plants. The two catcher/processor cooperatives were allowed to begin operations in 1999, followed by both the mothership and inshore cooperatives in 2000.

To prevent AFA boats from using the rationalized fishery as a way to increase their participation in other fisheries, regulations were passed that limited AFA boats to their historic participation in other Bering Sea and the Gulf of Alaska fisheries. The regulations, commonly referred to as sideboards, limit the amount of target and prohibited species catch by the AFA vessels.

In order to manage the harvest of sideboard fisheries and the related prohibited species catch, intercooperative agreements were developed. While originally dealing with pollock over-harvest issues, directed sideboard harvest, and halibut and crab limits in the trawl cod fishery, the coops soon realized that salmon bycatch in the pollock fishery could also be reduced through an additional intercoop agreement. Prior to the AFA, the race for fish afforded little time to fishermen to consider bycatch reduction as part of their fishing plan. Formal bycatch reduction agreements between fishermen had been contemplated but never pursued as the legal structure surrounding such an agreement seemed ambitious and unanimous acceptance was very unlikely in an olympic fishery environment. However, once rationalized, the pollock industry recognized that the time afforded them by slower paced AFA fishery could be used to reduce salmon bycatch.

The pollock cooperatives developed a system of rolling hot spot closures that vessel captains felt would lower chinook and chum bycatch and still provide adequate harvesting opportunities. The system incorporates the following concepts:

- All vessels report salmon bycatch rates from the grounds. C/Ps and observers utilize the observer reporting system while shoreside vessels report via VMS or email.
- Closure areas are determined based on bycatch rates, which are computed from observer data or plant counts of retained salmon from unobserved vessels. Bycatch rates for ADFG statistical areas are computed and the worst statistical area with a rate over a threshold rate is closed. Currently, one statistical area is closed for chinook and up to two statistical areas closed for chums.
- Areas do not have to conform to ADFG statistical area boundaries, but may be shaped according to bottom topography and information on salmon abundance within the area.

- Cooperative vessels are given selective access to closure areas based on their cooperative's salmon bycatch performance. This gives an incentive to vessels to fish cleanly and also allows some information on bycatch rates to be extracted from closed areas. Coops are assigned to one of three tiers based on the bycatch rates of member vessels: Tier 1 (cooperatives with low bycatch rates), Tier 2 (moderate rates), and Tier 3 (high rates). Tier 1 coops are not affected by closures, Tier 2 coops are closed for four days, and Tier 3 are closed for a week.
- Tier levels are evaluated each week, and are based on pollock and salmon bycatch from the preceding two weeks. Closure areas were initially also determined each week, but subsequently became subject to change every twice weekly.
- Compliance with Intercoop closures is verified by VMS systems, which have been required on all pollock vessels since 2001. All observer data, fish ticket information and VMS records are forwarded to a 3rd party (Sea State, Inc) which monitors both bycatch levels and compliance with the agreement.

We believe that the next level of improvement in salmon bycatch management measures in the Bering Sea pollock fishery may be a system under which the regulatory management regime is suspended on a year to year basis, so long as the private cooperative regime is in place and effective. This approach would provide the pollock harvesting cooperatives with the incentives to outperform the current regulatory regime, while eliminating the problems it causes.

4. Draft Problem Statement.

In light of the considerations above, the problem facing the Council could be stated as follows:

> Salmon bycatch locations are extremely variable within any given year and from year to year. Therefore, discrete area fishing closures to restrain bycatch can only be effective if bycatch incidents are reported very quickly, the locations of the incidents are closed to fishing very quickly, and closed areas are repeatedly modified during the course of a season. The National Marine Fisheries Service is under legal constraints that severely limited its use of emergency actions, and required prolonged public notice and comment periods in connection with all non-emergency actions. The Council has therefore adopted salmon savings areas where chinook and chum salmon bycatch has been concentrated over a multi-year period. This regime has actually proven to be counter-productive in 2003 and 2004, as in those years salmon bycatch has been higher outside of the salmon savings areas than within them. In addition, the closure areas impose unnecessary costs on the pollock fleet, by forcing them to fish outside of the regulatory savings areas, even though they are actually experiencing increased salmon bycatch by doing so.

5. Preliminary Alternatives.

Alternative 1. - Status Quo.

Alternative 2 – Eliminate the regulatory salmon savings area closures.

Alternative 3. – Suspend the regulatory salmon savings area closures on a year-by-year basis so long as the pollock cooperatives have in place a salmon bycatch "hot zone" closure system.

Alternative 4. – Determine new regulatory salmon savings area closures based on the additional data concerning salmon bycatch from more recent years.

Alternative 5. – Develop an individual vessel accountability program that may be implemented if, after 3 years, it is determined the pollock cooperatives' "hot zone" closure system has not reduced salmon bycatch.

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Jill Klein 11:22a

YUKON RIVER DRAINAGE FISHERIES ASSOCIATION

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Dec. 13, 2004

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

Dear Mr. Oliver,

RE: Salmon Bycatch in the Bering Sea Pollock Fisheries

Bycatch of Yukon River salmon in the Bering Sea pollock fisheries is of great concern to the Yukon River Drainage Fisheries Association (YRDFA). We would like to see the North Pacific Fisheries Management Council (NPFMC) take further steps to reduce bycatch as it directly affects the lives and livelihoods of our members, subsistence and commercial fishers who live along the Yukon River and its tributaries.

In the mid-1990's, YRDFA proposed salmon savings areas in the Bering Sea to the North Pacific Fisheries Management Council, which, after some compromises, resulted in the chinook and chum savings areas that exist today. Originally, we had proposed a much larger area based on NOAA data, but felt that what resulted was certainly better than what existed beforehand, which was nothing. Of course, we would like to see even further reduction in the bycatch. Generally speaking, salmon that survive their first year at sea have a fairly strong likelihood of returning to their natal streams as adults. Thus bycatch, particularly of the older fish, has a nearly direct effect on the numbers of returning salmon.

Materials prepared by the NPFMC staff for this meeting show that, in 2003, an estimated 54,911 chinook and 197,091 chums were caught in the Bering Sea groundfish bycatch and that these numbers increased to 62,471 Chinook and 456,885 just through Nov. 15 of this year (2004). Using the distribution and mortality rates assumed by Witherell et al. (2002), which is also part of the NPFMC meeting materials, this could translate into a estimated loss of adult returns to Western Alaskan watersheds of 26,689 Chinook from the 2003 bycatch, 30,363 Chinook from the 2004 bycatch, 43,097 chums from the 2003 bycatch and 99,905 chums from the 2004 bycatch. Other estimators would have put the numbers of lost adults due to these interceptions as much higher. In any case, these numbers represent substantial lost opportunity to meet escapement goals and to provide for subsistence and commercial salmon harvests.

The YRDFA Board of Directors recently heard a presentation by the United Catcher Boats (UCB) concerning the efforts they are taking to lower interception of non-target salmon during the conduct of the pollock fisheries and we commend them for that. Their data shows that when their salmon bycatch requires them to leave the salmon savings area, the boats often pick up an even higher number of salmon per trawl in other locations. Curiously, these are largely within the savings area initially proposed by YRDFA which was later reduced in size. UCB has some organizational ways of reducing the pollock fishing by their members in these high-intercept areas in a more real-time manner than might be otherwise done via regulation or information flow through NOAA to their fishermen. This is the "rolling hot spot" concept that allows UCB to turn around observer bycatch data within a couple of days to get their

member boats out of the area. They are also working on net designs that allow greater escapement of salmon while still largely retaining most of the pollock they are targeting. Their efforts are to be highly commended and encouraged to continue.

Nevertheless, as the managers of the pollock fisheries, the NPFMC can do more to reduce the interception of salmon than they previously have. YRDFA has several recommendations to the Council which are:

1. Form an Advisory Bycatch Committee of stakeholders and scientists to re-examine the bycatch issue in light of more recent information. This committee would be composed of commercial pollock fishers and subsistence and commercial salmon fishers from the Alaskan regions represented by the intercepted stocks. This committee should also include fisheries scientists involved in stock identification, feeding and migratory behavior as their insights would be invaluable. The committee's recommendations to the Council would represent those harvesting the pollock resource, those dependent upon the salmon, and those knowledgeable about the resources but without vested interests.

2. Develop alternatives to the current savings areas and investigate these for a definite, limited period of time, perhaps several years. If these methods are not found to acceptably reduce bycatch by the end of this sunset period, impose effective fines or other financial disincentives to force boat owners to avoid significant salmon bycatch. The rolling hot spot idea is a good concept worth further examination including a scientifically defensible set of criteria to evaluate its success, but there must also be a fallback plan when bycatch within and outside the saving areas exceeds a total allowable number of salmon. If voluntary or industry-imposed efforts do not succeed, effective regulatory actions must be taken.

3. We support the effort UCB has made in the past and is continuing to make to identify behaviors that result in higher bycatch by some boats more consistently than others. We encourage them to work with fisheries scientists to create and test hypotheses in a scientifically defensible manner to determine adverse behaviors resulting in higher bycatch. Industry-imposed financial disincentives to modify behavior as a result of these experiments could forestall the need for regulatory action, but as noted above, there should be a limited window for industry to make these changes.

4. Encourage continuing work on the salmon excluder nets. UCB has made two presentations now to the YRDFA Board on these nets and it appears that their latest efforts are increasingly more successful at allowing salmon to escape while retaining pollock. Nevertheless, still less than half the salmon entering the nets are able to escape. Continuing research may improve this number and to the extent that the NPFMC can impact those numbers by their support and other actions, they should.

5. The observer program's data gathering needs to be strengthened. There are opportunities here for samples that may tell us more about the stocks, age classes and migration routes. This information could help us avoid particular stocks or result in fewer adult equivalents, perhaps, of those salmon that are intercepted.

Thank you for your attention to this matter.

Sincerely,

Jill C. Klein,
Executive Director

12/13/2004, 3:21 PM

D-1b Pub Test handout 12.14.04
Bob Storrs/Dave Fulton 11:25a
UNFA

November 30 2004

The Unalaska Native Fishermen Association would like to see 100% observer coverage for the mid-water trawlers fishing in Unalaska bay. There are several reasons that we want 100% observer coverage. I have been trawling in Alaska since 1980 and I know that mid-water trawls fish on the bottom if that's where the fish are. Most mid- water trawls have net openings between 35 to 50 fathoms . The trawlers fishing in Unalaska bay are starting their tow in Nateekin bay which is shallower than 35 fathoms which means their nets are on the bottom catching Halibut and tanner crab. There are three salmon rivers located in the Unalaska bay , one in Nateekin , one in Broad bay and another river in the end of Captains bay. I'm sure that the mid-water trawlers are catching salmon along with Halibut , cod and herring. The small boat fleet in Unalaska fishes in the bay for cod ,halibut , herring and tanners at times it's the only place the small boats and skiffs can fish be cause of the weather. When the mid-water trawlers start fishing in the bay in the fall, the fishing declines for the small boat fleet which I'm a part of . I have lost long line gear because of the trawlers in the bay. If the small boats can't fish in the bay because they are getting pushed out they have to go out side the bay to find fish, this doesn't make since in my book. I've been in situations where it gets dangerous fishing in the bay with the trawlers fishing there also. If we can have 100% observer coverage I'm sure we'll find that the trawlers are catching a lot of by catch that shouldn't be allowed.

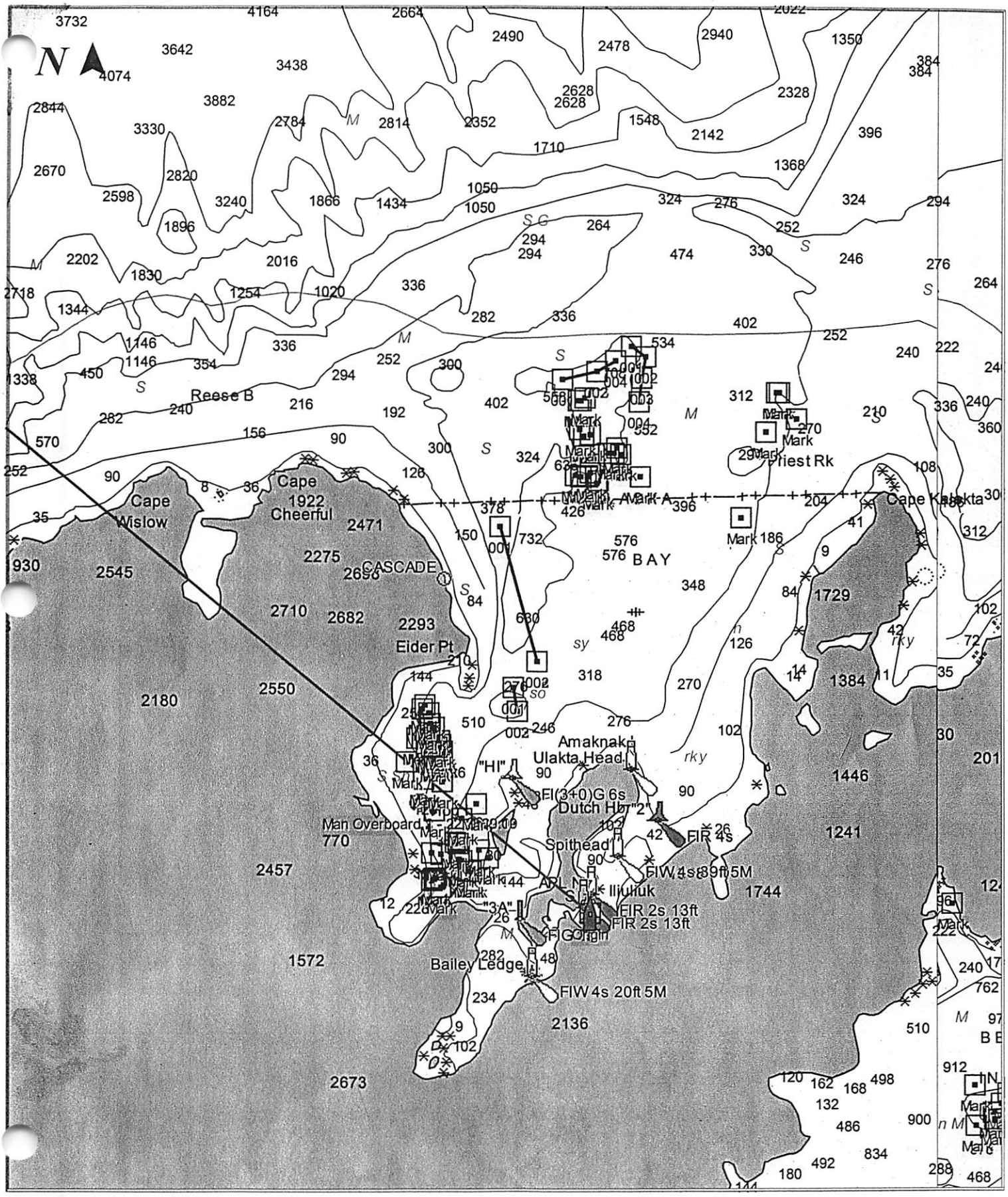
The first chart shows the different sets that I make for halibut , cod and tanner crab.

The second chart shows the tows that the trawlers make in the bay.

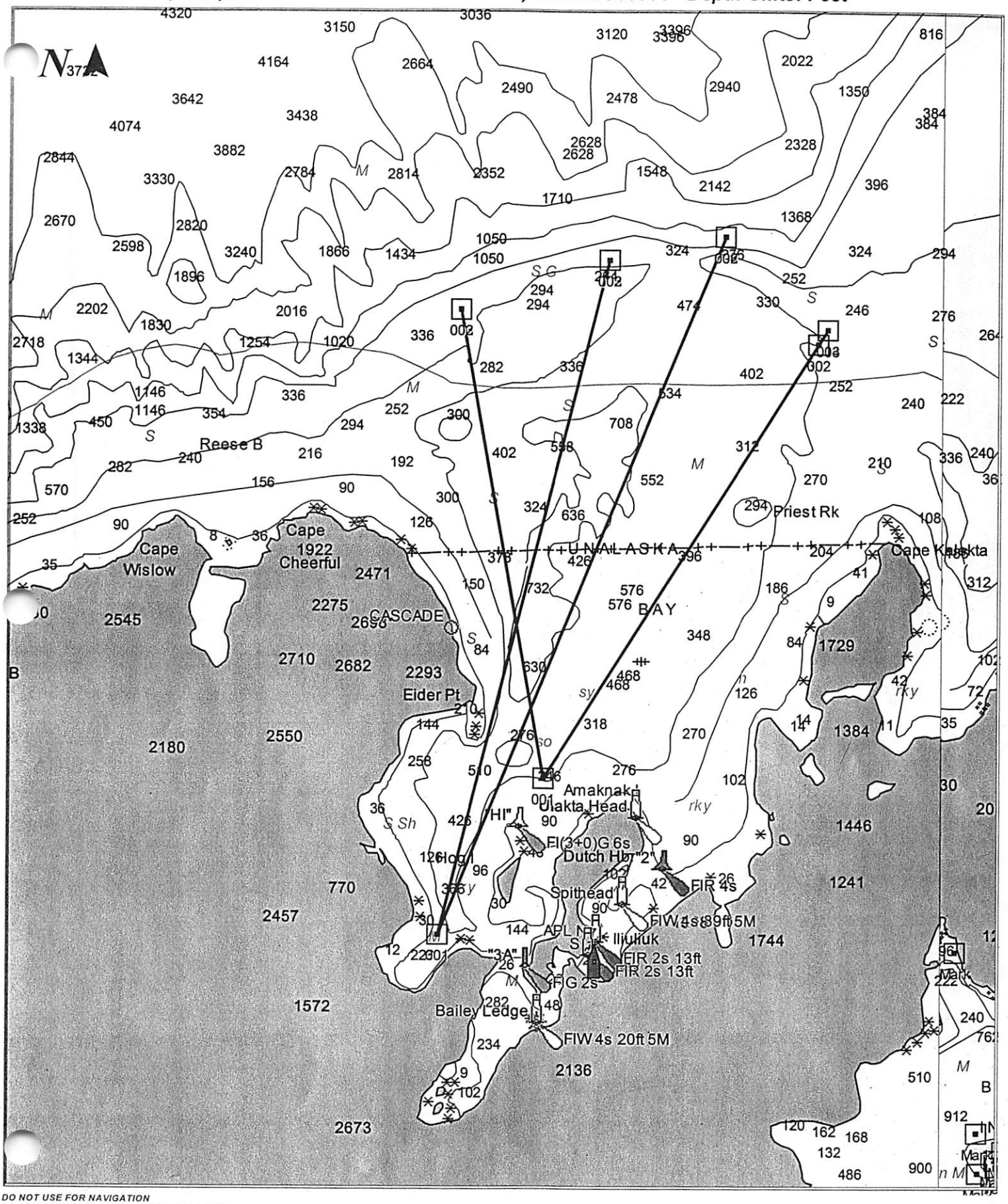
Sincerely

David Fulton

U.S. ALASKA. ALASKA PENINSULA AND ALEUTIAN ISLANDS TO SEGUAM PASS. - 1 : 760,000
(Passport World Charts - vector format) Chart #U16011 - Depth Units: Feet



U.S. ALASKA. ALASKA PENINSULA AND ALEUTIAN ISLANDS TO SEGUAM PASS. - 1 : 760,000
(Passport World Charts - vector format) Chart #U16011 - Depth Units: Feet



DRAFT MOTION
12-_-04 11:44am

Agenda Item D-1(b)
Bering Sea Salmon Bycatch

Preliminary Problem Statement
and
Preliminary Alternatives

1. The Council hereby adopts the following as its preliminary Bering Sea salmon bycatch problem statement:

> Salmon bycatch locations are extremely variable within any given year and from year to year. Therefore, discrete area fishing closures to restrain bycatch can only be effective if bycatch incidents are reported very quickly, the locations of the incidents are closed to fishing very quickly, and closed areas are repeatedly modified during the course of a season. The National Marine Fisheries Service is under legal constraints that severely limited its use of emergency actions, and required prolonged public notice and comment periods in connection with all non-emergency actions. The Council has therefore adopted salmon savings areas where chinook and chum salmon bycatch has been concentrated over a multi-year period. This regime has actually proven to be counter-productive in 2003 and 2004, as in those years salmon bycatch has been higher outside of the salmon savings areas than within them. In addition, the closure areas impose unnecessary costs on the pollock fleet, by forcing them to fish outside of the regulatory savings areas, even though they are actually experiencing increased salmon bycatch by doing so.

2. The Council hereby adopts the following as its preliminary Bering Sea salmon bycatch alternatives:

> Alternative 1. - Status Quo.
>
> Alternative 2 – Eliminate the regulatory salmon savings area closures.
>
> Alternative 3. – Suspend the regulatory salmon savings area closures on a year-by-year basis so long as the pollock cooperatives have in place a salmon bycatch "hot zone" closure system.
>
> Alternative 4. – Establish new regulatory salmon savings area closures based on current salmon bycatch data.
>
> Alternative 5. – Develop a regulatory individual vessel salmon bycatch accountability program.