Public Testimony Sign-Up Sheet
Agenda Item D-2 Salmon Management

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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.

AGENDA D-2
OCTOBER 2007

MEMORANDUM

TO: Council, SSC and AP Members

FROM: Chris Oliver
Executive Director

DATE: September 26, 2007

SUBJECT: BSAI Salmon Bycatch

ESTIMATED TIME
2 HOURS

ACTION REQUIRED

(a) Salmon Bycatch Workgroup Report
(b) Refine alternatives for analysis
(c) Report on salmon excluder EFP

BACKGROUND

(a) Salmon Bycatch Workgroup Report:

In April, 2007, the Council appointed a Salmon Bycatch Workgroup to work with staff in providing recommendations to the Council for refining alternatives under consideration for salmon bycatch reduction measures in the Bering Sea pollock fishery. The Workgroup met on August 29, in Anchorage AK to review preliminary analyses by staff and to provide further recommendations to the Council on the draft alternatives. A report from the workgroup including their specific recommendations for the Council is attached as Item D-2(a).

(b) Refine alternatives for analysis:

At this meeting, the Council will receive the report from the Salmon Bycatch Workgroup (SBW) and review a discussion paper from staff which lays out the Council motions on salmon bycatch into a proposed alternative structure. This paper is attached as Item D-2(b)(1). The discussion paper reviews elements and revised options and presents outstanding issues. The Council will review both the report from the workgroup as well as the discussion paper by staff and further refine alternatives as necessary.

Several discussion papers have been prepared for review by the SSC at this meeting. These papers cover analytical methodologies for addressing several aspects of proposed alternatives and include:

- Item D-2(b)(2) a draft paper that addresses how one might establish a cap relative to salmon run size impacts
- Item D-2(b)(3) identifying candidate closures areas based on either proposed rate-based or threshold criteria
- Item D-2(b)(4) methods using a cost benefit optimization technique to identify candidate closure areas and times.

Input from the SSC is sought on identifying appropriate methodologies for use refining the alternatives for the Council.

(c) Report on salmon excluder EFP:

An update will be provided on the on-going investigations to evaluate the use of a salmon excluder device on pollock trawl nets in the Bering Sea. The 2 year study tested incremental changes in the design and location of the excluder device. Investigations focused on the use of the device on both catcher vessels (using a recapture net), and catcher processors (employing side by side vessel comparisons in year one and a recapture net in year two). A preliminary report following the spring 2007 excluder trials is attached as Item D-2(c). Additional information on results from both years of the experiment will be provided by the principal investigators at this meeting.

Salmon Bycatch Workgroup meeting minutes

The NPFMC Salmon Bycatch Workgroup convened at 9am on August 29th, 2007 at the Hawthorn Suites in Anchorage, AK.

Members of the workgroup were the following:
Stephanie Madsen, co-chair
Eric Olson, co-chair
Becca Robbins Gisclair
Karl Haflinger
John Gruver
Jennifer Hooper
Paul Peyton
Michael Smith

Staff assisting in the meeting and members of the public in attendance included the following: Diana Stram (NPFMC), Cathy Coon (NPFMC), Jason Anderson (NMFS), Alan Haynie (NMFS AFSC), Jim Ianelli (NMFS AFSC by phone), Martin Loeffland (NMFS AFSC), Tim Baker (ADF&G), Dani Evenson (ADF&G), Herman Savikko (ADF&G), Gene Sandone (ADF&G), Chris Oliver (NPFMC), Jim Seeb (ADF&G), Eric Volk (ADF&G), Don Rivard (USFWS/OSM), Russ Holder (USFWS), Dan Bergstrom (ADF&G), Karen Gillis (BSFA), Anne Vanderhoeven (BBEDC), Chris Stark (UAF), Brent Paine (UCB), Jill Klein (YRDFA), Ragnar Alstrom (Yukon Delta CDQ), Bill Quinlavin (Yukon Delta CDQ), Simon Kinneen (NSEDC), Robin Samuelson, Art Nelson(CVRF), and Larson Hunter(CVRF).

The attached agenda (appendix 1) was adopted for the meeting. Documentation provided to participants in advance of the meeting is attached (appendices 2 and 3).

Dani Evenson and Tim Baker of ADF&G provided a presentation of 2007 in river returns to the Nushagak, Yukon, and Kuskokwim river systems. Meeting participants discussed the expected versus preliminary returns as well as the age composition breakdowns of those numbers. In the Yukon, it was noted that the 6 year old fish are the dominant age class in the returns and that the age composition of the returns follows the expected breakdown however the numbers thus far are low. For the Nushagak the 1.2, 1.3, and 1.4 fish dominate the returns. Preliminary data on run returns by river system for Chinook salmon in 2007 indicated that observed returns were much lower than expected returns for three river systems (Nushagak, Yukon and Kuskokwim) while one river system (Unalakleet) had higher observed returns than the expected goal. Preliminary regression analyses comparing western Alaskan Chinook returns with BSAI trawl bycatch suggest an increased harvest rate in recent years.

Discussion noted that on-going genetic stock identification techniques by Drs Jim and Lisa Seeb will provide updated information on the relative contribution from various western Alaska river sources in the bycatch. An update on this preliminary work was provided by Jim Seeb at the previous SBW meeting, and it is anticipated that published results of this work may be available as early as February 2008.

Jim Ianelli participated by phone and presented investigations on methods to evaluate bycatch impacts on salmon runs. This method can be used to evaluate the impact of a single salmon bycatch cap or alternatively, to arrive at a cap level on the basis of acceptable risk to salmon runs. This work is being refined for application in the amendment package.

The remainder of the presentation portion of the meeting involved a review of Council alternatives and presentation of preliminary results of additional cap formulations and closure configurations by Council staff (Diana Stram, Cathy Coon) and NMFS AFSC staff (Alan Haynie). These included preliminary results of average bycatch numbers for cap formulation, proposed incremental percentages above the average and highest year to address cap alternative 1b and the need for further clarification regarding the intent of cap alternative 4 "international treaty considerations".

Discussion with members of the committee as well as members of the public present focused upon the intent of the Yukon River Agreement with respect to addressing cap alternative 4. The actual language of the treaty was discussed as well as the obligation of the Council to adhere to its intent. Members of the Yukon River Panel present noted that the initial concern in signing this agreement was about the actual numbers of bycatch from the fishery at the time of the signing of the treaty in 2001.

Numerous issues and clarifications were raised by the committee in discussions of the closure configuration methodologies proposed as well as the need for additional information from the agency on possible alternative methodologies. These clarifications include the following:

- Definition of criteria for rate-based cutoffs in defining closures?
- Regulatory structure and flexibility within which to refine closures?
- Could rates be identified in one year and used to define closures in the following year?
- How can we best deal with inter-annual variability?
- Importance of considering the enforcement implications of various sized closures and configurations

Per request of Dr. Haynie, further discussion commented on what must be considered in evaluating the potential impacts on the pollock fleet of proposed new closures. These impacts should include travel time for shore-based boats, fuel costs, and loss of quality. It was noted by members of the industry that roe quality issues will be particularly difficult to evaluate. Karl Haflinger noted that in his experience with Sea State closures, it is difficult to predict where displaced vessels will go to fish when closed out of certain areas. John Gruver further noted that the vessels tend not to necessarily spread out when they are displaced but often to clump and that the general response to closures appears to be non-linear. Robin Samuelson further suggested that indications of impacts on the fleet should be broken out by sector, looking separately at motherships, catcher processors and catcher vessels.

The meeting then broke into discussion groups between the trawl industry representatives and the western Alaskan representatives. Following discussion and deliberations amongst groups regarding recommendations to the Council and for the analysts, both groups reconvened to offer their respective reports. What follows are the consensus recommendations of the entire Salmon Bycatch Workgroup following deliberation of various options brought forward by either side. Changes from the initial cap alternatives are shown in strike-out and bold while further recommendations to analysts or the Council (outside of these specific cap alternatives) are also shown in bold.

Cap Formulation alternatives:

1. Establish cap based on:

a. Average historical bycatch;
   i. 3 years (2004-2006)
   ii. 5 years (2002-2006)
   iii. 10 years (1997-2006)
      Option: drop 2000
b. Percentage increase of :
   i. Historical average
      1. **10%**
      2. **20%**
      3. **30%**
   ii. Highest year
      1. **10%**
      2. **20%**
      3. **30%**

2. Set cap relative to salmon returns:
   a. ~~short term: link historic bycatch to in-river returns~~
   b. ~~long term: Use cumulative acceptable amounts for each river system, pending GSI information (i.e., identify what component of bycatch is from each river and what would be an acceptable amount of bycatch for each river. The cap would be the sum of the acceptable amounts for each of the rivers).~~

   Recommend that analysts prepare draft language to better characterize on-going investigations by analysts here for presentation to the Council in October
3. Incidental Take Permit amount
4. International treaty considerations
   a. **Average historical bycatch pre-2002**
      i. **3 years (1999-2001)**
      ii. **5 years (1997-2001)**
      iii. **10 years (1992-2001)**
   b. **Percentage decrease of historical averages:**
      i. **10% decrease**
         1. **3 years (1999-2001)**
         2. **5 years (1997-2001)**
         3. **10 years (1992-2001)**
      ii. **20% decrease**
         1. **3 years (1999-2001)**
         2. **5 years (1997-2001)**
         3. **10 years (1992-2001)**
      iii. **30% decrease**
         1. **3 years (1999-2001)**
         2. **5 years (1997-2001)**
         3. **10 years (1992-2001)**

Closure configuration recommendations:
Recommend that staff develop a method to apportion caps by closure area in a way that minimizes bycatch (e.g. to evaluate separate trigger caps by closure area apportioned according to the overall limit) as well as a single cap which triggers multiple areas.

Staff was requested to obtain further clarity on the ability (in a regulatory sense) to modify trigger caps in-season as well as scenarios of potentially reopening a closed area following a decrease in observed bycatch levels. It was also noted that fixed closures remain as an alternative to be evaluated.

Recommend that status quo in the alternatives be described as the VRHS system with the existing exemption to the CSSA closures. Recommend that an option be explicitly added to the alternatives for new closures which would likewise allow for an exemption for the fleet to these new closures.

It was clarified that this exemption option is to apply only to the alternatives under consideration which would implement new salmon savings area closures. This exemption would not be intended to apply to hard cap formulations.

Recommend that additional rate-based breaks be considered in formulating criteria for identifying closures such that a more defined and consistent range of rate breaks are considered (e.g. 0.1, 0.2, 0.3, 0.4, ...)

This recommendation was made to address the draft methodology presented which relied solely upon natural breaks in the data (for example purposes only). Additional commentary from the workgroup requested that the upcoming analysis indicate the relative amount of pollock in the areas removed as well as the percentage of pollock tows in the area as presented.

Several questions and clarifications of interest to members of the workgroup were unable to be specifically resolved at the meeting due to the necessity of consultation with the agency and possibly NOAA GC in order to address them. These questions included the following:

- What is the ability to framework aspects of the alternatives in regulation?
- What are the legal obligations and responsibilities under the Pacific Salmon Treaty (i.e. the Yukon River Agreement)?
- What type of NEPA analysis will be required for the forthcoming salmon bycatch amendment analysis, an EA or an EIS?

Understanding that Council staff and agency staff were scheduled to have a meeting the following day to investigate several legal and in-season management issues regarding some of the ideas discussed for further refining and formulating alternatives, the workgroup looks forward to an update from staff at a time following this meeting to better inform the SBW members on the potential implications for refining alternatives.

The meeting adjourned at 4:15pm.

Appendix 1: meeting agenda

NPFMC Salmon Bycatch Workgroup meeting
August 29, 2007
Ballroom B, Hawthorne Suites,
1110 West 8th Avenue
Anchorage, AK
Agenda

Meeting objective: Salmon Bycatch Workgroup to review on-going work by analysts on refining alternatives for analysis for salmon bycatch amendment package

9:00am- 5:00pm
lunch break 12:00-1:00pm

Topics to be addressed:

1- Introductions and discussion of continuation of role of Salmon Workgroup. *Olson/Madsen*
2- Summary of 2007 Inriver Chinook Salmon Runs Nushagak, Yukon and Kuskokwim River 2007 Chinook Runs Compared to projected and description of Nushagak River Chinook fishery – *Dani Evenson and Tim Baker*
3- Review of Council alternatives and objective for October meeting: revised alternatives per Salmon Work Group recommendations (June 2007). Plan for further revisions of alternatives and Council staff discussion paper for review in October *Stram*
4- Preliminary cap analysis: preliminary work on hard cap estimation and trigger cap numbers by season and annual totals *Stram/Ianelli*
5- Spatial evaluation of candidate closures I (A and B season). Evaluation of closures and salmon hot spots using observed salmon numbers and salmon bycatch rates *.Coon/Stram*
6- Spatial evaluation of candidate closures: Evaluation of candidate closures using a proposed optimization technique *Haynie*
7- Workgroup Discussion and recommendations for Council consideration

Appendix 2: Background paper for caps

BSAI Salmon Bycatch

Update on Salmon Bycatch analysis

The following provides a brief overview of the current suite of alternatives and progress towards analysis for refinement of the alternatives under consideration by the Council for the forthcoming salmon bycatch reduction amendment analysis. These alternatives include modifications made by the Council in June following the recommendations of the Salmon Bycatch Workgroup.

This amendment package will evaluate alternative means of salmon bycatch reduction measures, focusing on time area closures and catch limits on the pollock fishery. Alternatives to be considered by the Council will include a range of closure configurations (fixed time/area closures and triggered time/area closures) as well as options for different means of establishing caps, both trigger caps (connected with a time/area closure or closure system) and a hard cap (upon attainment of which all pollock fishing must stop). Alternatives are intended to be formulated such that caps and closures may be selected by the Council (in crafting their preferred alternative) in conjunction with each other.

A specific description of the alternatives including closure configurations options and the cap formulations (below) will be drafted prior to the October Council meeting for Council consideration. Analysts are currently working on several different methodologies for proposed closure configurations. Analysis focuses on rates of salmon bycatch by area in the pollock fishery, absolute numbers of bycatch in the fishery by area in the pollock fishery and a cost-benefit scheme for optimizing closure configurations in conjunction with fishing opportunities. Based upon action by the Council at the June 2007 meeting, the following year combinations are the focus for analysis (both spatially and for catch limits): 2004-2006 (3 years); 2002-2006 (5 years); 1997-2006 (10 years). Consideration will also be given to bycatch numbers and rates reported preliminarily from the 2007 A season. The 2007 B season is currently underway and all bycatch estimates are too preliminary to be included in the analysis at this point.

Cap considerations

Specific cap considerations will include the following formulations for both trigger and hard caps methodology:

5. Establish cap based on:
    a. Average historical bycatch;
        i. 3 years
        ii. 5 years
        iii. 10 years
    b. Percentage increase of :
        i. Historical average
        ii. Highest year
6. Set cap relative to salmon returns:
    a. <u>short term</u>: link historic bycatch to in-river returns
    b. <u>long term</u>: Use cumulative acceptable amounts for each river system, pending GSI information (i.e., identify what component of bycatch is from each river and what would be an acceptable amount of bycatch for

each river. The cap would be the sum of the acceptable amounts for each of the rivers).

7. Incidental Take Permit amount
8. International treaty considerations

For the average historical bycatch years the "most recent year" under consideration is currently considered to be 2006, thus the years utilized for average bycatch are as listed previously. The percentage increase over the historical average and the highest year is estimated based on an evaluation of relative increase from the mean rate by year (75-100% greater than a given average) and by the relative increase from the highest numbers by year (10-20% higher than the highest year). These estimated ranges bracket the variability over the time period under consideration.

Chinook limits: average historical plus options (June motion 2007)

		Chinook:			
Average historical:		A season	B season	Total	B+A accounting (total)
3 year	2004-2006	41,772	31,240	75,300	
5 year	2002-2006	37,911	23,988	64,235	
10 year	1997-2006	28,374	17,613	49,562	

Percent increase:

historical average: 75%>, 100%>		Total		A season		B season		B+A acounting (total)	
Average historical:		75% [1]	100% [1]	75% [1]	100% [1]	75% [1]	100% [1]	75% [1]	100% [1]
3 year	2004-2006	131,775	150,600	73,101	83,544	54,670	62,480		
5 year	2002-2006	112,411	128,470	66,344	75,822	41,979	47,976		
10 year	1997-2006	86,734	99,124	49,655	56,748	30,823	35,226		
		Total		A season		B season		Total	
10%>, 20%>		10% [2]	20% [2]	10% [2]	20% [2]	10% [2]	20% [2]	10% [2]	20% [2]
Highest year:	(2006): 87,786	96,565	105,343	67,747	73,906	44,067	48,073	111,814	121,979

1-based on evaluation of relative increases from the mean rate by year (attch rate spreadsheet for justification)
2-based on relative increases from the highest number by year (attch rate spreadsheet for justification)

A cap level linked to the relative magnitude of salmon returns could be established based on evaluating historical run-strengths, total bycatch mortality, and relative bycatch stock composition (i.e., the stock origins found in the bycatch). The historical data used may be limited (for some runs the period of data availability may be short) and due to inherent uncertainties at each stage, the decision for setting a cap using a scientific approaches necessitates two steps: 1) defining a reference impact rate (i.e., mortality of run attributed to bycatch), and 2) defining "acceptable" probabilities that a cap will exceed the defined impact rate. For example, a cap could be determined based on analysis that showed: "there was a 10% chance that a cap level of x salmon will exceed an impact rate of 5%."

The final two cap formulations are specific numbers that represent agreed upon bycatch levels. The first "Incidental Take Permit" amount is the revised threshold level for triggering a formal consultative process for endangered Chinook salmon species in the BSAI area. This number was revised following the 2006 consultation and is currently 87,500 fish. The second number indicated by "international treaty considerations" is intended to reflect the bycatch levels agreed upon in formulation of the Pacific Salmon Treaty and specifically the Yukon River Salmon Agreement in 2002. While there is no hard number associated with this treaty amount, bycatch numbers at the time of the signing of the agreement were intended to be reduced. A means of evaluating this as a numerical value would be to look at the values up to and including 2002 with the intention of reducing numbers below this amount.

An additional consideration for the cap/closure system will be an option to modify the accounting year for the salmon biological year. This means that the accounting system for salmon species would begin in the B season and continue through the A season, i.e. accounting would begin in June and continue through May. The intention of this option is that it more closely tracks the salmon biological year whereby juvenile salmon (those primarily taken as bycatch) likely enter the Bering Sea in the fall to feed and remain on the grounds throughout the winter. This group then migrates to other locations during the summer months prior to beginning their return to the natal streams (those that are of spawning age) in the summer. Thus, the same cohort of salmon that are being caught in the B season remain on the grounds in the A season and any closure potentially triggered by high B season Chinook catch would protect the same age class of salmon from additional impacts in the A season. This is in contrast to the current accounting system whereby the catch accounting for salmon begins January 1 and tracks through December 31st. A closure which is triggered due to high rates of catch following the A season is then actually protecting a different cohort of salmon in the B season from those that triggered the need for protection following the A season.

Closure considerations

Draft closure configurations will be circulated for discussion purposes for the Salmon Bycatch Workgroup meeting. These closure configurations are intended as a starting point to assist the Council in refining alternatives for analysis at the October 2007 Council meeting. Some additional considerations for the closure configuration system still to be formulated and evaluated include:

- Setting separate caps or rates for different closure areas;
- Increasing size and/or number of closure areas based on number of salmon caught (i.e., the more salmon are caught the more area closed);
- Decreasing size and/or number of closure areas based on number of salmon caught (i.e., the fewer salmon are caught the more area opened).
- Closing set areas at set times when known bycatch is high in that area (i.e., non-triggered, fixed closures).
- Considering time/area bycatch stock composition in closure determinations.
- Closure duration based on historical hotspot duration.

An option that is intended to be included in the suite of alternatives for analysis includes the option to adjust the Chinook and non-Chinook regulatory closure areas periodically based on the most current bycatch data available, such as the 2-3 year rolling average of bycatch rates by species and area.

Appendix 3: background paper for closure methodology examples

BSAI Salmon Bycatch

Closure considerations

Alternative closure configurations are presented as candidates for consideration by the Salmon Bycatch Workgroup meeting. These closure configurations are intended as a starting point to assist the Council in refining alternatives for analysis at the October 2007 Council meeting. In the first section, simple closures areas are defined following three configuration criteria. These are intended to be invoked when bycatch levels reach a predetermined limit or "hard cap" within a year and are intended to remain closed. In the second section, closures are designed to be invoked based on seasonal area-specific limits ("seasonal triggers"). For example, these are defined by seasonal (monthly) periods such that an area would become closed only if observed bycatch levels exceeded some predetermined limit for that area.

Area closures based on a hard cap

Adjust the Chinook and non-Chinook regulatory closure areas based on current bycatch data available based on using average bycatch rates by species. Three time periods were proposed by the Council in June 2007.

i. 3 years 2004-2006
ii. 5 years 2002-2006
iii. 10 years 1997-2006

Figures of this methodology are provided in the attached document using A season Chinook bycatch rates - (pollock non-pelagic trawl fishery) as an example. A more in depth presentation will occur at the August workgroup meeting.

The closures were determined based on areas where high levels of bycatch were observed. Once a cap is reached the area would remain closed for the duration of the season. The caps would be set based on several considerations and are discussed separately.

Closure areas can be tailored according to balance bycatch goals with practical fishery and management considerations. For example, a series of smaller closures could be triggered as lower bycatch levels are attained. Alternatively, a single larger area similar to the current CSSA could be closed as an upper limit of bycatch is reached.

Observer data from the non-pelagic pollock trawl fishery was summarized by haul for salmon bycatch. Data has been aggregated over multiple years and large geographic areas in order to address confidentiality restrictions. Bycatch rates were calculated based on observed numbers of salmon per metric ton of pollock. Data were brought into a GIS to be viewed spatially and temporally. Examples here are based on 2004-2006 combined data from the pollock A season for Chinook bycatch. Closure areas were determined by calculating average bycatch rates (number of observed salmon/ t pollock) within a 100 km^2 area (Figure 1). Based on the spatial pattern of bycatch rates natural breaks were using three different criteria. These rates were:

1) 0.123 Chinook/t pollock
2) 0.220 "
3) 0.397 "

These closure configurations are shown in Figures 2-4 and result in successively smaller more fragmented management areas. Table 1 shows the percentage of bycatch inside a proposed closure area for each of these configurations as well percentage of all (observed) tows. For the final analysis the spatio-temporal CPUE (pollock / hour towed) and bycatch rates will be evaluated before and after closures would be invoked.

Closure	Rate (# salmon/mt)	size (nm2)	Total Observed Chinook Inside Closure All Years	Total Observed Chinook	% Observed Chinook in closure	Total Annual Numbers	# of Tows In Closure	Total # of tows	% of tows in closure
1	0.123451	15,756	130,482	144,468	90%	43,494	10,062	13,183	76%
2	0.220423	8,697	111,828	144,468	77%	37,276	7,438	13,183	56%
3	0.3967	2,764	38,754	144,468	27%	12,918	901	13,183	7%

This evaluation revealed that there are several hauls with very high rates compared to the vast majority of pollock trawl operations. The effects of these few hauls could have large impacts on subsequent bycatch analyses for management. For the actual analyses of closures, appropriate data transformations or rank percentiles should be used to ensure robustness to the outliers.

Seasonally triggered closures

Seasonally triggered closures are intended to be simplified versions of the current rolling hot spot closures used through inter cooperative agreements. The simplifications include using set areas at set times as an option bycatch rates. For this study, historic Chinook A-season bycatch data by 10km areas and months were evaluated using combined data from 1997-2006.(Figure 5). Candidate closure areas were determined using bycatch rates in excess of 0.221 Chinook/t of pollock (Figure 6). As trigger limits are reached, the highest bycatch areas would be closed (Figure 7a). The remaining areas with little or zero bycatch would remain open (Figure 7b). The inseason bycatch rates could be tabulated on a week ending basis and used to determine which areas could remain open (based on being below historic average rates). However, if bycatch levels were high inside a management area then that area could be closed for the rest of the season. This evaluation revealed that higher bycatch rates during February and March over the 10 year period also occur in some the areas (Figures 9 & 10), however April the effort and bycatch distribution changes (Figure 11). Sequential closures could be set on a finer temporal scale (e.g., week to week) as an alternative. For the analysis the increased effort outside of the closure areas should be discussed.

It should be recognized that such rolling closures present Inseason monitoring and regulatory challenges. Staffing needs for inseason monitoring would likely be higher and the ability to write appropriate regulations for a complex set of closures may be unrealistic. Based on the observed variability in bycatch patterns in space and time, the flexibility needed to provide real reductions in bycatch levels appears to fit poorly within a regulatory framework.

Additional considerations for closure configurations include:

- Setting separate caps or rates for different closure areas;
- Using different criteria to delineate high bycatch rate locations
- Increasing size and/or number of closure areas based on number of salmon caught (i.e., the more salmon are caught the more area closed);
- Decreasing size and/or number of closure areas based on number of salmon caught (i.e., the fewer salmon are caught the more area opened).
- Closing set areas at set times when known bycatch is high in that area (i.e., non-triggered, fixed closures).
- Considering time/area bycatch stock composition in closure determinations.

- Closure duration based on historical hotspot duration.

It is hoped that if the extent of these added considerations (and the types of closure specifications presented) should be brought forward for analyses will be determined by the working group.

BSAI Salmon Bycatch

October 2007 staff discussion paper

The following paper provides a brief overview of the current suite of alternatives under consideration by the Council for the forthcoming salmon bycatch reduction amendment analysis. These alternatives include modifications made by the Council in June following the recommendations of the Salmon Bycatch Workgroup. Further recommendations from the Salmon Bycatch Workgroup following a meeting in August 2007 have not yet been incorporated into this description of alternatives pending Council action on the recommendations in October. Additional issues for clarification and refinement by the Council are included at the end of this paper. The action before the Council at this meeting is to further refine these alternatives.

The goal of this amendment package is to evaluate alternative means of salmon bycatch reduction measures, focusing on time area closures and salmon bycatch limits on the pollock fishery. Alternatives to be considered by the Council will include a range of closure configurations (fixed time/area closures and triggered time/area closures) as well as options for different means of establishing caps, both trigger caps (connected with a time/area closure or closure system) and a hard cap (upon attainment of which all pollock fishing must stop). Alternatives are intended to be formulated such that options for caps and closures may be selected by the Council (in crafting their preferred alternative) in conjunction with each other.

Current Suite of Alternatives

The following represents the suite of alternatives under consideration by the Council for the Salmon Bycatch amendment analysis. These alternatives were last revised by the Council in June 2007 following recommendations from the Council's Salmon Bycatch Workgroup. Council motions since October 2005 have now been formulated into NEPA alternative structure (alternatives, elements and options) for clarity.

Alternative 1: Status quo
Alternative 2: Establish new regulatory salmon savings systems.
- Element 1: Hard cap
- Element 2: Fixed closures
- Element 3: Triggered closures
- Element 4: Modify the PSC accounting period

Note that elements in elements 1-4 can be selected in conjunction with each other or separately. Elements 1, 2 and 3 have several different options which are described below.

Element 1: Hard Cap

Option A) Timing options
- 1- Annual cap
- 2- A season cap[1]
- 3- B season cap

Option B) Cap formulation based on:
1. Average historical bycatch;
   - a. 3 years
   - b. 5 years

[1] Applies to Chinook only

c. 10 years
2. Percentage increase of historical average
   a. 3 years
   b. 5 years
   c. 10 years
3. Percentage increase of highest year
4. Set cap relative to salmon returns:
   a. <u>short term</u>: link historic bycatch to in-river returns
   b. <u>long term</u>: Use cumulative acceptable amounts for each river system, pending GSI information (i.e., identify what component of bycatch is from each river and what would be an acceptable amount of bycatch for each river. The cap would be the sum of the acceptable amounts for each of the rivers).
5. Incidental Take Permit amount[2]
6. International treaty considerations

Note that unless footnoted, all options apply to both Chinook and chum cap formulation)

Discussion of options under Element 1

Option A) Timing options: The Council has indicated that separate seasonal caps as well as an annual cap will be considered. An A season hard cap, if reached, would presumably close the directed pollock fishery for the remainder of the A season. Since chum salmon are not caught in any great quantities during the A season, this cap would apply to Chinook salmon only. The fishery would then re-open to directed pollock fishing at the beginning of the B season. If a B season cap were reached, directed pollock fishing would cease for the remainder of the B season. An annual cap would begin to accrue at the start of the A season, and if reached would close fishing for the remainder of the year.

Option B) Cap formulation options: In refining alternatives in June 2007, the Council specified the types of formulations to be utilized in considering alternative hard cap numbers. Where methodology is only appropriate to Chinook the option is footnoted accordingly.

Option B-1 refers to a cap formulation based upon the average of historical bycatch numbers by a range of years. These numbers are the extrapolated numbers tabulated by the NMFS catch accounting system. For purposes of initial consideration, the "most recent year" is currently considered to be 2006. Option B-2 incorporates a percentage increase above the average histrocial bycatch amount for the same range of years as in option B-1. This option would provide for values higher than the average amounts in those years. Option B-3 similarly refers to a percentage increase over a specified value, this time it is a single year amount from the highest bycatch year to date over the time period under consideration by species. The percentage increase over the historical average and the highest year were evaluated for the Salmon Bycatch Workgroup's consideration as estimated based on an evaluation of relative increase from the mean rate by year (75-100% greater than a given average) and by the relative increase from the highest numbers by year (10-20% higher than the highest year). These estimated ranges bracketed the variability over the time period under consideration. The workgroup recommended the use of different percentages for the relative increase. These recommendations are contained in the Salmon Bycatch Workgroup report.

Option B-4 refers to a cap level linked to the relative magnitude of salmon runs. This type of formulation could be established based on evaluating historical run-strengths, total bycatch mortality, and relative bycatch stock composition (i.e., the stock origins found in the bycatch).

[2] Applies for Chinook only

The historical data used may be limited (for some runs the period of data availability may be short) and there is inherent variability in ocean survival, proportion of catch ascribed to runs, and salmon run sizes. To arrive at a science-based policy decision two steps should be considered: 1) defining a reference impact rate (i.e., mortality of run attributed to bycatch), and 2) defining "acceptable" probabilities that a cap will exceed the defined impact rate. For example, a cap could be determined based on analysis that showed: "there was a 10% chance that a cap level of x salmon will exceed an impact rate of 5%." Analysts are currently investigating methods to formulate this type of cap. Ideally this formulation would result in an equation that could then be frameworked into regulations to allow for the use of annually updated information it becomes available. PSC cap regulations for BSAI species of crab and herring follow prescribed equations. For example, herring and snow crab caps depend on biomass estimates whereas red king crab and Tanner crab caps follow a stair-stepped function depending on discrete biomass levels. A similar approach can be developed for this alternative. Such a prescription requires that the inputs for the function are straightforward so as to avoid values that are discretionary in nature. Additional considerations on frameworking are included in the "Legal and Implementation Issues" section later in this paper.

Option B-5, the "Incidental Take Permit" amount refers to the revised threshold level for triggering a formal consultative process for endangered Chinook salmon species. This take permit amount is the level of Chinook catch in BSAI trawl fisheries below which no apparent harm is considered likely for those endangered species of Chinook salmon from WA/OR river systems. This number was revised following the 2006 consultation and is currently 87,500 fish. This limit option would be considered only for Chinook species. No equivalent threshold exists for chum salmon in the BSAI trawl fisheries.

Option B-6, the "international treaty considerations" is intended to reflect the bycatch levels agreed upon in formulation of the Pacific Salmon Treaty and specifically the Yukon River Salmon Agreement in 2001. While there is no hard number associated with this treaty amount, it could be inferred that bycatch numbers at the time of the signing of the agreement were intended to be reduced. Further clarification by the Council is necessary to define an appropriate means of addressing the intent of this option in the analysis.

Element 2: Fixed Closures

Option A) Timing options
1. A season
2. B season

Option B) Area options
[TBD]

Option C) Periodic adjustment for updated bycatch information

Note that options can be selected in conjunction with each other or separately.

Discussion of options under Element 2

Option A) Timing: This option refers to two different possibilities for seasonal fixed closure options. The actual duration of the closure is to be determined based upon analysis of hot spot data. The options here only refer to the ability to establish fixed closures in either A season, B season or in both given that options may be selected in conjunction with each other.

Option B) Area options: Candidate closure areas have not yet been formulated but will be provided to the Council in conjunction with the process of refining alternatives as preliminary analysis of data to provide these closure options allows. Multiple fixed closure options and timing durations may be provided for consideration by the Council.

Option C) Periodic adjustment: This option refers to the original Council language in alternative development indicating the intent to "adjust the regulatory closure areas periodically based on the most current bycatch data available, such as the 2-3 year rolling average of bycatch rates by species and area". Here the intent is that regulatory closure areas (and duration of closure timing) may be adjusted as information indicates a necessity for this. It is the understanding of staff that some frameworking of area closure may be possible in regulations provided clear criteria are specified for the establishment of an adjustment to the closure areas. This would allow for the modification of actual areas on an annual or multi-year basis. Further guidance on this will be provided by the agency.

Element 3: Triggered closures

Option A) Timing options
1. A season
2. B season
3. Closure for remainder of season when triggered

Option B) Trigger cap formulation based on:
1. Average historical bycatch;
    a. 3 years
    b. 5 years
    c. 10 years
2. Percentage increase of historical average
    d. 3 years
    e. 5 years
    f. 10 years
3. Percentage increase of highest year
4. Set cap relative to salmon returns:
    g. <u>short term</u>: link historic bycatch to in-river returns
    h. <u>long term</u>: Use cumulative acceptable amounts for each river system, pending GSI information (i.e., identify what component of bycatch is from each river and what would be an acceptable amount of bycatch for each river. The cap would be the sum of the acceptable amounts for each of the rivers).
5. Incidental Take Permit amount[3]
6. International treaty considerations

Option C) Area options [actual areas TBD]
1. Adjust area according to the number of salmon caught
2. Single area closure
3. Multiple area closures

Option D) Periodic adjustment for updated bycatch information

[3] Applies for Chinook only

Discussion of options under Element 3

Here a 'trigger' refers to a specific catch limit for salmon by species. The attainment of this trigger limit closes a designated area for a specified time period. The current regulatory salmon savings areas for Chinook and chum are triggered closures. The amount of the trigger as well as the duration and geographic extent of the closure are fixed in regulation. Under this element, different closure options are to be examined. Some flexibility in the specification of actual areas may be possible in order to be responsive to inter-annual variability.

Option A) Timing: This refers to different timing considerations in defining triggered area closure options. The options here refer to the ability to establish closures in either A season, B season or closures that when triggered may close for the duration of the year. The actual durations of the specific closures to be considered in the A season or the B season are to be determined based upon analysis of hot spot data.

Option B) Cap formulation: These options are similar in methodology to those listed in Element 1, option B, for hard cap formulation. The only difference between the two is in the implication of the cap (i.e. that it triggers an area closure not a fleet-wide fishing closure). The methodology for formulating the caps is identical.

Option C) Area options: Here there are three options for area closure configurations. The first refers to the intent in June 2007 by the Council motion to include in the alternatives the ability to: *"Increase size and/or number of closure areas based on number of salmon caught (i.e., the more salmon are caught the more area closed); Decrease size and/or number of closure areas based on number of salmon caught (i.e., the fewer salmon are caught the more area opened)"*(Council motion June 2007). Currently to address this idea, consideration is being given to an expanding area closure that would be stair-stepped to specific PSC limits by salmon species. Another possible means to address this would be to re-open closed areas according to a predetermined schedule of bycatch amounts by month (e.g. stair-step mechanism but with criteria specified such that if bycatch numbers do not exceed by X a certain date then specific areas may re-open for a specified time period). The remaining two options for area closures are to evaluate a large scale closure with a single trigger, or multiple area closures with either an aggregate trigger for all areas or individual triggers by specific areas.

The specific candidate areas for consideration under these options are being evaluated by analysts using a variety of methodological approaches. The SSC at this meeting will be reviewing and commenting on these approaches such that analysts may be able to provide actual candidate areas for each alternative at the December Council meeting in order to finalize the range of alternatives. Multiple triggered closure options and timing durations may be provided for consideration by the Council.

Option D) Periodic adjustment: This refers to the original Council language in alternative development indicating the intent to "adjust the regulatory closure areas periodically based on the most current bycatch data available, such as the 2-3 year rolling average of bycatch rates by species and area". Here the intent is that regulatory closure areas (and duration of closure timing) may be adjusted as information indicates a necessity for this. It is the understanding of staff that some frameworking of area closures may be possible in regulations provided clear criteria are specified for the establishment of an adjustment to the closure areas. This would allow for the modification of actual areas on an annual or multi-year basis.

Element 4: Modify the PSC accounting period for salmon

An additional consideration for the cap/closure system will be an option to modify the accounting year for the salmon biological year. This means that the accounting system for salmon species would begin in the B season and continue through the A season, i.e. accounting would begin in June and continue through May. The intention of this option is that it more closely tracks the salmon biological year whereby juvenile salmon (those primarily taken as bycatch) likely enter the Bering Sea in the fall to feed and remain on the grounds throughout the winter. This group then migrates to other locations during the summer months prior to beginning their return to the natal streams (those that are of spawning age) in the summer. Thus, the same cohort of salmon that are being caught in the B season remain on the grounds in the A season and any closure potentially triggered by high B season Chinook catch would protect the same age class of salmon from additional impacts in the A season. This is in contrast to the current accounting system whereby the catch accounting for salmon begins January 1 and tracks through December 31st. A closure which is triggered due to high rates of catch following the A season is then actually protecting a different cohort of salmon in the B season from those that triggered the need for protection following the A season.

This element could be applied to all of the cap closures under consideration. The analysis will then need to evaluate the implications of a change in the accounting system as it applies to each seasonal and annual cap. Cap formulation annually and by season would then consider the modification in accounting period (e.g. for those cap formulation options which depend upon average numbers or consideration of the highest year).

Legal and Implementation Issues

The Council is considering several trigger and area closure methodologies that raise legal and practical management issues associated with rulemaking and implementation. Recently, NMFS and Council staff met with NOAA GC and NMFS Inseason Management branch to discuss implications of these methodologies. This section summarizes those discussions. As the Council refines alternatives for analysis, staff will provide further input.

As described above, Elements 1 through 3 could include options to framework triggers or closures to accommodate recent salmon bycatch information. For example, Element 1 considers a hard cap that would be based on an equation promulgated in regulation, and incorporates information updated over some predetermined interval. In another example, Element 2 considers closure areas that are predetermined, and close when a predetermined trigger is reached. In this case, the closures could vary annually to the extent that salmon bycatch varies geospatially over time.

Analysis will undoubtedly include multiple permutations of these concepts, and NOAA GC is unable to provide specific guidance until alternatives are formulated. However, in general, NMFS may promulgate regulations that incorporate formulas or equations to determine closure triggers or caps, as long as there is no discretion to change the formulas or equations. Also, the data to be used in the formulas or equations must be clearly identified in regulations and readily verifiable. The data that is used in those formulas or equations may change based on new or recent information, but the formulas or equations may not change without further notice and comment rulemaking. Similarly, regulations may be promulgated that established a fixed network of predetermined closure areas and triggers. The areas that close could vary from year to year depending of whether triggers or caps are reached for each of the closure areas. Similar to the example provided above, NMFS does not have discretion to change the triggers or closure areas once they are implemented by regulations, even though the input data may vary over time.

The only method to change these triggers or closure areas would be through notice and comment rulemaking.

Frameworked equations are currently used to determine opilio tanner crab PSC management caps. For example, regulations at 679.21(e)(1)(iv)(A) state that the PSC limit for opilio crab caught by trawl vessels while engaged in directed fishing for groundfish in the COBLZ will be specified annually in the harvest specifications process using trawl survey information on the total abundance of opilio crab in the following frameworked equation:

(A) PSC Limit. The PSC limit will be 0.1133 percent of the total abundance, minus 150,000 C. opilio crabs, unless;

In this case, the Secretary has no discretion about the input variable of annual biomass, and the PSC limit within the COBLZ is determined annually through the specification process.

From a practical standpoint, however, the ability of inseason managers to provide responsive action to close areas when triggers or caps are reached is constrained. Currently, managers are able to provide notice that triggers for the chum and Chinook salmon savings areas have been reached, and close those areas according to regulation. However, a system of opening and closing fine scale areas based on biomass or rate based triggers is not workable. Fine scale closures such as those implemented under the Voluntary Rolling Hotspot closure system by industry cooperative agreements are not possible. Internal NMFS processes to issue a closure notice can take up to 6 days, and are staff intensive. Pollock cooperatives are much better positioned to quickly prohibit or allow fishing among their members through legal agreements in small areas based on the most current salmon bycatch information.

Additionally, depending on the size of the closure areas, data may not be reported in the scale necessary for NMFS managers to accurately determine bycatch rates or amounts. For example, salmon bycatch numbers for catcher vessels are reported at the trip level. Managers may not be able to determine salmon bycatch for specific fine scale geospatial areas.

In general, implementing triggers, caps, and closures that incorporate frameworked equations, and where the Secretary has no discretion to change the equations is possible. However, there may be practical constraints for NMFS inseason managers associated with the scale and timeliness of certain closure options. As the Council refines alternatives, NOAA GC and NMFS will continue to provide input.

Update on analysis of closure configurations and additional considerations for alternatives

Analysts are currently investigating several different methodologies for proposed closure configurations. Analysis focuses on rates of salmon bycatch by area in the pollock fishery, absolute numbers of bycatch in the fishery by area in the pollock fishery and a cost-benefit scheme for optimizing closure configurations in conjunction with fishing opportunities. Based upon action by the Council at the June 2007 meeting, the following year combinations are the focus for analysis (both spatially and for catch limits): 2004-2006 (3 years); 2002-2006 (5 years); 1997-2006 (10 years). Consideration will also be given to bycatch numbers and rates reported preliminarily from the 2007 A season. The 2007 B season is currently underway and all bycatch estimates are too preliminary to be included in the analysis at this point.

Draft closure configurations will be provided for discussion purposes at the October Council meeting. At this time, the primary purpose is to examine the appropriate methodology to be employed in defining the closures, not to identify the specific area for consideration. Once a methodology (or a variety of approaches) is approved, specific areas (as appropriate) will be put forward by analysts as candidates to be included in the alternatives. These closure configurations are intended as a starting point to assist the Council in refining alternatives for analysis. Closure configurations are currently being considered as either large scale closures (based upon a threshold criteria for a cutoff), and smaller scale, more numerous closures (based upon a threshold criteria for a cutoff). A range of closure configurations is intended to be included in the analysis. Closures may have separate triggers by area or an aggregate trigger for all of the closures.

One final consideration for bycatch avoidance measures that previously has been noted in discussions is the potential to evaluate clean fishing time periods and increase the ability of the fleet to fish during this timing. The SSC minutes from March 2007 following the Salmon Bycatch Workshop suggested the following for inclusion in the suite of alternatives for the forthcoming amendment package:

- *Temporal closures or adjustments to the fishing season based on seasonal differences in catch rates (e.g., modifying start or end dates of the A and B season.)*
- *Short "stand-down" periods to avoid high bycatch rates during certain hours of the day (based on diel patterns in catch rates resulting from vertical migrations of salmon).*
  (SSC Minutes, March 2007)

These ideas have not yet been brought forward into the alternatives under consideration in this analysis, but could provide an alternative to time/area closures which may allow for greater bycatch reduction. This could include adjusting the pollock fishing seasons; however this option likely would require formal consultation with NMFS Protected Resources given that the current pollock seasons and TAC apportionments (see attached table) are largely because of SSL protection measures. An FMP-level Section 7 consultation on the current SSL protection measures in the groundfish fisheries is currently on-going. The consultation and development of a draft Biological Opinion is scheduled for after completion of the draft Revised SSL Recovery Plan. The timing of incorporating these ideas (Change in season start or end dates and/or a stand-down period during the day) as alternatives for consideration could be integrated with the on-going consultation and could be potentially considered within that on-going work. The Council could refer this concept to its Steller Sea Lion Mitigation Committee and have that committee develop the alternative in concert with its current work on possible revisions to SSL protection measures. Alternatively, the season change alternative could remain part of this action and a separate consultation could be done if needed.

Problem Statement

In conjunction with refining alternatives, the Council may wish to modify its problem statement for the analysis at this time. The problem statement approved by the Council in October 2005 has not been modified. This problem statement was adopted at the time of final action on amendment 84, to exempt vessels participating in the VRHS system from regulatory salmon savings area closures. The current problem statement is as follows:

The Council and NMFS have initiated action to exempt AFA qualified and CDQ vessels participating in the intercooperative voluntary rolling hotspot system (VRHS) from regulatory Bering Sea salmon bycatch savings areas. Analysis and refinement of the current salmon savings areas may be necessary in the event pollock vessels either surrender or lose their exemption and return to fishing under the regulatory salmon bycatch program.

Further, alternatives to the VRHS system and/or the regulatory salmon bycatch program should be developed to assess whether they would be more effective in reducing salmon bycatch. The *following amendment packages are not intended to preclude the intercooperative annual review as required under Amendment 84.*

The Council should consider the intent of the forthcoming analysis, specifically the Council goals in reducing bycatch and the benchmarks by which to measure bycatch reduction, and revise the problem statement accordingly to be consistent with this intent.

Issues for clarification

Given the issues noted in the previous discussion, the following are put forward as clarifications that could be addressed in conjunction with refining alternatives at this meeting. Some of these may be clarified by the Council in October while others may require agency and legal input for clarification.

1. Frameworking issues: closures and caps, some ability to framework but possibly limited by staffing ability (closures) and discretionary information (cap). Need additional clarification on how alternatives may be optimally formulated for frameworking ability.
2. Additional alternatives to consider incorporating: Changing pollock fishing dates, Stand down periods
3. Intended result of exceeding a cap: closure (time and area or to all fishing) for directed pollock fleet only for specified time period. What about mixed fisheries and incidental catch of pollock? Does bycatch from other fisheries accrue towards cap?
4. How will CDQ caps be defined?
5. Enforcement issues: Note that need input from enforcement during development of alternatives
6. Problem statement: refine problem statement in conjunction with alternatives. What is the Council's goal in adopting new measures, is it to reduce the rate of bycatch or the number of bycatch?

TABLE 3.—2007 AND 2008 ALLOCATIONS OF POLLOCK TACS TO THE DIRECTED POLLOCK FISHERIES AND TO THE CDQ DIRECTED FISHING ALLOWANCES (DFA)[1]

[Amounts are in metric tons]

Area and sector	2007 Allocations	2007 A season[1]		2007 B season[1]	2008 Allocations	2008 A season[1]		2008 B season[1]
		A season DFA	SCA harvest limit[2]	B season DFA		A season DFA	SCA harvest limit[2]	B season DFA
Bering Sea subarea	1,394,000	n/a	n/a	n/a	1,318,000	n/a	n/a	n/a
CDQ DFA	139,400	55,760	39,032	83,640	131,800	52,720	36,904	79,080
ICA	33,129	n/a	n/a	n/a	33,214	n/a	n/a	n/a
AFA Inshore	609,735	243,894	107,725	365,841	576,493	230,597	161,418	345,896
AFA Catcher/Processors[3]	487,788	195,115	136,581	292,673	461,195	184,478	129,134	276,717
Catch by C/Ps	446,326	178,531	n/a	267,795	421,988	168,797	n/a	253,186
Catch by CVs[3]	41,462	16,585	n/a	24,877	39,202	15,681	n/a	23,521
Unlisted C/P Limit[4]	2,439	976	n/a	1,463	2,306	922	n/a	1,384
AFA Mothership	121,947	48,779	34,145	73,168	115,299	46,119	32,284	69,179
Excessive Harvesting Limit[5]	213,407	n/a	n/a	n/a	201,773	n/a	n/a	n/a
Excessive Processing Limit[6]	365,841	n/a	n/a	n/a	345,896	n/a	n/a	n/a
Total Bering Sea DFA	1,358,871	543,548	380,484	815,322	1,284,787	513,914	359,740	770,872
Aleutian Islands subarea[1]	19,000	n/a	n/a	n/a	19,000	n/a	n/a	n/a
CDQ DFA	1,900	760	n/a	1,140	1,900	760	n/a	1,140
ICA	1,600	800	n/a	800	1,600	800	n/a	800
Aleut Corporation	15,500	15,500	n/a	0	15,500	15,500	n/a	0
Bogoslof District ICA[7]	10	n/a	n/a	n/a	10	n/a	n/a	n/a

[1] Pursuant to § 679.20(a)(5)(i)(A), the Bering Sea subarea pollock, after subtraction for the CDQ DFA – 10 percent and the ICA – 3.35 percent, is allocated as a DFA as follows: inshore component – 50 percent, catcher/processor component – 40 percent, and mothership component – 10 percent. In the Bering Sea subarea, the A season, January 20–June 10, is allocated 40 percent of the DFA and the B season, June 10–November 1, is allocated 60 percent of the DFA. Pursuant to § 679.20(a)(5)(iii)(B)(2)(i) and (ii), the annual AI pollock TAC, after subtracting first for the CDQ directed fishing allowance – 10 percent and second the ICA – 1,600 mt, is allocated to the Aleut Corporation for a directed pollock fishery. In the AI subarea, the A season is allocated 40 percent of the ABC and the B season is allocated the remainder of the directed pollock fishery.

[2] In the Bering Sea subarea, no more than 28 percent of each sector's annual DFA may be taken from the SCA before April 1. The remaining 12 percent of the annual DFA allocated to the A season may be taken outside of SCA before April 1 or inside the SCA after April 1. If 28 percent of the annual DFA is not taken inside the SCA before April 1, the remainder is available to be taken inside the SCA after April 1.

[3] Pursuant to § 679.20(a)(5)(i)(A)(4), not less than 8.5 percent of the DFA allocated to listed catcher/processors shall be available for harvest only by eligible catcher vessels delivering to listed catcher/processors.

[4] Pursuant to § 679.20(a)(5)(i)(A)(4)(iii), the AFA unlisted catcher/processors are limited to harvesting not more than 0.5 percent of the catcher/processors sector's allocation of pollock.

[5] Pursuant to § 679.20(a)(5)(i)(A)(6) NMFS establishes an excessive harvesting share limit equal to 17.5 percent of the sum of the pollock DFAs.

[6] Pursuant to § 679.20(a)(5)(i)(A)(7) NMFS establishes an excessive processing share limit equal to 30.0 percent of the sum of the pollock DFAs.

[7] The Bogoslof District is closed by the final harvest specifications to directed fishing for pollock. The amounts specified are for ICA only, and are not apportioned by season or sector.

Adult Equivalence Estimation for Incidental Salmon Harvest Designed to evaluate Run Size Impacts

James N. Ianelli

Abstract—**The regulations on incidental take of salmon by Alaska groundfish fisheries are an important part of the multi-species management system. These regulations are being revised due to new information collected over the past decade and changes in the magnitude and pattern of salmon catch. To evaluate these practices, methods that appropriately account for the impact incidental catches have on salmon populations are required. In this study a simulation model is proposed that accounts for the observed inter-annual variability of salmon run-sizes and allows for sources of variability including the salmon age-composition, ocean survival, and run-size estimation uncertainty. Results from an example case study show how variability propagates from these sources.**

I. Introduction

The incidental catch (bycatch) of salmon in Alaska groundfish fisheries varies a function of the abundance of salmon, the amount of effort, the temporal-spatial pattern of fishing, and environmental conditions. Salmon bycatch in the Alaska groundfish fisheries is closely monitored and regulated by NMFS through "prohibited species catch" (PSC) allowances (ADFG 1995a and ADFG 1995b). These regulations currently include closures of fixed areas that traditionally had high incidental salmon catches. Recent initiatives to further reduce bycatch levels have included cooperative rolling hot-spot closures and industry-based incentives. These and other tools are used to advise the managers on best practices. To evaluate these practices, methods that appropriately account for the impact incidental catches have on salmon populations are required. In this study a stochastic "adult equivalence" model is developed that accounts for sources of uncertainty. Management measures to minimize bycatch levels require approaches that are effective at minimizing bycatch while being robust uncertainty and variability. Additionally, management measures require a degree practicality. Currently, accurate, in-season salmon abundance levels are unavailable and management must rely on analyses of historical data for developing alternatives. A single value as an overall salmon bycatch limit, should that approach be adopted, could be selected based on an estimates of likely run size impacts (with associated range of probabilities). This approach requires managers to pick an acceptable run-size impact limit which can be applied using this model. Alternatively, should managers provide a set of catch limits, the model presented below will provide a basis for evaluating the impacts on salmon runs (and associated levels of uncertainty).

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II. Methods

A. The model

The model begins with a measure of bycatch impact. This measure relates the historical bycatch levels relative to the subsequent returning salmon run k in year t:

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

where $C_{t,k}$ and $S_{t,k}$ are the bycatch and stock size (run return) estimates of the salmon species in question. The calculation of $C_{t,k}$ includes the bycatch of salmon returning to spawn in year t and the bycatch from previous years of the same cohort (i.e., at younger, immature ages). This latter component needs to be decremented by ocean survival rates. This sum of catches (at earlier ages and years) can thus be represented as:

$$C_{t,k} = \sum_{a=1}^{A} c_{t-a-1,a,k} s_a \qquad (2)$$

where $c_{t-a-1,a,k}$ is the catch of age a fish in year t, A is the oldest age of their ocean phase, and s_a is the proportion of salmon surviving from age a to $a+1$.

The values of $c_{t,a,k}$ are computed from the total salmon catch in year i multiplied by the proportion at age a, based on the length frequency of the salmon catch in

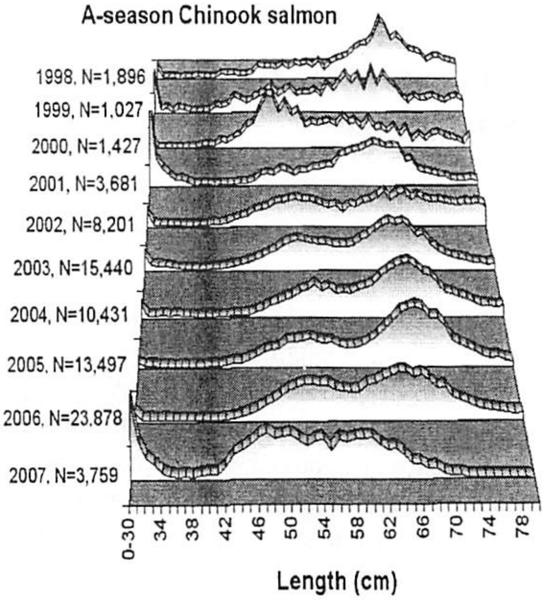

Fig. 1. Length frequencies of Chinook salmon taken incidentally in the pollock groundfish fishery during the winter (A-season), 1998-2007.

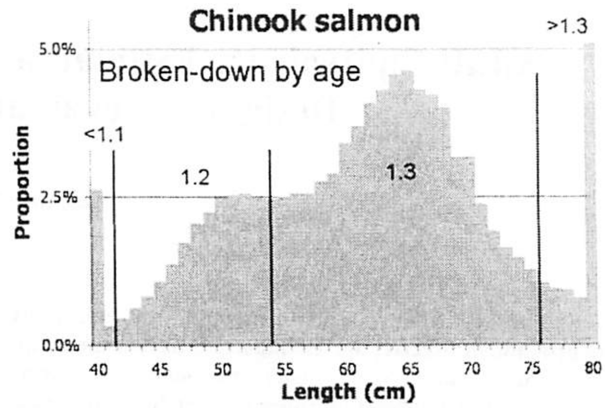

Fig. 2. Length frequency showing length-categories for estimating proportions-at-age from trawl fishery bycatch data.

that year (e.g., Fig. 1, Table 1).

The total bycatch numbers in any given year must be assigned to the possible river-system origins. This is typically done using genetic methods and/or through scale pattern analyses. These data are limited in quantity but are available for some years and river-systems. For example, the estimate of total salmon bycatch of unknown origin, $C_{t,\cdot}$, is used to compute the age-specific annual level found in a given year by the,

$$c_{t,a,k} = \phi_{t,a} p_k C_{t,\cdot} \tag{3}$$

where $\phi_{t,a}$ is the proportion at age based on partitioning length frequency data in each year (e.g., Table 1, and Fig. 2) and p_k is the proportion of the salmon bycatch assigned to river-system k.

Stochastic versions of the adult equivalence calculations acknowledge both run-size inter-annual variability and run size estimation error, as well as, uncertainty in the oceanic phase of salmon survival, 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 $S_{t,k}$):

$$\dot{S}_{t,k} = \overline{S}_k e^{\varepsilon_t + \delta_t} \quad \varepsilon_t \sim N\left(0, \sigma_1^2\right), \quad \delta_t \sim N\left(0, \sigma_2^2\right) \tag{4}$$

where σ_1^2, σ_2^2 are specified levels of variability in inter-annual run sizes and run-size estimation variances, respectively.

The stochastic survival rates were simulated as beta-distributions:

$$\dot{s}_{a,k} \sim B\left(\alpha_a, \beta_a\right) \tag{5}$$

with parameters α_a, β_a specified to satisfy the expected value of age-specific survival (Table 1) and a pre-specified coefficient of variation term (provided as model input).

Similarly, the parameter responsible for assigning bycatch to river-system of origin can be modeled using a beta distribution:

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

Note that this bycatch proportion assigned to river-systems almost certainly varies from one year to the next. For the purposes of this study, the estimation uncertainty is considered as part of the inter-annual variability in this parameter.

The simple steps (implemented in a spreadsheet) are outlined as follows:

1. Use existing bycatch length frequencies (season and year)
2. Divide these into putative age-classes ($\phi_{t,a}$)

TABLE 1. Example demographic parameters used in the adult equivalent model

True Age	Salmon Age	Model Age (a)	s_a	Lower length (cm)	Upper length (cm)
2	1.1	1	0.7	0	40
3	1.2	2	0.8	41	55
4	1.3	3	0.9	56	76
5	1.4	4	1.0	76	∞

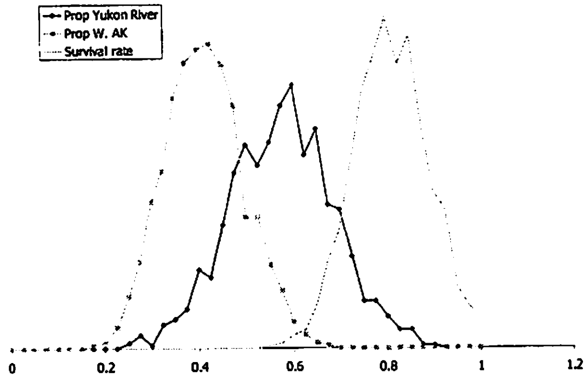

Fig. 3. Example relative probabilities of randomized input values used in the AEQ model.

3. Assign to river of origin components ($\dot{p}_k$)
4. Propagate forward into likely year-of-return (Eq. 2)
5. Sum over all bycatch years and compare with run-size estimates for impact rate calculations
6. Repeat above steps 1,000 times with independent random variables
7. Compile results over all years and compute frequencies from which relative probabilities can be estimated.

The example is based on information from NMFS observer data on length frequencies of Chinook salmon caught in the pollock fishery (Table 2). Also, the example draws from run-size estimates on Yukon River Chinook (Table 3). ***Results are intended for illustration purposes only.*** Sensitivity analyses of assumptions about uncertainty and variability are conducted. These are intended to highlight areas where data collection programs may improve the ability to evaluate management options.

III. RESULTS

The distribution of simulation model input parameters were plotted for illustration and checking (e.g., Fig. 3). A reference simulation run was completed with moderate assumptions about input sources of variability/uncertainty. Reference model coefficients of variation for these were assumed to be 20% and this indicated that historically, the median bycatch impact was about 4% while in recent high bycatch years (2005 and 2006) there appears to be less than a 5% chance that the bycatch impact is higher than 7.5% (Fig. 4).

A. Evaluation of sources of uncertainty

Sensitivity to assumptions about uncertainty and variability are required to understand where

TABLE 2. Estimated Chinook bycatch and example breakout of age composition proportions.

Year	Bycatch (t) as estimated	Age composition of bycatch <1.1	1.2	1.3	>1.3
1999	42,685	48%	32%	12%	8%
2000	8,871	11%	61%	18%	9%
2001	24,448	21%	38%	32%	9%
2002	40,041	15%	41%	23%	21%
2003	61,886	10%	52%	30%	8%
2004	50,051	13%	45%	30%	12%
2005	62,474	12%	48%	32%	8%
2006	103,966	12%	55%	25%	7%
2007	88,276	34%	56%	8%	1%

information can be improved. It also provides a way to objectively evaluate management systems (such as an upper limit on total allowable bycatch levels). Figure 5 a)-d) present alternative variance specifications to the reference model. When the survival and run-size uncertainty is minimal, the uncertainty due to apportioning the bycatch to river of origin still provides a wide degree of uncertainty in run impact (Fig. 5a). With assignment CV configured to be small (river-of-origin in the bycatch is precisely known), the other sources of variability still contribute significantly to the impact of bycatch on run size (Fig. 5b). When all other aspects of run size variability are minimized, the "natural" inter-annual variability still results in a broad range of potential impacts to run sizes (Fig 5c). Finally, if survival and assignment to river of origin can be precisely estimated, the effect of uncertainty in run-size is substantial (Fig. 5d).

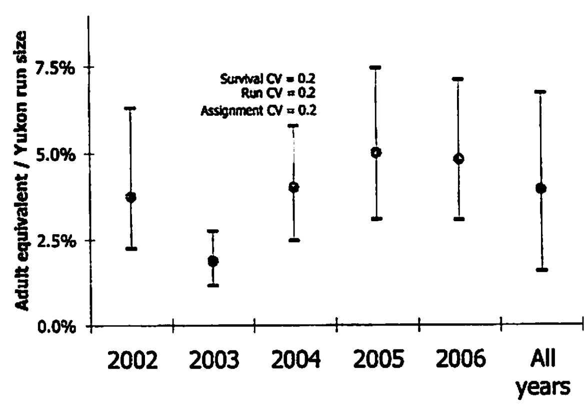

Fig. 4. Results showing bycatch impact from AEQ model by year of data availability and for all years combined. Upper and lower dashes represent 95th and 5th percentiles and bullet displays the median value.

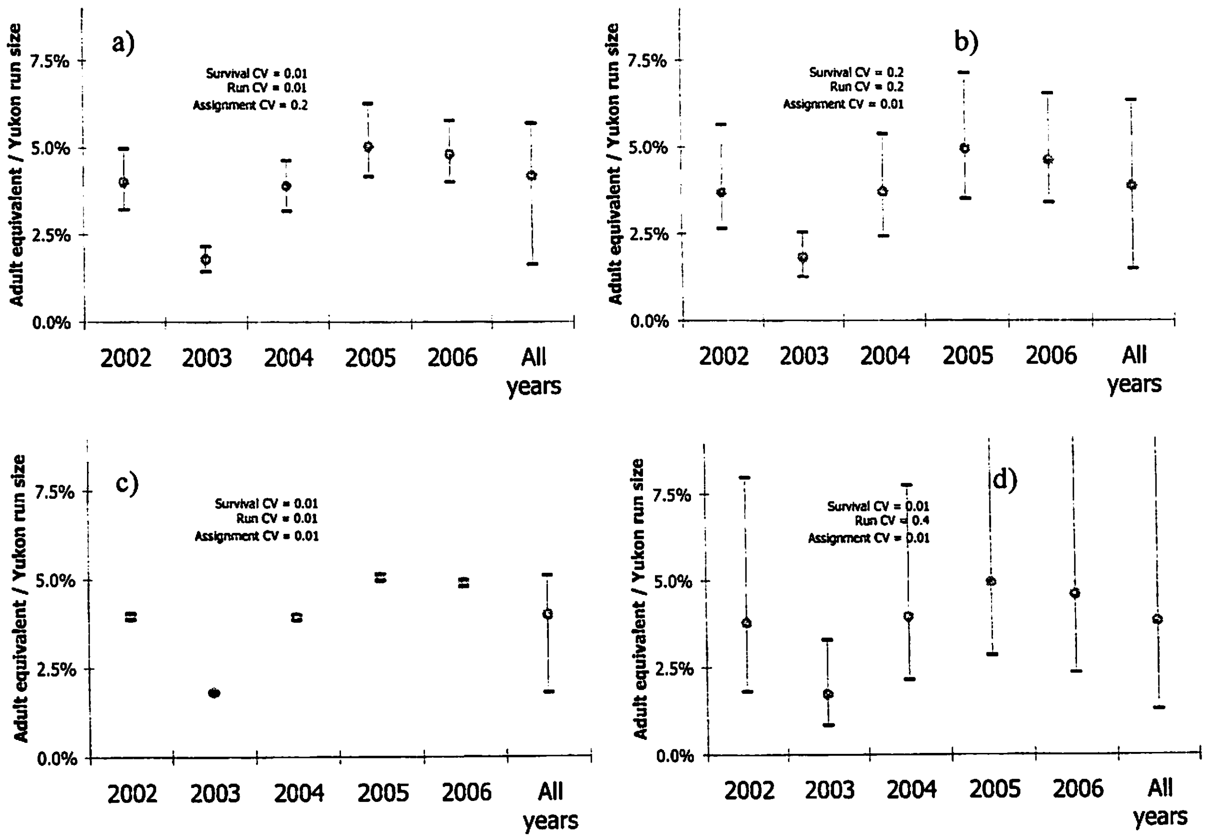

Fig. 1. Sensitivities of AEQ model to different uncertainty levels: a) precise survival and run-size estimates; b) precise river-of-origin assignment; c) precise input variables (but interannual run-size variability remains); and d) precise survival rates and river-of-origin assignments but highly uncertain run-size estimates.

IV. Discussion

Witherell *et al.* (2002) reviewed salmon bycatch but assumed a constant approximation of how bycatch propagates through to adult equivalents of salmon returning to spawn. Here, the sources of uncertainty and natural variability are accounted for to provide a more defensible approach to evaluating the uncertainty on picking management alternatives. A single-value "cap" could be analyzed to provide a basis for decisions or alternatively, an acceptable impact level (at specified probability) could be provided and a limit that satisfies that condition could be found.

A major weakness of this study and approach is with the extent of data. The inter-annual variability of run-sizes is relatively short and the assumed levels of measurement errors were contrived for this example. Also, as environmental conditions likely play a large role in the distribution of salmon (e.g., Freidland *et al.* 2001) and future conditions may differ substantially from the period covered in this study.

A logical next step would be to evaluate the run-size impact on actual fishery/salmon production. Salmon production is partly a function of stock-recruitment relationships. These are highly uncertain therefore translation to impacts on salmon production will be difficult.

V. Conclusions

The identified sources of uncertainty affects the ability to precisely measure the impact overall bycatch caps may have on salmon runs. This provides a tool that should allow managers to quantitatively assess alternatives and better understand the trade-offs in evaluating effective real-time management systems.

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BSAI Salmon Bycatch- Closure considerations

The Salmon Bycatch Workgroup received a report on methodologies for closure configurations in August and made some suggested additions for Council review. This discussion of methods to determine closure configurations are intended as a starting point to assist the Council in refining alternatives for analysis.

Area closure based on a hard cap:

Adjust the Chinook and non-Chinook regulatory closure areas based on the most current bycatch data available based on average historical catch by species. Three time periods have been proposed by the Council in June 2007.

i. 3 years (2004-2006)
ii. 5 years (2002-2006)
iii. 10 years (1997-2006)

Areas could be configured by either overall catch (in numbers) or bycatch rates. Figures of these methodologies are provided in the attached document using A season Chinook bycatch rates - (pollock non-pelagic trawl fishery) as an example, but are suggested to be analyzed by A and B seasons as well as species.

The closures are configured such that it encompasses areas that historically have had the highest levels of bycatch. Once a cap is reached the area would remain closed for the duration of the season. The caps would be set based on several considerations and are discussed separately.

Concepts for closure areas can be developed based on bycatch goals. A series of smaller closures would have a set of smaller cumulative caps while one larger area similar to the current CSSA would have a larger cap.

Observer data from the non-pelagic pollock trawl fishery was summarized by haul for salmon bycatch. Bycatch rates were calculated based on observed numbers of salmon per metric ton of pollock. Numbers are presented based on observer counts. Data were brought into a GIS to be viewed spatially and temporally. Examples here are based on 2004-2006 combined data from the pollock A season for Chinook bycatch. Closure areas were determined by calculating average bycatch rates (number of extrapolated observed salmon/ MT pollock) within a 100 km^2 area (Figure 1). Observed values of bycatch rates are viewed by natural breaks to determine the spatial locations of bycatch ranges. Proposed rate based threshold criteria are established for delineating closures. If there are three or more grids of interest that exceed the established rate based threshold, an area closure is created. Under Closure '1' this threshold is set at an average bycatch rate that exceeds 0.123 Chinook/ pollock MT (Figure 2). While for Closure 2 and 3 the thresholds were set at 0.22 N/mt and 0.3967 N/mt (Figures 3 & 4) respectively. A summary table was calculated that examined the percentage of bycatch numbers inside a proposed closure area as well % of tows. During the analysis CPUE rates as well as bycatch rates would need to be identified both spatially and temporally before and after the area closure is triggered. The salmon workgroup recommended that additional rate based breaks be considered in formulating criteria for identifying closures such that a more defined and consistent range of rate breaks are considered (i.e. 0.1, 0,2, 0.3, 0.4…)

Within this example there are several hauls that have very high rates compared to the majority of sets in the time period. To normalize the effects of these few hauls the optimal method to depict bycatch rates would need to be analyzed. Preliminary concepts of this include: Transformations such as (log x+1), or normalizations as a percentage of the maximum rate or upper quartile may be warranted. Configurations of the closure areas would vary based on the method to display rates and will need to be fully evaluated in the analysis.

In addition to examining bycatch rates a second consideration would be to set an overall bycatch reduction goal and then spatially depict the contrast between closing off a large area to meet that bycatch reduction goal vs. amount of pollock catch outside of that area. Examples here are based on 2002-2006 combined data from the pollock A season for Chinook bycatch. This methodology is similar to the original creation of the CSSA; however the criterion would need to be specified in the regulations. Specific criterion would be analyzed to reduce overall bycatch numbers (i.e. reduction of 55, 75 or 90%) and then define those areas with the optimal boundaries for pollock harvest (Figure 5). One difficulty of achieving a larger reduction level with one or more large contiguous closures will be allowing for an economically viable pollock harvest (Figure 6).

<u>Series of closures based on triggered caps</u>

Rolling closures or closing set areas at set times may provide another option to reduce bycatch rates. One example of this approach is to look at the historic bycatch data by both year and month. Figures of this methodology use combined data from 1997-2006 for the Chinook A season. Historic bycatch rates are examined over a multi-year period (Figure 7). Candidate multiple closure areas would be set based on bycatch rate criteria (this example uses Chinook #s/mt > .221) prior to a fishing season (Figure 8). Once an initial trigger limit was reached an initial closure would occur that falls within the highest bycatch area (Figure 9). Bycatch rates would be tabulated on a week ending basis and reported to Inseason management. If a monthly tally indicates that current bycatch rates are lower than the average historic rate rolling closures areas would remain open in the following month. However, if bycatch is high inside of any closure areas that area would be closed for the rest of the season (February to April examples can be observed in Figures 10-12).

A similar stair step approach for a closure configuration based on bycatch hotspots (in numbers) could be a logical approach to address the spatial and temporal distribution of the fishery and bycatch levels (Figure 13-15). These closures would occur on a monthly basis once a specified trigger level was reached and would be additive (closures would not reopen).

Sequential closures could be set on a week to week basis as well. Patterns of fishing as well as bycatch rates change both spatially and temporally during the time period examined. One large consideration in a rolling or stair step set of closures would be Inseason monitoring and regulatory challenges. Staffing needs for Inseason monitoring would likely be greatly increased. Additionally setting regulations for an annual set of closures may be unrealistic. In addition to working with pre-determined closures areas developed prior to a season does not provide reductions for inseason high bycatch rates. Additional considerations for a closure configuration system still to be formulated and fully evaluated include: Closure duration based on historical hotspot duration as well as considering time/area bycatch stock composition in closure determinations.

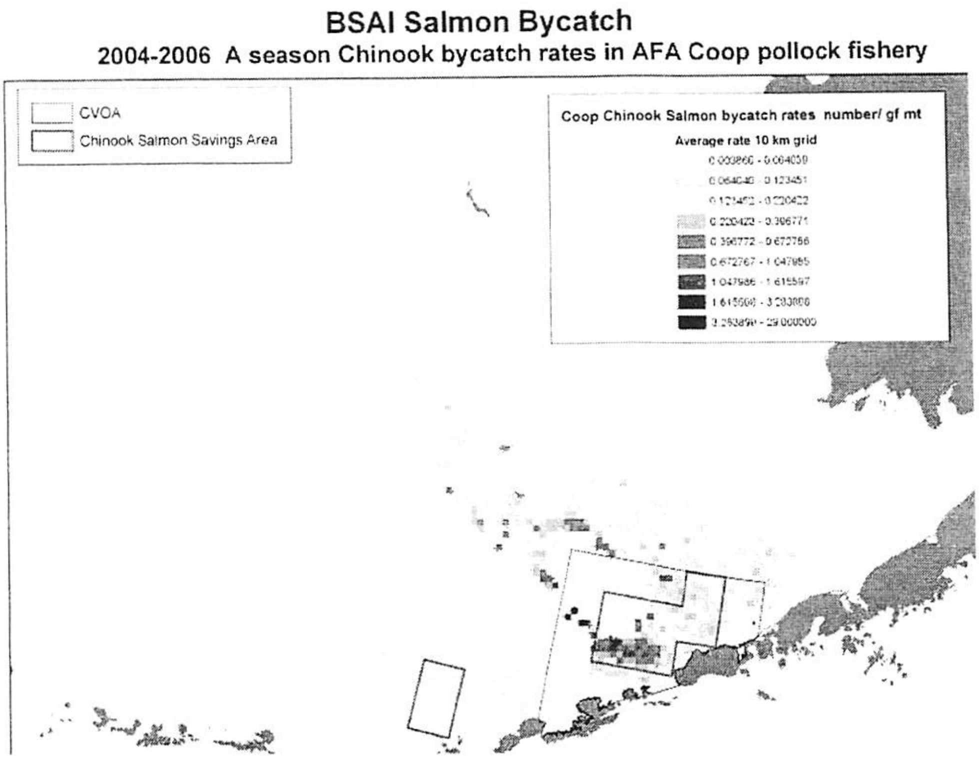

Figure 1. Average observed Chinook bycatch rates in the pollock A season 2004- 2006.

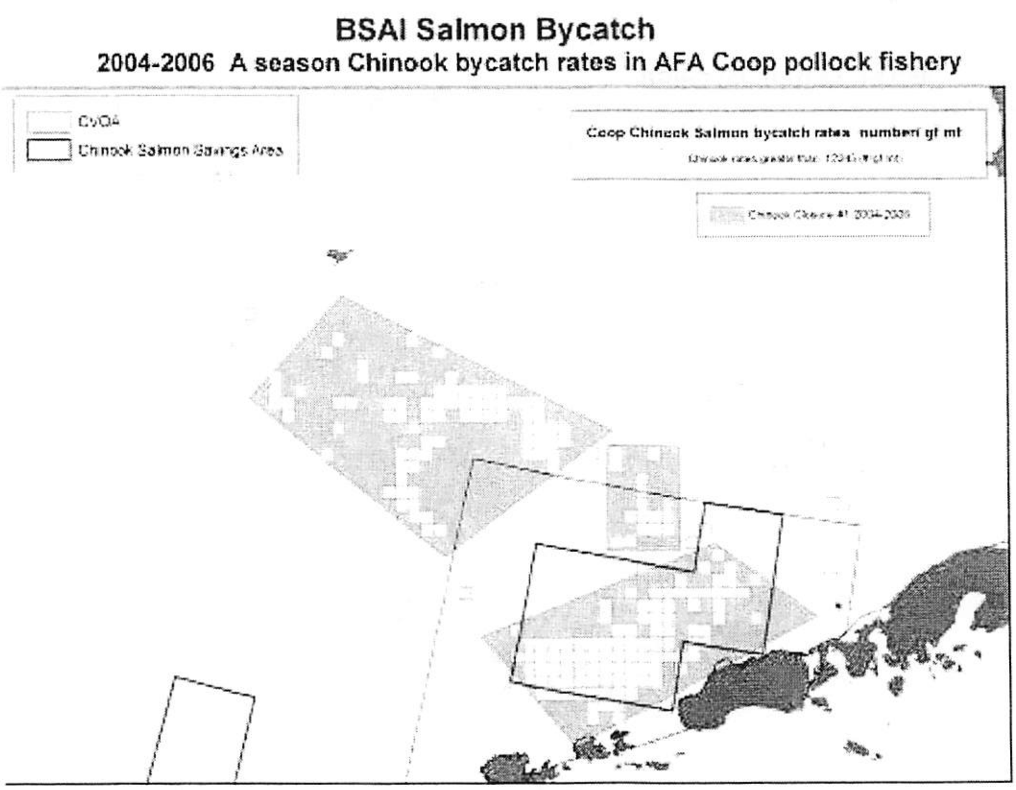

Figure 2. Example of Closure configuration #1 determined by threshold bycatch rate (.123 Chinook/pollock mt) using 2004-2006 observer estimates in the pollock A season.

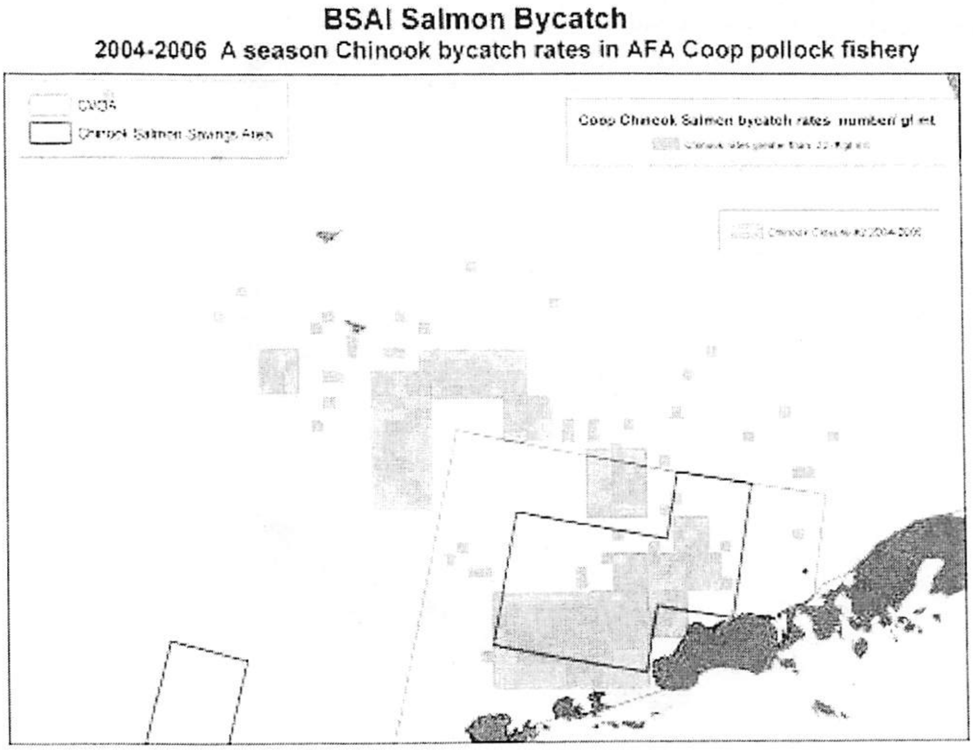

Figure 3. Example of Closure configuration #2 determined by threshold bycatch rate (.22 Chinook/pollock mt) using 2004-2006 observer estimates in the pollock A season.

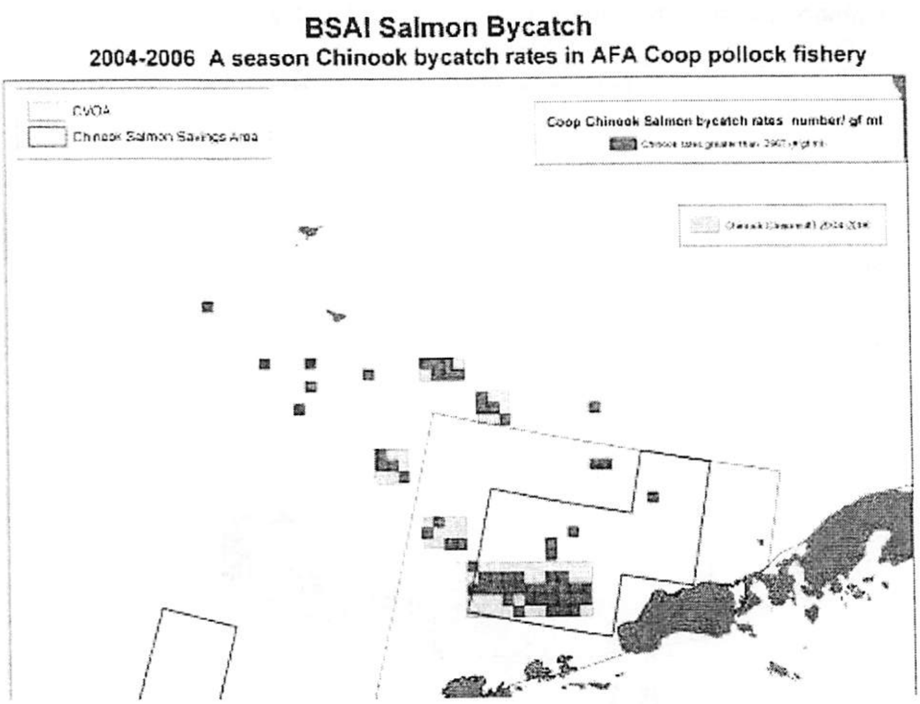

Figure 4. Example of Closure configuration #3 determined by threshold bycatch rate (.3967 Chinook/pollock mt) using 2004-2006 observer estimates in the pollock A season.

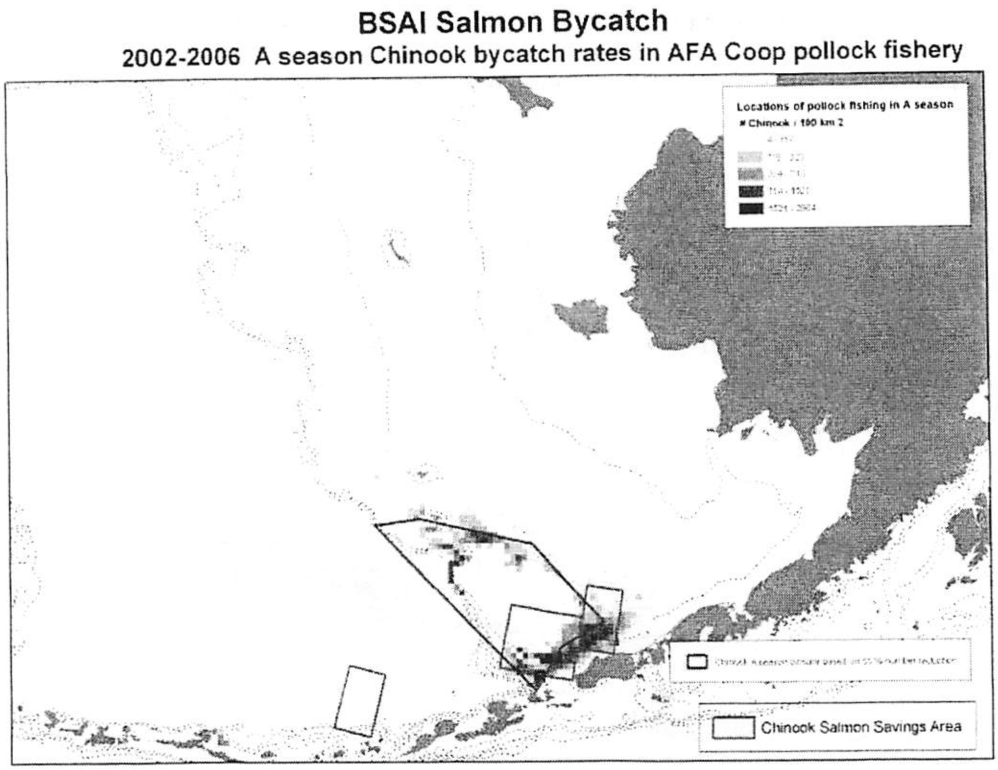

Figure 5. Example of Closure configuration based on overall bycatch reduction goal, example of 55% bycatch reduction based on 2002-2006 observed bycatch numbers and pollock CPUE.

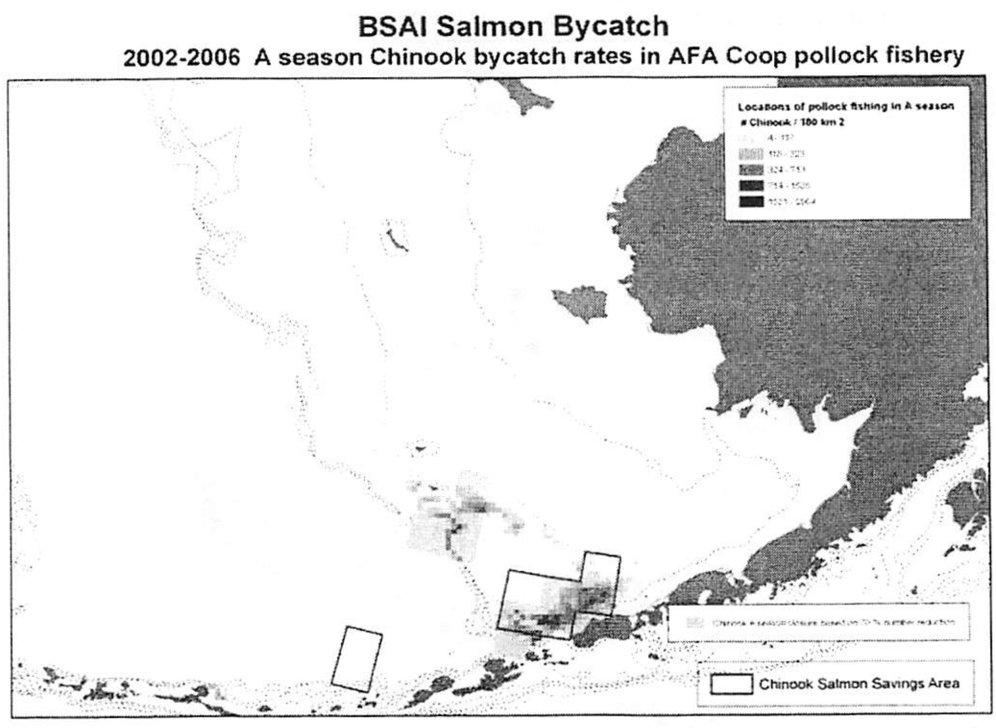

Figure 6. Example of Closure configuration based on overall bycatch reduction goal, example of 75% bycatch reduction based on 2002-2006 observed bycatch numbers and pollock CPUE.

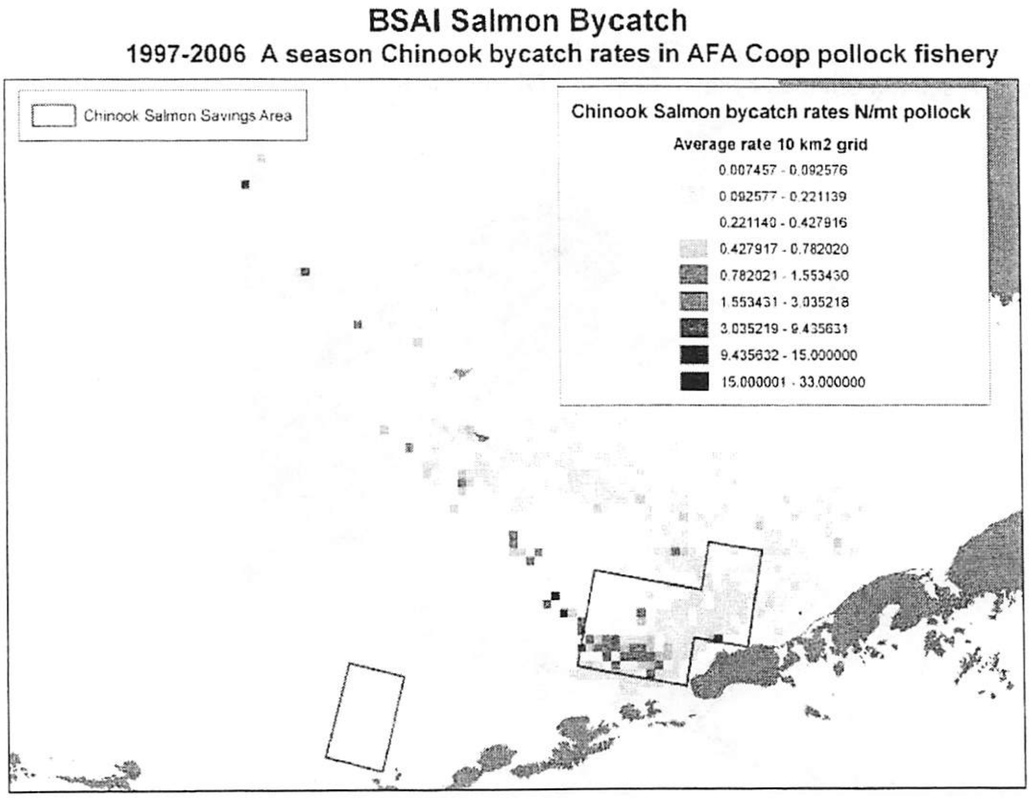

Figure 7. Average observed Chinook bycatch rates in the pollock A season 1997- 2006.

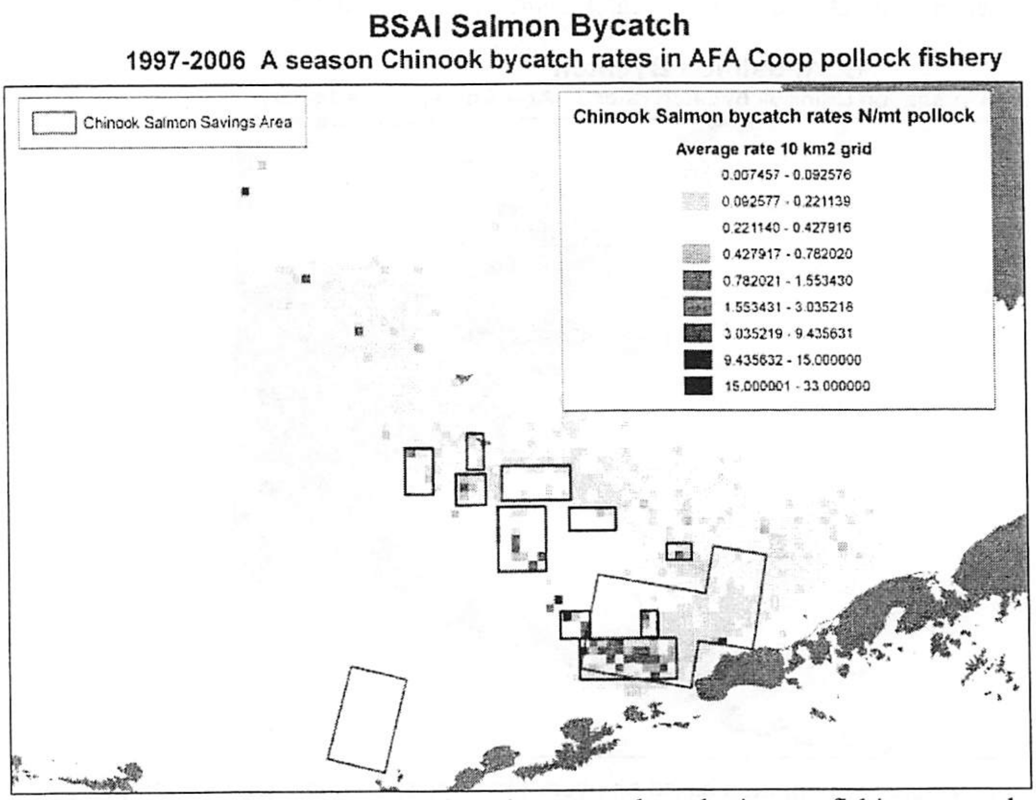

Figure 8. Example of multiple candidate closures evaluated prior to a fishing season by threshold bycatch rate (.221 Chinook/pollock mt) using 1997-2006 observer estimates in the pollock A season.

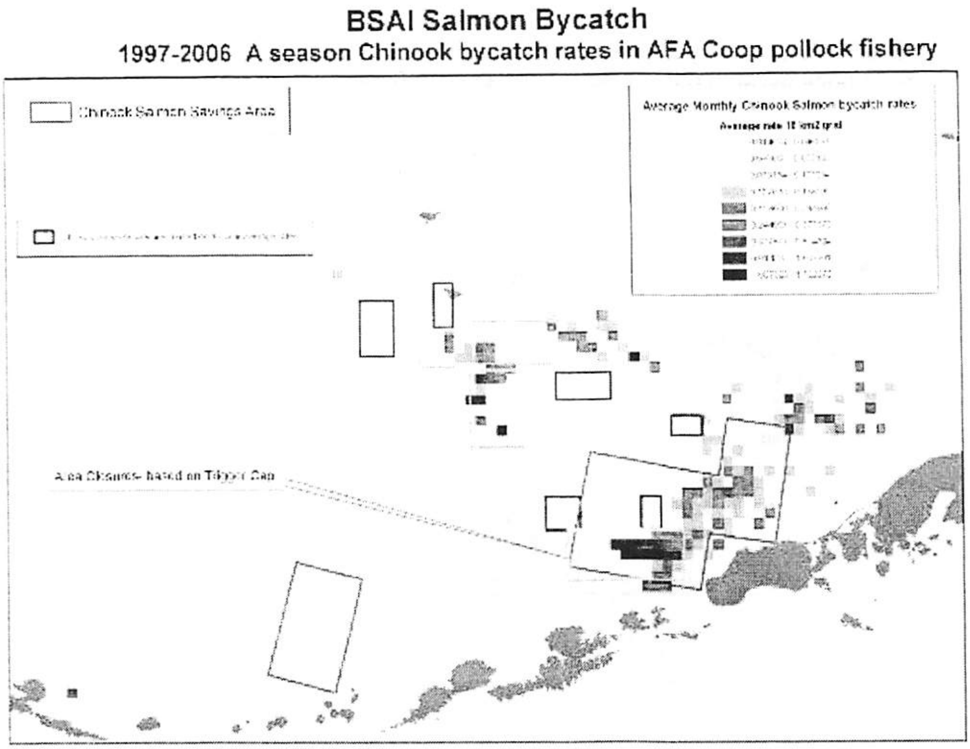

Figure 9. Example of triggered closures determined by threshold bycatch rate (.221 Chinook/pollock mt) using 1997-2006 observer estimates in the pollock A season, once a rate is reached in the area the entire block is closed.

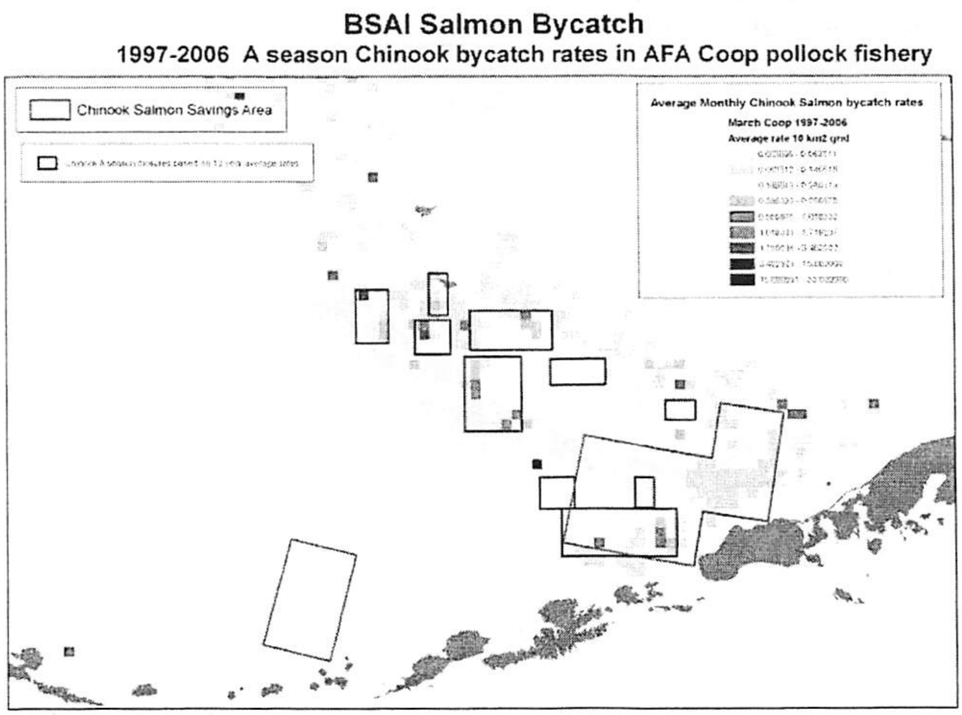

Figure 10. Examples of monthly trends of bycatch rates in relationship to multiple candidate closures evaluated prior to a fishing season based on January 1997-2006 average bycatch rates.

BSAI Salmon Bycatch
1997-2006 A season Chinook bycatch rates in AFA Coop pollock fishery

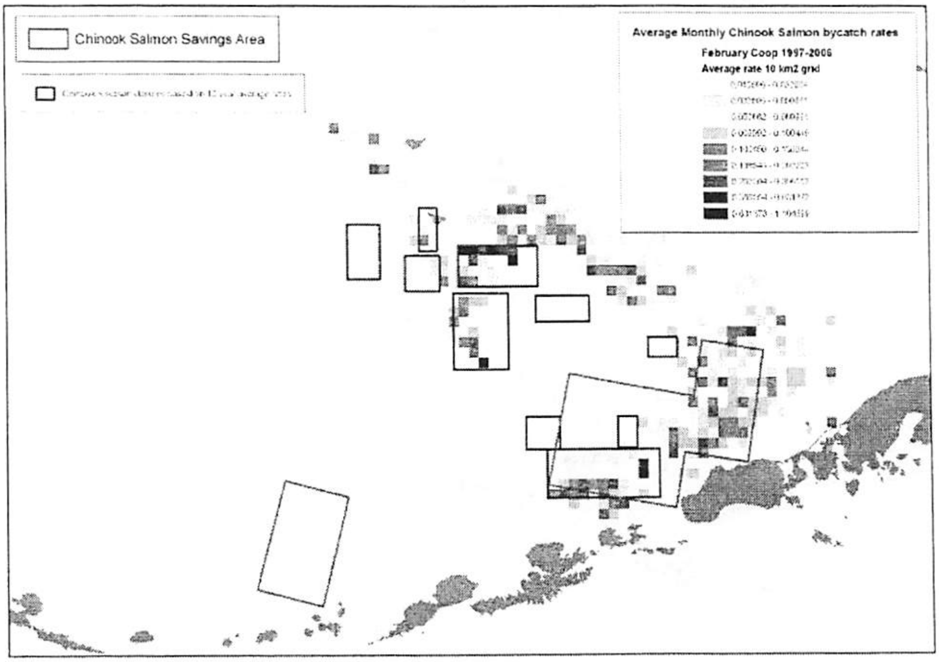

Figure 11. Examples of monthly trends of bycatch rates in relationship to multiple candidate closures evaluated prior to a fishing season based on February 1997-2006 average bycatch rates.

BSAI Salmon Bycatch
1997-2006 A season Chinook bycatch rates in AFA Coop pollock fishery

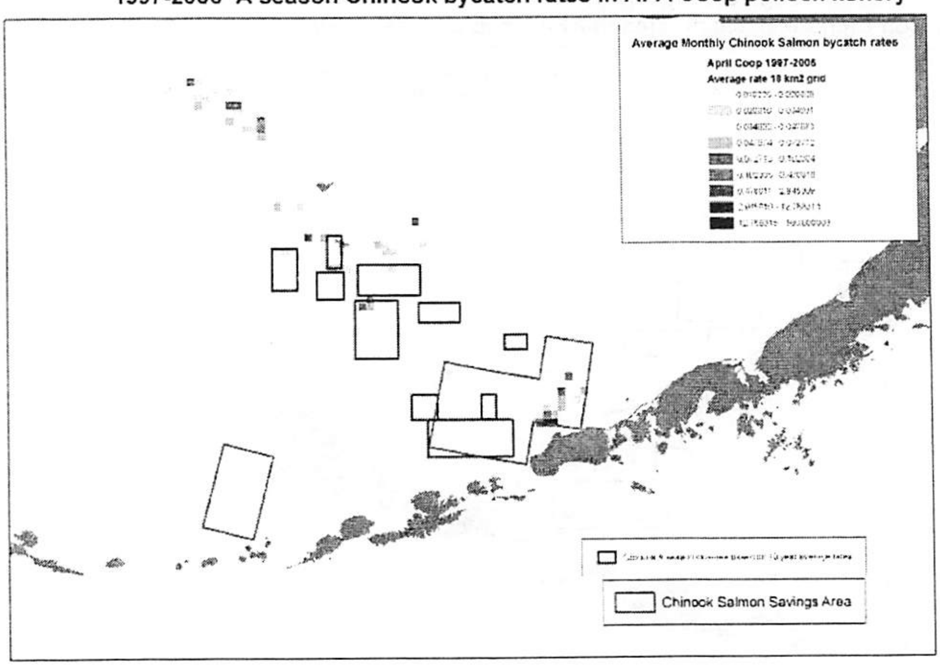

Figure 12. Examples of monthly trends of bycatch rates in relationship to multiple candidate closures evaluated prior to a fishing season based on March 1997-2006 average bycatch rates.

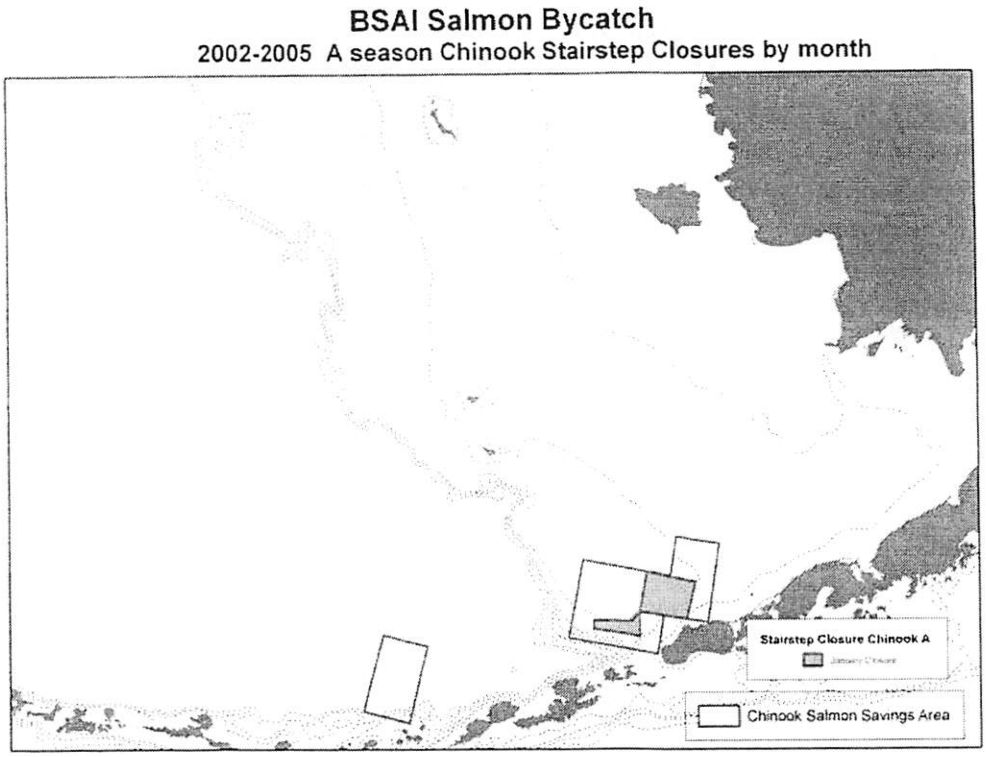

Figure 13. Example of monthly Chinook Closure in the A season based on bycatch hotspots and pollock CPUE, based on January 2002-2005 observed fishing effort.

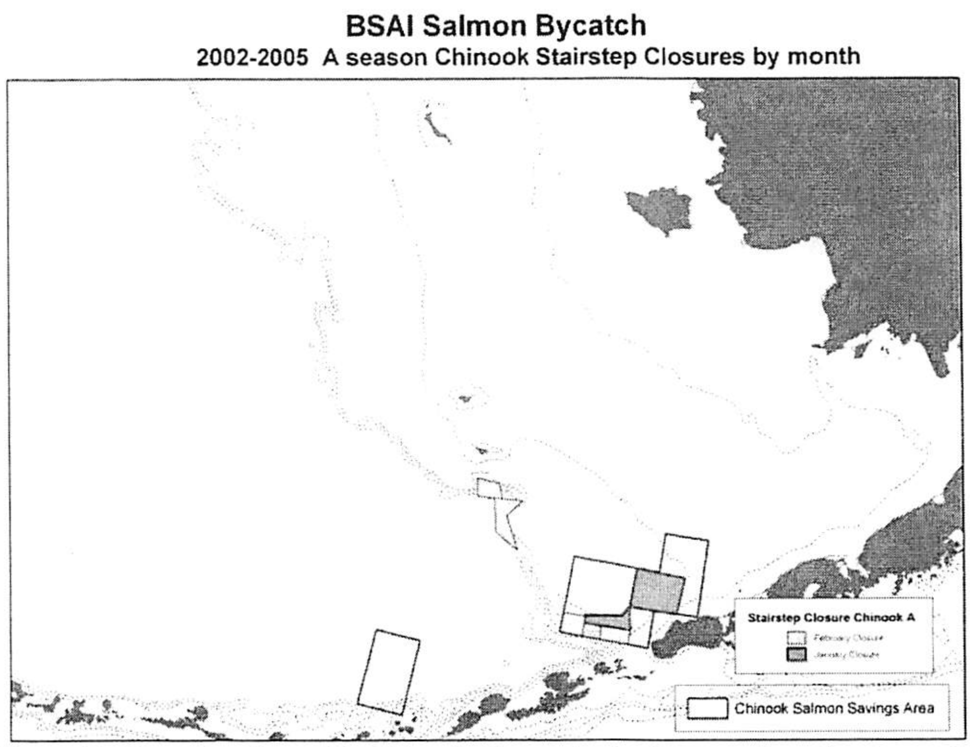

Figure 14. Example of monthly Chinook Closure in the A season based on bycatch hotspots and pollock CPUE, based on January and February 2002-2005 observed fishing effort.

BSAI Salmon Bycatch
2002-2005 A season Chinook Stairstep Closures by month

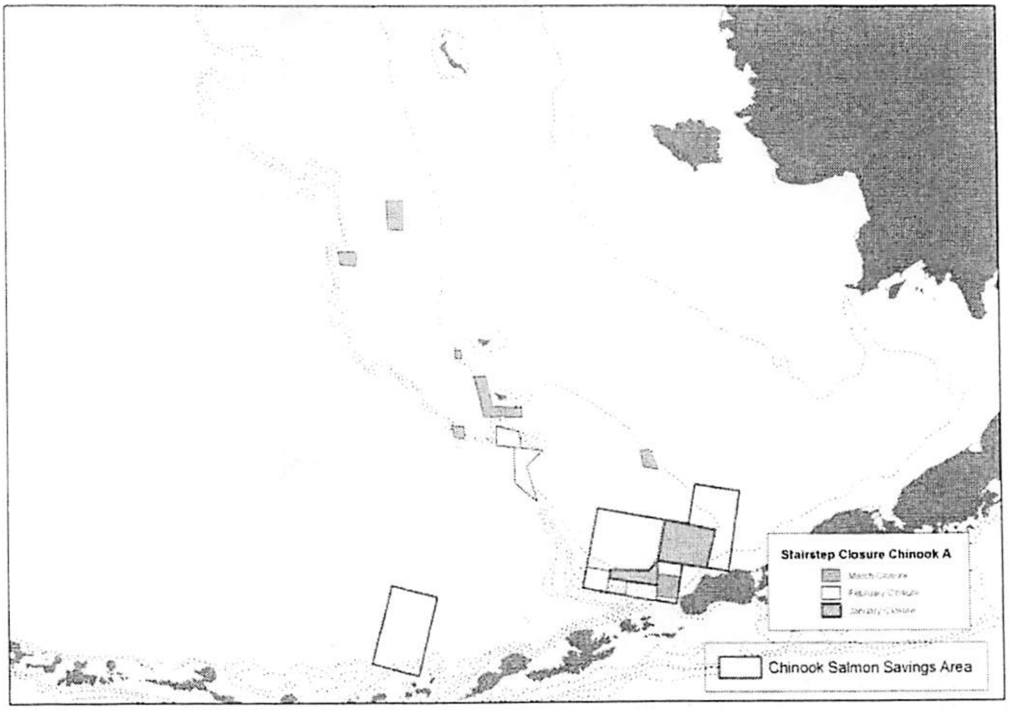

Figure 15. Example of monthly Chinook Closure in the A season based on bycatch hotspots and pollock CPUE, based on January, February, and March 2002-2005 observed fishing effort.

Discussion Paper: Optimal Salmon Bycatch Closure Design

By Alan Haynie, Alaska Fisheries Science Center [1]

Introduction

Since Amendment 84 suspended the Chinook and Chum Salmon Savings Areas (SSA), the North Pacific Fisheries Management Council (NPFMC) has decided that it is important to consider alternative time-area closures that would be in place behind the industry-operated Voluntary Rolling Hotspot (VRHS) system. This paper offers a discussion of important issues for consideration in closure design and a brief description of a methodology that could be used to identify potential candidate closures.

The experience of the SSA has illustrated how closures designed on historical bycatch may not be effective in reducing bycatch in the context of changing interactions of pollock and salmon. To illustrate this method, we focus here on the time-period from 2001-2006, but during future analysis, we will consider how much closures change with the inclusion/exclusion of different years of data.

The starting point for the design of these closures is to determine whether or not there are any time and area combinations that, if closed, would have reduced bycatch. Temporally, we consider closures lasting 2, 4, 6, and 8 weeks. Other closure lengths can be considered as deemed appropriate. Spatially, we consider closures ranging from 1-10 ADF&G statistical areas. As presented, this method uses statistical areas as the basis for

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the analysis, but any grid-size could be used as part of the same methodology. The method proposed here considers all options up to a 3-by-3 closure.[2]

A fundamental assumption of this methodology is that vessels reallocate effort from closed areas to open areas *proportional to other effort*. For example, if there were only three areas with 1/3 of the catch caught in each area, closing one area would lead to ½ of the catch being caught in each of the two areas that remains open. This is very different from assuming that the pollock effort vanishes with a closure and it means that in order for closures to be effective, there must be clean fishing areas available. Of course, depending on which areas are closed, the proportional reallocation may be limiting. We return to this in the discussion but here we believe that it is a good first approximation.

This method is "optimal" in the sense that it considers all of the potential area closures that could be created and then presents the costs of the salmon avoidance, in terms of both the size of the closure (in number of areas) and in the proportion of pollock catch reallocated by the closure.

When attempting to make a decision about what closure should actually be implemented, policy makers will undoubtedly wish to consider the costs of implementing any potential closure. A consideration of costs of closures involves a number of factors. Primary costs of salmon closures are 1) increased travel and search costs and 2) decrease in revenue resulting from a decrease in product value (either in lost roe or in lower value product). In the discussion section we outline our efforts to better assess these costs.

[2] Because of irregularly shaped closures near land, this grid can actually include 10 rather than 9 cells.

Methods

We consider the Chinook bycatch that would have been avoided if closures had been put in place and pollock fishing had been redistributed to other areas. The time period of reallocation is the week—for each week that a potential closure is in place, the historical average bycatch rate is applied to the historical pollock catch (adjusted for the catch redistributed by the closures). Closures examined here are for time periods of 2, 4, 6, and 8 weeks.

As displayed in Figure 1 below, we consider the closure of a base cell and the closure of each (and all) of its neighbors. As part of the analysis, we consider every statistical area as a base cell and calculate the reduction in salmon from closing the base cell and every combination of its neighbors.

Neighbor 1	Neighbor 2	Neighbor 3
Neighbor 8	**Base Cell**	Neighbor 4
Neighbor 7	Neighbor 6	Neighbor 5

Figure 1: Base cell display—each cell is an ADFG Statistical Area

In some cases, the ADF&G areas are not as regular as in Figure 1, so there are 10 neighbors for some base cells and fewer than 8 for those areas along the edge of the fishery.

The data for this analysis relies on observer data records from 2001-2006. For each week of the year, the number Chinook and pollock caught are summed and a

Chinook bycatch rate is calculated for each area. During the six-year period analyzed, fishing occurs in a total of 114 ADF&G statistical areas. For most time periods, however, many of the included statistical areas have no fishing activity.

The results presented below show the "best" closures for any given reduction in salmon. If more salmon can be avoided at a higher "cost" in terms of the redistribution of catch or the size of the closure, then the closure appears on the figures. Closures that are clearly inferior do not make it onto the figures. If an equal amount of salmon can be avoided but at a higher cost of reallocation or size of closure, then this potential closure is rejected, as clearly we would prefer the alternative closure with less reallocation for the same amount of salmon reduction. The figures presented below allow us (based on historical data) to examine potential trade-offs of salmon reduction with both the size of the closures and the degree of pollock catch reallocation.

Results

For all closure time-lengths, winter closures reduce salmon bycatch by more than summer closures, so the winter and summer periods are displayed separately. Figure 2 shows the number of salmon avoided by all potential closures of 2-8 weeks and the proportion of observed pollock catch redistributed during the closure period. Figure 3 displays the same information for summer closures, which have less salmon reduction per unit of pollock redistributed, though these closures may be desirable for other reasons (e.g. it's more expensive to close an area in the winter because of roe product value).

Figures 4 and 5 display the best closures by the number of statistical areas closed and the number of salmon avoided. Figure 4 shows the best winter closures, which again are also always better than the best summer closures in terms of the salmon avoided per area closed. Figure 5 shows the best summer closures.

There is a degree of subjectivity in choosing which point on these figures is optimal from a policy sense. All other things being equal, we would like to be as far to the left as possible on the graphs (more salmon avoided) and closer to the bottom (less area closed or salmon effort redistributed). No one would argue with a closure at the lower left point of the graph, but the appropriate point to be on the graph is a policy question. The marginal cost per salmon avoided is higher the steeper the line on the figures, so the cost of moving from one closure to another is much higher when there is a steep line connecting two closures, which are designated by the shapes in the figures.

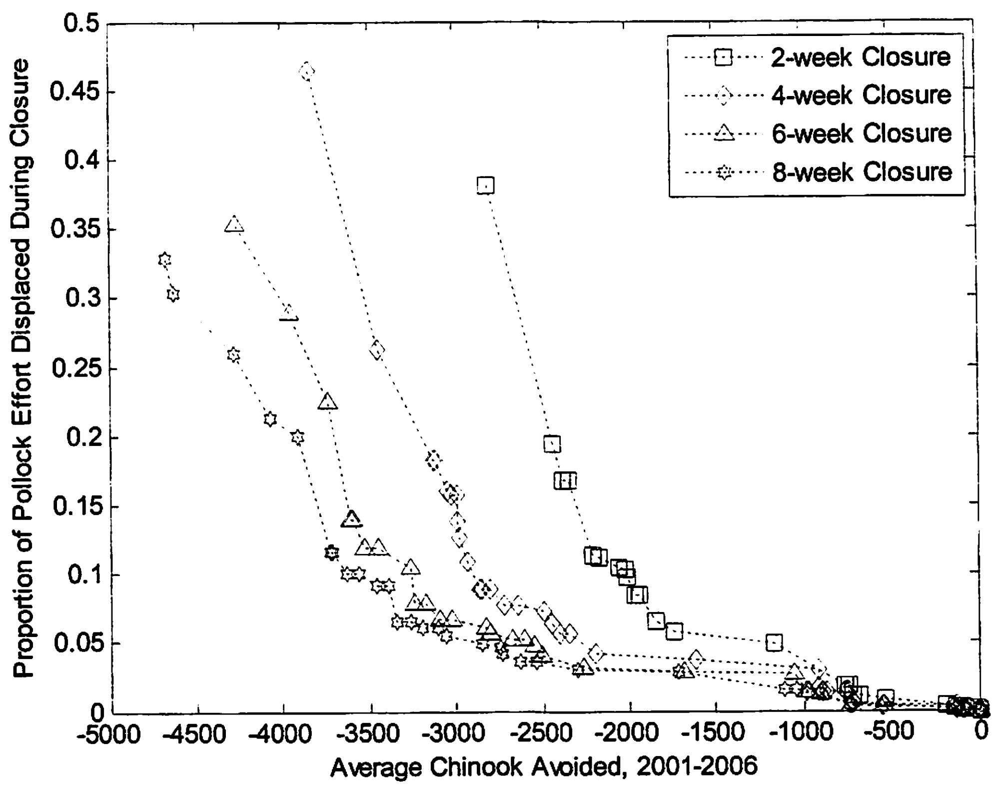

Figure 2: Average Chinook Avoided Per Year, 2001-2006 for Different Closure Lengths (All Winter Season Closures)

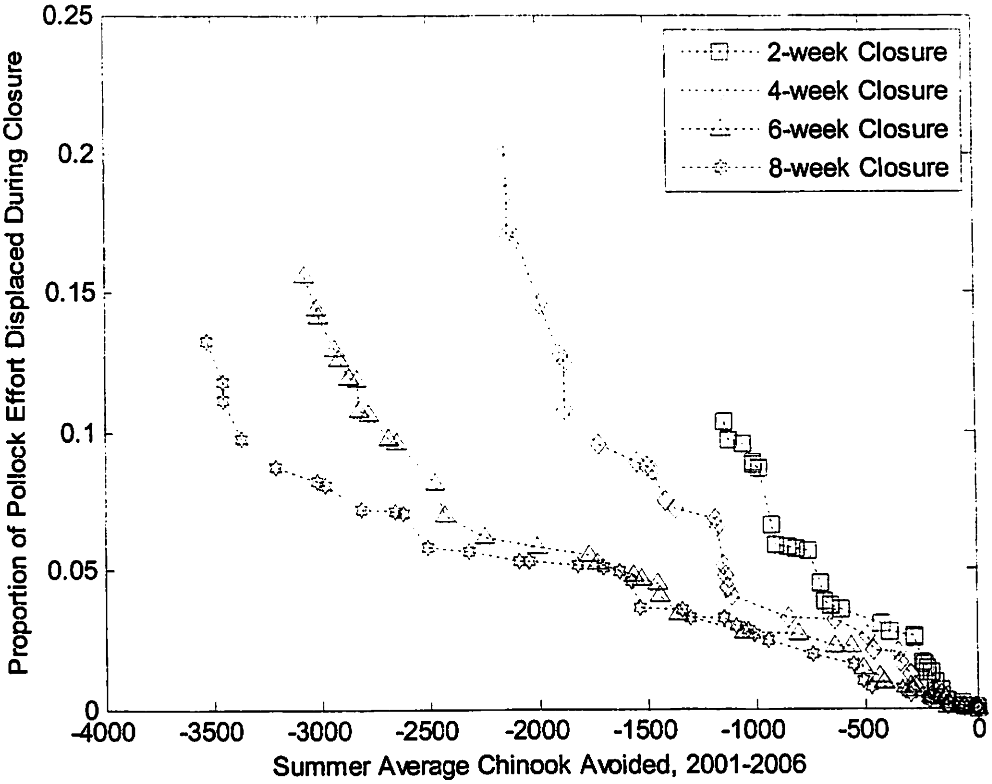

Figure 3: Average Chinook Avoided Per Year, 2001-2006 for Different Closure Lengths (Summer Season)

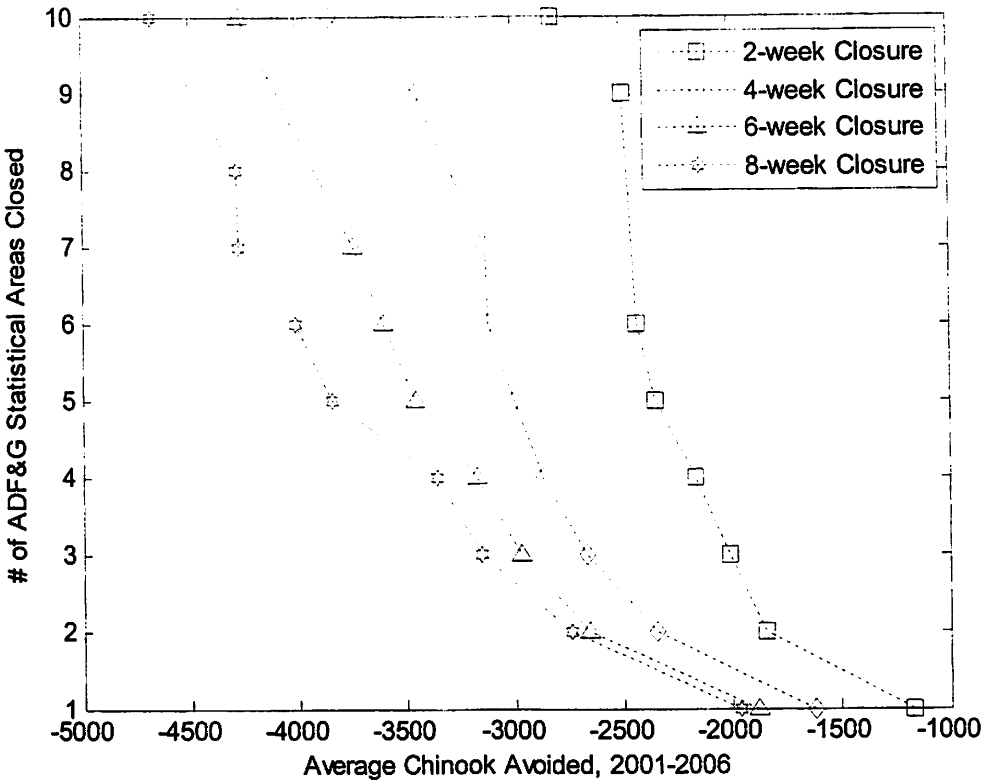

Figure 4: Average Chinook Avoided Per Year, 2001-2006 for Different Sized Closures (Winter Season)

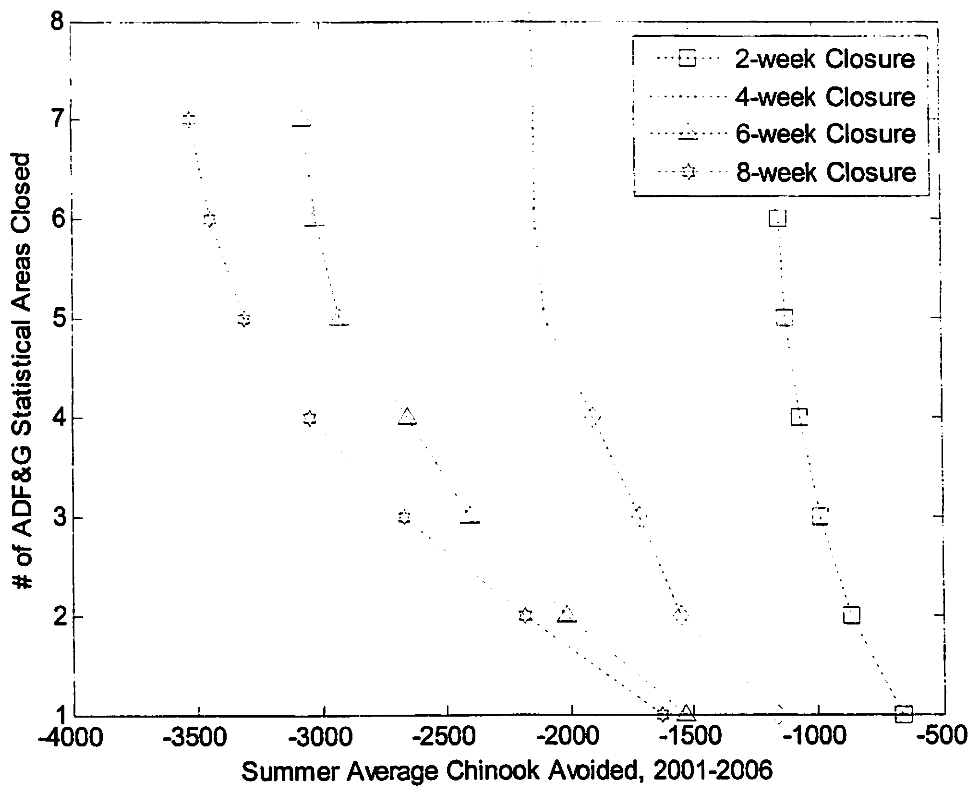

Figure 5: Average Chinook Avoided Per Year, 2001-2006 for Different Sized Closures (Summer Season)

Examining Several Potential Closures

There are a variety of closures that by the metrics above can achieve salmon reduction. There symbols in the graphs each represent a unique time-area closure, though in many cases these closures may be overlapping in time and space. For example, there may be a number of closures that include statistical area 655530 but with different combinations of weeks (week 2-3 or 3-4) or areas (all of the neighboring areas versus some of them). Figure 6 displays the "best" winter closure, in terms of Chinook avoided. This is an 8-week closure starting at the first week of the year, which would have led to a reduction of 4,675 Chinook per year. Creating the same area closure a week later (and also for 8 weeks) would have achieved the very similar results (4,626 Chinook avoided per year). This closure corresponds to the points that are the farthest left in Figure 2 and Figure 4.

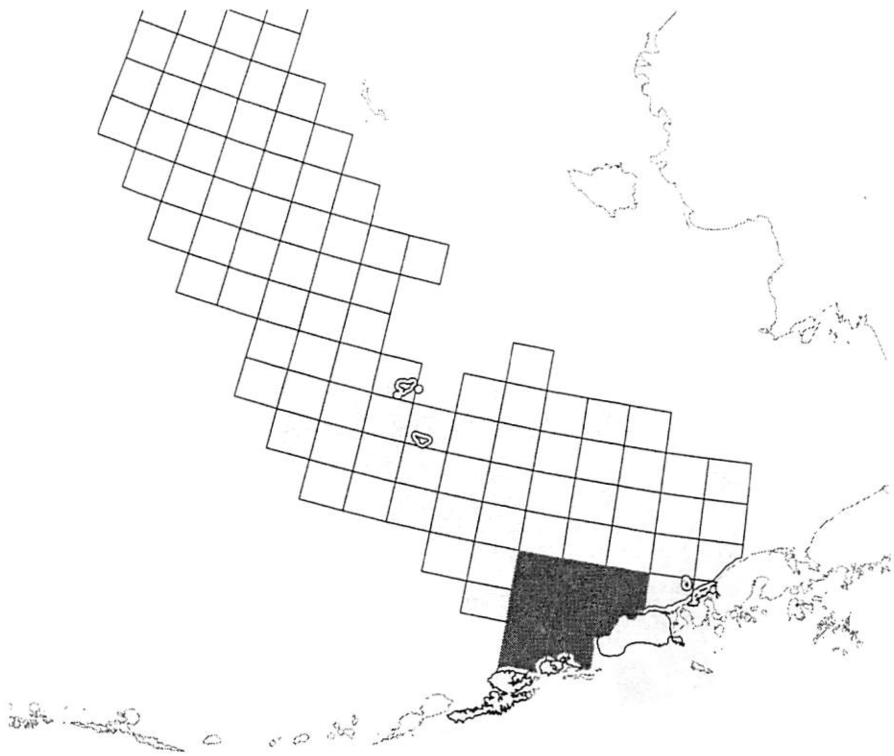

Figure 6: "Best" Winter Closure, in terms of Chinook Avoided

Below, Figure 7 illustrates one of the more effective summer salmon closures. This closure corresponds to the fourth point from the left on Figure 3, before the curve becomes significantly steeper. This is an 8-week closure beginning in week 32. This is essentially the end of the season – there are some years with an additional week, but this reflects the very high Chinook rates seen at the end of the year. This closure would have reduced Chinook bycatch by 3,372 per year. As can be seen in Figure 3, there are three potential closures that achieve slightly highly salmon reduction, but after a significant increase in the reallocation of catch. This closure might or might not be deemed to be "better" than one of the three closures that achieve a higher salmon reduction but at a greater cost.

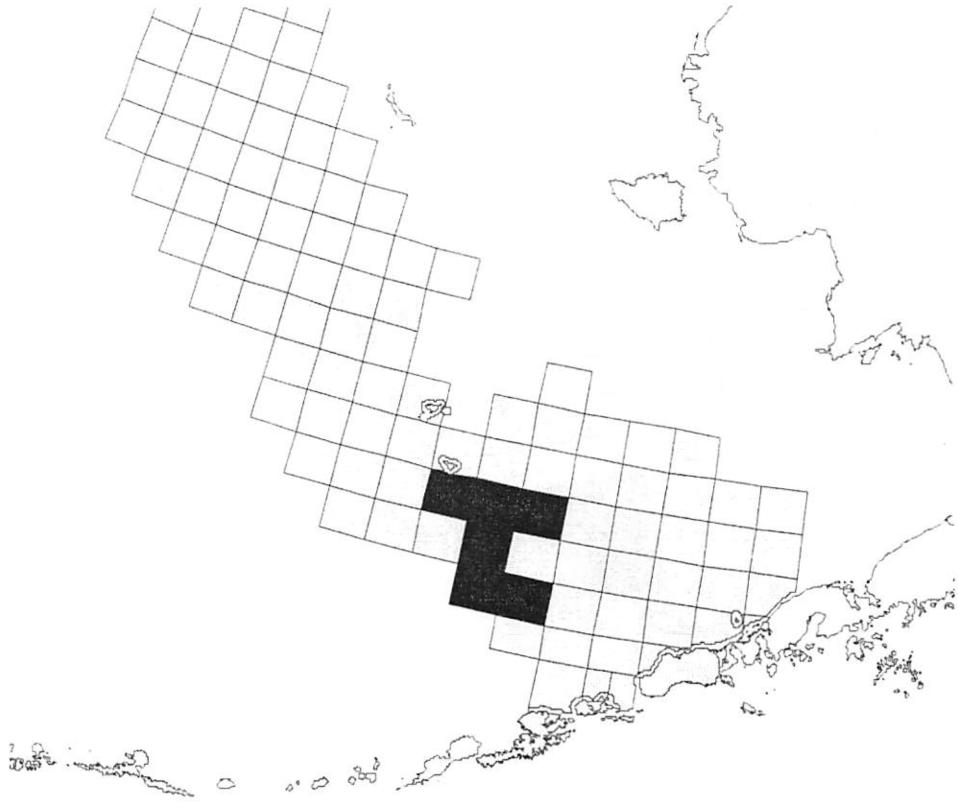

Figure 7: "Good" Summer Closure, in terms of Chinook Avoided and Pollock Reallocation

Other Considerations

One should be concerned that in creating any new closure that it would not account for the active management that Sea State has applied to the fishery during the period of historical data considered in this analysis. Overlaying the Sea State closures from 2001-early 2007 provides a map that has a great deal of overlap with Figure 6. Figure 8 displays a map of the number of days that areas of the pollock fishery have been closed during since the Sea State program started. This figure is interesting in that it is centered within the potential winter closure shown in Figure 6, because it suggests that despite the censoring of data by Sea State closures that the area identified by the optimization process remains a reasonable area to close. This may be due to the fact that Sea State could not designate areas early in the winter season during the time period analyzed.

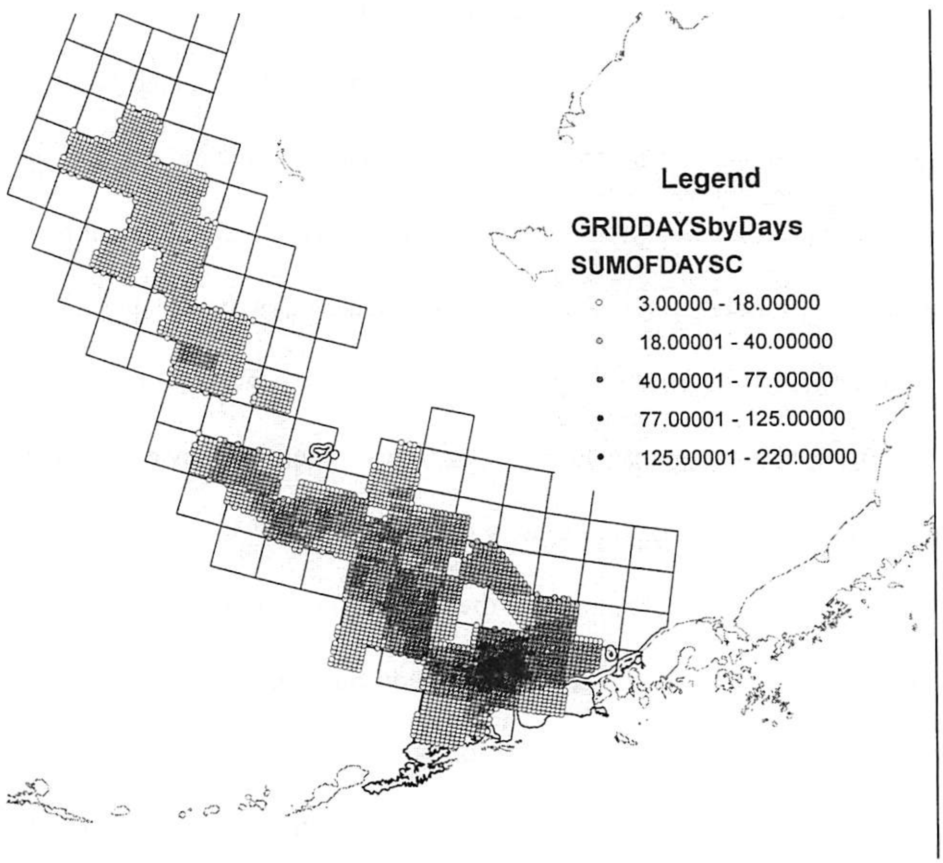

Figure 8: Overlay of Sea-State Closures in terms of days closed

Discussion

The results above show that there are a number of potential closures that could have potentially reduced Chinook bycatch over the last six years. We display the costs of this redistribution in terms of pollock catch reallocation and the size of the potential closures. Longer winter closures result in less reallocation of pollock effort than summer closures, but this does not account for other costs on the pollock fishery, namely the impact on roe recovery and quality. Not surprisingly, closing areas for a shorter period of time requires larger areas to be closed to achieve a comparable reduction in bycatch.

These results should be considered preliminary and illustrate how this method can be applied, but do not account for several important factors. We did not account for the presence of Sea State closures in this analysis, which may actually account for the hottest of hot spots. As discussed above, the overlay of closure days reduces but does not eliminate this concern. In fact, it may be the case that Sea State closures have closed some of the highest bycatch areas during other times of year so they do not appear to be desirable closures in this analysis. Future work will explore ways to more accurately and effectively incorporate these closures into the design of other closures.

Similarly, fishing was limited in the Salmon Savings Areas for some portion of the summer periods of the study, so predictions for the coming summers do not incorporate this information. Specifically, the Chum Savings Area was closed for all of the August and Chum and Chinook SSAs were in place for different periods between 2002 and 2006. In the forthcoming analysis, we will take several steps to address this shortcoming. We will run simulations which differentially weight bycatch rates for the non-SSA years and we will incorporate information from CDQ trips to estimate likely bycatch rates for these areas during the closure periods.

One key issue about these proposed closures is that the data are averaged over all years and thus the scale of salmon bycatch reduction may be imprecise for any given year. In some cases, the proposed closed areas are driven by an extremely high bycatch observation in one or two years rather than every year. Adjusting the method to close areas with the highest frequency of high bycatch in *every year* may alleviate the problem. However, this approach may fail to close the really dirty areas in some years. During the forthcoming analysis, we will simulate closures based on different time periods (e.g. 1997-2006, 2002-2006, 2004-2006) and will examine the impact of excluding different years. We can then explicitly consider candidate closures that offer different trade-offs between eliminating very high bycatch some years and eliminating a more modest level every year.

Another important issue is the whether or not the metrics included are good indices of the "cost" of a closure. Here we equate the cost with either the size of the closure or the percentage of the catch for a time-period that has to be reallocated from the closed area. We assume that reallocation is actually a better metric than the gross size of the closure, given that the statistical areas are actually arbitrary boxes around different-sized fishing grounds. In reality, primary costs of salmon closures are 1) increased travel and search costs and 2) decrease in revenue resulting from a decrease in product value (either in lost roe or in lower value product). We are currently analyzing methods other than proportional redistribution of effort to account for potential increases in travel costs. We are utilizing data on previous closures to directly assess the impact of the closures on travel distances. Research efforts with other researchers at AFSC are also attempting to better estimate the product quality impacts of closing different areas, but it is uncertain if this research will be able to be incorporated in this analysis.

In this study, the focus was on Chinook but the same method will be applied to chum bycatch and proposed summer closures. For any sized closure, we can also examine the feasible combinations of chum and salmon savings (or in some cases, the trade-off between the two).

The gains from these closures are in some sense relatively modest (less than 5,000 salmon per year), but the closures were in place for approximately ¼ of the fishing season (in the case of the 8-week closures). Longer or larger closures can easily be incorporated into the analysis.

MCA FOUNDATION

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To: Chris Oliver, ED NPFMC
From: John Gauvin,
Date: April 26, 2007
Re: Preliminary Results from Salmon Excluder EFP

Chris: Based on our conversation yesterday, we will plan to report to the Council in October on the last four field trials of the salmon excluder, specifically covering the work started in the fall of 2005 and concluded last March. This research is being done through a continuing partnership between Dr. Craig Rose of the Alaska Fisheries Science Center, John Gruver as the gear designer and inter-cooperative manager for the pollock cooperatives, and me as part of the cooperative research work I do for the Marine Conservation Alliance Foundation. To give you an idea of our findings, here's a quick look at what we learned.

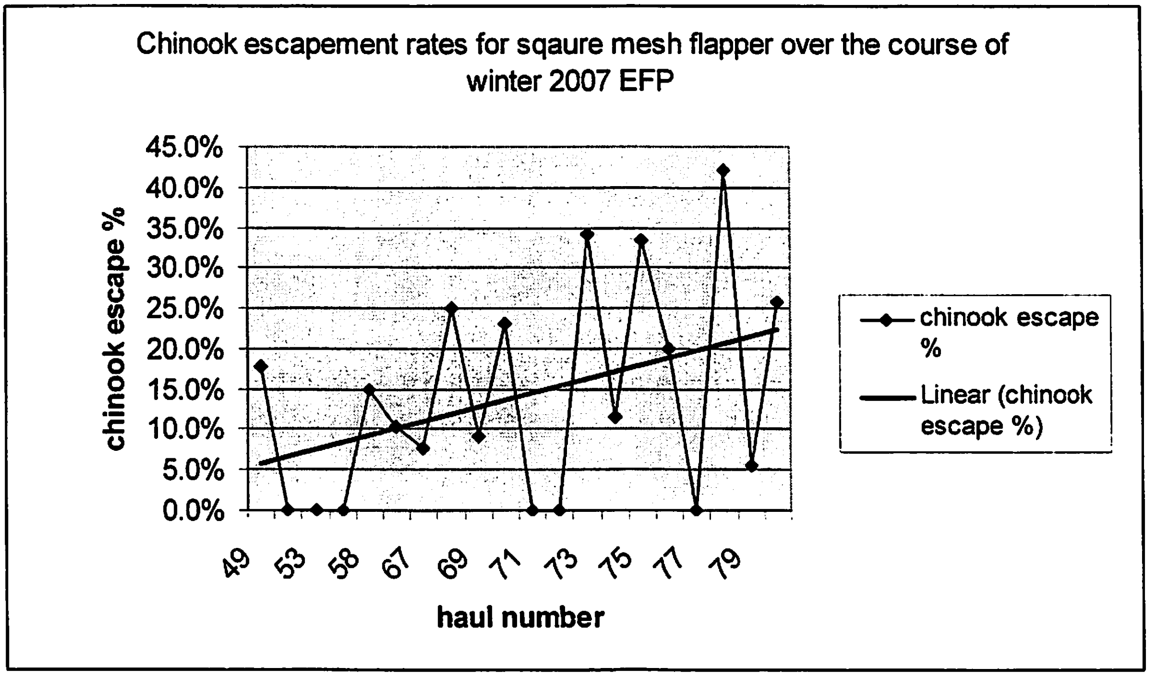
Our first three field trials concentrated on modifications to the funnel excluder design to address the bulge problem encountered in our earlier trials. In two of these three testing stages, we also evaluated performance of the funnel excluder on catcher processors given that all our earlier testing had utilized catcher vessels.

For the trails on catcher vessels, we managed to obtain more consistent performance on a tow by tow basis with chinook escapement rates of approximately 35%. For these, pollock escapement remained between 1-2%. Prior to this, we achieved comparable chinook salmon escapement on average but tended to see very inconsistent escapement rates. Unfortunately, despite several modifications to improve the transition between the diamond mesh intermediate and the square mesh funnel, when pollock catch rates were high, we continued to observe loss of trawl door spread and bulge problems.

On the catcher processor trials, we encountered difficulties sizing the funnel to the high degree of mesh opening ratios achieved by catcher processors due to their greater towing force and momentum. When pollock catch rates were low, we achieved some excellent salmon escapement but when catch rates were higher, bulge problems occurred and tended to be extreme. This was attributable to the fact higher-than-anticipated mesh opening ratios meant that our excluder funnel was somewhat undersized to begin with.

The most recent trials this winter/spring focused on a completely different approach to salmon escapement based on allowing salmon to egress then net during periodic slowdowns instead of attempting to slow down the water passing through the trawl intermediate. This "flapper device" appears to have no effect on catch passing through the trawl while towing and very minimal pollock escapement. With the flapper and periodic 10 minute slowdowns, the results were an average chinook escapement rate of 20%. This is a pretty encouraging result given the early stage of development of the flapper excluder. Even more encouraging were the trials we did once we completed sufficient testing for statistical validation of the results under our experimental design. At that point, we allowed the captain of the test vessel to vary the way slowdowns were done to see if higher escapement rates could be achieved. This resulted in some tows with chinook escapement in the 35-40% range. The figure below illustrates the increase in escapement rates once the captain and mate were allowed to vary to way slowdowns were conducted to attempt to maximize the escapement rate.

In October we plan to provide the Council with more detail regarding these findings, show some of the recent video of the flapper excluder, and give our assessment of the role we feel the salmon excluder can serve as one tool in the salmon bycatch reduction toolbox. We look forward to that opportunity.



AGENDA D-2
Supplemental
OCTOBER 2007

Western Interior Alaska Subsistence
Regional Advisory Council
c/o Office of Subsistence Management
101 12th Avenue, Room 110
Fairbanks, Alaska 99701
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Fax: 1-(907)-456-0208
E-mail: Vince_Mathews@fws.gov

RE
SE
N.P.F.M.C.

September 7, 2007

John Bundy, Vice Chair/Acting Chair
North Pacific Fishery Management Council
605 W 4th Avenue, Suite 306
Anchorage, Alaska 99501

Dear Vice Chair Bundy,

Attached is a re-submittal of the Western Interior Alaska Subsistence Regional Advisory Council's letter of January 2007 concerning high rate of salmon by-catch of the Bering Sea/Aleutian Islands (BSAI) pollock fishery. The Regional Council would like our letter considered during your discussions on the Salmon Bycatch Workgroup report during your upcoming meeting on October 3 - 9, 2007 at the Hilton Hotel in Anchorage.

If you or others have any questions, please contact myself (1-907-678-2007) or our coordinator, Vince Mathews at 1-907-456-0277.

Thank you in advance for your consideration of our concerns.

Yours truly,

Jack Reakoff

Jack Reakoff, Chair

cc: Pete Probasco, Assistant Regional Director, Subsistence
Rod Campbell, Fisheries Liaison, Office of Subsistence Management
Steve Klein, Chief, Fisheries Division, Office of Subsistence Management
Western Interior Regional Council members
Jill Klein, Yukon River Drainage Fisheries Association

Western Interior Alaska Subsistence
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c/o Office of Subsistence Management
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E-mail: Vince_Mathews@FWS.GOV

January 23, 2007

COPY

Stephanie Madsen, Chair
North Pacific Fishery Management Council
605 W 4th Avenue, Suite 306
Anchorage, Alaska 99501

Dear Chair Madsen:

The Western Interior Alaska Subsistence Regional Advisory Council (Council) met in Ruby, Alaska, on October 11-12, 2006. The Council represents all Western Interior subsistence communities and rural residents. The Council is authorized by the Alaska National Interest Lands Conservation Act (ANILCA), and chartered under the Federal Advisory Committee Act (FACA). ANILCA in Section 805 and the Council's charter recognize the Council's authority to "initiate, review and evaluate proposals for regulations, policies, management plans, and other matters related to subsistence uses of fish and wildlife on public lands within the region" and to "provide a forum for the expression of opinions and recommendations ... (on) any matter related to the subsistence uses of fish and wildlife on public lands within the region."

The Council has concern about the current efforts to reduce the salmon bycatch of the Bering Sea/Aleutian Islands (BSAI) pollock fishery. The Salmon Savings Areas and the Voluntary Rolling Hot Spot (VRHS) systems were developed and implemented to reduce the bycatch of salmon bound for the Western and Interior Alaska. The salmon bycatch has increased dramatically over the past six years from less than 10,000 Chinook salmon in 2000 to 75,000 in 2005. Studies in the 1990's shown that over 56% of the bycatch Chinook salmon in the BSAI fishery are of Western Alaskan origin and over 40% of those Western Alaskan Chinook are Yukon River stocks (*Salmon Bycatch in the Alaska Pollock Fishery Update,* Yukon River Drainage Fisheries Association 2006 flier). Based on this data, in 2005 over 13,000 Yukon River-bound Chinook salmon were bycatch in the BSAI fishery. This represents 27% of the 2005 subsistence catch and 47% of the Canadian border escapement goal. Invaluable salmon bound for our area to meet our subsistence and cultural needs are wasted as an undesirable by-product at an alarmingly increasing rate. This has to stop.

The Voluntary Rolling Hot Spot system, a self-policing of the pollock fleet effort, when developed was seen by in-river fishers as an effective option to reduce salmon bycatch but in practice it has failed and the bycatch numbers for Chinook and chum dramatically show that. The Council, representing subsistence fishers along the Yukon and Kuskokwim Rivers in the Western Interior Alaska Region, requests the North Pacific Fishery Management Council (NPFMC) take whatever steps are necessary reduce the salmon bycatch and take back control of the BSAI fishery to provide strong protection for returning salmon bound for Western and Interior Alaska. The continuation of these high bycatch rates will decimate Western and Interior Alaska salmon runs that have been central to the subsistence lifestyle for thousands of years.

The Council appreciates the NPFMC staff's past efforts to meet with Council leadership across the Yukon River drainage. The Council wants to continue that cooperative effort and believes that, through understanding, we can find common ground and by working together, we can protect the valuable wild resources of Alaska. We look forward to hearing from you regarding your ideas and plans to reverse the upward trend of salmon bycatch by the BSAI fishery.

If you have any questions, please contact our Vice-chair, Jack Reakoff or our Subsistence Council Coordinator, Vince Mathews. Mr. Reakoff can be reached at 1-907-678-2007; Mr. Mathews' contact information is in the letterhead.

Sincerely,

Jack Reakoff

For Ron Sam, Chair

cc: Mike Feagle, Federal Subsistence Board Chair
Pete Probasco, Assistant Regional Director, Office of Subsistence Management
Rod Campbell, Fisheries Liaison, Office of Subsistence Management
Don Rivard, Chief, Interior Regions Division, Office of Subsistence Management
Western Interior Regional Council members
Jill Klein, Yukon River Drainage Fisheries Association

World Wildlife Fund
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WWF

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September 20, 2007

Mr. John Bundy, Acting Chair
North Pacific Fishery Management Council
605 West 4th Street, Suite 306
Anchorage, AK 99501-2252

Mr. Doug Mecum, Regional Administrator
NOAA Fisheries, Alaska Region
709 W. 9th Street
Juneau, AK 99802-1668

Re: Salmon Bycatch D-2

Dear Mr. Bundy and Mr. Mecum,

The World Wildlife Fund (WWF) appreciates the opportunity to comment on the salmon bycatch measures being considered for analysis by the Council. WWF is a global conservation organization with over 1.2 million members in the US. WWF seeks science-based, non-partisan, collaborative, and creative solutions to conservation issues. In the North Pacific, we collaborate with colleagues in our Russian field offices in Vladivostok and Petropavlovsk to seek conservation solutions for the Kamchatka/Bering Sea Ecoregion. We submit this letter in support of salmon bycatch reduction efforts in the Bering Sea and Aleutian Islands (BSAI) pollock fisheries.

WWF commends the continued efforts of the Council to address salmon bycatch. The existing Salmon Savings Areas and the Voluntary Rolling Hot Spot (VRHS) program adopted under Amendment 84 represent admirable efforts by the Council to address salmon bycatch in the BSAI pollock fleet. Unfortunately, bycatch numbers for Chinook are currently at over 83,000 with approximately 6 weeks left in the pollock fishery – a 17% increase from the 2006 final bycatch numbers. WWF remains concerned the increasing bycatch of salmon in the BSAI pollock fishery may affect the health of salmon stocks that originate on the Russian and U.S. coasts of the Bering Sea. Therefore, WWF continues to recommend that the Council include alternatives in the analysis for soft or hard caps as a mechanism to reduce salmon bycatch in the BSAI pollock fishery.

Current measures are clearly insufficient to reduce salmon bycatch. Soft or hard caps would provide an additional tool to managers in the process of addressing increasing salmon bycatch. Additionally, the analysis should include consideration of fixed and indexed caps linked to salmon abundance. The analysis of both fixed and indexed caps would help identify advantages and disadvantages of each, informing the public and assisting the Council in making the best decision. Moreover, soft or hard caps may be designed in various ways to prevent unnecessary extreme measures such as complete seasonal fishery closures.

Due to the large number of Alaska Native communities affected by this decision, WWF also encourages the Council to engage in meaningful consultation with the Alaska Native tribes as required by the Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994), and Executive Order 13175, *Consultation and Coordination With Indian Tribal Governments* (2000). Several Alaska Native tribes depend heavily on the king and chum salmon runs in Western Alaska.

The Alaska Native tribes must be allowed adequate opportunity to provide input consistent with the authority granted under the Executive Orders.

Therefore, WWF encourages the Council to include the consideration of hard and soft caps as alternatives for the Salmon Bycatch agenda item D-2 as it moves forward with its analysis.

Thank you for your time and consideration of these comments.

Respectfully,

Alfred Lee "Bubba" Cook Jr.
Kamchatka/Bering Sea Ecoregion Senior Fisheries Program Officer
World Wildlife Fund

BSFA
Bering Sea Fishermen's Association
110 E. 15th Avenue, Unit A
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September 26, 2007

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Mr. John Bundy, Vice Chair/Acting Chair
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, AK 99501

Jim Balsiger, Regional Administrator
NOAA Fisheries, Alaska Region
709 W. 9th Street
Juneau, AK 99802

Re: Salmon Bycatch, Agenda Item D-2(a)(b)

Dear Mr. Bundy and Mr. Balsiger:

The Bering Sea Fishermen's Association (BSFA) is grateful for the opportunity to comment on the issue of salmon bycatch. Salmon bycatch numbers are at record highs again this year, with 85,573 Chinook salmon caught as bycatch as of September 10, 2007.[1] Therefore, BSFA recommends that the Council promptly move the Amendment 84B package forward with the broad range of alternatives recommended by the, Council appointed, Salmon Bycatch Workgroup and to adopt management measures which will successfully reduce the number of salmon caught as bycatch.

Salmon bycatch in the pollock fleet have risen dramatically in the past 5 years, and at current rates this year's Chinook salmon bycatch numbers will likely exceed last year's nearly record high of 87,500 Chinook salmon. It is time that the Council implement management measures to augment or replace the provisions of Amendment 84A. Allowing additional time within the Voluntary Rolling Hot Spot System prevents us from achieving the mandate of Magnuson-Stevens Act Standard 9 to "minimize bycatch" as the VRHS system continues to produce record high Chinook salmon bycatch numbers. BSFA recommends that the Council place an upper limit on the amount of salmon which can be caught as bycatch.

While Chinook salmon bycatch numbers have climbed to new highs, Western Alaskan Chinook salmon runs, and other Pacific Stocks have not seen corresponding increases. Rather, runs in the Yukon, Kuskokwim and

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[1] Non-CDQ numbers from NMFS AKRO Catch Accounting System (Sept. 10, 2007). CDQ numbers *at* http://www.fakr.noaa.gov/cdq/daily/cdqctd07.pdf (Sept. 10, 2007).

Nushagak rivers this year were below average, and well below the Alaska Department of Fish and Game run forecasts. The 2007 Chinook salmon run in the Yukon River was 70,000 fish short of the pre-season projection. In both the Kuskokwim and Nushagak rivers, the Chinook salmon runs were 100,000 fish short of pre-season projections this year. The outlook for 2008 is expected to be worse (Sandone, 2007 bycatch working group).

While subsistence needs were generally met in Alaska, only a small commercial harvest of 33,629 Yukon River Chinook salmon was allowed in the US while the Canadian commercial and sport fisheries were closed. This commercial harvest was 30% below the recent 10-year average of 58,254[2] , during a time period which several AYK stocks have been listed as a Stocks of Yield Concern by the Alaska Board of Fish. Recent Yukon River returns are about 100,000 short (harvestable fish) of the 1980's average during a time when US BSAI pollack fisheries by-catch was about ½ (40k) of recent years.

The recommendations put forward by the Salmon Bycatch Workgroup on the methodologies for determining a cap number represent a broad range of alternatives. While this broad range may be necessary for analytical purposes, it is our position that an applied cap shall not exceed historic bycatch levels, particularly with the associated poor runs in Western Alaska. Further, any cap numbers which exceed pre-2002 bycatch numbers may violate the United States' treaty obligations in the Yukon River Salmon Agreement. Through the Yukon River Salmon Agreement, the U.S. and Canada are both bound 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."[3]

As Chinook salmon runs in Western Alaska remain low with several stocks including Yukon River and Norton Sound Chinook salmon listed as Stocks of Concern, it is essential that salmon bycatch in the pollock fleet is reduced. To this end we urge the Council to continue to move forward promptly and adopt a salmon bycatch cap which will effectively reduce the *number* of salmon caught as bycatch.

Sincerely,

Karen Gillis
Executive Director

---

[2] *Id.*
[3] Pacific Salmon Treaty, Annex IV Chapter 8 (27)(Yukon River Salmon Agreement)(2002).

BSFA

Bering Sea Fishermen's Association

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Anchorage, Alaska 99501
(907) 279-6519 or (888) 927-2732
FAX (907) 258-6688

Serving western Alaska small boat fisheries since 1980

September 26, 2007

KAREN GILLIS, BERING SEA FISHERMEN'S ASSOCIATION (BSFA)

Currently the Executive Director of the Bering Sea Fishermen's Association, Karen Gillis has been with BSFA since 1992. Ms. Gillis has increasingly expanded her involvement in Alaska's fisheries industry focusing on economic development, salmon marketing, marine and freshwater salmon research and international relations. Ms. Gillis has the honor of participating in many different forums related to western Alaska. Ms. Gillis serves the Bering Sea Fishermen's Association as a representative of the following:

North Pacific Anadromous Fish Commission, U.S. Advisor;
Arctic-Yukon-Kuskokwim Sustainable Salmon Initiative;
Norton Sound Research and Restoration Initiative;
Western Alaska Salmon Stock Identification Program Advisory Committee;
Alaska Fisheries Development Foundation Member;
Yukon River Joint Technical Committee;
Kuskokwim Fisheries Research Coalition; and
Arctic-Yukon-Kuskokwim Coalition.

The focus of Ms. Gillis' position ensures that she works closely with state and federal oversight agencies to promote responsible development in line with preserving our marine and freshwater resources for the future.

YUKON RIVER DRAINAGE FISHERIES ASSOCIATION

September 25, 2007

Mr. John Bundy, Vice Chair/Acting Chair
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, AK 99501

Jim Balsiger, Regional Administrator
NOAA Fisheries, Alaska Region
709 W. 9th Street
Juneau, AK 99802

Re: Salmon Bycatch, Agenda Item D-2(a)(b)

Dear Mr. Bundy and Mr. Balsiger:

The Yukon River Drainage Fisheries Association (YRDFA) appreciates the opportunity to comment again on the issue of salmon bycatch. Salmon bycatch numbers are at record highs again this year, with 85,573 Chinook salmon caught as bycatch as of September 10, 2007.[1] The Yukon River Chinook salmon run on the other hand was below average this year. We therefore ask the Council to move the Amendment 84B package forward quickly with the broad range of alternatives recommended by the workgroup and to adopt management measures which will effectively reduce the number of salmon caught as bycatch.

Salmon bycatch in the pollock fleet has been rising steadily over the past years, and at current rates this year's Chinook salmon bycatch numbers will likely exceed last year's nearly record high of 87,500 Chinook salmon. In fact, Chinook salmon bycatch numbers at this level have not been seen since the days of foreign fishing days in 1979 and 1980 (Figure 1). While Chinook salmon bycatch numbers have climbed to new highs, Western Alaskan Chinook salmon runs have not seen comparable increases. Rather, runs in the Yukon, Kuskokwim and Nushagak rivers this year were below average, and well below the Alaska Department of Fish and Game run forecasts. The 2007 Chinook salmon run in the Yukon River was 70,000 fish short of the pre-season projection. In both the Kuskokwim and Nushagak rivers, the Chinook salmon runs were 100,000 fish short of pre-season projections this year.

[1] Non-CDQ numbers from NMFS AKRO Catch Accounting System (Sept. 10, 2007). CDQ numbers *at* http://www.fakr.noaa.gov/cdq/daily/cdqctd07.pdf (Sept. 10, 2007).

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WWW.YUKONSALMON.ORG

On the Yukon River, only 23,000 Chinook salmon crossed the border into Canada, falling far short of the border passage goal of 45,500 Chinook salmon necessary to meet the Canadian escapement goal agreed upon by the U.S. and Canada through the Yukon River Panel.[2] While subsistence needs were generally met in Alaska, only a small commercial harvest of 33,629 Chinook salmon was allowed. This commercial harvest was 30% below the 10-year average of 58,254.[3] Because of the shortfall, no commercial or domestic fisheries were allowed in Canada, although aboriginal (First Nations subsistence) fishing was allowed.[4]

Given the low Chinook salmon runs returning to Western Alaska streams in a year of extremely high bycatch, it is imperative that the Council consider management measures to augment or replace the provisions of Amendment 84A, which instituted the Voluntary Rolling Hot Spots System. As this new system continues to produce record high Chinook salmon bycatch numbers, it is essential that the Council place an upper limit on the amount of salmon which can be caught as bycatch. The recommendations put forward by the workgroup on the methodologies for determining a cap number represent a broad range of alternatives. While this broad range may be necessary for analytical purposes, it is our position that any cap number which exceeds historic bycatch levels, particularly with the associated poor runs in Western Alaska, will not achieve the mandate of Magnuson-Stevens Act Standard 9 to "minimize bycatch." Further, any cap numbers which exceed pre-2002 bycatch numbers may violate the United States' treaty obligations in the Yukon River Salmon Agreement. Through the Yukon River Salmon Agreement, the U.S. and Canada are both bound 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."[5]

As Chinook salmon runs in Western Alaska remain low with several stocks including Yukon River and Norton Sound Chinook salmon listed as Stocks of Concern, it is essential that salmon bycatch in the pollock fleet is reduced, not increased as in recent years. To this end we urge the Council to continue to move forward quickly in adopting a salmon bycatch cap which will effectively reduce the *number* of salmon caught as bycatch.

Sincerely,

Rebecca Robbins Gisclair

---

[2] Alaska Department of Fish and Game, 2007 Preliminary Yukon River Summer Season Summary, 2007 Yukon River Summer Salmon Fishery News Release #61 (Sept. 4, 2007).
[3] *Id.*
[4] *Id.*
[5] Pacific Salmon Treaty, Annex IV Chapter 8 (27)(Yukon River Salmon Agreement)(2002).

Figure 1. Chinook Salmon Bycatch in the Bering Sea/Aleutian Islands (BSAI) Groundfish Fishery 1977-2007[6]

Year	Number of Chinook Salmon
1977	47,840
1978	44,548
1979	107,706
1980	115,036
1981	36,218
1982	15,644
1983	10,334
1984	11,274
1985	11,069
1986	9,237
1987	22,221
1988	30,320
1989	40,354
1990	13,990
1991	35,766
1992	37,372
1993	46,014
1994	43,821
1995	23,436
1996	63,205
1997	50,530
1998	55,431
1999	12,937
2000	8,223
2001	40,547
2002	39,684
2003	55,594
2004	63,138
2005	74,975
2006	87,781
2007	85,573

[6] 1977-1992 numbers are from David Witherell, *A Brief History of Bycatch Management Measures for Eastern Bering Sea Groundfish Fisheries*, MARINE FISHERIES REVIEW (Fall 1997). 1993-2007 numbers are from the NMFS AKRO Catch Accounting System, accessed March 30, 2007 and September 10, 2007, and http://www.fakr.noaa.gov/cdq/daily/cdqctd07.pdf, accessed March 30, 2007 and September 10, 2007.

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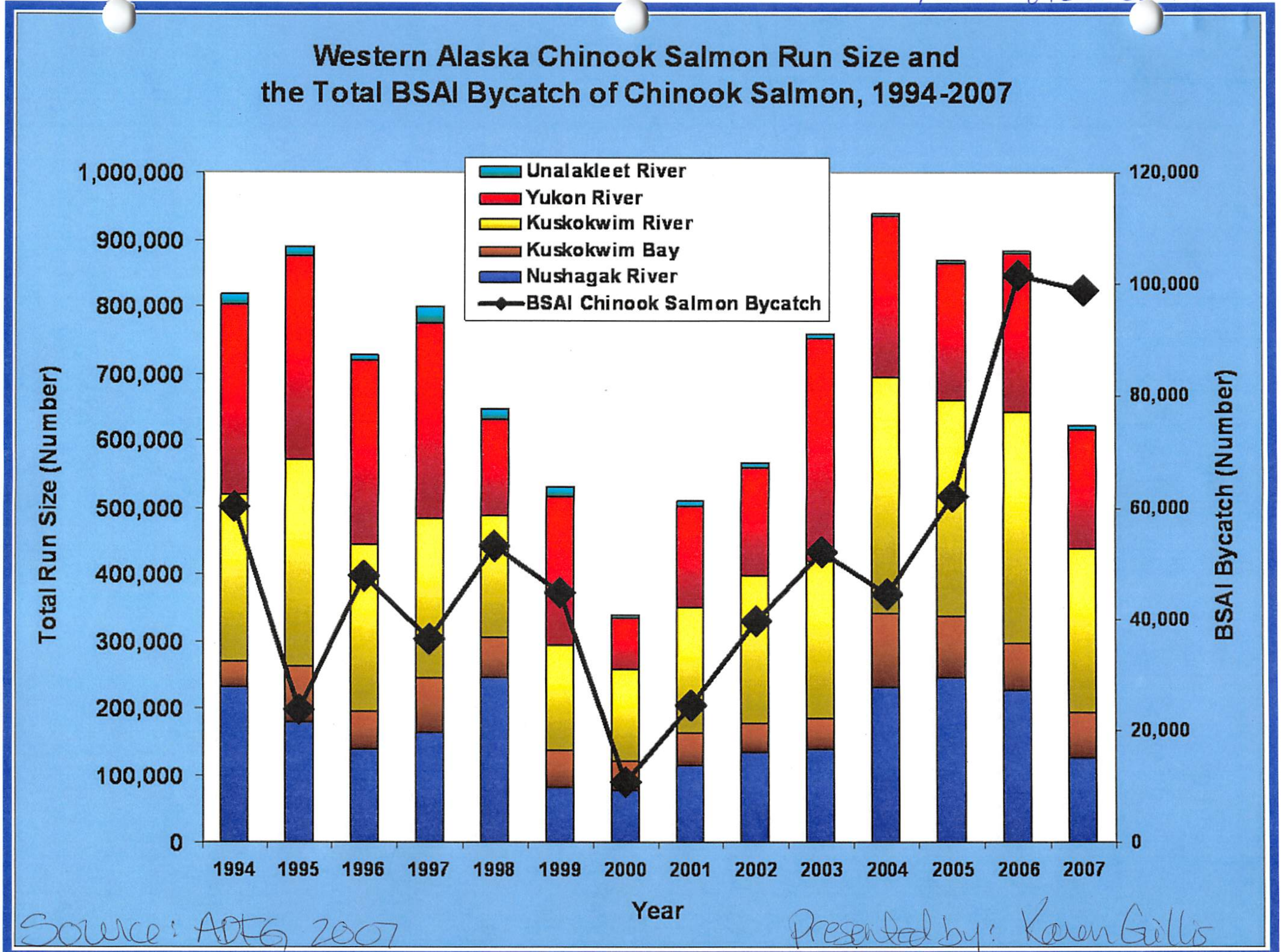

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