Public Testimony Sign-Up Sheet

Agenda Item D-3(b) GOA Crab/Salmon

	NAME (PLEASE PRINT)	AFFILIATION
1	Theresa Peterson	AMCC
2	Aletus Kwachka	F/V Majoe
3	Kurt Waters	Mar del Norte
4	John Gauvin	
5	DAVID KUBIAK	F/V MYTHOS
6	Walter Sargent	Fisherman (longtime)
7	PETER THOMPSON	FISHERMAN
8	Julie Bonney	AGDB
9	Mark Chandler	F/V Topaz
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Together

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.

Public Testimony Sign-Up Sheet

Agenda Item D-3(c) Misc. Groundfish Issues GEAR MODIFICATION

	NAME (PLEASE PRINT)	AFFILIATION
1	Miles Szymanski	FCA
2	Todd Loomis	Cascade Fishing Inc
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Public Testimony Sign-Up Sheet

Agenda Item D-3(d) Am80

	NAME (PLEASE PRINT)	AFFILIATION
1	LORI SWANSON	GROUNDFISH FORUM
2	Mike Szymanski	FCA
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AGENDA D-3
JUNE 2008

MEMORANDUM

TO: Council, SSC and AP Members

FROM: Chris Oliver
Executive Director

DATE: May 28, 2008

SUBJECT: Miscellaneous Groundfish Management

ESTIMATED TIME
6 HOURS
ALL D-3 ITEMS

ACTION REQUIRED

(a) Review committee recommendations on other species analysis.
(b) Review GOA salmon and crab bycatch discussion paper (Council only).
(c) Receive report on gear modification research.
(d) Review discussion paper on Amendment 80 sector cooperative criteria. (T)
(e) Report on halibut excluder EFP.

BACKGROUND

(a) Review committee recommendations on other species analysis and take action.

April 2005 Other Species Alternatives for Analysis

Alternative 1.	No Action
Alternative 2.	Eliminate "other species" assemblage and manage squids, skates, sculpins, sharks, and octopi as separate assemblages.
Alternative 3.	Manage only BSAI skates and BSAI and GOA sculpins as separate assemblages.
Alternative 4.	Manage only BSAI skates as separate assemblage
Alternative 5.	Add grenadiers to BSAI and GOA TAC specification process: Option 1. in a separate assemblage Option 2. in the other species assemblage

In 2005, the Council initiated an analysis of a large suite of alternatives to separate some or all of the component groups from the other species complex in the GOA and BSAI groundfish FMPs (see box). It was subsequently decided that these alternative actions should be separated into multiple analyses on separate timelines. The Council identified preliminary priorities after it reviewed two staff discussion papers in February 2008. The Council tasked its Non-Target Species Committee with reviewing and commenting on those preliminary priorities: 1) move BSAI and/or GOA squid into the forage fish category; 2) move BSAI and/or GOA octopus into the forage fish category or remove it from the FMPs and defer management to the State of Alaska; 3) do not add grenadiers to the TAC specification process; and 4) separate the remaining proposed alternatives into distinct BSAI and GOA amendment packages. The committee added a review of the forage fish complex to its April 23, 2008 agenda after unusually high harvests of eulachon around Kodiak resulted in numerous enforcement actions on the trawl fleet.

Committee minutes are provided under **Item D-3(a)(1)**. An excerpt of committee recommendations for setting priorities for action is listed below. Draft action plans are provided for the first two recommended priorities (BSAI skates and BSAI/GOA squid) for Council review (**Item D-3(a)(2) and (a)(3)**). The first analysis could be scheduled for initial review as soon as October 2008. The second analysis could be scheduled for initial review as soon as April 2009.

Non-Target Species Committee Recommendations for prioritizing actions to enhance management of other species.

A. BSAI skates (1st)
   1. No Action
   2. Separate into its own specification group

B. BSAI and/or GOA squid (2nd)
   1. No Action
   2. Move BSAI and/or GOA squid into forage fish category
   3. Separate GOA squid into its own specification group

C. BSAI and/or GOA sharks (3rd)
   1. No Action
   2. Separate into their own specification groups
   3. Non-Target Species Management Approach

D. BSAI and/or GOA octopus
   1. No Action
   2. Move into forage fish category (with different maximum retainable allowance)
   3. Separate into their own specification group
   4. Non-Target Species Management Approach

   Option: Harmonize state and federal regulations (HIGH)

E. BSAI and/or GOA sculpins
   1. No Action
   2. Separate into their own specification group

F. BSAI and/or GOA grenadiers
   1. No Action
   2. Set BSAI and/or GOA grenadiers as specification groups
   3. Non-Target Species Management Approach

(b) Review GOA salmon and crab bycatch discussion paper (Council only).

In October 2007, the Council tasked staff to update a previous discussion paper on options for salmon and crab bycatch reduction measures in the GOA. The previous paper was presented to the Council in October 2005, as part of the GOA groundfish rationalization initiative. The AP reviewed this requested discussion paper in December 2007, however time did not allow for Council review at that meeting. The AP minutes on this item from December 2007 are attached as **Item D-3(b)(1)**. The SSC reviewed an updated version of that paper in April 2008; their comments are attached as **Item D-3(b)(2)**. The staff discussion paper provides updated information on salmon and crab bycatch, an overview of species abundance, and discusses the alternatives previously developed by the Council. At this meeting the Council will review the discussion paper, as well as previous comments by the AP and SSC, and initiate an analysis if deemed necessary.

(c) Receive report on gear modification research.

At its June 2007 meeting, the Council deferred action on the sweep modification for flatfish trawls in the Bering Sea. Modification of trawl sweeps was a part of the Bering Sea Habitat Conservation package, wherein the Council approved several closure areas for non-pelagic trawls. Deferring action on the flatfish trawl sweep modification was necessary to address several implementation issues regarding practicality and enforcement for use of the modified sweeps in the regular flatfish fisheries. In deciding to defer action, the Council asked staff to schedule a report by the flatfish industry and Dr. Rose in June of 2008 to inform the Council on progress to address the implementation issues. This provided a twelve month period for additional field testing and for gear manufacturers and fishermen to work out challenges regarding the use of the modified sweeps on vessels without net reels, clamps and other methods of attaching the discs to combination rope (two-inch diameter fabric over cable material commonly used for trawl sweeps), and spacing of the discs to achieve the habitat benefits while also achieving feasibility in terms of with being able to roll the modified discs onto net reels and sweep or main wire winches. Craig Rose (AFSC) and John Gauvin (H&G Workgroup) have been working with the flatfish industry and will give a report on progress to address the implementation and feasibility issues as well as an assessment of whether the gear modification is now ready for Council consideration.

(d) Review discussion paper on Amendment 80 sector cooperative criteria.

In February 2008, the Council bifurcated Amendment 80 post harvest transfers and rollovers to consider each separately. For post harvest transfers, the Council selected unlimited post-harvest transfers as its preferred alternative. For rollovers, the Council postponed a decision to better assess the need for this action for optimizing harvest of groundfish allocated to the Amendment 80 sector. To assist in the rollover decision, the Council requested a discussion paper that overviews the criteria for establishing cooperatives in the Amendment 80 sector. The discussion paper will be handed out at the meeting as **Item D-3(d)(1)**.

(e) Report on GOA Halibut Excluder EFP.

In June 2006, the Council reviewed an application for an exempted fishing permit (EFP) to test a halibut bycatch reduction device designed for the Gulf of Alaska Pacific cod fishery. The permit was granted by NMFS, and the development of the device and various field tests were conducted in 2006 and 2007. The final report was mailed to the Council in mid-May, and the EFP applicant, Mr Gauvin, will present a summary of the project's findings at the meeting.

The objective of the excluder test was to evaluate its performance and feasibility for reducing halibut bycatch on typical "inshore" catcher vessels that target Pacific cod in the Gulf of Alaska. The performance goal for the device was to reduce the halibut bycatch by at least 40% (by weight) while minimizing loss of target catch (cod catch per hour) compared to an unmodified net. The test also sought to evaluate the functionality of handling aspects of the excluder for use on Gulf of Alaska trawl vessels, which tend to be smaller than Bering Sea trawlers (where the excluder is already used in many fisheries).

Overall, the results from the experiment suggest that the test was successful at measuring the effects of the excluder on halibut, cod, and flatfish catches. The test data show a much greater escapement rate of cod (35%) than was expected, as well as a considerably higher overall halibut escapement (57%). As configured, the high cod escapement rate is likely to make the device impractical for use in the regular fishery. The analysis of the data collected through the experiment, however, suggests that there may be ways to address this issue through modifications to the device.

Non-Target Species Committee

April 23, 2008

The Non-Target Species Committee convened at 9 am (PST) on April 23, 2008 from numerous locations. The committee's charge was to review a set of prioritized actions that the Council adopted at its February 2008 meeting, after it reviewed two staff discussion papers on a large suite of alternatives to break apart the other species complex in the GOA and BSAI groundfish FMPs and manage some or all of the groups separately. The committee also added a review of the forage fish complex to its agenda, after unusually high harvests around Kodiak resulted in numerous enforcement actions.

Seattle: Dave Benson, Julie Bonney, Lori Swanson, Dr. Paul Spencer, Janet Smoker, John Gauvin, Karl Haflinger, Jane DiCosimo, Dr. Olav Ormseth, Liz Conners, Dr. Kerim Aydin, Dr. Sarah Gaichas, Rebecca Reuter, Mary Hutzinger, Mike Guttormsen, Kenny Down.

Juneau: Jon Warrenchuk, John Lepore, Andy Smoker, Cindy Tribuzio, Dave Clausen, Johanna Vollenweider

Kodiak: Tom Pearson, Wayne Donaldson

Nome: Simon Kineen

Homer: Dr. Ken Goldman

Absent: Michelle Ridgway

I. At the request of the committee, Jane DiCosimo reviewed the ten year history of the Council initiative to revise management of the other species complex. The committee discussed the pros and cons of shifting its focus back to the larger non-target species issue rather than on interim steps, since rulemaking on annual catch limits and revised guidelines for national standards 1 (overfishing) and 2 (best available science) was expected to be published by the end of 2008. The committee also discussed concerns about the impacts of managing many, smaller allocations as these groups are managed separately.

Alternative 1.	No Action
Alternative 2.	Eliminate "other species" assemblage and manage squids, skates, sculpins, sharks, and octopi as separate assemblages.
Alternative 3.	Manage only BSAI skates and BSAI and GOA sculpins as separate assemblages.
Alternative 4.	Manage only BSAI skates as separate assemblage
Alternative 5.	Add grenadiers to BSAI and GOA TAC specification process: Option 1. in a separate assemblage Option 2. in the other species assemblage

In February 2008, the Council modified its previous suite of alternatives for analysis (see box). Those alternatives were separated into separate draft action analyses for committee review and comment: 1) move BSAI and/or GOA squid into the forage fish category; 2) move BSAI and/or GOA octopus into the forage fish category or remove it from the FMPs and defer management to the State of Alaska; 3) delete Alternative 5 (add grenadiers to the TAC specification process); and 4) separate the proposed alternatives into distinct BSAI and GOA amendment packages.

II. The committee recalled the requirement for implementing **annual catch limits** (ACLs) by 2010 according to the Magnuson-Stevens Act and that proposed rulemaking for ACLs has been delayed. The committee requested an update on how they may affect management of other species and non-target species in the North Pacific. Drs. Paul Spencer and Olav Ormseth reported on their participation in the Vulnerability Evaluation Working Group, one of three groups developing national policy guidance on ACLs. This group is developing technical guidance for evaluating the relative vulnerability of species within a given FMP. The approach computes vulnerability as a function of: 1) the ability of stock to recovery from fishing impacts; and 2) the susceptibility of the stock to fishing impacts. Several fisheries throughout the U.S will be used as case studies in the final report, which is scheduled for completion in

December 2008. Two other groups are compiling reports on 1) dealing with uncertainty and how to translate that into management measures and 2) dealing with the role of the SSC and the issue of independent review of stock assessments.

III. Staff briefed the committee on a 2007 petition to list populations of Pacific **eulachon** in Washington, Oregon, and California as a threatened or endangered species under the Endangered Species Act (ESA). In response, NMFS will initiate a status review of the species regarding the population structure and status of Pacific eulachon throughout their range in Alaska, British Columbia, Washington, Oregon, and California. Mike Guttormsen presented information on eulachon in the GOA, including some results from the 2008 EIT (acoustic) survey in Shelikof Strait. This survey covered the entire sea valley associated with the strait, i.e., it extended approximately 100 nm south of Kodiak. Eulachon constituted 43% of the biomass recovered in sample tows. The proportion of eulachon in tows was also highly variable, so some tows were almost entirely eulachon. This result is consistent with a general trend during the 2000s of an increasing proportion of eulachon (relative to pollock) in EIT sample tows. Part of this is due to decreasing pollock abundance, but recent trends are separate from that. The surveys use a 1.25" mesh liner in the codend, but tend to lose a substantial number of eulachon through the net. AFSC staff (Kresimir Williams) is analyzing this type of escapement. Over the last two decades there has also apparently been a shift in eulachon distribution. Before 1991, there were few eulachon along the western edge of Shelikof Strait, where most of the pollock were located. During the 1990s more eulachon moved into this area, and since 2000 eulachon have been ubiquitous in the strait. Eulachon are hard to assess using acoustics because they have no swim bladder. Using different acoustic frequencies may allow for direct estimation of eulachon abundance, but another possibility is to estimate eulachon as a proportion of the pollock abundance, which is easier to estimate. Eulachon generally occur lower in the water column than do pollock. The separation of the two species appears to follow a diurnal cycle.

Olav Ormseth advised the committee on the composition of these offshore, anadromous eulachon stocks. Rob Spangler (US Forest Service) is working on some genetics of eulachon in the Twentymile River (Cook Inlet), and the Auk Bay Lab staff is conducting similar genetic studies of eulachon in southeast Alaska. Eulachon found off British Columbia apparently come mostly from Canadian stocks, so ocean migrations may not be very extensive, but there is only one study that has looked at this so far. No efforts are currently underway to look at the composition of offshore stocks in Alaska. Spawning runs of eulachon are found throughout Alaska. Historically there have been huge runs in the Fraser and Columbia Rivers, but these have diminished in recent years. In early 2008 a petition was submitted to list eulachon in Washington, Oregon, and California as an endangered or threatened species. It is not known if any lower-48 or BC eulachon are found in Alaska. There was discussion about the difficulty of estimating eulachon biomass from spawning runs.

Tom Pearson referenced the materials he provided for the meeting, which indicate that the Gulf of Alaska eulachon population periodically peaks, as it is doing now. Julie Bonney reported that the Kodiak-based pollock trawl fishery progressed differently in 2008. The fleet was fishing near Areas 610 or 620, about 20 h from town; when pollock are closer to town, then the fleet has a 12 h run to the grounds. Staff reviewed the history of the development of the forage fish category and the maximum retainable allowance (MRAs) of forage fish in directed fisheries. The committee discussed that if the Council decides to consider adding new species to the forage fish category, then the analysis should also consider new MRA rates and the possibility of removing processing restrictions (i.e., eliminating the fishmeal-only provision). Management issues related to the forage fish category was discussed more below.

IV. Dr. Kerim Aydin presented a summary of the central role that **squids** play in the Bering Sea ecosystem, compared with the localized effect that **octopuses** play (i.e., they can be an important prey for a few species and therefore has a more questionable role as forage species).

Liz Conners provided discard mortality rates for octopus in the groundfish fisheries (see box below). While octopuses are not a directed fishery, they add economic value as incidental catch to the cod pot fishery. Because octopuses are poorly sampled in the trawl surveys, the OFL and ABC estimates are based on historical catches. The current levels of removals do not appear to be a conservation concern.

Wayne Donaldson summarized a written report on state fishery management of octopuses. The committee agreed with the staff conclusion that there was no clear advantage to state management of octopuses. The state report also identified a management problem the results from different approaches between state and federal management. The committee endorsed Council consideration of action to address the concerns that ADF&G staff identified in its paper (Appendix). Jane DiCosimo suggested that this paper could be added to the Joint Plan Team meeting agenda in September 2008.

The committee discussed that some of the larger squid (e.g., *Berryteuthis magister*, commonly referred to as "red") may not have the same forage role as some of the smaller squid species, although they are eaten by larger animals such as toothed whales. Kerim Aydin presented the role of squid in the ecosystem, noting that they occupy a trophic level that is similar to many of the species currently in the forage fish category. Aydin's ecosystem model suggests that an average of 1 million mt of squid are consumed in the BSAI by all predators, compared with a tiny amount taken by commercial fisheries. An even smaller proportion of squid are taken by the commercial sector in the GOA. The committee suggested that there may not be a conservation concern for squid given those numbers, and that an unnecessary move of squid into the forage fish category may present other difficulties. They were concerned about additional and more constraining limits on the fisheries that incidentally catch squid. While there is no incentive to target squid, the industry may want to market incidental catches. Processors put up squid for bait for the crab season. Catcher vessels delivering to shore do not sort at sea, but brings all of its catch to shore. While commercial fisheries typically are not retaining squid, they do not control harvests at sea in order to discard incidentally caught squid down to the MRA. And the MRAs are accounted instantaneously rather than by trip and therefore can result in violations. While squid harvest can be avoided, changes in fishing behavior are expensive. Julie Bonney noted that current Tier 6 specifications are an artificial cap based on catches from the foreign fishing period, when catches were higher than in recent years.

Olav Ormseth summarized the status of squid assessments. There are 15 species in the Bering Sea and 18 species in the Gulf of Alaska. Because AFSC surveys are inappropriate for surveying squids, biomass information on squids is considered unreliable. Squids are identified to species in the AFSC bottom trawl surveys, and length data from the surveys and fisheries are becoming increasingly available. The Tier 6 specifications include early (since 1978) foreign directed fishing catches. Ormseth considers squids to play a forage role in the ecosystem. He suggested that while MRAs need to accomodate some level of incidental catch of squids, they also need to be based on maintaining a sustainable level for the populations. Tom Pearson concurred that if squids are moved into the forage fish category, then appropriate MRAs and processing limits should be implemented for them in the category.

Jon Warrenchuk suggested that MRAs under the forage fish category may not necessarily be the best management for squids since there is no upper limit on harvests, such as an OFL. He felt that management under current specifications has been adequate.

Sarah Gaichas identified what would be needed to allow development of a new directed fishery: species identification of the catch, biomass estimates, and catch accounting. Exempted fishing permits could be used to collect additional life history and food habit data. This was the planned approach for a developing GOA skate fishery, but the commercial fleet did not initiate discussions with the Council or NMFS to develop an EFP and a directed GOA skate fishery has not been authorized.

V. Dr. Dave Clausen summarized a paper prepared for committee review on **grenadiers**, which provided the AFSC rationale for including grenadiers in Alaska Groundfish FMPs. Reasons included: 1) ecological importance of giant grenadier; 2) high rates of bycatch and discards of giant grenadier, which far exceeds that of any other non-target species in the "other species" or "non-specified" categories in both the GOA

and the AI; 3) while overfishing does not appear to be occurring, giant grenadier may be particularly susceptible to overfishing because of its 100% discard mortality rate, the disproportionate catch of females, and the documented vulnerability of many deep-sea fish to overfishing because of their peculiar life history traits; and 4) grenadiers meet the definition of "other species" although this same definition was used to justify its removal from the other species category and placement into the 'non-specified" category under GOA FMP Amendment 5.

There was concern expressed by the non-target committee that observer coverage in the sablefish fishery may not be robust enough to determine grenadier catch within the fishery. This is also true for the halibut longline fishery, although Julie Bonney reported that IPHC staff thinks that very few, if any, grenadier are caught in that fishery. A large component of the shoreside sablefish fleet is under 60 ft and has no observer requirements. According to observer data tables provided by NMFS, observed catch for the shoreside sector for the GOA sablefish hook and line target fishery ranged from 13% to 14% for the years 2004 to 2006. Janet Smoker reported that there was good observer coverage on turbot boats.
Dave Benson suggested that there was more rationale for moving grenadiers into the specification process in the GOA than in the BSAI based on biomass. Staff acknowledged that using Pacific g for proxies, proxy results in lower M and therefore higher ABC; area of greatest abundance is WGOA and EBSAI.

Staff identified that moving grenadiers into the FMPs would not change their harvest estimates in the catch accounting system unless retention was required and that the additional grenadier TAC (admittedly small, at about 4,500 t) would count against the 2 million mt OY cap in the BSAI and could lower TACs for more valuable species.

Jon Warrenchuk noted that grenadiers account for the biggest bycatch/mortality issue in the North Pacific that is not being addressed by the Council. He added that we have good estimates of grenadier biomass and bycatch and a framework in place for their management.

Priorities The committee applied two criteria in developing its recommendations for prioritizing analyses: conservation concerns and data availability. While the committee identified high conservation concerns for sharks, skates, grenadiers, and sculpins, it recommended that the Council set the highest priority for preparation of an analysis in 2008 to separate skates from the BSAI other species complex. This priority was based on 1) its Tier 5 status (having a reasonable estimate of biomass upon which to base annual specifications), 2) its potential economic value as a fishery, 3) parity with the GOA FMP amendment (#63) to separate skates from the GOA other species complex in 2005, and 4) enhanced protection of remaining groups in the other species complex by removing a high biomass (and ABC) from the cumulative biomass for the complex. Jane DiCosimo responded that she and Scott Miller could prepare a draft analysis for Council review in October 2008, if the Council concurred with this committee recommendation.

The committee identified preparation of an analysis for BSAI and GOA squid as its second priority. This analysis would include two alternatives to 1) manage GOA squid separate from the complex (BSAI squid is already managed separately) and 2) move them into the forage fish category. This latter action would include a review of the forage fish category and development of appropriate maximum retainable allowances for squid, as the current maximum retainable allowance for the category (2 percent) is not viewed as appropriate for squids. Jane DiCosimo reported that this analysis could be scheduled for initial review as early as April 2009.

The committee identified BSAI sharks as having the highest conservation priority, but low data availability. Therefore the committee gave this complex a medium ranking for action. The committee noted that Council action for separating sharks from the other species complex should be scheduled after significant improvements during the next two assessment cycles on both BSAI and GOA shark complexes were completed. Jane DiCosimo reported that this analysis could be scheduled for initial review possibly in October 2009.

The committee did not rank the remaining groups (octopuses, sculpins, and grenadiers) for action at this time. It concluded that the Council might prefer to reevaluate action for the broader non-target species initiative in two years (see below).

A. BSAI skates (1st)
   1. No Action
   2. Separate into its own specification group

B. BSAI and/or GOA squid (2nd)
   1. No Action
   2. Move BSAI and/or GOA squid into forage fish category
   3. Separate GOA squid into its own specification group

C. BSAI and/or GOA sharks (3rd)
   1. No Action
   2. Separate into their own specification groups
   3. Non-Target Species Management Approach

D. BSAI and/or GOA octopus
   1. No Action
   2. Move into forage fish category (with different maximum retainable allowance)
   3. Separate into their own specification group
   4. Non-Target Species Management Approach

   Option: Harmonize state and federal regulations (HIGH)

E. BSAI and/or GOA sculpins
   1. No Action
   2. Separate into their own specification group

F. BSAI and/or GOA grenadiers
   1. No Action
   2. Set BSAI and/or GOA grenadiers as specification groups
   3. Non-Target Species Management Approach

APPENDIX. Brief overview of octopus management in state waters and our understanding of octopus management in federal waters.

Contributions from:
Alaska Department of Fish & Game (ADF&G) staff in Southeast, Prince William Sound, Cook Inlet, Kodiak, Chignik, South Alaska Peninsula and BSAI management areas
May 2008

National Marine Fisheries Service (NMFS) classifies octopus as a groundfish in federal waters, whereas the state of Alaska classifies octopus as a miscellaneous shellfish in state waters. Different classification by state and federal management systems results in fishery management that is not coordinated for this transboundary species.

State Waters

Directed fishing for octopus in state waters may occur only by commissioner's permit (5 AAC 38.062) and requires a Commercial Fisheries Entry Commission (CFEC) interim use permit card for octopus. The commissioner's permit allows ADF&G to stipulate harvest location and duration, limit gear and other harvest procedures, and require periodic or annual reporting. Commissioner's-permit terms are crafted to structure fishing so that ADF&G may gather CPUE, distribution and other biological data with gear restrictions designed to reduce crab and fish bycatch. Harvests are closely monitored through catch reporting and biological catch sampling. In Westward Region, during recent years only several vessel operators have requested this permit and harvests have been very limited. In Prince William Sound no permits have been issued in recent years. Cook Inlet is closed to directed fishing; octopus may only be retained as bycatch. In Southeast Alaska, in the 1980s, permits were issued for exploratory fisheries using lair pots but catch was insignificant. Since 2000, two permit requests in Southeast Alaska for a directed octopus fishery were denied since ADF&G has no funding or program in place to sustainably manage a directed octopus fishery. In all management areas there are no preseason harvest levels established for octopus, or survey or biomass information.

Retention of octopus bycatch in other directed fisheries within state waters is allowed (this would include parallel groundfish fisheries). In most management areas bycatch is allowed at 20%, however in the Southeast Alaska pot shrimp fishery octopus bycatch is limited by permit to 5% of the total converted whole weight of shrimp on board the fishing vessel. In Southeast Alaska a commissioner's permit is required for retaining octopus bycatch, however the bycatch is landed on the directed fishery CFEC permit card. In Southeast Alaska, since 2001 an average of 22 permits have landed an average of 2,806 pounds of octopus per year, 0.3% of total shrimp landings.

Bycatch is landed on the harvester's directed species CFEC permit, not an octopus CFEC permit. This practice allows ADF&G to calculate the octopus bycatch harvest as a percentage of the target species harvest. Bycatch retention does not require a registration, except in Southeast Alaska. Octopus are regularly landed as bycatch, constituting the bulk of octopus landed from state waters.

Federal Waters

In federal waters octopus is open to directed fishing with any legal gear for groundfish. Octopus are part of the federal "other species" groundfish assemblage. The TAC for this assemblage is set at an arbitrary percentage of all other TACs. These levels are generally set to provide for traditional bycatch retention without restricting the major directed fisheries and to provide limited opportunity for the development of new fisheries. Substantial bycatch landings of octopus occur during the Pacific cod fishery. At times these incidental harvests are landed on a CFEC octopus permit card indicating a directed fishery, whereas they were actually taken in conjunction with fishing for another species. Landing octopus on a separate

octopus permit card does not provide a true picture in the state's fish ticket database of harvesting practices.

If a directed octopus fishery were to develop in federal waters there are few protection measures in place. Skates are a good example of a species that was in the other species assemblage and quickly developed into a targeted fishery simultaneous to the Pacific cod fishery, particularly for the longline fleet. In 2003, markets for skates developed creating rapid increases in effort and harvest. The 2002 skate harvest in the Central and Western Gulf was 15.9 million pounds and the 2003 harvest was 74.1 million pounds.

Concerns

The management differences for octopus between state and federal waters may lead to misreporting of octopus bycatch harvests when vessel operators are participating in a directed fishery that is open in state and federal waters (e.g. parallel/federal Pacific cod). A vessel participating in both state and federal waters could not land more than 20% octopus bycatch from state waters but could land an amount above 20% from federal waters.

The generic life history of octopus is conducive for a viable directed fishery because they are short-lived, fast growing, and are fecund. However, little is known about the species assemblage. Cephalopod identification is difficult and it is likely that there are several species that are harvested in Alaska. The majority of harvested octopus is assumed to be the Giant Pacific octopus. Biomass, migrations, and discard mortality by gear type and the level of non-reporting of octopus retained for personal use as bait, are unknown. Biomass estimates of octopus from the NMFS trawl survey have been produced but are considered highly unreliable.

ACTION PLAN TO REMOVE SKATES FROM THE OTHER SPECIES ASSEMBLAGE IN THE BERING SEA/ALEUTIAN ISLANDS GROUNDFISH FMP

May 2008

DRAFT

pending Council approval of committee recommendations

PROPOSED ACTION In April 2005 the Council initiated a joint BSAI/GOA Groundfish FMP amendment to eliminate the "other species" category and set separate specifications for squid, shark, skate, sculpin, and octopus (and possibly grenadier), based on recommendations from its Groundfish Plan Teams, Scientific and Statistical Committee, and Non-Target Species Committee. The Council decided to break this comprehensive analysis into separate analyses after reviewing two staff discussion papers[1] in February 2008 and tasked the committee with reviewing its preliminary set of action priorities. In June 2008, the Council will review a recommendation from the committee to set an analysis to separate skates from the BSAI other species assemblage as the Council's first other species management priority. The remaining actions will follow in separate analyses.

PROBLEM STATEMENT/OBJECTIVE The two groundfish FMPs require that specifications be set for the "other species" assemblage (BSAI squid and GOA skate specifications already are set separately). Management of the assemblages, however, may not offer sufficient protection from overfishing of the component groups because its overfishing level (OFL), allowable biological catch (ABC), and total allowable catch (TAC) is set equal to the sum of the estimates for the groups in the BSAI. Therefore, any one (or more) groups (or species within a group[2]) are vulnerable to overfishing because they are managed under specifications that are set above the level deemed appropriate for that individual group. Action to manage BSAI skates separate from the assemblage was identified as the top priority based on 1) its Tier 5 status (having a reasonable estimate of biomass upon which to base annual specifications), 2) its potential economic value as a fishery, 3) parity with the GOA FMP amendment (#63) to separate skates from the GOA other species complex in 2005, and 4) enhanced protection of remaining groups in the other species complex by removing a high biomass (and ABC) from the cumulative biomass for the complex.

ANALYSIS An EA/RIR/IRFA for a joint BSAI/GOA Groundfish FMP amendment and regulatory amendment is required.

RANGE OF ALTERNATIVES

Alternative 1. No Action
Alternative 2. Manage BSAI skates separate from the other species assemblage.

STAFF RESOURCES

NPFMC	Jane DiCosimo
NOAA AKR	Scott Miller, Tom Pearson, Steve Lewis, Sally Bibb
NOAA AFSC	Olav Ormseth, Beth Matta
NOAA GCAK	John Lepore
HQ	No national policy implications

[1] http://www.fakr.noaa.gov/npfmc/current_issues/non_target/208_OspeciesD2B5.pdf and http://www.fakr.noaa.gov/npfmc/analyses/OspeciesMgmt1007.pdf

[2] Specifications for species will be set as information is deemed sufficient to break them out of a group, per GOA Plan Amendment 63.

TIMELINE TO IMPLEMENTATION

August 2006 interagency staff meeting to draft the action plan for this analysis
October 2006 Council, AP, and SSC reviews action plan and analytical outline
November 2006- AFSC prepares stock assessments for the groups
- Plan Teams recommend 2007-2008 group OFLs and ABCs for analysis
December 2006 SSC recommends 2007-2008 groups OFLs and ABCs for analysis
March 2007 - SF In-Season Management staff prepares discussion paper on:
1) temporal/spatial fishery interactions between groups and directed groundfish fisheries; and
2) effects of proposed group specifications on groups and directed fisheries
- Non-Target Species Committee, Council, AP, and SSC reviews paper
June 2007 interagency staff meeting to revise the action plan for this analysis
September 2007 Groundfish Plan Teams review AKR staff discussion paper on fishery interactions
October 2007 SSC and AP reviews revised action plan and discussion paper
February 2008 Council reviews action plan and discussion papers and identifies preliminary priorities
April 2008 Non-Target Species Committee recommends priorities for action
June 2008 Council reviews committee recommendations and approves revised draft action plan
September 2008 Plan Teams review draft analysis
October 2008 Initial Review of EA/IRFA
November 2008 Plan Team recommends OFL and ABC for BSAI skates
December 2008 Final Action on EA/IRFA, Council recommends OFL, ABC, and TAC for BSAI skates
? 2009 Approval by the Secretary; Implementation of FMP amendment

APPLICABLE LAWS NEPA, MSA, EO 12866, Regulatory Flexibility Analysis

MAJOR ISSUES

- Protect BSAI skates from overfishing as intermediate step in long range plan to revise policy
- Most non-target species are managed under Tier 5 or 6 (data poor), yet these specifications are managed equal to those set at Tier 1 or 3 (less uncertainty)
- Difficulty in managing small TACs, with CDQ and area suballocations
- Complex temporal/spatial patterns of how fleets shift effort between directed fisheries
- Historical patterns of how fleets respond to high levels of incidental catches
  - Can not predict future patterns – case by case basis
- How SF –In Season Management responds when catches approach TAC, ABC, and OFL
- Geographic hotspots where high levels of incidental catches occur
- Would increase workload on recordkeeping and reporting systems (would be mitigated by electronic reporting), In-Season Management, Groundfish Plan Teams, and SSC
- Already increased workload on AFSC RACE, REFM, and Observer Programs
- No enforcement or legal issues identified

SQUID

ACTION PLAN TO REMOVE SKATES FROM THE OTHER SPECIES ASSEMBLAGE IN THE BERING SEA/ALEUTIAN ISLANDS GROUNDFISH FMP

May 2008

DRAFT

pending Council approval of committee recommendations

PROPOSED ACTION In April 2005 the Council initiated a joint BSAI/GOA Groundfish FMP amendment to eliminate the "other species" category and set separate specifications for squid, shark, skate, sculpin, and octopus (and possibly grenadier), based on recommendations from its Groundfish Plan Teams, Scientific and Statistical Committee, and Non-Target Species Committee. The Council decided to break this comprehensive analysis into separate analyses after reviewing two staff discussion papers[1] in February 2008 and tasked the committee with reviewing its preliminary set of action priorities. In June 2008, the Council will review a recommendation from the committee to set an analysis to separate GOA squid from the other species assemblages and/or move BSAI and GOA squid into the forage fish category as the Council's second other species management priority. The remaining actions will occur in separate analyses.

PROBLEM STATEMENT/OBJECTIVE The two groundfish FMPs require that specifications be set for the "other species" assemblage (BSAI squid and GOA skate specifications already are set separately). Management of the assemblages, however, may not offer sufficient protection from overfishing of the component groups because its overfishing level (OFL), allowable biological catch (ABC), and total allowable catch (TAC) is set equal to the sum of the estimates for the groups in the BSAI. Therefore, any one (or more) groups (or species within a group[2]) are vulnerable to overfishing because they are managed under specifications that are set above the level deemed appropriate for that individual group. Action to address management of BSAI and GOA squid was identified as its second priority, after addressing management of BSAI skates. This analysis would include two alternatives to 1) manage GOA squid separate from the complex (BSAI squid is already managed separately) and 2) move them into the forage fish category. This latter action would include a review of the forage fish category and development of appropriate maximum retainable allowances for squid, as the current maximum retainable allowance for the category (2 percent) is not viewed as appropriate for squids.

ANALYSIS EA/RIR/IRFA

RANGE OF ALTERNATIVES

Alternative 1. No Action
Alternative 2. Move BSAI and/or GOA squid into the forage fish category
Alternative 3. Separate GOA squid into its own specification group

STAFF RESOURCES

NPFMC	Jane DiCosimo
NOAA AKR	Scott Miller, Tom Pearson, Steve Lewis, Sally Bibb
NOAA PR	Kaja Brix
NOAA AFSC	Olav Ormseth, Lowell Fritz
NOAA GCAK	John Lepore
HQ	No national policy implications

[1] http://www.fakr.noaa.gov/npfmc/current_issues/non_target/208_OspeciesD2B5.pdf and http://www.fakr.noaa.gov/npfmc/analyses/OspeciesMgmt1007.pdf

[2] Specifications for species will be set as information is deemed sufficient to break them out of a group, per GOA Plan Amendment 63.

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1) temporal/spatial fishery interactions between groups and directed groundfish fisheries; and
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June 2008 Council reviews committee recommendations and approves revised draft action plan
April 2009 T Initial Review of EA/RIR/IRFA
June 2009 T Final Action on EA/RIR/IRFA
November 2009 Plan Team recommends OFL and ABC for GOA squid (depending on preferred alternative)
December 2009 Council recommends OFL, ABC, and TAC for GOA squid (depending on preferred alternative)
? 2010 Approval by the Secretary; Implementation of FMP amendment

APPLICABLE LAWS NEPA, MSA, EO 12866, Regulatory Flexibility Analysis

MAJOR ISSUES

- **Protection of forage fish for ecosystem considerations**
- **Protected resources issues**
- **Protect GOA skates from overfishing as intermediate step in long range plan to revise policy**
- **Most non-target species are managed under Tier 5 or 6 (data poor), yet these specifications are managed equal to those set at Tier 1 or 3 (less uncertainty)**
- **Difficulty in managing small TACs, with CDQ and area suballocations**
- **Complex temporal/spatial patterns of how fleets shift effort between directed fisheries**
- **Historical patterns of how fleets respond to high levels of incidental catches**
  - Can not predict future patterns – case by case basis
- **How SF –In Season Management responds when catches approach TAC, ABC, and OFL**
- **Geographic hotspots where high levels of incidental catches occur**
- **Would increase workload on recordkeeping and reporting systems (would be mitigated by electronic reporting), In-Season Management, Groundfish Plan Teams, and SSC**
- **Already increased workload on AFSC RACE, REFM, and Observer Programs**
- **No enforcement or legal issues identified**

Excerpted from April 2007 Advisory Panel Minutes

D-1 (g) GOA Salmon and Crab bycatch

The AP feels that the available data in the GOA does not provide adequate reliability to support developing bycatch limitation programs. Therefore, the AP recommends the Council delay further action on this agenda item and focus on development of more reliable observer coverage and a feasible electronic monitoring program. We further recommend that the bycatch document should be updated annually so the Council maintains awareness of bycatch issues in the GOA.
Motion passed 12/2

Minority Report on Failed Substitute Motion
The minority believes that analysis of a GOA bycatch analytical package should be advanced at this time, and recommends the following refinements to the draft alternatives in the 2007 discussion paper (pg 14). 1. Strike Alternative 4 under all sections 2. Apply analysis to all sectors (all trawl and jig for salmon, all trawl and pot for crab) 3. add to tanner and king crab sections: consider areas of scientifically documented biological importance for analyzing triggered or year around closures 4. analyze applying VMS requirements for any sector to which management measures may be applied. Michelle Ridgway, Ed Poulson, Chuck McCallum, John Moller

Excerpted from April 2008 SSC Minutes

D-1 (b) GOA Crab and Salmon Bycatch

Diana Stram (NPFMC) reported on a discussion paper on Gulf of Alaska salmon and crab bycatch in groundfish fisheries. This issue was originally included in the GOA Rationalization EIS and only recently has been elevated as an independent issue. The last time the SSC reviewed this issue was in 2005. Further action on this issue is dependent on a request from the Council. The current analysis is dated. Some aspects of the analysis will be updated, if the Council requests further action on this issue. The present document does include additional information on actual observed coverage levels in the GOA groundfish fisheries, based on new information provided by Jennifer Hogan (NMFS). Public comment was provided by Julie Bonney (Alaska Groundfish Databank), John Gauvin (Head and Gut Workgroup), and Therese Peterson (Alaska Marine Conservation Council).

The report shows bycatches of Tanner crab and Chinook salmon have increased in recent years. The majority of Tanner crab is taken in the flatfish and cod fisheries. The majority of Chinook is taken in the pollock fisheries. In the case of Pacific cod and flatfish, a large fraction of the fleet has been unobserved, making accurate bycatch accounting problematic. The proposed alternatives currently included in the discussion paper are the same as those considered in the BSAI salmon bycatch initiative. **The SSC concludes that the document does not provide sufficient information to assess whether current trends in salmon or crab bycatch are either a conservation or an economic concern. The SSC recommends adding the following information to improve the analysis, in the event that the Council chooses to have this analysis go forward.**

Where possible, the SSC requests that bycatch trends be compared to trends in stock status, and the target fishery, to differentiate between an increase in fishing mortality and an increase in encounter rates with PSCs. For example, it is not clear whether the increase in Tanner crab bycatch is a result of unrepresentative expansion of a small number of observed catch records, recovery of crab populations in the GOA, or a change in the groundfish target species. To aid in differentiating between these factors, the SSC requests a table, showing ADF&G's trawl survey crab abundance data and a summary of salmon run size relative to escapement goals.

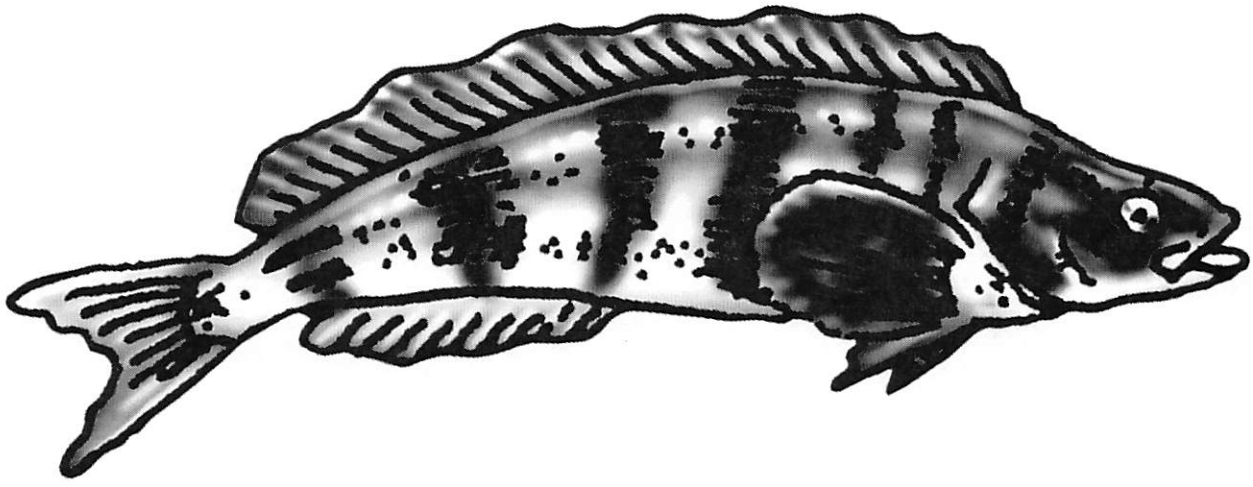
The SSC does not recommend using CPUE to assess chum salmon abundance. This estimator could be biased. Also, SSC requests that Table 7 be edited to include units of measurement.

The SSC is concerned about the low levels of observer coverage in the GOA groundfish fisheries. There appear to be high levels of uncertainty in the bycatch estimates of salmon and crab in the GOA, and this should be discussed relative to the ability to properly identify the impacts of alternatives. Furthermore, implementation of a trigger-dependent bycatch program is likely to be ineffective, due to the large portion of the fleets that are unobserved.

If this analysis goes forward, the Council may want to consider splitting the alternatives or the amendment to separate the crab analysis from the analysis for salmon. This might be necessary in order to account for the differences in crab and salmon behavior and, thus, differences in mitigation measures needed to reduce bycatch for each species.

AGENDA ITEM D-3(d)
JUNE 2008

Discussion Paper
Modifying Amendment 80 cooperative formation criteria



Prepared by:
Mark Fina, NPFMC
Glenn Merrill, NMFS, Alaska Region

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Executive Summary

Most participants in the Amendment 80 sector have successfully established a cooperative in the first year of the program. However, some participants have expressed concern that over the long term, cooperative formation standards may disadvantage them, and they may be constrained from establishing cooperative relationships, receiving and exclusive annual harvest allocation, and ending the "race for fish." This discussion paper responds to the Council's February 2008 request to provide a qualitative review of the goals of the existing cooperative formation standards, current conditions in the fishery, and the implications of modifying cooperative formation criteria.

Smaller vessel owners with limited QS are likely to have weakened negotiating leverage as the GRS increases if they cannot be competitive in the limited access fishery and options in the GOA are not viable. Participants of any size will find it difficult to receive the benefits of cooperative management if they cannot reach agreement on negotiated terms and the limited access fishery is an unattractive outside option, or (less likely) a cooperative is able to derive some benefit from forcing an entity into the limited access fishery.

Relaxing cooperative formation standards either by reducing the number of quota share (QS) permits that must be assigned, or the number of owners required could: (1) provide additional opportunities to QS holders to form cooperatives because more relationships are possible; (2) diminish the negotiating leverage of vessel owners who may be necessary to meet the threshold requirements under more stringent cooperative formation standards; (3) reduce the potential risk of any one company being unable to negotiate settlement and be able to fish only in the limited access fishery; and (4) reduce the incentive for members of a cooperative to attempt to create conditions that are unfavorable for certain fishery participants to form a cooperative.

Easing cooperative formation standards could reduce the risk that a person may not be able to reach agreement with other members and would be forced into the limited access fishery. However, any change to the existing cooperative formation standards would require a careful reconsideration of the potential impacts on groundfish retention standard (GRS) compliance and quota management that were raised as concerns when the Amendment 80 Program was adopted and implemented.

Purpose of Discussion Paper

In February 2008, the Council requested a discussion and review of the criteria for establishing cooperatives under Amendment 80. This paper is staff's response to the Council's request. This discussion paper is intended to provide a qualitative review of the goals of the existing cooperative formation standards, current conditions in the fishery, and the implications of modifying cooperative formation criteria. The discussion reviews criteria for the number of unique entities, the number of QS permits, and amount of assigned QS required for cooperative formation. The paper also examines the consequences of modifying one or more of the criteria, including interactive effects of those changes.

Background

Development of Amendment 80

After several years of development, the Council took final action to recommend Amendment 80 on June 9, 2006. The Council submitted Amendment 80 for review by the Secretary of Commerce (Secretary) in April 2007. NMFS approved Amendment 80 in July 2007, and published a final rule to implement Amendment 80 on September 14, 2007 (72 FR 14147). Fishing under Amendment 80 regulations began in 2008.

The Amendment 80 Program allocates several BSAI non-pollock trawl groundfish species among trawl fishery sectors and facilitates the formation of harvesting cooperatives in the non-American Fisheries Act (AFA) trawl catcher/processor sector. The Program meets the broad goals of (1) improving retention and utilization of fishery resources by the non-AFA trawl catcher/processor fleet by extending the groundfish retention standard (GRS) to all non-AFA trawl catcher/processor vessels; (2) allocating fishery resources among BSAI trawl harvesters in consideration of historic and present harvest patterns and future harvest needs; (3) establishing a Limited Access Privilege Program (LAPP) for the non-AFA trawl catcher/processors and authorizing the allocation of groundfish species to harvesting cooperatives to encourage fishing practices with lower discard rates and to improve the opportunity for increasing the value of harvested species while lowering costs; and (4) limiting the ability of non-AFA trawl catcher/processors to expand their harvesting capacity into other fisheries not managed under a LAPP.

Prior to the adoption of Amendment 80, the GRS was approved by the Council under Amendment 79 in June 2003, published as a final rule in April, 2007 (71 FR 17362), and became effective in 2008. The GRS requires a minimum retention of all Federal groundfish as those species are defined in regulations from 65 percent of all groundfish caught in 2008, rising to 75 percent in 2009, 80 percent in 2010, and peaking at 85 percent in 2011 and all future years.

Relevant to this discussion paper, the Amendment 80 Program anticipates that this LAPP will improve retention and utilization of fishery resources by allocating six species (Aleutian Islands Pacific ocean perch, BSAI Atka mackerel, BSAI flathead sole, BSAI Pacific cod, BSAI rock sole, and BSAI yellowfin sole quota share (QS), which is a long-term harvest privilege, to persons: who met criteria established by Congress under the Capacity Reduction Program (CRP) in December 2004;[1] and based on landings of Amendment 80 species from1998 through 2004.

The CRP defined the vessels that may initially qualify to participate as non-AFA trawl catcher/processors for specifically defined non-pollock groundfish species in the BSAI. All of the Amendment 80 species are defined as non-pollock groundfish species in the CRP.

[1] The CRP was enacted through the Consolidated Appropriations Act of 2005 (Public Law 108-447).

Specifically, the CRP allows only those non-AFA trawl catcher/processors that made a minimum of 150 metric tons of harvest of non-pollock groundfish in the BSAI from 1997 through 2002 to initially qualify for participation in the Amendment 80 fishery.[2] Based on NMFS records, only 28 vessels met these criteria, and these vessels are listed in regulation and in Table 1 to this discussion paper.[3]

Amendment 80 defined the specific amount of QS derived from each of the 28 initially qualified vessels based on total catch during 1998 through 2004. NMFS may issue a single QS permit for the catch history for each of the 28 vessels listing the amount of each of the six Amendment 80 species derived from the vessel's catch history. Once NMFS issues that QS permit it may not be subdivided and QS allocations of specific species may not be transferred separately. Furthermore, that QS permit is affixed to the vessel that gave rise to the QS. Once affixed to a vessel, a QS permit may not be transferred independently from that vessel. However, if a vessel sinks, is scrapped, or is otherwise permanently ineligible to be used in the program, the vessel owner may transfer the QS permit assigned to that vessel to the LLP license originally derived from that vessel.[4] Once QS is assigned to an LLP license, NMFS reissues that LLP license with the QS affixed to it as an Amendment 80 LLP/QS license (LLP/QS license). With four exceptions shown in Table 1, the QS permits that may be issued in the Amendment 80 fishery are assigned to one of the 28 initially eligible vessels. Throughout this document the terms vessel owner and QS holder are used interchangeably because the vessel and QS are linked with these limited exceptions.

Each year, the program allocates an amount of Amendment 80 species available for harvest, called the initial total allowable catch (ITAC), and crab and halibut PSC to two defined groups of trawl fishery participants: (1) the Amendment 80 sector; and (2) the BSAI trawl limited access sector. Allocations made to one sector are not subject to harvest by participants in the other fishery sector except under a specific condition: fish that are allocated to the BSAI trawl limited access sector and projected to be unharvested could be reallocated to Amendment 80 cooperatives.

Annually, NMFS determines the division of the Amendment 80 sector's total allowable catch (TAC) within the sector based on QS holdings of sector members. Depending on a QS holder's choice, the portion of the TAC associated with that person's QS is assigned to either a cooperative or a limited access fishery. A vessel owner may choose to assign a vessel to either a cooperative or the limited access fishery, but owners of multiple vessels may choose to assign each vessel independently to a cooperative or to the limited access fishery depending on the perceived benefits of those choices for each specific vessel. In general, if a person who holds one percent of the Amendment 80 QS for a given species assigns that QS to a cooperative, one percent of that species TAC would be assigned to that cooperative for that year. Crab and halibut prohibited species catch (PSC) limits in the BSAI are allocated to the Amendment 80 and BSAI trawl limited access sectors and within the Amendment 80 sector in a similar manner.

Generally, the Amendment 80 Program is intended to facilitate the formation of cooperatives that will receive exclusive harvest privileges for a portion of these fishery resources known as cooperative quota (CQ). Participants who choose not to join a harvesting cooperative may fish in a limited access fishery, without an exclusive harvest privilege, and must continue to race for fish with other participants in that fishery. The allocation of CQ allows vessel operators

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[2] On May 19, 2008, the United States District Court for the Western District of Washington issued an order in the case *Arctic Sole Seafoods v. Gutierrez* that vacated specific regulations that limit the use of specific vessels in the Amendment 80 Program to allow "a qualified [Amendment 80 vessel] owner to replace a lost qualifying vessel with a single substitute vessel." NMFS is in the process of implementing the Court's order.

[3] See Table 31 to part 679 at: www.fakr.noaa.gov/regs/default.htm

[4] See regulations at 50 CFR 679.90(e)

to make operational choices to improve returns from the fisheries and reduce discards of fish because the limited access incentives to maximize catch rates to capture a share of the available catch are removed. The principal benefits from the Program are achieved with harvesters choosing to join cooperatives. In order to form a cooperative three standards must be met:

1. The cooperative must be comprised of at least three unique persons who are not affiliated with one another through direct or indirect ownership of more than 10 percent in one another.[5] This standard is commonly known as the American Fisheries Act 10 percent rule.
2. At least nine (of the 28) QS permits in the Amendment 80 sector must be assigned to the cooperative[6]; and
3. The cooperative applies to receive a CQ permit by November 1 in the year prior to fishing.[7]

These cooperative formation standards are discussed in detail in the Final Environmental Assessment/Regulatory Impact Review/Final Regulatory Flexibility Act (Analysis) prepared for the Amendment 80 Program, and were addressed during Council deliberations during the development of the program.[8] The Council considered and rejected a range of options before ultimately selecting these criteria. The Analysis notes that cooperative management offers several advantages over individual fishing quotas (IFQs). Specifically, multispecies quotas for both target and bycatch species are difficult to manage when not managed on an aggregate basis. The likelihood that any person would exceed a given allocation may increase under IFQ management. The Analysis notes that managing and monitoring individual quota accounts is more costly and complex than cooperative allocations. NMFS also notes that another goal of the Program was to reduce bycatch, improve the retention of bycatch, and reduce the potential costs associated with bycatch reduction compliance. Applying the GRS on an aggregate basis to vessels in cooperatives may help meet that goal, by allowing vessels to coordinate the harvest and processing of allocations.

The Council reviewed and rejected options that would have required fewer persons to form a cooperative. Yet, the minimum standards for cooperative formation selected were deemed to best meet the goals of encouraging cooperation and consolidation, minimizing costs, and providing adequate opportunity for individual participants to establish relationships with similarly situated harvesters.

With its decision, the Council intended to address concerns raised by some industry participants that holders of relatively small QS amounts (or owners of smaller vessels) could become less desirable as cooperative members as the GRS is increased. The minimum standard sought to balance the negotiating leverage of the various fishery participants to ensure that they could continue to be members of cooperatives and receive value for their QS through that membership. Over time one would expect smaller vessel owners who may have a more difficulty meeting GRS requirements to be disproportionately disadvantaged by the competition in the limited access fishery, and would require cooperative relationships to remain viable.

Overview of Amendment 80 fleet, fisheries, and allocations

The nature of the fleet and historic harvest patterns are described in detail in the Analysis prepared for Amendment 80, and are not repeated here.[9] Briefly, the Amendment 80 fleet is

[5] See 50 CFR 679.91(h)(3)(iii) at: www.fakr.noaa.gov/regs/default.htm
[6] See 50 CFR 679.91(h)(3)(ii) at: www.fakr.noaa.gov/regs/default.htm
[7] See 50 CFR 679.91(b) and (h)(2)(ii) at: www.fakr.noaa.gov/regs/default.htm
[8] See Analysis on NMFS website at: www.fakr.noaa.gov/sustainablefisheries/amds/80/earirfrfa0907.pdf
[9] See Analysis at: www.fakr.noaa.gov/sustainablefisheries/amds/80/earirfrfa0907.pdf, Section 1.9.3.

comprised of a suite of vessels that have historically targeted primarily the Amendment 80 fisheries in the BSAI, and various rockfish species, and to a lesser extent various flatfish fisheries and Pacific cod, in the GOA.

Amendment 80 allocated each of the Amendment 80 species in the BSAI, except Pacific cod, to the sector as well as to individual participants, based on historic catch patterns of the 28 initially eligible vessels during 1998 through 2004, and is summarized in regulation.[10] Pacific cod was allocated to the Amendment 80 sector as a whole under the criteria that the Council adopted under Amendment 85 in April 2006 and NMFS published as a final rule in September 2007 (72 FR 50788). The rationale for Pacific cod allocation to the Amendment 80 sector is described under the analysis prepared for Amendment 85.[11] The Amendment 80 fleet is also subject to limits on the amount of halibut and crab PSC that it may use while fishing in the BSAI. These PSC limits are lowered in a stepwise fashion over a period of years to provide additional reductions in bycatch over time.[12]

The Amendment 80 fleet is constrained by harvest limits in the GOA, commonly known as sideboards, that limit the catch of pollock, Pacific cod, northern rockfish, Pacific ocean perch, and pelagic shelf rockfish as well as halibut PSC based on harvest patterns during 1998 through 2004.[13]

Under the criteria established under the CRP, and the recommendations developed by the Council, NMFS issued 28 QS permits for the originally qualifying vessels. Table 1 lists the vessels that were eligible to generate QS, the owners of those vessels, the length overall of the LLP licenses that were originally issued for those vessels, and whether those owners assigned their vessels and associated QS permits to either a cooperative, limited access fishery, or chose not to apply for QS for 2008. Table 1 notes that seven vessels have been assigned to the limited access fishery, 17 to a single cooperative, and four potential QS holders choose not to apply for their QS for 2008. Those four potential QS permit holder may choose to apply for QS by October 15, 2008, receive QS for the 2009 fishing year, and participate in the Amendment 80 sector. It is worth noting that one owner with multiple vessels has assigned four QS permits to a cooperative, and one relatively smaller vessel with limited QS to the limited access fishery. The percentage of the aggregate QS pool shown in Table 1 is the sum of all QS held by a given owner from all of their vessels.

There is not a clear distinction between large and small vessels in the Amendment 80 fleet. The Analysis indicated that vessels of smaller sizes had a lower retention rate than larger vessels.[14] For purposes of this discussion paper, smaller vessels would refer to vessels that are most likely to have a difficult time achieving GRS requirements if fishing independently. Referring to Table 1-98 in the Analysis, it appears that vessels with average length overall of less than 144 feet retained 63 percent of their total catch during 1995 through 2003. This is slightly less than the current GRS of 65 percent. While the retention rates during this time frame may not reflect current retention rates, particularly for vessels targeting specific species with higher retention rates, or under cooperative management which reduces the incentive to race for fish, it provides some indication of the relative size of vessels that may have a difficult time meeting higher GRS requirements. The smaller vessels, vessels that are limited to a maximum length overall of less than 144 feet on the LLP license originally issued for that vessel, are indicated in Table 1 in bold font. As the GRS increases, the definition of a smaller vessel would likely change as even larger vessels may become more constrained by the GRS.

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[10] See Tables 33 and 34 to part 679 at: www.fakr.noaa.gov/regs/default.htm
[11] See Final EA/RIR/IRFA for Amendment 85: www.fakr.noaa.gov/analyses/amd85/bsa85final.pdf
[12] See Tables 35 and 36 to part 679 at: www.fakr.noaa.gov/regs/default.htm
[13] See Tables 37 and 38 to part 679 at: www.fakr.noaa.gov/regs/default.htm
[14] See Analysis at: www.fakr.noaa.gov/sustainablefisheries/amds/80/earirfrfa0907.pdf, Table 1-98

Table 1: Owners of Amendment 80 vessels, QS permits, LLP licenses, and QS holdings derived from Amendment 80 vessels.

Participants in 2008 Amendment 80 Limited Access Fishery				
Participant Data		Percentage of Initial QS pool held by owner		
Owner[1]	**Amendment 80 Vessel(s)/LLPs with QS and length overall (LOA)[2]**	**Species**	**Percentage by species**	**Percentage of aggregate QS pool**
Fishing Company of Alaska (FCA), Inc. (Management entity for owner)	*Alaska Juris* (238 ft) *Alaska Ranger* (203 ft -QS may be assigned to LLP license derived from vessel) *Alaska Spirit* (221 ft) *Alaska Victory* (227 ft) *Alaska Voyager* (228 ft) *Alaska Warrior* (215 ft)	Flathead Sole (FSOL)	10.7	35.9
		Pacific cod (PCOD)	16.0	
		Rock sole (ROCK)	23.5	
		Yellowfin sole (YFIN)	38.3	
		AI POP (POP)	53.0	
		Atka mackerel (AMCK)	58.2	
U.S. Seafoods, Inc. (Management entity for owners)	***Ocean Alaska***[3] (124 ft)	FSOL	1.6	See aggregate total listed under Amendment 80 cooperative below
		PCOD	0.6	
		RSOL	0.6	
		YFIN	0.7	
		POP	0	
		AMCK	0	
Participants in 2008 Amendment 80 Cooperative (Best Use Cooperative)				
U.S. Seafoods, Inc. (Cont.)	***Alliance*** (124 ft) ***Legacy*** (132 ft) ***Prosperity*** (138 ft - QS assigned to LLP license derived from vessel) *Seafreeze Alaska* (296 ft)	FSOL	6.5	9.6 (Includes Ocean Alaska)
		PCOD	11.8	
		RSOL	8.9	
		YFIN	7.0	
		POP	14.3	
		AMCK	9.8	
Iquiqui U.S., LLC	*Arica* (186 ft) *Cape Horn* (158 ft) ***Rebecca Irene*** (140 ft) ***Tremont*** (131 ft) *Unimak* (185 ft)	FSOL	35.5	16.9
		PCOD	23.4	
		RSOL	26.6	
		YFIN	20.6	
		POP	0	
		AMCK	0.3	
O'Hara Corporation	*Constellation* (150 ft) ***Defender*** (124 ft) ***Enterprise*** (132 ft)	FSOL	32.5	12.6
		PCOD	19.3	
		RSOL	17.1	
		YFIN	13.2	
		POP	0	
		AMCK	0.7	
Fishermen's Finest (Management	*American No. 1* (160 ft) *U.S. Intrepid* (185 ft)	FSOL	5.4	8.1
		PCOD	14.8	
		RSOL	14.6	
		YFIN	8.2	

Entity for owners)		POP	0.4	
		AMCK	2.2	
Cascade Fishing, Inc. (Management Entity for owners)	*Seafisher* (230 ft)	FSOL	1.1	8.1
		PCOD	5.2	
		RSOL	1.9	
		YFIN	4.8	
		POP	18.6	
		AMCK	18.6	
Ocean Peace	*Ocean Peace* (219 ft)	FSOL	5.3	6.0
		PCOD	5.2	
		RSOL	4.2	
		YFIN	4.0	
		POP	13.6	
		AMCK	9.2	
Jubilee Fisheries	***Vaerdal*** (124 ft)	FSOL	1.5	1.9
		PCOD	3.5	
		RSOL	3.5	
		YFIN	1.7	
		POP	0	
		AMCK	0.7	
Owners who did not apply for Amendment 80 QS and are not participating in 2008				
Trident Seafoods	*Bering Enterprise* (183 ft - QS could be assigned to LLP derived from vessel) *Harvester Enterprise* (188 ft)	FSOL	0.2	0.5
		PCOD	0	
		RSOL	1.0	
		YFIN	1.0	
		POP	0	
		AMCK	0	
Arctic Sole Seafoods	***Arctic Rose*** (122 ft - QS could be assigned to LLP derived from vessel)	FSOL	0.8	0.3
		PCOD	0.4	
		RSOL	0.6	
		YFIN	0.2	
		POP	0	
		AMCK	0	
Golden Fleece	***Golden Fleece*** (124 ft)	FSOL	0.2	0.1
		PCOD	0.5	
		RSOL	0.3	
		YFIN	0	
		POP	0	
		AMCK	0	

1 Ownership data are derived from multiple sources including information provided on Amendment 80 QS applications, Restricted Access Management (RAM) LLP database (http://www.fakr.noaa.gov/ram/llp.htm#list), Groundfish Forum (http://www.groundfishforum.org), and personal communications with Dave Benson (Trident), Bill Orr (Iquiqui U.S., LLC), Susan Robinson (Fishermen's Finest), Mike Szymanski (FCA), and Dave Wood (U.S. Seafood). Most owners designate subsidiary corporations to own the vessels. In turn, those subsidiary corporations are wholly owned by the owner.

2 LOA data derived from RAM LLP license database (see URL above). These data indicate the maximum LOA of the vessel that may use the LLP originally issued for that vessel. Vessel lengths listed in the LLP database may differ from vessel lengths listed in USCG Vessel Documentation files.

3 Vessels considered to be smaller vessels for purposes of this discussion paper are noted in bold text.

Factors affecting cooperative formation

Three broad factors are likely to affect the choice of participants to join a cooperative: (1) the appeal of the "outside" option of the limited access fishery; (2) the nature of the cooperative model chosen; and (3) the specific circumstance of the participant and the circumstances in the fisheries.

Cooperative vs. Limited Access Fishery

As noted earlier, the advantages of joining a cooperative arise from receiving an exclusive allocation and ending the race for fish. In addition, fishery participants in cooperatives are permitted to pool groundfish retention with application of the GRS rates at the cooperative rather than at the individual vessel level. Depending on the structure of the cooperative, harvesters may consolidate operations and integrate their fishing operations to improve revenues and reduce costs. Depending on the circumstances, the "outside" option of fishing in the limited access fishery may not be significantly less attractive to a specific fishery participant. For example, if a vessels faces limited or no competition in the limited access fishery, no race for fish may occur. At the extreme, a vessel with high catch rates may the opportunity to harvest a greater amount of fish in the limited access fishery than would likely result from the QS they would bring to a cooperative. If the vessel operator is able to meet GRS compliance requirements with little complication, those requirements may not affect the decision of whether to join a cooperative.

In some circumstances, it is possible that a small vessel operator with limited QS holding may have an advantage from foregoing cooperative membership, if the vessel can "fish into" the amount of ITAC assigned to the limited access fishery by other participants. This choice, however, will depend on whether the vessel believes that GRS compliance is achievable in the limited access. As noted in Table 1, one owner is active in both the cooperative and the limited access fishery. This may provide the best evidence that vessel owners can perceive a greater benefit in participation in the limited access fishery than fishing under a cooperative.

Conversely, larger vessel owners with larger QS allocations may find the limited access option substantially less attractive if there is considerable risk that competition from other vessels will limit their catch in the limited access. In any case, the choice to participate in the limited access involves some risk, since participants all must choose whether to join a cooperative or fish the limited access at the same time each year. So, by reducing risk and provide some assurance of catch, a cooperative provides more certain benefits.

Cooperative Models

Some participants may find cooperative membership more or less attractive depending on the degree to which the cooperative regulates the fishing activities of its members. Based on anecdotal information from other cooperative management programs (i.e., AFA, Central GOA Rockfish, and cooperatives in the BSAI crab rationalization program) there appear to be two distinct types of cooperative operations, "pass through cooperatives" and "integrated cooperatives" with a continuum between these extremes. Table 2 summarizes the ways in which these two basic models differ.

Table 2: Pass Through vs. Integrated Cooperative

Factor	Pass Through Cooperative	Integrated Cooperative
Coordination of Fishing Operations	• Members responsible for fishing allocation derived from their QS. • Limited coordination of fishing	• Fishing plan among members negotiated pre-season and modified during the season as necessary. • Members coordinate vessels in fisheries

	practices. • Cooperative managers provided limited catch information from other members. • Cooperative members do not establish buffers for the entire cooperative. Each member is effectively assigned a "hard cap" to limit catch.	and areas to minimizing bycatch and maximize profit (not based on past participation or QS holdings). • Cooperative members have access to detailed catch and PSC rates of other cooperative members. • Fishing vessels used and the amount harvested not necessarily related to the amount of QS member assigns to the cooperative. • A buffer is established for the entire cooperative to ensure CQ amounts are not exceeded.
Distribution of Costs	• Operational costs fully borne by each participant.	• Insurance costs pooled. • Observer coverage requirements negotiated for all vessels under a single contract. • Cooperative pays for fuel, labor, and other costs and those costs are split proportionally according to the cooperative contract.
Distribution of Revenues	• Revenue not pooled. Each member receives value from the fish harvested on his vessels.	• Common marketing of cooperative product. • Pooling net crew revenue among all vessel operators and crew proportional to total catch.

In the first year of the program, the Best Use Cooperative (BUC) has adopted a pass through cooperative with specific provisions to address PSC rates and the management of GOA sideboard limits. The cooperative establishes target PSC rates and informs members of cooperative PSC rates in-season. Each company is responsible for managing the amount of PSC that would be derived from its QS, effectively acting as a limit for that owner. If an owner reaches his assigned limit of Amendment 80 species CQ or PSC CQ, the owner may establish intra-cooperative trades for additional CQ with other cooperative members or stop fishing. BUC members have also established a private agreement to apportion the Amendment 80 GOA sideboard limit among members, as a means of effectively managing the sideboard limit. This agreement does not include participants in the limited access fishery and actions taken by the participants in the limited access fishery to fish more than their traditional amounts of GOA sideboard fisheries could affect this private contractual arrangement.[15]

Several industry participants in BUC have indicated that they believe that with time a more integrated cooperative structure may develop as: (1) familiarity with the program grows; (2) GRS compliance becomes more challenging; (3) changes in market conditions and operational costs present challenges and opportunities; (4) TACs change; or (5) greater consolidation of vessel ownership occurs.

Factors affecting cooperative membership

Although not exhaustive, some of the factors harvesters are likely to consider when forming a cooperative are described below.

[15] Personal communication, Jason Anderson, BUC Manager.

Historic relationships among participants:

Participants may have long standing relationships and alliances among owners and crew and those relationships can affect the ability of participants to effectively. Participants with similar approaches to marketing, fishing patterns, and operational styles may be easier to coordinate. Conversely, companies with a history of disagreement or distrust may be unwilling or unable to effectively compromise and meet the obligations necessary to implement cooperative management.

Given the complex nature of the program and the need to coordinate catch and PSC mortality, as well as ensure compliance with GRS requirements (and possibly harvests in under GOA sideboards), effective working relationships among the members of a cooperative are critical.

Common economic interests

Presumably companies able to develop economic synergies could find it advantageous to establish and maintain cooperative relationships. The importance of aligned economic interests would likely vary depending on the type of cooperative and participants' operations and markets. As an example, under a pass through cooperative model where each member of the cooperative is responsible for harvesting its own quota and PSC use, little consideration may be given to coordination of operational and marketing activities. In a more integrated cooperative model, participants may wish to have members able to coordinate the development of economic benefits from the cooperative.[16]

QS holdings

Presumably, prospective cooperative members with greater or more complementary QS holdings would be more attractive as cooperative members because they could provide more useful CQ to the cooperative, increasing flexibility for the cooperative to ensure that its catch is efficiently harvested. Larger QS holders may be most desirable under an integrated cooperative model where the relative cost per unit of effort decreases as quota increases. Likewise, QS holders with allocations of relatively scarce or high demand species (including PSC) may be particularly desirable. Even under a pass through cooperative model, harvesters with these QS holdings could contribute to a buffer to ensure the cooperative stays below its CQ allocation.

GRS compliance

Larger vessels may be better suited to meet GRS requirements due to the greater amount of space available onboard to accommodate increased storage capacity required for the larger proportion of groundfish that will need to be retained as the GRS is increased. In addition, it may be possible that some of the largest Amendment 80 vessels could improve their retention of groundfish through the use of fish meal plants that are not feasible on smaller vessels. Generally, larger vessels would be more likely to have lower operational costs when retaining products than smaller vessels that would be required to make more frequent offloads. All Amendment 80 vessels may have difficultly finding markets for some groundfish species that may be required to be retained in greater proportions as the GRS is increased (e.g., Alaska plaice, northern rockfish, and arrowtooth flounder).

Members who primarily target species that can be harvested with lower incidental catch rates of other less valuable species may be desirable members of the cooperative because the retention rate of those vessels would be expected to be high would increasing the overall retention

[16] In all cases, participants will need to ensure that any market cooperation is permitted by antitrust law, which may include the development of a Fishermen's Collective Marketing Act. This paper does not examine compliance of activities with those requirements.

rate of the cooperative. Vessels targeting species with a higher incidence of species that are less economically desirable may decrease net returns of the cooperative, as a whole, particularly under an integrated cooperative model, or may decrease overall retention by the cooperative. One would anticipate that such members may be less desirable as members of the cooperative, particularly if meeting GRS requirements become a concern.

The changes in operations to meet GRS requirements may increase operational costs at a proportionally greater rate for smaller vessels, and encourage smaller vessel owners to enter into and maintain cooperative membership with members that own larger vessels that may be better able to meet the GRS requirements. Owners of a single relatively small vessel particularly would be expected to desire a cooperative relationship if they perceive GRS compliance as difficult or costly and alternative fishing opportunities in the GOA (without the complication of GRS compliance) are not available. If smaller vessels are perceived as less able to meet the GRS, or are expected to adversely affect the ability of the cooperative to meet its GRS because they have a low retention rate, these factors could adversely affect their negotiating leverage, particularly if other larger vessels can form and maintain cooperative participation without the smaller vessels.

Enforcement Compliance

With any cooperative management structure, coordination is essential, both in terms of regulatory compliance and oversight of contractual relationships. Entities perceived to have a checkered past of historically poor compliance performance or who are resistant to oversight and information sharing may be particularly unattractive as cooperative partners.

Costs of cooperative participation

Establishing and maintaining a cooperative requires investments by its members to establish and oversee cooperative arrangements. These requirements impose additional costs on industry participants that may affect their decisions to establish or join a cooperative. For owners of single vessels with limited QS, the costs of cooperative membership could be disproportional relative to expected benefits of cooperative membership.

Coordination on non-cooperative quota fishing

Participants in the Amendment 80 sector are active in CDQ fisheries, various fisheries in the GOA, and BSAI species that are not allocated under the Amendment 80 Program (e.g., Alaska plaice, arrowtooth flounder). As part of the negotiating process, QS permit holders and vessel owners may wish to ensure that their activities in these other fisheries are not adversely affected. As an example, members of the existing cooperative privately negotiated the apportionment of GOA sideboard limits among cooperative members with historic activities in those fisheries. The ability of a cooperative to effectively address these fishing patterns may be a deciding factor for some QS holders' cooperative membership.

Harvesting capacity

Some participants in the Amendment 80 sector assert that persons who hold an LLP/QS license (i.e., QS without the accompanying vessel on which the CQ could be harvested) may not be able to effectively negotiate cooperative membership that provides a reasonable value for their QS. The validity of this assertion cannot be tested unless and until a person were to undertake the process of negotiation to become a member of a cooperative. The circumstances within the sector likely determine the extent of this effect. For example, a person with an LLP/QS license, who also owns an Amendment 80 vessel able to harvest the CQ yielded by the license might be unaffected in negotiations. Furthermore, A LLP/QS holder who may represent the necessary third owner or ninth QS permit necessary to form a cooperative may be in strong negotiating

position. Similarly, a license holder with strong historic relationships with other sector members who has valuable CQ to contribute to the cooperative for harvest by others may be unaffected. On the other hand, a relatively independent license holder with no well-established relationships could be disadvantaged, particularly if a large single cooperative within the sector has developed. In this circumstance, with the only outside opportunity being to assign the LLP/QS license to the limited access fishery without a vessel, the license holder is likely to be poorly positioned to negotiate a reasonable price for contributing QS to the cooperative. This circumstance is unlikely to persist, since a recent court order in the *Arctic Sole Seafoods v. Gutierrez* case allows Amendment 80 sector members who lose a vessel to replace that vessel. However, depending on the circumstances, vessel replacement may take one or more years, disadvantaging the license holder for a period of time.

Rationale behind the current cooperative standards

The current cooperative standards are intended to provide several benefits to sector members and fishery managers. Some of these benefits are more likely to be realized over time, so the failure to obtain the full intended benefit in the first year of the program (i.e., all members under cooperative management) is not necessarily a failure of the formation standards. As previously described, numerous reasons exist why the limited access fishery may be preferred by some fishery participants. On the other hand, evolution of the fleet over time could prevent some of the benefits, or apparent benefits, realized in the first year of the program from being realized in future years.

The existing entity and vessel thresholds may provide benefits by encouraging associations, and ultimately consolidation, among vessel owners. This in turn could provide additional benefits from the fisheries through greater production efficiencies (i.e., increasing revenues and decreasing costs). Although pass through cooperatives (such as the one formed in the first year of the program) may not achieve these as much as an integrated cooperative, it does represent a first step in development of more efficient operational associations. Management burdens also can be decreased through the consolidation of activities in larger units, transferring more of the day-to-day decisions and monitoring burden to cooperative members. As an example, because NMFS does not close cooperatives from directed fishing, the cooperative becomes responsible for ensuring its members are well-monitored to avoid overages.

The cooperative formation standards are also intended to interact with GRS for the benefit of smaller vessel owners who might otherwise have little negotiating leverage when interacting with other owners as the GRS is increased. Some assert that small vessels are a necessary lynchpin for other vessel owners to meet cooperative formation thresholds, thereby providing them with a relatively strong negotiating position. Even if smaller vessels may be perceived to be weakly positioned because of smaller allocations and potentially more costly compliance with GRS, if they are instrumental to meeting cooperative formation requirements, they may be able to overcome these shortcomings. In the first year of the program, most small vessels have joined the single cooperative that has formed.

Whether this membership indicates that the threshold is working as intended could be questioned for a few reasons. First, the cooperative is a pass through cooperative under which most members simply fish any allocation attributed to their own QS. In this cooperative structure, any benefit realized by small vessel owners is attributable only to their own allocations. Second, the lower GRS applicable in the first couple of years of the Amendment 80 program (i.e., 2008 and 2009) is not likely to be a limiting obstacle even for smaller vessels in the fisheries, particularly when associated with larger vessels in a cooperative. While the high proportion of smaller vessels in cooperatives in the first year is encouraging, it may not indicate that those vessels will be continue to be needed to meet cooperative formation thresholds as intended in future years when GRS becomes more constraining. Once the GRS rises, it is conceivable that

vessels able to comply with the GRS may be less willing to come to terms with small vessels challenged by the GRS, for fear that they could jeopardize the cooperative's ability to meet the GRS and threaten its compliance. At the extreme, large vessels could form their own cooperative associations offering small vessels a choice between isolation in their own cooperative or the limited access. This could leave those vessels in a position of either fishing in the limited access fishery with a relatively small allocation with challenging GRS requirements, or the potentially poor terms for cooperative membership (which may include very constraining requirements to ensure that the cooperative's GRS is not compromised). Since cooperative associations are privately negotiated and will evolve with changes of circumstances, it is difficult to predict the outcome for small vessels that are not essential for cooperative formation.

Issues raised concerning the current cooperative standards

Arguments advanced for relaxing the cooperative formation standards generally contend that the current standard has reduced the potential for cooperative membership. Some participants contend that by establishing cooperative formation thresholds, some sector members who might otherwise choose to fish in the cooperative fishery have been unable to form the cooperative relationships necessary to meet the cooperative formation thresholds. Some participants contend that in a sector with few participants, thresholds provide little opportunity for sector members unwilling to consent to majority positions. Under these circumstances, the majority (who may be in one or more cooperatives of their own) could effectively force some vessels into the limited access fishery. In some instances, cooperative members could benefit from refusing to accept some prospective members in their cooperatives either by a late season rollover of unharvested allowable catch from the limited access as was contemplated, but not approved by the Council, under Amendment 90,[17] or by entering vessels into the limited access fishery -- effectively fishing off of the allocation of sector members unwelcome in a cooperative or unable to come to terms with a cooperative.

Whether persons strategize to reach this result, or merely benefit from unexpected circumstances, the outcome could be a windfall for one or more cooperative members arising from their unwillingness (or inability) to come to terms with other sector members. As noted in earlier sections of this paper, persons whose interests have coalesced and are able to meet the standards to form a cooperative are under no requirement to accept additional members. Perfectly valid reasons may justify not wanting certain members in a cooperative, such as historically poor working relationships, concern about joint liability for violations, or differing harvest strategies that do not comport with other members. Yet, in any case when a cooperative member chooses to enter a vessel in the limited access fishery, one might question whether that choice is simply to assert leverage by encroaching on the allocation of vessels unable to come to terms with the cooperative.

Because the negotiations to form a cooperative are private negotiations, it is not clear that there is any objective way to distinguish between an inability to agree to terms and behavior by participants who seek to create a competitive advantage by excluding others. This paper does not attempt to determine the specific factors that led to cooperative formation and limited access fishery participation for this year. Furthermore, it is not appropriate to assume that the cooperative formation patterns observed in the first year of the program (described in Table 1) would be observed in future years, so any analysis predicated on this year may be inappropriate. As an example, four prospective QS permits, currently held by three separate persons, were not applied for, and not issued this year. The holders of those permits could choose to apply for their QS for 2009 and participate in the fishery, thereby increasing the number of persons and QS

[17] See Draft EA/RIR/IRFA prepared for Amendment 90 at: www.fakr.noaa.gov/npfmc/analyses/AM90_108.pdf, Section 2.4.2.1

permits who are eligible to form a cooperative. Similarly, some members of BUC in 2008 could prefer to form alternative relationships for 2009, thereby changing negotiation dynamics.

It is conceivable that one or more members of a cooperative could receive benefits from excluding persons from a cooperative, if the cooperative can coordinate efforts, use fewer more efficiently to harvest the cooperative's quota, or allow other vessels from the cooperative to join the limited access fishery. Under an integrated cooperative model this cooperation is more likely to occur than under a pass through model, when each member effectively harvests an amount of CQ derived from the QS they have assigned to the cooperative.

In any instance, cooperative members engaged in forcing persons into the limited access fishery would need to be careful to avoid any violation of antitrust law or other regulations governing the constraint of trade. Certain arrangements are likely to be problematic. These generally arise from the opportunity for a cooperative member with multiple vessels to enter a vessel in the limited access fishery and harvest a greater value of fish than if that vessel were fishing in the cooperative, with that marginally greater revenue could be passed on to other cooperative members. Alternatively, a cooperative member could enter a vessel in the limited access, engage in fishing fish high PSC rates, effectively closing the fishery to ensure that catch is not harvested in the limited access fishery. At its most egregious, a cooperative could adversely affect the markets of competitors to provide an advantage to a cooperative. Whether any of these scenarios would be a regulatory or legal violation depends on the circumstances, but each is problematic in that cooperative members are coordinating associations with the purpose of depriving others and sharing benefits arising from that action.

More generally, cooperative formation standards that may not be easily achieved may be opposed by persons who believe that in all cases cooperative fishing should be preferred to the limited access. It is generally believed that fishing exclusive cooperative allocations allows participants to end the race for fish and modify fishing practices to improve fishery returns and reduce bycatch. These benefits are argued to outweigh the possible intended benefits from formation thresholds (including distributional effects), since those benefits are uncertain (i.e., may or may not be realized). It may be argued that penalizing sector members unable to come to terms with others in the sector forsakes the benefits that arise from cooperative allocations for benefits that are less certain.

Modifying cooperative formation standards

Cooperative formation standards could be modified (or relaxed) to address some of the issues raised by persons concerned with the current standards.

Modifying the number of QS permits required to form a cooperative

Lowering the number of QS permits that are required to form a cooperative could provide additional cooperative opportunities for large and small QS holders. On the other hand, reducing the number of QS permits (vessels or LLP/QS licenses) required to form a cooperative could reduce the negotiating leverage of smaller vessel owners if those vessels are less necessary to meet the cooperative formation requirements. In the extreme, if single small vessel owners are not perceived as necessary to form a cooperative, and it is perceived that these vessels cannot meet GRS requirements and economically participate in the BSAI, the negotiating leverage of those smaller vessels will be very limited. Again, whether this effect occurs is likely to depend on the circumstances and actions of sector members, in part, because it is not certain that small vessels will be instrumental in meeting the existing formation standard.

Modifying cooperative formation standards so that fewer QS permits are required to form a cooperative could provide additional opportunities for cooperative formation. Easing the

requirements could allow more cooperatives to form, each structured around similar fisheries or operations. It is difficult to predict the relative value of lower cooperative formation thresholds to companies owning a single or few vessels. One would expect that if more cooperatives can be formed, then owners of single vessels or few vessels, whether large or small, would have additional opportunities to negotiate. Under certain conditions, it could be possible that more than one owner of multiple vessels could be attempting to form a cooperative and these vessel owners could be actively competing to attract a single vessel owner to join. Under that scenario, the lower cooperative formation standards could improve the negotiating leverage of the single vessel owners because they may have additional opportunities to provide the necessary vessel or number of owners required. Without knowing the specific dynamics of the negotiating positions of the parties, which will vary from year to year, it is not possible to definitively state how modifying the number of QS permits would affect negotiating leverage.

Also, it is possible that negotiations would become more transparent with the lowering of cooperative formation thresholds. Specifically, the greater the number of outside opportunities, the more likely that persons negotiating cooperative membership will receive the actual value of their operations and assets to the cooperative. For example, a person who is instrumental to cooperative formation may be able to leverage that position with the cooperative to receive greater value for their participation in the cooperative than reflected by the value of their QS or assets under other fishing conditions because the other members would be willing to "pay" for that person's participation so they are not deprived of the benefits brought by cooperative membership that is ensured by the threshold member. On the other hand, if the cooperative can form with or without a person, the person will have no special leverage with respect to other members in negotiations. Thresholds that allow more cooperatives to form limit the extent to which leverage may be asserted by persons who are non-members prior to the threshold being met or by persons who are members after that threshold is met. In addition, creating a limited access fishery as the outside option likely increases any leverage arising from constraining cooperative thresholds, since the opportunity in the limited access fishery is likely to be substantially less appealing than the opportunity in a cooperative. In any case, persons in a position to deprive others from the benefits of cooperative membership will have added leverage, to the extent that the limited access opportunity poses challenges. This added leverage rises with competition in the limited access and will also rise for some sector members as the GRS increases.

Modifying the number of owners required to form a cooperative

Depending on the degree of any ownership threshold, sector members could be faced with requirements that require negotiation with several other owners in the fishery, or forming a single company cooperative and effectively receiving an individual fishing quota. Allowing a single company to form a cooperative would allow any sector member to form his own cooperative and receive an exclusive harvest privilege that could be fished or transferred to other sector members. A single person threshold would have the advantage of eliminating the potential adverse consequences of managing and fishing of a race for fish in the limited access fishery. Allowing a single company cooperative, however, could limit the formation of associations among participants who might wish to form a cooperative relationship with other owners because they may be less economically efficient or may be challenged by the GRS without the benefit of the larger vessels or larger QS allocations that would be brought to the cooperative by other sector members.

A potential advantage to lowering the number of owners required to form a cooperative, including providing a single company cooperative, is that owners who may otherwise be undesirable as cooperative partners would be able to receive an allocation that could be fished or traded to other members. These unwanted potential partners could be entities such as companies

with poor working relationships with other members, or small vessels that pose GRS challenges, and risks, for other cooperative members. By allowing single company cooperatives, those sector members would only assume joint liability for the actions of cooperative members with whom they truly desire business relationships, rather than sector members who must be taken on simply to meet the threshold. Once could argue that lower ownership standards could encourage companies with strong working relationships to operate more collaboratively under an integrated cooperative model, further increasing the potential benefits of cooperative management.

Establishing a minimum QS holding threshold for cooperative formation

Currently, no threshold amount of QS is required for cooperative formation. Establishing a standard to a cooperative to form, only if that cooperative holds a minimum amount of QS could be used to ensure that all cooperative exceed some minimum size. Various thresholds could be considered, if the Council wishes to consider this approach. Depending on the choice of thresholds, however, sector members could be treated differently under such a rule. For example, if a cooperative may be formed provided its member(s) hold a minimum of 10 percent of the aggregate QS under Amendment 80 fishery, only three of the existing sector members could independently form a cooperative (see Table 1). While these three members may be well positioned for negotiating cooperative terms, knowing that they can simply form an independent cooperative, the remaining sector members are likely to be disadvantaged. It is difficult to predict the precise effects on negotiating leverage of a QS threshold on any participant, but by allowing only larger QS holders to form cooperatives independently of other sector members, such a rule could disadvantage smaller entities. Generally, it is not clear that establishing a minimum QS threshold to form a cooperative would address the concerns raised by some fishery participants and described in this paper.

Summary and next steps

As noted throughout this document: (1) smaller vessel owners with limited QS are likely to have weakened negotiating leverage as the GRS increases if they cannot be competitive in the limited access fishery and options in the GOA are not viable; and (2) participants of any size will find it difficult to receive the benefits of cooperative management if they cannot reach agreement on negotiated terms because the limited access fishery is not an unattractive outside option, they cannot reach agreement on specific terms, or (less likely) a cooperative is able to derive some benefit from forcing an entity into the limited access fishery.

The document suggests that if the Council chooses to relax the cooperative formation standards it could: (1) increase the opportunities to QS holders to form cooperatives; (2) diminish the negotiating leverage arising from thresholds (which may be desirable because negotiating leverage has limited predictability because it is circumstance dependent); (3) reduce the potential for some sector members to force others to fish in the limited access fishery; and (4) reduce the incentive for members of a cooperative to attempt to create conditions that are unfavorable for certain fishery participants to form a cooperative.

Another potential solution to reduce the risk that a person may not be able to reach agreement with other members and would be forced into the limited access fishery would be to provide each QS holder with an amount of individual fishing quota that could be fished either individually, or could be assigned to a cooperative in a manner similar to the existing BSAI Crab Rationalization Program. Under such a model, small or large QS holders could choose to coordinate, or choose to fish independently without coordination. Such a model could provide an opportunity for smaller QS holders to continue to be active as individual operators, form smaller cooperatives, or choose to lease their CQ to other cooperatives or vessel operators.

Any modifications to the cooperative formation standards would require a careful reconsideration of the potential impacts on GRS compliance and quota management that were raised as concerns when the Amendment 80 Program was adopted and implemented.

If the Council chooses to proceed, a problem statement would need to be fleshed out and a range of options developed that would examine options possibly including:

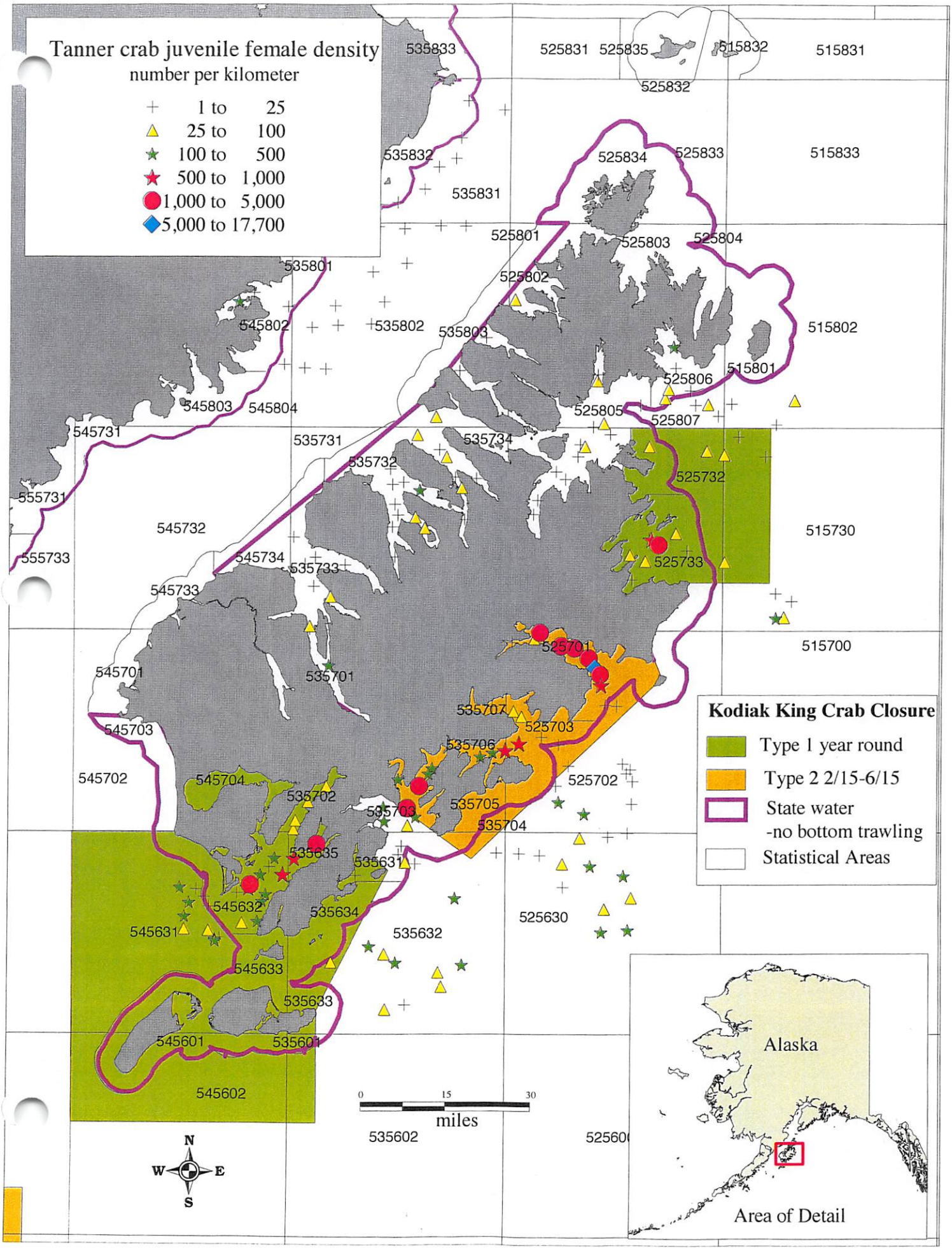
- Alternative 1: Status quo
- Alternative 2: Allow each QS holder to receive IFQ and allow QS holders to establish cooperatives under the existing cooperative formation criteria similar to the allocation process used under the BSAI crab rationalization fishery.
- Alternative 3: Reduce the number of owners required to form a cooperative from three, to two, or one unique owner.
- Alternative 4: Reduce the number of QS permits required from the existing nine permits to some lower range (e.g., three permits to the existing nine permits).
- Alternative 5: Combine Alternatives 3 and 4 to reduce both the number of owners and the number of permits required to form a cooperative (e.g., two owners with 6 permits).

Persons Consulted

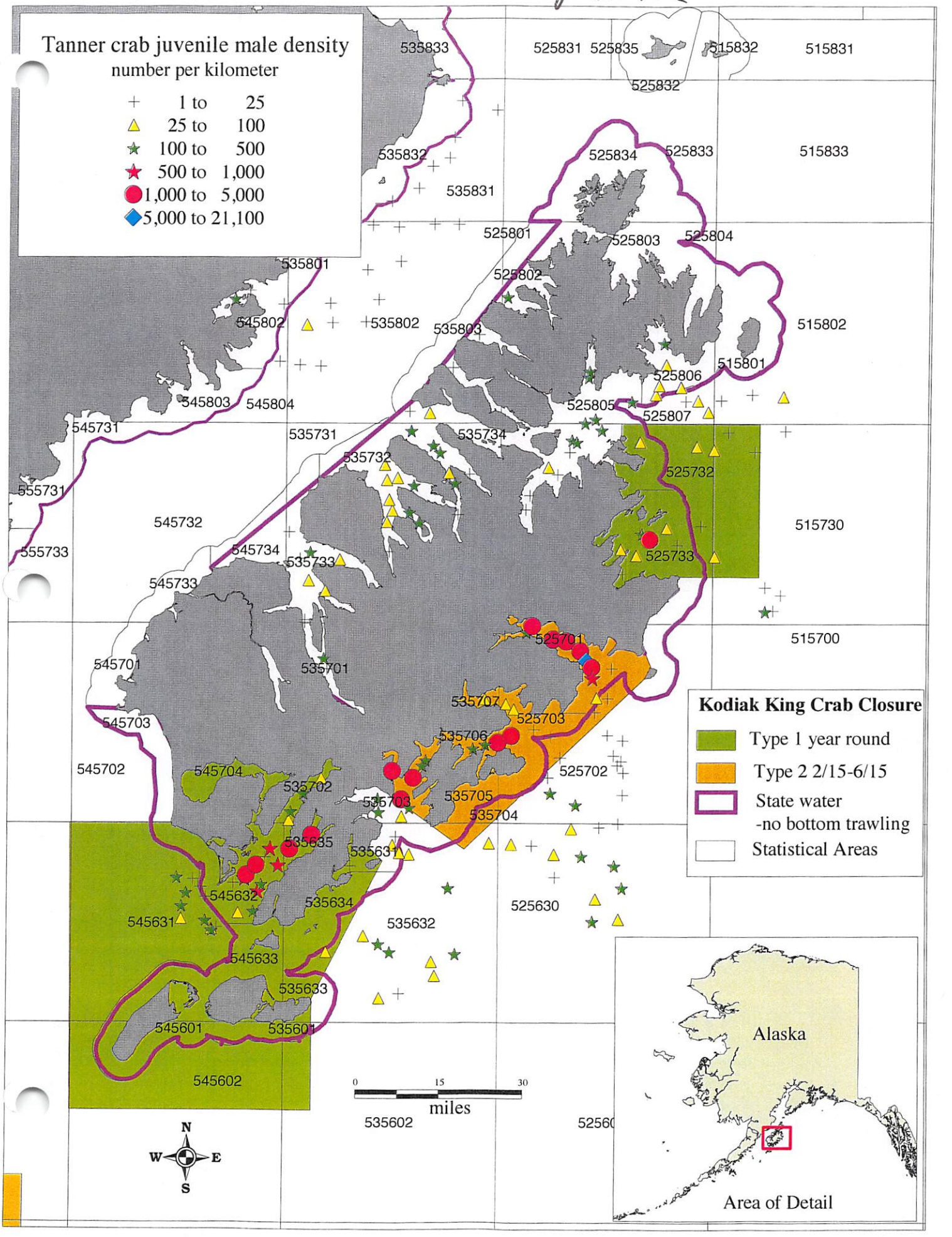
Jason Anderson	Dave Benson	Tracy Buck	Mary Furuness
Bill Orr	Susan Robinson	Lori Swanson	Mike Szymanski
Dave Wood			

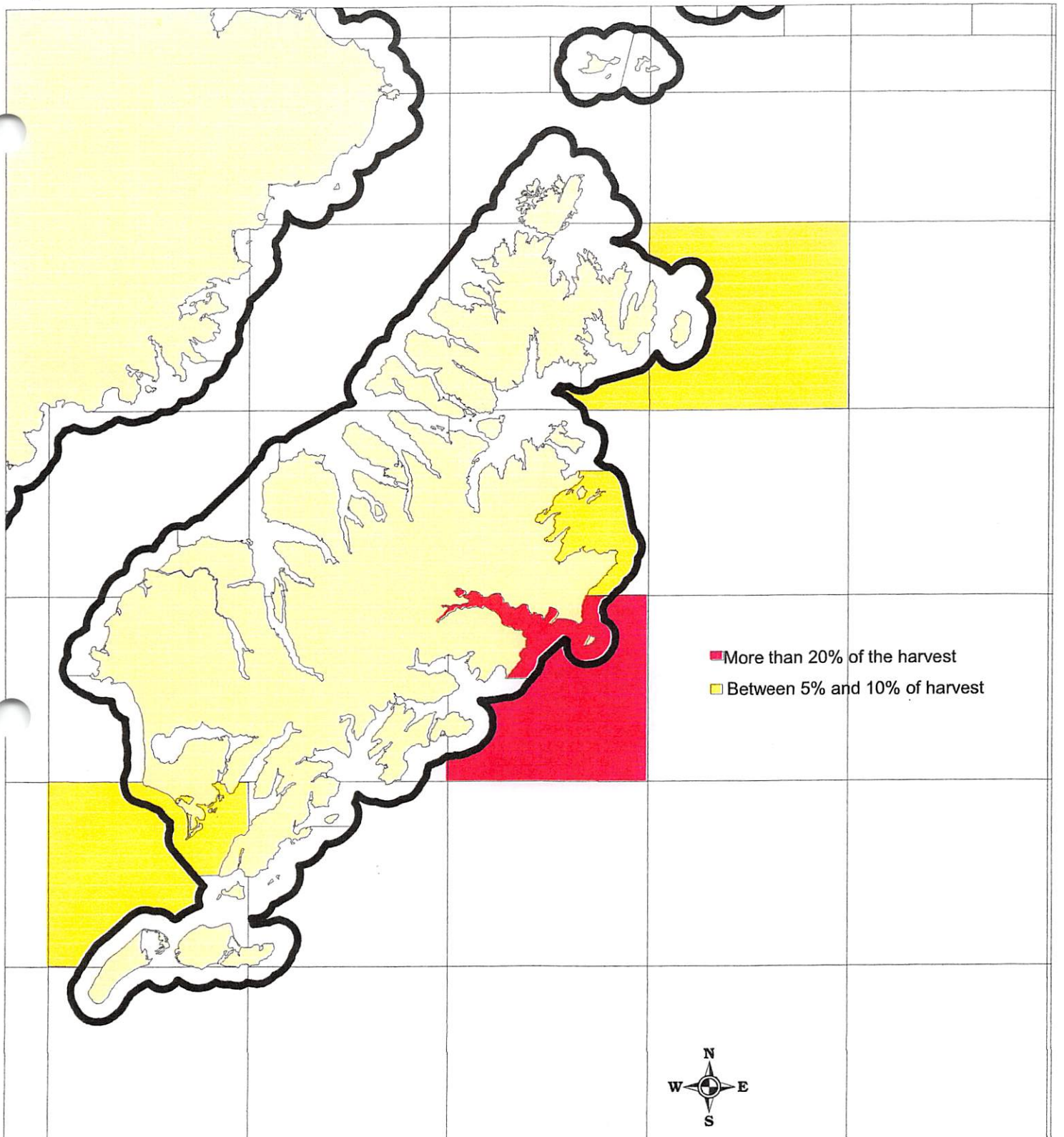
2007 Trawl Survey data - ADF&G

Peterson, Kwachka, 1-3/15
Waters, Gavin



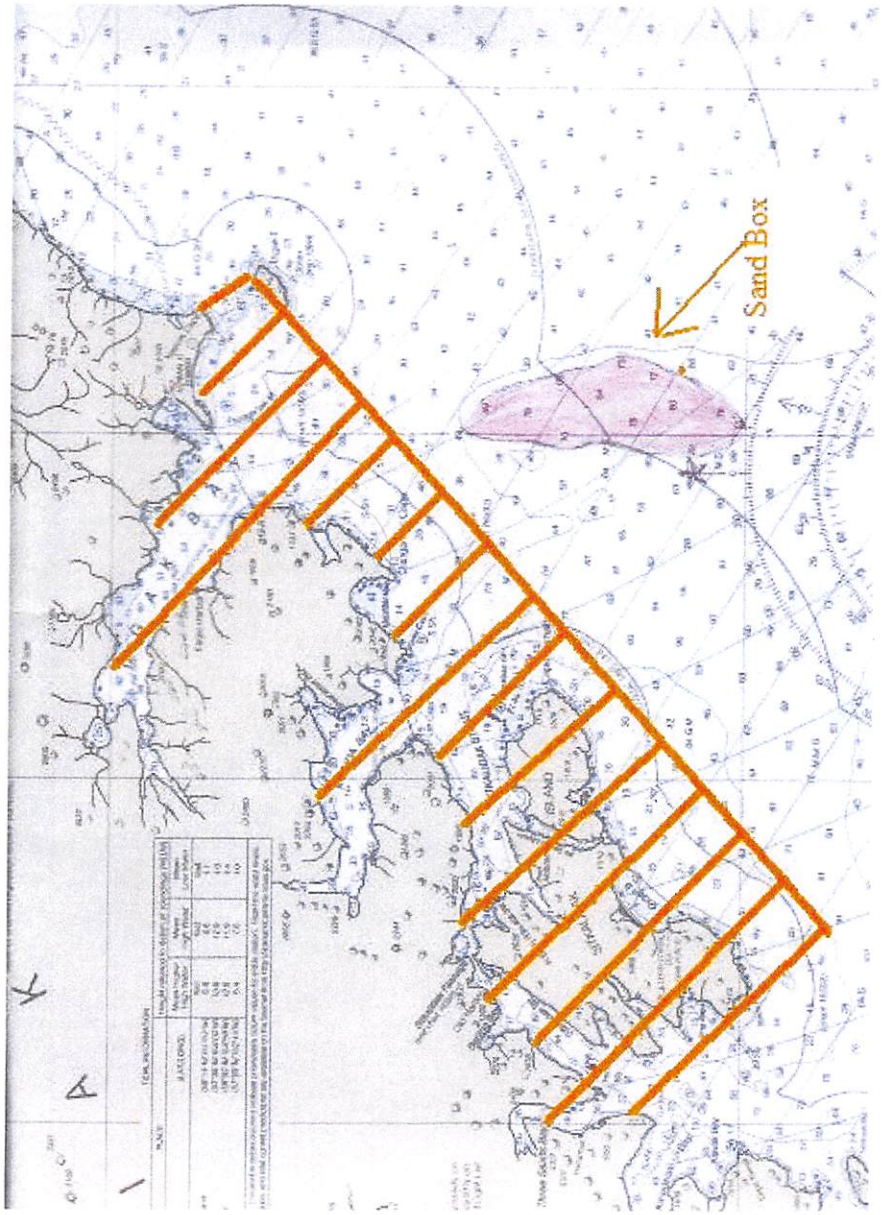
2007 ADF&G Trawl Survey data





Percentages based on total harvest 2005 - 2008.
Relative importance may change on a year to year basis
(only one stat area not included was important in one year - Kiliuda)

Directed Tanner Fishery ADFG



Proposed areas for 100% observer Coverage

Salmon and Crab Bycatch Measures for Gulf of Alaska Groundfish Fisheries

June 2008

Staff Discussion Paper

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Introduction

The North Pacific Fishery Management Council (Council) has adopted measures over the years intended to control the bycatch of some species taken incidentally in groundfish fisheries (Witherell and Pautzke, 1997). Bycatch control measures have been established in the Bering Sea and Aleutian Islands trawl fisheries for Chinook salmon (*Oncorhynchus tshawytscha*), 'other' salmon (consisting primarily of chum salmon, *O. keta*), Pacific herring (*Clupea pallasi*), Pacific halibut (*Hippoglosses stenolepis*), red king crab (*Paralithodes camtschaticus*), Tanner crab (*Chionoecetes bairdi*), and snow crab (*C. opilio*). Halibut bycatch limits and bottom trawl closure areas to protect red king crab have also been established for Gulf of Alaska (GOA) groundfish trawl fisheries (NMFS 2003). To date, no bycatch control measures have been implemented for salmon or other crab species taken incidentally in GOA groundfish fisheries.

In October 2007, the Council tasked staff to update a previous analysis on options for salmon and crab bycatch reduction measures in the GOA. The previous paper was presented to the Council in October 2005 under the GOA groundfish rationalization initiative. The Council is considering bycatch reduction measures for salmon and crab species in the groundfish fisheries. Species currently under consideration are Chinook salmon, chum (or 'other') salmon, *C. bairdi* Tanner crab and red king crab. In this paper, we provide a general overview of the available information on salmon and crab bycatch, an overview of species abundance, where available, and discussion the alternatives under consideration.

Methods

Catch and bycatch data were provided by the NMFS Regional Office and the North Pacific Groundfish Fishery Observer Program, and examined to gain insight into the amount, species composition, timing, and location of salmon and crab caught incidentally in GOA groundfish fisheries. NMFS catch statistics for years 1990–2007 for salmon and crab bycatch were summarized annually by each groundfish trawl fishery. Additionally, the amount of bycatch was reported on both a weekly and quarterly period to determine any temporal aspect to the bycatch rates for the fisheries with the highest bycatch. Average amounts of bycatch for multiple years and for percent contribution by individual fisheries were calculated with equal weighting given to each year utilized. The observer data represented all trawl catch for a given year, and was queried to produce bycatch of observed hauls by target fishery. Specific locations of salmon and crab bycatch were input into a GIS to produce charts of catch locations. Information on crab survey abundance estimates were obtained by published Alaska Department of Fish and Game (ADFG) reports, as well as data provided by the ADFG staff.

The North Pacific Groundfish Observer Program collects catch and bycatch data used for management and inseason monitoring of groundfish fisheries. Since 1990, all vessels larger than 60 ft (length overall) participating in the groundfish fisheries have been required to have observers onboard at least part of the time. The amount of observer coverage is based on vessel length, with 30% coverage required on vessels 60 ft to 125 ft, 100% coverage on vessels larger than 125 ft, and 100% coverage at shorebased processing facilities. There are no observer coverage requirements for vessels less than 60 ft. Since January 2003, observer requirements for pot vessels >60 feet have been modified such that these vessels are only required to have coverage on 30% of their pots pulled for that calendar year, as opposed to the 100% of the fishing days coverage required on other vessels >125 feet. Observer data provide for accurate and relatively precise estimation of groundfish catch, particularly on fleets with high levels of observer coverage, such as the Bering Sea walleye pollock fishery (Volstad et al. 1997). However, the precision of salmon bycatch estimates depends upon the number of vessels observed and the fraction of hauls sampled (Karp and McElderry 1999). In the Bering Sea, fisheries such as walleye pollock have a high percentage of hauls that are sampled so fleet wide estimates of salmon bycatch are considered to be reasonably accurate for management purposes (NPFMC 1995a, 1995b, 1999).

Observed catch estimates in the GOA

For Gulf of Alaska fisheries, observer coverage is lower in some target fisheries, due to the prevalence of smaller vessels in the GOA fishing fleet than in the Bering Sea fleet. Because observer coverage requirements are generally based on vessel length, the majority of the GOA fleet is subject to 30% observer coverage (vessels ≥60' to <125'), while the majority of the BSAI fleet is subject to 100% or greater observer coverage (vessels ≥125' or participating in specific rationalization programs). Only 53% of bottom trawl vessels in the GOA had any observed coverage between 1990 and 2000 (Coon 2006). Over the past 10 years, there has generally been an increasing level of participation by smaller vessels in the GOA groundfish fisheries, particularly trawl and fixed gear catcher vessels less than 60 ft (NPFMC 2003). Note that vessels <60' are not currently subject to any observer coverage requirements. Therefore, it should be noted that estimates of salmon and crab bycatch in GOA fisheries may be less precise than estimates of bycatch in Bering Sea fisheries.

Additional information on actual observed coverage levels in the GOA groundfish fisheries has been made available for the April Council meeting per distribution of a draft report in conjunction with the Observer Advisory Committee meeting on March 17, 2008. NMFS compiled a series of tables that provides a breakout of the percentage of harvest observed for each year 2004–2006, inclusive, in order to evaluate the effective rate of coverage in particular target fisheries. The data are broken out by observer coverage category (30%, 100%), gear type, area (BSAI, and Western and Central Gulf subareas), and component of the catch by the <60' fleet that is unobserved.[1] These tables are provided for review under the Council's Observer Advisory Committee report (C-5(a)) at the April Council meeting.

Information in the tables pertinent to the discussion of fisheries in the GOA is summarized below. Observer coverage is notably lower in the GOA than in the BSAI and any measures under discussion must take that into consideration as well. For the GOA Pacific cod pot fisheries, more than half the catch from 2004–2006 came from the <60' fleet that is unobserved. The remaining catch primarily came from the ≥60' to <125' fleet where percent coverage ranged from 19%–22% over these three years.[2] For the Pacific cod hook-and-line fisheries, in both 2004 and 2006, the catcher processor catch was nearly equally split between the ≥60' to <125' fleet and the ≥125' fleet where coverage ranged from 21%–73% and 100%, respectively. (Confidential data prevents this same comparison in 2005.) For catcher vessels, the majority of hook-and-line catch was in the <60' unobserved fleet. For the Pacific cod trawl fisheries delivering shoreside, approximately 10%–50% of the annual catch over the three-year period is in the unobserved fleet, while in the ≥60' to <125' category coverage ranged from 24%–32% in this time frame. For the pollock trawl fisheries, less than 25% of the catch was from the unobserved <60' fleet each year. The remaining catch came from the ≥60' to <125' fleet where coverage ranged from 33%–37% over these three years. For arrowtooth flounder, the majority of the catch delivered shoreside was in the ≥60' to <125' category and percentage covered ranged from 20%–26% over the three-year period. Catch of flathead sole in the catcher processor fleet was primarily in the ≥60' to <125' category and percentage covered ranged from 32%–54%. The relative coverage of catch in the shallow-water flatfish category was estimated at 0%–14% during the three-year period.

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[1] Note that the total catch data referenced is from the NMFS catch accounting system, and the observer data is from the NMFS observer database. The observer data includes both sampled and unsampled hauls when an observer is onboard, as the data request attempts to determine the percent observed catch whenever an observer is onboard a vessel. High variability in percent observed catch among years has been correlated to several factors, such as the varying season lengths, number of participating vessels, different catch rates per year, weather, and market prices.

[2] In 2004, some catch is also attributed to the ≥125' fleet, whose effective rate of coverage was 64%.

Catch Accounting

Data from observed vessels are utilized to determine prohibited species catch (PSC) rates when sufficient data are available. The PSC rate is the weight or number of animals per metric tons of groundfish; salmon are calculated by number. All shoreside processing with the same gear, target, and area use an average PSC rate for all observed catcher vessels with the same gear, target, and area. An observed catcher/processor uses the rates from the observer on the vessel. An unobserved catcher/processor uses a PSC rate from observed vessels in the same area and target fishery using the same gear type. The smaller vessels (under 60 ft) with no observers and those that only require 30% observer coverage utilize rates calculated based on the best data available. The first choice is to use one of four different types of "three week average rates" for the same week, reporting area, gear, and target. Three of the four types are sector rates that use either observer data from catcher vessels delivering to shoreplants, catcher vessels delivering to motherships, or data from catcher processor observers. The sector rates are used and applied to unobserved catch from the corresponding sector if a sufficient number of observer reports are available. The fourth rate combines data from all catcher vessels and catcher processor observers. The combined rate is used only if an insufficient amount of observer data exist to be able to use one of the three sector rates. If one of the four different types of "three week average" sector rates does not have sufficient observations, a substitute rate, based on data from prior years, in the same reporting area, gear and target may be used as the second choice. If that is not available, the third choice is for GOA and BSAI annual average yearly rates, using the same gear and target.

Once the PSC rate has been determined, the PSC estimates are computed by multiplying the rate for each prohibited species, times the total groundfish weight for the processor from the groundfish catch accounting system. Key information including week, reporting area, gear, and target are used to match PSC rates with the groundfish catch.

Several improvements were made to the catch accounting system in 2003, which include computing PSC rates daily instead of weekly. Observed catcher vessels also now use the rates from the observer on the vessel, rather than an average PSC rate for all observed catcher vessels applied to the shoreside processor data with the same gear, target, and area. Although this data methodology is not as accurate as having an observer onboard monitoring 100% of the hauls on all vessel sizes, it is repeatable and uses the best available information and approach (NMFS, AKR, Mary Furuness, pers. comm.).

Mortality Rates

Gear specific mortality rates for crab species have been calculated as 8% for pot gear, 80% for trawl gear, 37% for longline gear, and 40% for scallop dredge gear (NPFMC 1995). NRC (1990) estimates for trawl caught king crab range from 2% to 81%, while Tanner crab mortality estimates from trawl gear range similarly from 12% to 82%. Some directed fishery information on mortality rates in the North Pacific are summarized below. Additional information on gear specific crab bycatch ranges can be found in the Crab Bycatch Chapter of the annual SAFE report for the BSAI Crab Fisheries (NPFMC 2007).

Recent analysis to re-evaluate appropriate biological parameters in establishing new overfishing definitions for BSAI crab stocks have employed 50% handling mortality rates for snow crabs, 20% for king crab, and 20% for Tanner crabs in the directed crab fisheries (NPFMC 2007). A range of rates have previously been considered for the directed crab species [by species and study]. Bycatch mortality rates in the directed snow crab fishery (pot rates) were estimated for discarded snow crabs during the 1998 fishery (Warrenchuck and Shirley 2002). An estimate of 22.2% mortality, which included the estimated effects of wind and cold exposure as well as handling injuries, was considered to be a conservative estimate because these factors were considered separately and not synergistically (Warrenchuck and Shirley 2002). Available studies on Tanner crab mortality in the GOA were all laboratory studies of natural mortality in crabs and focused upon snow crab, not *C. bairdi* Tanners (e.g. Shirley 2004). No additional studies on trawl or pot caught mortality

rates for *C. bairdi* (or any other) crabs in the GOA were available at this time (T. Shirley, pers. comm.). Discard mortality rates for red king crab have been estimated at 37% for longline fisheries and 8% for pot fisheries (NPFMC 1999). Gear-specific bycatch mortality rates are employed annually in the annual Crab SAFE report (NPFMC 2007) to summarize mortality by the directed crab and other fisheries and use the following for groundfish trawl, fixed gear, and scallop dredge gear mortality: 80%(trawl), 20% (fixed) and 40% (dredge). Species specific rates for the directed crab fisheries use the following: 24% for *C. opilio*, 20% for *C. bairdi*, and 8% for blue king crab and red king crab. Additional discussion of the these rates both for directed crab fisheries as well as incidentally-caught crab in other fisheries is likely to occur at the spring Crab Plan Team meeting in conjunction with implementation progress on revised Crab OFLs.

Salmon mortality rates are also highly variable, both by gear type and for different size salmon. Chinook salmon caught in troll gear have an estimated mortality rate as low as 8%, while longline gear mortality rates have been estimated to be as high as 100% (Alverson et al. 1994). For the purpose of this discussion, it is assumed that the full bycatch of salmon has a 100% mortality rate within the longline and trawl fisheries.

Review of Existing Closures

In consideration of additional time and area closures in the GOA groundfish fisheries, it is important to review and consider the interaction of the existing closures in this region. Figures 1 through 4 show the existing State and Federal closures in the GOA management area. The timing and purpose of each closure are summarized below (dates in parentheses indicate the year of implementation of the closure).

Kodiak red king crab closures: Type I and Type II (1993). Trawl closure areas, designed to protect Kodiak red king crab because of the poor condition of the king crab resource off Kodiak and because trawl bycatch and mortality rates are highest during the spring months when king crab migrate inshore for reproduction. The molting period off Kodiak begins around February 15 and ends by June 15. Type I areas have very high king crab concentrations and, to promote rebuilding of the crab stocks, are closed all year to all trawling except with pelagic gear. Type II areas have lower crab concentrations and are only closed to non-pelagic gear from February 15 through June 15.

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

SSL no pollock trawl zones (2003). Groundfish fishing closures related to SSL conservation establish 10-nm fishing closures surrounding rookeries to protect endangered Steller sea lions.

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

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

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

State Water no bottom trawling (2000). State managed area provides year-round protection from all bottom trawl gear. Closes all state waters (0–3 nm) to commercial bottom trawling to protect nearshore habitats and species.

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

Salmon Bycatch

The following section provides updated bycatch information for salmon in the GOA. A more detailed report on salmon bycatch in groundfish fisheries off Alaska as it pertains to the GOA is provided by Witherell et al. (2002).

Amount of Bycatch

Pacific salmon, including Chinook, chum, coho *(O. kisutch)*, sockeye (*O. nerka*), and pink (*O. gorbuscha*) are taken incidentally in the groundfish fisheries within the Gulf of Alaska. Salmon are not generally caught in longline and pot gear (Berger 2003). However, salmon are taken incidentally in most GOA trawl fisheries, thus this discussion focuses upon bycatch in the trawl sector. Salmon bycatch is currently grouped as Chinook salmon or 'other' salmon, which consists of the other four species combined. Over 95% of the 'other' salmon bycatch consists of chum salmon (Table 1). The bycatch of 'other' salmon in the last 3 years (average of 5,067 salmon, 2004–2007) is much lower than the time series average (average of 15,452 salmon, 1990–2007). Bycatch of Chinook salmon in the last 3 years (average of 27,195 salmon, 2004–2007) is higher than the time series average (average of 21,488 salmon, 1990–2007).

'Other' salmon bycatch declined substantially from the 1993-1995 period. Bycatch of 'other' salmon in the GOA groundfish trawl fisheries from 1993–1995 is shown in Table 2. Bycatch was typically highest in the month of July, reaching a peak of 48,518 salmon in 1998. This peak in 'other' salmon bycatch during this period was due to the timing of the pollock trawl fishery. During these years the season opened in July. In 2000, the pollock trawl fishery timing was changed due to changes in regulation for Steller sea lions to the current seasonal openings of January 20, March 10, August 25 and October 1. Since this change, the 'other' salmon bycatch has been far less than the 1995 peak. Since 1995, the highest annual amount of 'other' salmon bycatch was 13,539 in 1998, with amounts decreasing to 3,487 in 2007. In more recent years, a maximum of 4,224 fish was reached in July (in 2005) and dropped to 605 in 2007 (Table 3). 'Other' salmon bycatch increased in 2003 to 10,362, but declined again in 2004 to 5,816, and has remained lower than 10,000 in the last 4 years.

Bycatch of Chinook salmon also fluctuates in the pollock fishery. In recent years the numbers of Chinook have increased from 15,506 in 2003, to over 40,000 in 2007. Bycatch is highest in February and March, with the greatest increase seen in March 2007, with over 28,654 estimated (Table 4). Additionally, Chinook bycatch is higher in October, with a range of 2,339 to 10,529 fish caught in the last three years.

In the 2003–2007 trawl fisheries, an average of about 11,000 Chinook salmon per year were taken by the walleye pollock pelagic trawl fishery; followed by 7,800 in the non-pelagic trawl fishery; 1,110 Chinook salmon in the Pacific cod fishery; 3,900 Chinook salmon in the flatfish fishery (all targets combined); and almost 1,000 Chinook salmon in rockfish target fisheries (Table 5). In an average year, the walleye pollock fishery accounted for 75% of the Chinook salmon bycatch, with the trawl fisheries targeting Pacific cod taking 4%, and flatfish fisheries taking 15%.

About 1,900 'other' salmon were taken in the walleye pollock fishery, on average, during the 2003–2007 fisheries (Table 6). In 2004, bycatch of 'other' salmon in this fishery was drastically reduced to 594 (in

2004), although the annual bycatch numbers show an increase to 1,417 and 817 in 2006 and 2007, respectively (Table 6). Out of the average 5 years more of the 'other' salmon bycatch has been taken in the flatfish fishery (44%) followed by the walleye pollock trawl fishery (30%), with the rockfish (26%) also taking a substantial proportion. It is likely that relative amounts of bycatch taken in the walleye pollock fisheries have been lower in recent years, due to reduced catch limits for walleye pollock.

Location and Timing of Bycatch

The timing of salmon bycatch follows a predictable pattern in most years. The average of 2003–2006 is shown as an example of the timing of bycatch in GOA groundfish fisheries (Figure 5). Chinook salmon were taken regularly from the start of the trawl fisheries on January 20 through early April, and also in high quantities during June/July and September/October in the walleye pollock fishery. Chum salmon were not taken in any great numbers until mid-June, after which they were taken regularly through the end of the season (Figure 6). The timing of salmon bycatch in 2007 appears similar to what occurred in previous years. Recall that the 2000 fishery exhibited a different temporal pattern of bycatch, perhaps due to the U.S. District Court order that forced the walleye pollock fleet to fish outside of Steller sea lion critical habitat (Witherell et al. 2002).

Salmon bycatch occurs in the western and central GOA management areas, corresponding to locations of the trawl fisheries. Since 1998, the eastern GOA (east of 140°W longitude) has been closed to all trawling, with the implementation of Amendment 58 to the GOA groundfish FMP. During the 2000–2002 period, Chinook salmon were taken in relatively higher numbers in some trawl hauls to the east of Kodiak Island (some over 200 salmon per haul from extrapolations), although they can be taken in relatively high numbers per haul in other areas (Figure 7). During the 2000–2002 period, 'other' salmon were taken in relatively low numbers along the shelf (Figure 8). Spatial information for recent years has not yet been investigated. Should the Council move forward with an analysis of GOA bycatch measures, updated spatial analysis will be done to better evaluate appropriate measures and candidate fisheries and areas for further management actions.

Comparison of salmon bycatch with regional and foreign run strength and hatchery release

Several countries in addition to the U.S. have hatchery releases of chum and Chinook salmon. The North Pacific Anadromous Fish Commission tabulates summaries of these hatchery releases in millions of fish (Table 7). For Chinook salmon, Canada and the United States share the highest amount of hatchery releases, with the U.S. releases predominantly in the Alaska region and the Canadian releases predominantly located in the western and southern coasts of Vancouver Island. For chum salmon a far greater amount of hatchery releases are recorded in Japan than Canada, the United States, or Russia. No correlation is available, however, with the bycatch of salmon in the GOA and the release from any of these hatchery sites.

Origin of Chinook and chum bycatch in the Gulf of Alaska

It is difficult to ascertain direct effects of hatchery salmon releases and bycatch of salmon without specific information on each bycaught salmon. While some bycatch sampling studies have been conducted for the Bering Sea salmon bycatch in the trawl fisheries, no studies have been done to specifically address the origin of the GOA trawl fishery bycatch. However some information is available from other studies on the origin of salmon species. The High Seas Salmon Research Program of the University of Washington routinely tags and monitors Pacific salmon species. The Coded Wire Tag (CWT) information may not accurately represent the true distribution of hatchery caught salmon. However, as much of the CWT tagging occurs within the British Columbia hatcheries and, thus, most of the CWT recovered come from those same hatcheries. CWT tagging does occur in some Alaskan hatcheries, specifically in Cook Inlet, Prince William Sound, other Kenai region hatcheries, as well as in hatcheries in Southeast Alaska (Johnson, 2004). Some CWT studies have also tagged Washington and Oregon salmon and many of these tagged salmon have been recovered in

the GOA (Myers et al. 2004). The 2003 program report for the High Seas Salmon Research Program details additional data on west coast salmon tag recoveries (Myers et al. 2004). In 2006, 63 tags were recovered in the eastern Bering Sea and GOA (Celewycz et al. 2006). Of these 63 new CWT recoveries, 8 CWT Chinook salmon were recovered from the Gulf of Alaska trawl fishery in 2006 and 2007, 8 CWT Chinook salmon were recovered from the Bering Sea-Aleutian Islands trawl fishery in 2006 and 2007, 44 CWT Chinook salmon were recovered from the Pacific hake trawl fishery in the North Pacific Ocean off WA/OR/CA in 2006, and 3 CWT steelhead were also recovered from Japanese gillnet research in the central North Pacific Ocean. Overall tagging results in the GOA showed the presence of Columbia River Basin Chinook and Oregon Chinook salmon tag recoveries (from 1982–2003). Some CWT recovered by research vessels in this time period also showed the recoveries of coho salmon from the Cook Inlet region and southeast Alaska coho salmon tag recoveries along the southeastern and central GOA. Scientists at the University of Washington are currently studying the stock origins of Chinook salmon incidental catch in the eastern Bering Sea (Myers et al. 2004); however, no studies have specifically examined the stock composition of salmon bycatch from GOA trawl fisheries.

Allozyme methodology has been applied to chum salmon samples collected by research gillnets in the high seas (Urawa et al. 2000). Results indicate that North American chum stocks were common in the central GOA (15% western Alaska, 25% Alaska Peninsula/Kodiak, 28% Southeast Alaska/Prince William Sound, 18% from Canada), and Asian chum salmon were predominant in the western GOA (25% Japan, 53% Russia, 13% western Alaska, 10% elsewhere). Chum salmon research in the Bering Sea was also recently completed, which details additional information on the origin of those stocks (Urawa et al. 2004).

Additional research on stock discrimination for Chinook salmon is being conducted by evaluating DNA variation, specifically single nucleotide polymorphisms (SNPs). Results, as they pertain to GOA trawl samples, have not yet been highlighted as the most recent focus for updated information and sampling has been on the Bering Sea pollock fishery. Additional information on stock of origin results for the Bering Sea pollock fishery in recent years will be presented at this meeting. The intent to replicate sampling and research in the GOA trawl fisheries is not yet clear.

Overview of Chum and Chinook Stock Status and Commercial Catch

Salmon stocks in the Gulf of Alaska are managed by the State of Alaska. Forecasts of salmon runs (catch plus escapement) for major salmon fisheries and projections of statewide commercial harvest are published annually by ADFG. For purposes of evaluating the relative amount of bycatch as compared to the commercial catch of salmon by area, Table 8 and Table 9 show the commercial catch of Chinook and chum species by management area between 2004 and 2007. It should be noted that these catches are shown here only as a proxy for an indication of run strength for Chinook and chum stocks across the GOA. Available information on individual stocks and run strengths varies greatly by river and management area. Commercial catches are subject to market constraints and, thus, are not the best estimate of the relative stock size. However, understanding this limitation, some limited information regarding the health of the resource can be obtained by reviewing the commercial catch. Should the Council move forward with an analysis of salmon bycatch measures in the GOA, data and information on run sizes, and management by river system will be compiled as well as an approximation made to the relative impact of bycatch in groundfish fisheries on individual river systems. A similar analysis is currently underway for the BSAI (Bering Sea Salmon Bycatch Management EIS). To date no analysis has been initiated by the Council in the GOA, thus commercial catch information only is summarized below to provide some indication of stock status in the GOA.

For Chinook stocks, the 2004 catch in the southeast area represented the highest Chinook harvest on record (since statehood) and almost twice the 10-year average (Eggers 2005). In Prince William Sound, the 2007 harvest was below the projected harvest and the 7th largest since 1985. Cook Inlet harvests were low compared to long term averages as well. For Kodiak, the 2004 harvest was much higher than the previous 10-year average (Eggers 2006), with lower catches in 2007 compared to the long term average. Estimated Chinook escapement was likewise higher than the escapement objective and greater than the previous 10-year average (Eggers 2005). For Chignik, the 2004 escapement was the largest on record and greatly exceeded the escapement goal (Eggers 2006). The harvest of Chinook was approximately equal to the previous two years' harvests (under the cooperative management plan) and roughly half of the 10- and 20-year averages. South Alaska Peninsula Chinook harvest in 2007 was less than the 10-year average.

For chum salmon, the statewide harvest of 17.3 million fish ranks within the top 10 harvests of all time, with an exvessel value of $39.5 million, compared to the most recent 10-year average of $32 million. (ADFG 2007). Not all areas experienced increases in harvests amounts (or value) in recent years, however it was noted that the trend in reduced fishing effort is affecting the ability of the fleet to harvest the available fish in some areas thus the harvest of some species might have been higher had there been greater demand for the product (Eggers 2006). Prince William Sound chum runs were below the expected enhanced run estimates. In the Upper Cook Inlet, the run was approximately 25% less than the recent 10-year average due primarily to reduced fishing time by the drift fleet (Eggers 2006). While chum salmon production in south central Alaska has been poor since 1986, incremental improvements have been occurring each year since 1995-1996 and the 2004 runs to most of Cook Inlet were good (Eggers 2005). Lower Cook Inlet chum harvest in 2004 was the highest catch since 1988 and over 7 times the 10-year average. For the Kodiak management area, the chum harvest was near the forecast and above the 10-year average. Overall escapement for Kodiak met the escapement objective but was slightly below the 10-year average. Limited aerial surveys led to incomplete escapement estimation for some systems (Eggers 2006). Chum harvests in the Chignik area were below average but also likely attributable to a lack of commercial effort. Overall Chignik escapement estimates for chum exceeded the sustainable escapement goals. The South Peninsula indexed total chum escapement was above the escapement objective in 2004, while harvests were below the 10-year average (Eggers 2005).

Crab Bycatch

Several species of crabs may be taken incidentally in GOA groundfish fisheries. For purposes of this discussion we are only characterizing the bycatch of red king crab and *Bairdi* Tanner crab species in the GOA groundfish fisheries. Additional information on the bycatch of other crab species in the GOA was provided in previous discussion papers. See the NPFMC website for additional background information: (http://www.fakr.noaa.gov/npfmc/current_issues/groundfish/goacoop.htm)

Amount of Bycatch in Trawl Fisheries

The numbers of crabs taken as bycatch in GOA groundfish trawl fisheries are shown in Table 10. Bycatch of red king crabs is relatively low. An average of 256 red king crabs were taken in 2004–2007 trawl fisheries.

Since 2003, the majority of red king crab have been taken in the combined flatfish fisheries, and in the rockfish trawl fisheries. The highest amounts of red king crab bycatch since 2003 occurred in 2006 fishery, with 345 red king crabs caught, all were from the shallow water flatfish trawl fishery. Previous to that high bycatch was recorded in the rockfish fishery in 2004 with 275 crabs (Table 11).

The bycatch of *C. bairdi* Tanner crabs in GOA trawl fisheries has fluctuated through the time series, reaching a high of 306,767 crabs in 2006, to a low of 29,947 crabs in 1999. Bycatch of *C. bairdi* Tanner crabs in the last 4 years (167,145 crabs per year average, 2004–2007) is higher than the average for the time series from

1993–2004 (108,540 crabs). An examination of the seasonal and annual bycatch of *C. Bairdi* Tanner crabs since 1993, with a specific focus on the recent period (since 2000) was conducted to identify the appropriate limits, and the fisheries for which these limits should apply. The bycatch of *C. bairdi* Tanner crabs in GOA trawl fisheries has fluctuated through the time series, from a low of fewer than 35,000 crabs in 1994, to a high of over 300,000 crabs in 2007 (Figure 9).

During these years, the highest total bycatch of Tanner crabs occurred in 2007, where particularly elevated bycatch in the pot sector was observed (Figure 10). The highest numbers of Tanner crab taken as bycatch occur primarily in the trawl fisheries (specifically the Pacific cod trawl and flatfish trawl) and in the pot fishery for Pacific cod (Table 12). The average percent contribution by gear type in 2007 for C. bairdi Tanner crab are: 40% for combined trawl fisheries, 60% for pot fisheries and <0.01% for all longline fisheries (Table 12). This is in contrast to the average from 2003–2007, where the trawl fisheries accounted for 60% of the bycatch and pot fisheries 39%. Bycatch of C. bairdi Tanner crabs in the Pacific cod pot fishery was notably higher from 2005–2007, than the estimates from 2003 and 2004. Further examination of the location of the pot cod fishery (and flatfish trawl fishery) may possibly provide an explanation for the relative decrease in crab bycatch in the pot cod fishery and increase in the flatfish trawl fishery. The relative observer coverage in these fleets is notably limited, particularly in the Pacific cod pot fishery. This will be an important aspect for examination in the forthcoming analysis.

Location and Timing of Bycatch in Trawl Fisheries

Bycatch amounts of *C. bairdi* Tanner crab taken in trawl fisheries appear to fluctuate temporally in direct response to groundfish catches, particularly catches of Pacific cod and flatfish, which are managed on a quarterly basis, with the trawl fishery beginning on January 20th each year. The seasons for trawl gear increased to 5 beginning in 2001. Average bycatch of Tanner crabs between 2003 and 2006 (in numbers of crabs) increased dramatically in mid-March due to bycatch in the combined flatfish fishery, and was high from late April through May and once again in mid-October (Figure 11), each time in the flatfish fisheries, notably in the flathead sole fishery (March), Shallow water flatfish (April–May) and Arrowtooth flounder fisheries (October). Bycatch of *C. bairdi* Tanner crabs in 2006 was highest (in numbers of crab) during late March and early April (shallow water flatfish), corresponding to seasonal release of the halibut PSC apportionment for use in the flatfish fishery with an additional spike in late July (Arrowtooth flounder) (Figure 12).

Bycatch in longline and pot fisheries

Bycatch of red king crab and *C. bairdi* Tanner crab, by gear and fishery, for 2003–2007, are shown in Table 11 and Table 12. Longline gear catches very few crabs of any species.

For red king crab, the average number of crabs taken in all fisheries for 2003–2007, is 200. Of this, 83% were in the trawl fishery, 3% in the pot fishery, and 14% in the longline fishery.

Bycatch of *C. bairdi* Tanner crabs in the Pacific cod pot fishery was notably higher from 2005-2007. Further examination of the location of the pot cod fishery (and flatfish trawl fishery) would possibly provide an explanation for the relative decrease in crab bycatch in the pot cod fishery and increase in the flatfish fishery. Also, as was noted in the previous discussion, the relative observer coverage in these fleets is limited, particularly in the Pacific cod pot fishery.

Contribution to bycatch by the State waters cod fishery

An examination was made of the State waters Pacific cod fishery contribution to the *C. bairdi* Tanner crab bycatch amounts (Table 13). Preliminary data were obtained by ADF&G for three locations in the Western GOA: Kodiak, South Peninsula, and Chignik. Data were available for various years in each location. In the

Kodiak district, data were obtained for observed trips in 1997–1999 and 2001. In the South Peninsula district, data were obtained in 1998–2002, 2004–2006 and in Chignik in 2003 only. Of these years, 2001 in Kodiak District showed the highest number of Tanner crab with 171. It was noted by ADF&G that this was obtained in only one observed trip. In the South Peninsula region, the highest number of Tanner crab was obtained in 2001, where 52 crab were caught, and 25 in 2006, as compared with 0 to 1 in all other years for which data were obtained for this region. For Chignik, 2003 was the only year for which preliminary data were available. Here 42 crabs were obtained as bycatch. The State waters bycatch numbers for *C. bairdi* Tanner crab are still low in comparison to total *C. bairdi* Tanner numbers in the GOA. Currently due to the absence of a full State onboard observer program less than 1% of the State waters fishery is observed. ADFG staff had noted that, due to rising concerns regarding the limited available observed pots, increased effort would be made to observe more trips in future fisheries. Unfortunately, the short and intense season in 2007, made it very difficult for ADFG staff to allocate a dockside sampler for an observer trip, thus, only one new observer trip was possible last year (Kally Spalinger, pers. comm.).

Overview of Crab Management and Stock Status

Crab fisheries in the GOA are managed by the State of Alaska, under a Federal FMP. Abundance estimates are produced by region (where possible). For most regions, actual abundance estimates are limited and commercial fishing has been closed. An annual trawl survey is conducted by ADFG. The survey methodology is designed to concentrate sampling in areas of historical king and Tanner crab abundance (Figure 13).

Red King Crab

Major red king crab fisheries have occurred historically in the Kodiak and Alaska Peninsula Areas. Stock size is estimated by an annual trawl survey, and fisheries are opened only if biomass estimates meet or exceed threshold levels established by the State. The Kodiak area red king crab population remains at historically low levels (Mattes and Spalinger 2007). Fishing seasons for Kodiak red king crabs have remained closed since the 1982/1983 season.

Results from the 2006 Kodiak trawl survey estimated the red king crab population at 215,976 animals (up from 113,710 crabs in 2005, but down from 369,779 in 2004). The majority of the crabs were found in the Southwest and Shelikof districts (Spalinger, In prep.). The mature red king crab female population was estimated to be 74,259 animals, well below the 5.1 million threshold required for a fishery opening (Mattes and Spalinger, 2007) Population estimates for Kodiak, based on 1994–2004 ADFG trawl surveys, are shown in Figure 14.

Results from the 2006 Alaska Peninsula survey indicated that the red king crab population there remains at very low levels. The estimated population from the survey was 34,178 crabs, an increase from the estimated 31,102 from the 2005 survey (Spalinger, In prep.). The stock is notably patchy in distribution, as well as at low levels, hence biomass estimates can be wildly varying from year to year. The fishery has been closed since the 1982/1983 season. Population estimates for the Alaska Peninsula based on 1994–2004 ADFG trawl surveys are shown in Figure 15.

For the Cook Inlet management region, no population abundances are estimated, but the survey is used to provide a relative abundance index (thus, no extrapolation is done on survey data for an overall population abundance estimate). However, based on the abundance index, the red king crab stocks in the Cook Inlet management region are considered to be severely depressed and patchily distributed. It was noted in the assessment that all of the current populations of red king crabs in the region are vital to supporting the existing population (Bechtol et al. 2002).

In the Southeast management region, pot surveys are used to estimate trends in abundance in northern and southern bays of the region, however a regional estimate of total population is not available. Survey results are utilized to estimate relative abundances, estimated as catch per pot day for each sex and size class of crabs. Survey results indicated greater increases in abundance in the northern regions, though both northern and southern regions have abundances comparable to the relatively high abundances seen in the early 1980s (Clark et al. 2003).

Tanner Crab

Commercial fishing for *C. bairdi* in 2007 occurred in areas of the Eastside and Northeast sections of the Kodiak District and the Western section of South Peninsula District. GHLs by region were the following in 2007: Kodiak (Eastside and Northeast sections combined) 800,000 pounds and South Peninsula 200,000 pounds. For 2008 (fishery begins January 15, 2008), the GHLs will be: Kodiak District 500,000 pounds and South Peninsula 250,000 pounds.

For *C. bairdi* Tanner crab, 2006 population estimates for the Kodiak District are at approximately 165 million crabs, for South Peninsula 77.3 million crabs, and Chignik 42 million crabs (Spalinger 2006). Population estimates for Kodiak and the South Peninsula District based on 1994–2006 ADFG trawl surveys are shown in Figures 16 and 17. For the South Peninsula this estimate represents an increase from the previous survey. Recent survey results indicate an increase in females from 2006–2007 (Spalinger 2007).

Population estimates for Cook Inlet management region list male *C. bairdi* Tanner crab abundances in the Southern region as 3.1 million males, however it was noted that the estimate of legal sized males is at a historic low. Female abundance in this region was estimated at 2.1 million crabs in 2001, primarily due to a very high number of estimated juveniles. The southern region has been closed to commercial fishing due to low crab abundances since 1995 (Bechtol et al. 2002).

The Kamishak and Barren Islands District of the Cook Inlet management region has also been closed to commercial fishing (since 1991) due to concerns of low crab abundance. In these regions the male abundance is estimated at 6.1 million crabs, with a near historic low in mature males, while female abundance is estimated at 5.1 million crabs with a record low percentage of mature females. There are limited data to assess the Outer, Eastern, and Central Districts of the Cook Inlet management region, and both regions have been closed to commercial fishing (since 1998 for Central and 1993 for Eastern/Outer).

For the Southeast region, a population survey was begun in 1997/1998 to evaluate regional distribution of *C. bairdi* Tanner crab stocks and the relative abundance estimates. However, at present, no estimates of overall *C. bairdi* Tanner crab abundance in the region are available.

Comparison of Survey Abundance, Existing Closures and Trawl Fishery Bycatch (through 2002)

Recent comparisons of survey abundance estimates with crab bycatch areas has not yet been analyzed. Should an analysis be initiated to evaluate bycatch reduction measures for crab and salmon species in the GOA, spatial analysis will be done utilizing the most current fishery and survey data. However, previous evaluations may be useful for discussion purposes of specific geographic regions with high bycatch by species. Evaluations done previously comparing 2002 fishery data with survey abundance estimates for the same year are summarized below.

Tanner crab bycatch, in all fisheries from 2000–2002, is shown with the survey abundance estimates for 2002 and existing closures in the area near Kodiak Island (Figure 18). The bycatch is highest in the areas of

Marmot Bay, along Albatross Bank, the southern and eastern shore of Kodiak, and northeast of the Trinity Islands. Some bycatch is also concentrated in Shelikof Strait. The highest concentration of Tanner crabs from the ADF&G survey are found in Alitak Bay, Ugak Bay and to the north of Marmot Bay (Figure 18). The ADF&G survey area is not uniform across the Kodiak Region, and is instead concentrated in areas of historical biomass of king and Tanner crabs (Figure 7). Additional information on the actual size and sex distributions of crabs by area and year are available in the assessment report (e.g., Worton 2002).

Red king crab bycatch in all fisheries from 2000–2002 is shown with the survey abundance estimates for 2002 and the existing closures in the area near Kodiak Island (Figure 19). Limited bycatch is observed in this area in these years, however some red king crab bycatch was observed on Portlock Bank to the east of Marmot Island. The highest concentration of red king crabs from the 2002 survey was observed in Alitak Bay and Uyak Bay. Smaller numbers of crabs were found near Cape Chiniak. Again, additional information on the actual size and sex distribution of red king crabs, by area and year, are available in the assessment report (Spalinger 2006).

Discussion

In February 2002, the Council initiated an analysis of alternatives to control salmon bycatch in the GOA groundfish trawl fisheries, and proposed alternatives, which included bycatch limits based on 1990-2001 average bycatch amounts (21,000 Chinook salmon and 20,500 'other' salmon). Attainment of these limits by trawl fisheries would result under that proposed action, in closure of specified areas for the remainder of the fishing year. The Council further clarified that specified areas would be designated, based on analysis of areas that have had historically high bycatch rates. Analysis of those specified limits did not go forward, but instead the Council elected to continue evaluating salmon and crab bycatch to investigate whether these or other measures would be appropriate.

Draft Alternatives as modified by the Council in June 2005

Draft bycatch reduction alternatives have been incrementally refined by the Council since first drafted in December 2003. The alternatives had been folded into the larger GOA groundfish rationalization EIS package for analysis, however based on Council discussion in October 2007, the analysis may occur on a separate tract. Providing the additional information contained in this paper is intended to assist the Council in further refining the alternatives, and focusing the measures appropriately.

The following are the draft alternatives:

Chinook Salmon

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

'Other' Salmon

Alternative 1: Status Quo (no bycatch controls).
Alternative 2: Trigger bycatch limits for 'other' salmon. Specific areas with high bycatch (or high bycatch rates) are closed for the remainder of the year if or when a trigger limit is reached by the pollock trawl fishery (and potentially additional areas for flatfish trawling).
Alternative 3: Seasonal closure to all trawl fishing in areas with high bycatch or high bycatch rates.
Alternative 4: Voluntary bycatch co-op for hotspot management.

Tanner Crab

Alternative 1: Status Quo (no bycatch controls).
Alternative 2: Trigger bycatch limits for Tanner crab. Specific areas with high bycatch (or high bycatch rates) are closed for the remainder of the year if or when a trigger limit is reached by:
Options: a) trawl flatfish fishery
b) all bottom trawling
c) groundfish pot
Alternative 3: Year-round closure in areas with high bycatch or high bycatch rates of Tanner crab by gear type.
Alternative 4: Voluntary bycatch co-op for hotspot management.

Red King Crab

Alternative 1: Status Quo (no bycatch controls).
Alternative 2: Trigger bycatch limits for red king crab. Specific areas with high bycatch (or high bycatch rates) are closed to flatfish trawling for the remainder of the year if or when a trigger limit is reached by the flatfish fishery.
Alternative 3: Year-round bottom trawl closure in areas with high bycatch or high bycatch rates of red king crab.
Alternative 4: Voluntary bycatch co-op for hotspot management.

Estimating Trigger Limits

Trigger limits, as proposed under Alternative 2, would close designated areas (as yet to be defined) to trawling in specified fisheries once a bycatch limit has been reached. For instance, for Chinook salmon, once a bycatch limit has been reached, the designated area closure would be closed to pollock fishing for the remainder of the year. Likewise for Tanner crab, once the bycatch limit has been reached, the area closure for the flatfish fishery would go into effect for the remainder of the year. For 'other' salmon, trigger limits may also be considered for flatfish trawl fishery (in addition to pollock trawl fishery) given the relative contribution of bycatch by that fishery.

At their June 2005 meeting, the Council provided direction to staff in proceeding with this analysis (Appendix A). Staff were encouraged to look at abundance-based methodologies in considering potential trigger limits. These could be either based on an estimate of, or float as a percentage of, the overall biomass of PSC species. This approach has been utilized in the BSAI groundfish fisheries using a stair-step procedure for crab species such as red king crab, an abundance-based zonal approach for *C. bairdi* Tanner crab and as a percentage of annual biomass estimates for snow crab. Biomass-based limits require a good understanding of the relative stock status for that species. A full description of stock status and the relative understanding of the health and vulnerability of crab stocks in the GOA will be included in the forthcoming analysis of these measures and will be integral to determining the appropriate mechanism for establishing trigger limits.

The proposed alternatives using trigger closures would work similar to other existing PSC management measures. Currently in the GOA, PSC limits exist in the flatfish fishery for halibut only, whereby if a given apportionment is reached within a specified season, the flatfish fishery is then closed for the remainder of that season. Trigger bycatch limits as proposed here would be similar, but would not close the area-wide flatfish fishery. Instead, designated high bycatch or hotspot areas would be closed to the fishery if the given trigger bycatch limit was reached while the fishery was being prosecuted. Similar trigger closures have been implemented in the Bering Sea to control the bycatch of Tanner crab, snow crab (*C. Opilio*) and red king crab (Witherell and Pautzke 1997).

Determining Appropriate Area Closures

Year-round and seasonal trawl closures, such as those proposed under Alternative 3, have also been used in both the GOA and BSAI fisheries to control the bycatch of prohibited species. Currently, in the GOA, trawl closure areas have been implemented around Kodiak Island to protect red king crab. Specific areas are designated as Type I, Type II, and Type III areas depending upon the importance of the area to concentrations of red king crab at various life stages. Type I closures are closed year-round to all non-pelagic trawling. Type II areas are closed during the molting period for red king crab (February 15 through June 15), while Type III areas are closed only during specified 'recruitment events' and are otherwise opened year-round. These closures are delineated in green (year-round) and red (seasonal) in Figures 1 and 3.

For salmon, however, the highest bycatch is seasonal, and is tied to the timing of the walleye pollock fishery. Here, seasonal closures of hot spot locations could possibly be examined, rather than year-round closures. Seasonal salmon closures have been utilized to control salmon bycatch in the BSAI groundfish fisheries, although in recent years these closures have been problematic (e.g., an exemption to the area closures was granted under Amendment 84, provided participants are enrolled in a voluntary rolling hot spot (VRHS) system). The existing regulatory measures in the BSAI are closures areas, triggered upon the attainment of a specified limit in the designated fishery. The Chum Salmon Savings Area in the eastern Bering Sea is closed to trawl fishing for all of August, and can be extended from September 14 through October 14 if specified chum salmon bycatch limits are reached in the trawl fishery. For Chinook salmon, the Chinook Salmon Savings Areas are closed when annual Chinook salmon bycatch limits are reached by the trawl fishery (similar to a seasonal closure under the trigger bycatch limits as described for Alternative 2). Since implementation of Amendment 84, the Council has been considering alternative means to reduce salmon bycatch, as bycatch of Chinook in recent years in the BSAI has exceeded historical highs, while the bycatch of chum salmon reached a historical high in 2005 and has since declined. The Council is currently considering measures such as hard caps on the pollock fishery, the attainment of which would close directed fishing for pollock by the fleet, and revised time and area closures based upon recent data. Given that the Council is currently revising bycatch reduction measures for salmon in the BSAI, any measures evaluated for bycatch reduction in the GOA should consider and build upon lessons learned in the BSAI. Some of the issues in the BSAI that are being raised in conjunction with evaluating hard caps on the pollock fisheries are sector-specific observer requirements in order for these limits to be appropriately maintained. As discussed earlier in this paper, observer coverage in the GOA is much more limited than in the BSAI, thus any measures under discussion would need to likewise consider the management and monitoring issues which are raised accordingly.

Voluntary Bycatch Cooperatives

Alternative 4 for both crab and salmon species proposes enacting a bycatch pool or cooperative for hotspot area management. This alternative is designed after the current BSAI bycatch cooperatives, in use by industry to control bycatch in the pollock fishery. Currently in the BSAI, a program of voluntary area closures exists with selective access to those areas for fleets which demonstrate success in controlling bycatch (Haflinger 2003). Voluntary area closures can change on a weekly basis and depend upon the supply

and monitoring of information by fishermen. The sharing of bycatch rates among vessels in the fleet has allowed these bycatch hotspots to be mapped and identified on a real-time basis, so that individual vessels can avoid these areas (Smoker 1996, Haflinger 2003). This system relies upon information voluntarily reported to Sea State by the fleet per their cooperative agreements.

A voluntary cooperative program could be modeled after the AFA catcher vessel Intercooperative Agreement between the nine catcher vessel cooperatives in the BSAI pollock fishery (Gruver 2003). Some aspects of this inter-cooperative agreement which would be useful to include in a GOA co-op alternative include provisions for: allocation, monitoring and compliance of the PSC caps amongst the catcher vessel fleet; establishment of penalties for co-ops which exceed allocations; promoting compliance with PSC limits while allowing for maximum harvest of allocated groundfish; and the reduction of PSC bycatch in the groundfish fishery. For the BSAI cooperative, Sea State is retained to provide data gathering, analysis and reporting services to implement the bycatch management agreement, and in doing so provides timely hot spot reports to the fleet, as well as summaries of bycatch characteristics, trends and/or fishing behaviors which may be having an effect on bycatch rates (Gruver 2003). Fleets are notified of avoidance areas for Chinook salmon and have previously agreed within the cooperative to avoid these areas as notified. Specific cooperative measures would need to be created for the characteristics of the GOA groundfish fishery; however measures from the BSAI cooperatives may prove useful in designing appropriate programs for salmon and crab bycatch co-ops in the GOA.

Action by the Council

When the Council next addresses this issue (scheduled for June 2008), they may wish to refine the existing draft alternatives in order to better focus measures prior to the initiation of the analysis. At the June 2005 meeting, the Council provided guidance to staff on methodologies for the analysis, as well as refined Alternatives 2 and 3 for Tanner crab.

The following items are put forward for discussion purposes as items in need of clarification when the Council next addresses this issue:

1) Current range of species covered for bycatch reduction:
   a. Are all of these salmon and crab species priorities for bycatch reduction measures under current fishing practices?
2) Current alternatives for species:
   a. Are there similar refinements (as per June 2005 Tanner crab action) to make for the other species under consideration?
   b. Should hard caps also be included for salmon species by fishery in the GOA per consideration of these measures in the BSAI?
   c. Management and monitoring concerns raised by relative observer coverage for the GOA.
3) Next steps for Council review:
   a. Staff could prepare "strawman" ~~trawl~~ closure areas based on data as specified by the alternatives. Does the Council wish to review these closure area boundaries as the next step?
   b. Does the Council wish to initiate an analysis for GOA bycatch reduction measures?

Should not be specific to gear type.

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Appendix A:

Council Motion on GOA Salmon and Crab Bycatch Measures June 2005
(as part of GOA Groundfish Rationalization)

The Council recommends the following to address staff questions and clarifications per directions for GOA bycatch reduction measures:

Trigger Limits:

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

General recommendations for the analysis:

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

GOA bycatch reduction measures will continue to be linked with the GOA groundfish rationalization initiative.

The Tanner crab alternatives are amended as follows (in bold and strike-out):

Tanner Crab

Alternative 1: Status Quo (no bycatch controls).

Alternative 2: Trigger bycatch limits for Tanner crab. Specific areas with high bycatch (or high bycatch rates) are closed for the remainder of the year if or when a trigger limit is reached ~~by the flatfish fishery~~.

Options: a) trawl flatfish fishery
b) all bottom trawling
c) groundfish pot

Alternative 3: Year-round ~~bottom trawl~~ closure in areas with high bycatch or high bycatch rates of Tanner crab **by gear type**.

Alternative 4: Voluntary bycatch coop for hotspot management.

Table 1. Bycatch of Pacific salmon in Gulf of Alaska groundfish trawl fisheries, by species, 1990-2007

Year	Chinook	Chum	Coho	Sockeye	Pink
1990	16,913	2,541	1,482	85	64
1991	38,894	13,713	1,129	51	57
1992	20,462	17,727	86	33	0
1993	24,465	55,268	306	15	799
1994	13,973	40,033	46	103	331
1995	14,647	64,067	668	41	16
1996	15,761	3,969	194	2	11
1997	15,119	3,349	41	7	23
1998	16,941	13,539			
1999	30,600	7,529			
2000	26,705	10,996			
2001	14,946	5,995			
2002	12,921	3,218[a]			
2003	15,506	10,362[a]			
2004	17,919	5,816[a]			
2005	31,573	6,694[a]			
2006	19,158	4,273[a]			
2007	40,130	3,487[a]			
1990–2007 Avg.	21,488	15,452[b]			
2004–2007 Avg.	27,195	5,067[b]			

[a] Coho, sockeye, and pink salmon are combined with chum salmon.
[b] Average chum salmon bycatch includes chum, coho, sockeye, and pink salmon.
Source: NMFS catch reports (website)

Table 2. 'Other' salmon bycatch by month, 1993-1995, in GOA groundfish trawl fisheries

Month	1993	1994	1995
January	203	3,690	2
February	919	3,950	2,007
March	213	164	39
April	227	109	1,290
May	150	0	39
June	4,927	5,956	9,928
July	48,518	18,709	42,163
August	303	15	0
September	4	1	11
October	832	4,632	9,313
November	64	2	0
December	28	0	0
Total	56,388	37,228	64,792

Table 3. 'Other' salmon bycatch by month, 1996-2007, in GOA groundfish trawl fisheries

Month	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
January	132	-	105	291	145	43	1	0	5	-	-	-
February	167	60	201	3,990	502	298	67	255	18	-	117	0
March	422	65	220	72	387	888	56	161	7	-	13	38
April	557	40	149	338	632	213	4	228	774	163	239	-
May	5	4	-	22	780	388	123	261	23	25	-	152
June	2,075	672	8,652	429	44	433	1,489	-	2,942	-	-	244
July	439	543	603	553	797	1,326	548	2,715	848	4,224	2,362	605
August	17	20	742	1,033	3,671	141	193	5,931	578	1,411	130	1,305
September	232	1,288	2,354	595	2,116	967	697	42	377	547	350	493
October	112	73	518	206	1,851	1,362	41	770	244	236	1,047	463
November	17	249	-	-	53	-	-	-	-	-	-	-
December	-	-	-	-	-	-	-	-	-	-	-	-

Data has been screened for confidentiality. Source: M. Furuness, J. Keaton, NOAA Fisheries, 1996-2002 (from blend database) 2003-2007 (from catch accounting database).

Table 4. Chinook salmon bycatch by month, 1996-2007, in GOA groundfish trawl fisheries

Month	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
January	1,454	1,528	1,120	3,776	3,181	829	1,093	1,187	300	961	1,955	167
February	3,537	3,501	1,022	7,427	2,813	4,875	3,226	2,316	3,791	10,674	1,855	1,532
March	1,842	1,732	944	634	3,052	3,287	2,275	1,069	3,820	7,348	4,693	28,654
April	1,853	852	676	1,649	2,472	1,161	1,482	3,057	629	451	1,450	234
May	15	5	1	68	1,375	1,381	326	2,608	33	60	10	1,532
June	383	292	2,330	332	1	22	1,278	-	33	-	-	1,149
July	392	2,372	251	361	1,293	536	224	938	1,033	461	291	713
August	68	42	337	352	6,117	149	372	1,242	1,519	121	13	260
September	6,038	4,450	6,176	5,649	4,048	625	2,412	470	1,644	961	4,966	2,214
October	120	235	4,126	10,352	2,177	2,156	233	2,619	5,119	10,529	3,787	3,859
November	62	221	-	-	173	-	-	-	-	-	138	45
December	-	-	-	-	-	-	-	-	-	-	-	-

Data has been screened for confidentiality. Source: M. Furuness, J. Keaton, NOAA Fisheries, 1996-2002 (from blend database) 2003-2007 (from catch accounting database).

Table 5. Bycatch of Chinook salmon in Gulf of Alaska groundfish trawl fisheries, by target fishery, 2003-2007

Species	2003	2004	2005	2006	2007	Average 2003-2007
Arrowtooth flounder	3,378	359	1,802	414	1,462	1,483
Flathead sole	598	1,446	Conf.	56	-	700
Non pelagic pollock	895	5,302	15,032	10,187	7,661	7,815
Pacific cod	3,167	893	41	892	634	1,125
Pelagic pollock	3,605	8,039	13,176	5,873	26,847	11,508
Rex sole	2,819	498	982	1,444	Conf.	1,436
Rockfish	928	885	461	291	2,395	992
Shallow water flats	116	498	63	-	420	274

Data has been screened for confidentiality. Source: M. Furuness, J. Keaton NOAA Fisheries, from catch accounting database.

Table 6. Bycatch of 'Other' salmon in Gulf of Alaska groundfish trawl fisheries, by target fishery, 2003-2007

Species	2003	2004	2005	2006	2007	Average 2003-2007
Arrowtooth flounder	1,061	-	425	429	710	656
Deep water species	-	6	-	-	-	6
Flathead sole	-	91	-	-	-	91
Non pelagic pollock	44	152	104	592	162	211
Pacific cod	-	47	141	-	142	110
Pelagic pollock	6,156	442	689	825	750	1,772
Rex sole	479	1,053	109	conf	conf	573
Rockfish	2,603	499	3,453	1,870	827	1,850
Shallow water species	-	3,524	1,774	-	235	1,844

Data has been screened for confidentiality. Source: M. Furuness, NOAA Fisheries, from catch accounting database.

Table 7. Salmon hatchery releases by country from NPAFC for Chinook and chum salmon

Chum:

Year	Russia	Japan	Korea	Canada	US	Total
1999	278.7	1,867.90	21.50	172.0	520.8	2,860.9
2000	326.1	1,817.40	19.00	124.1	546.5	2,833.1
2001	316.0	1,831.20	5.30	75.8	493.9	2,722.2
2002*	306.8	1,851.60	10.50	155.3	507.2	2,831.4
2003*	363.2	1,840.60	14.70	137.7	496.3	4,091.5
2004	363.1	1,817.20	12.93	105.2		
2005	387.3	1,844.00	10.93	131.8		
2006	344.3	1,858.25	13.75	107.1		

Chinook:

Year	Russia	Japan	Canada	US	Total
1999	0.60	-	54.4	208.1	263.1
2000	0.50	-	53.0	209.5	263.0
2001	0.50	-	45.5	212.1	258.1
2002	0.30	-			
2003	0.74	-			

*Preliminary through November 6, 2007.

Table 8. Chinook salmon GOA commercial catch by area (1000's of fish)

Year	Southeast	PWS	Cook Inlet	Kodiak	Chignik	South Peninsula	Total
2004	497	39	29	29	3	18	615
2005	462	36	29	14	3	14	558
2006	379	32	19	20	2	13	465
2007	352	40	18	17	2	13	442

Source: ADFG (http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/catchval/blusheet/07exvesl.php)

Table 9. Chum salmon GOA commercial catch by area (1000's of fish)

Year	Southeast	PWS	Cook Inlet	Kodiak	Chignik	South Peninsula	Total
2004	11,372	2,002	352	1,122	1	810	15,659
2005	6,428	2,099	169	477	9	785	9,967
2006	13,993	2,182	137	1,082	62	1,320	18,776
2007	9,412	3,579	78	745	79	861	14,754

Source: ADFG (http://www.cf.adfg.state.ak.us/geninfo/finfish/salmon/catchval/blusheet/07exvesl.php)

Table 10. Bycatch of red king crab and Tanner crabs in Gulf of Alaska groundfish trawl fisheries, by species, 1993-2007

Year	*C. bairdi* Tanner	Red king crab
1993	55,304	1,012
1994	34,056	45
1995	47,645	223
1996	120,796	192
1997	134,782	18
1998	105,817	275
1999	29,947	232
2000	48,716	35
2001	125,882	46
2002	89,433	20
2003	142,488	60
2004	62,277	331
2005	126,905	91
2006	306,767	345
2007	197,286	0
Average 1993-2007	108,540	195
Average 2004-2007	167,145	165

Data has been screened for confidentiality. Source: M. Furuness, J. Keaton, NOAA Fisheries, 2003–2007 from catch accounting database.

Table 11. Bycatch of red king crab in Gulf of Alaska groundfish fisheries, by gear type and target fishery, 2003-2007

Gear and Target Fishery	2003	2004	2005	2006	2007
Hook & Line:					
Halibut	0	23	0	0	0
Pacific cod	0	0	0	0	0
Sablefish	29	0	88	0	0
Pot:					
Pacific cod	0	31	0	0	0
Non Pelagic Trawl:					
Arrowtooth	0	0	0	0	0
Arrowtooth flounder	0	0	0	0	0
Flathead sole	0	0	0	0	0
Non-pelagic pollock	0	0	0	0	0
Other species	0	0	0	0	0
Pacific cod	0	0	0	0	0
Pelagic pollock	0	0	0	0	0
Rex sole	0	0	0	0	0
Rockfish	60	275	0	0	0
Sablefish	0	0	0	0	0
Shallow water species	0	0	91	345	0
Pelagic Trawl:					
Non-pelagic pollock	0	56	0	0	0
Pacific cod	0	0	0	0	0
Pelagic pollock	0	0	0	0	0
TOTAL GOA	**89**	**385**	**179**	**345**	**0**

Data has been screened for confidentiality. Source: M. Furuness, J. Keaton, NOAA Fisheries, 2003-2007 from catch accounting database.

Table 12. Bycatch of *C. bairdi* Tanner crabs in Gulf of Alaska groundfish fisheries, by gear type and target fishery, 2003 -2007

Gear and Target Fishery	2003	2004	2005	2006	2007
Hook & Line:					
Arrowtooth	0	0	0	0	0
Cod			1,491	403	114
Halibut				138	
Sablefish	21	29	290	8	153
Non Pelagic Trawl:					
Arrowtooth	29,377	33,133	69,364	89,114	36,608
Cod	2,227	1,160	1,381	742	15,295
Flathead sole	17,484	7,514	43,957	25,885	254
other	20		Conf.		
Pollock	Conf.	474		83,598	18,801
Rex sole	33,932	9,030	4,461	73,528	45,274
Rockfish	183	1,510	1,475	957	161
Sablefish					171
Shallow water flatfish	59,153	8,789	5,942	32,533	79,167
Pelagic Trawl:					
Arrowtooth				Conf.	Conf.
Cod					280
Pollock	9	667	4	408	113
Rockfish	Conf.		Conf.		Conf.
TOTAL TRAWL	142,385	62,277	126,584	306,765	196,124
Pot:					
Cod	13,036	17,030	116,764	103,370	293,133
TOTAL GOA	**155,443**	**79,336**	**245,129**	**410,685**	**489,523**

Data has been screened for confidentiality. Source: M. Furuness, NOAA Fisheries, 2003-2007 from catch accounting database. 2007 data through 9/20/07.

Table 13. Pacific cod observer data, crab bycatch numbers, observed vessels only

Area	Year	Observed Trips	Pots Liftted	Tanner crab	King crab	Cod Catch Whole pounds	Cod Catch Metric tons	Tanner (mt)	King (mt)
Chignik	2003	1	268	42	0	28,297	12.84	3.27	0.00
Kodiak	1997	1	333	11	0	36,432	16.53	0.67	0.00
	1998	1	261	4	9	20,418	9.26	0.43	0.97
	1999	3	1,006	48	0	69,257	31.42	1.53	0.00
	2001	1	200	171	0	6,638	3.01	56.79	0.00
South Peninsula	1998	1	174	1	0	47,453	21.53	0.05	0.00
	1999	1	240	0	0	40,952	18.58	0.00	0.00
	2000	2	419	0	0	126,908	57.57	0.00	0.00
	2001	2	619	52	0	130,771	59.32	0.88	0.00
	2002	1	58	1	0	10,248	4.65	0.22	0.00
	2004	1	30	1	0	13,099	5.94	0.17	0.00
	2005	1	76	0	0	13,554	6.15	0.00	0.00
	2006	2	433	25	0	94,827	43.01	0.58	0.00

Source: ADF&G K, Spalinger.

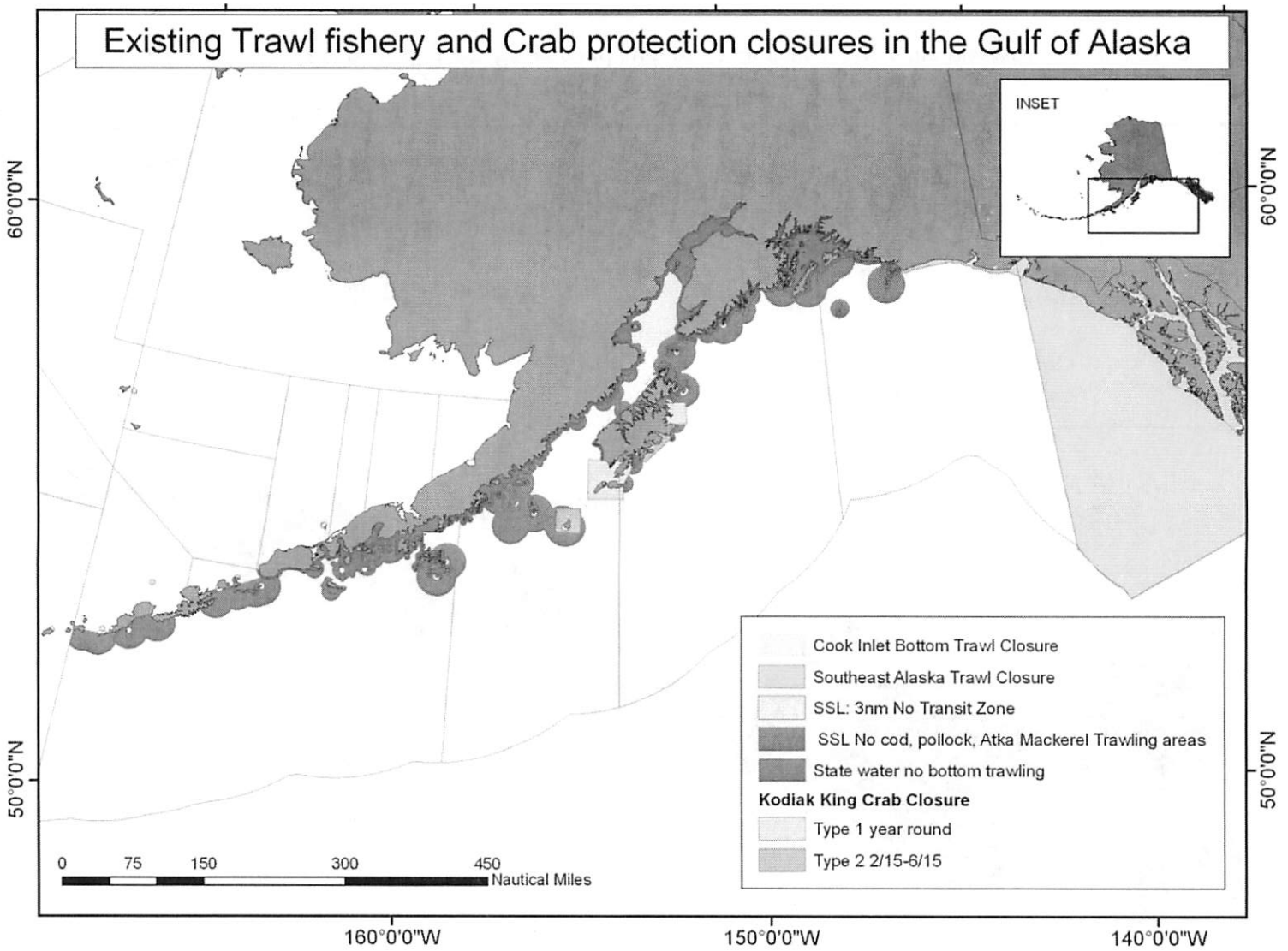

Figure 1. Locations of existing trawl fishery and crab protection closures in the Gulf of Alaska

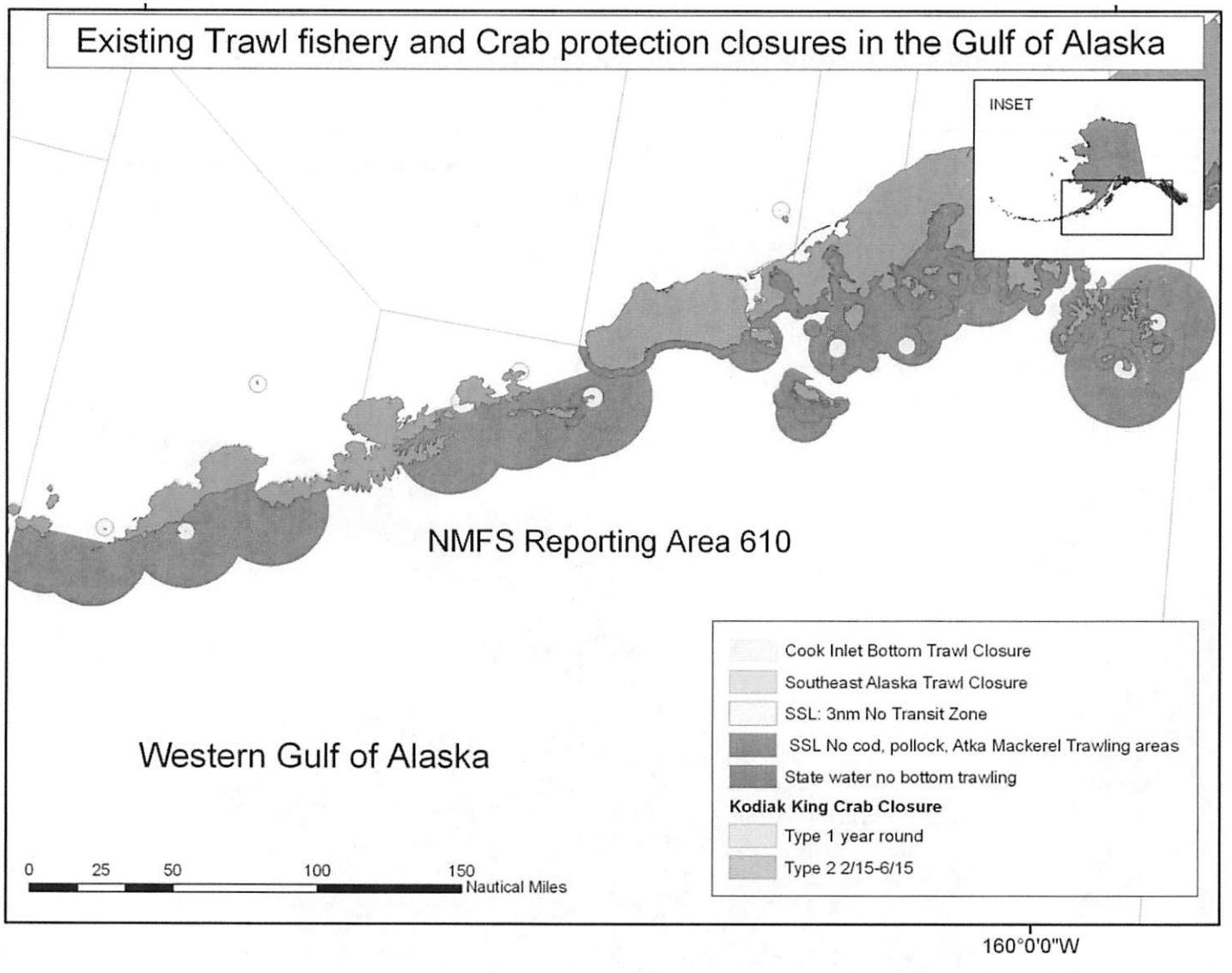

Figure 2. Locations of existing trawl fishery and crab protection closures in the Western Gulf of Alaska

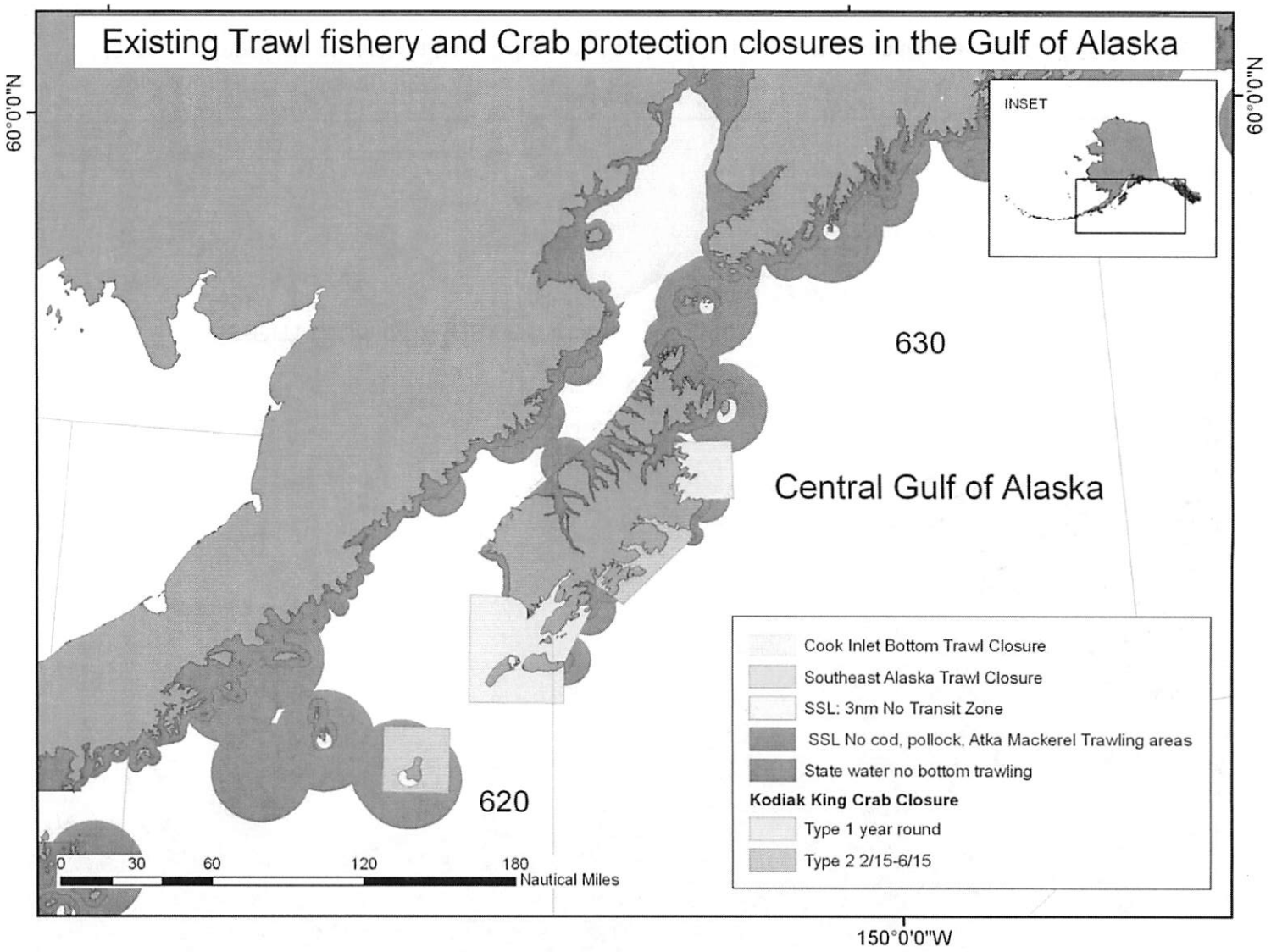

Figure 3. Locations of existing trawl fishery and crab protection closures in the Central Gulf of Alaska

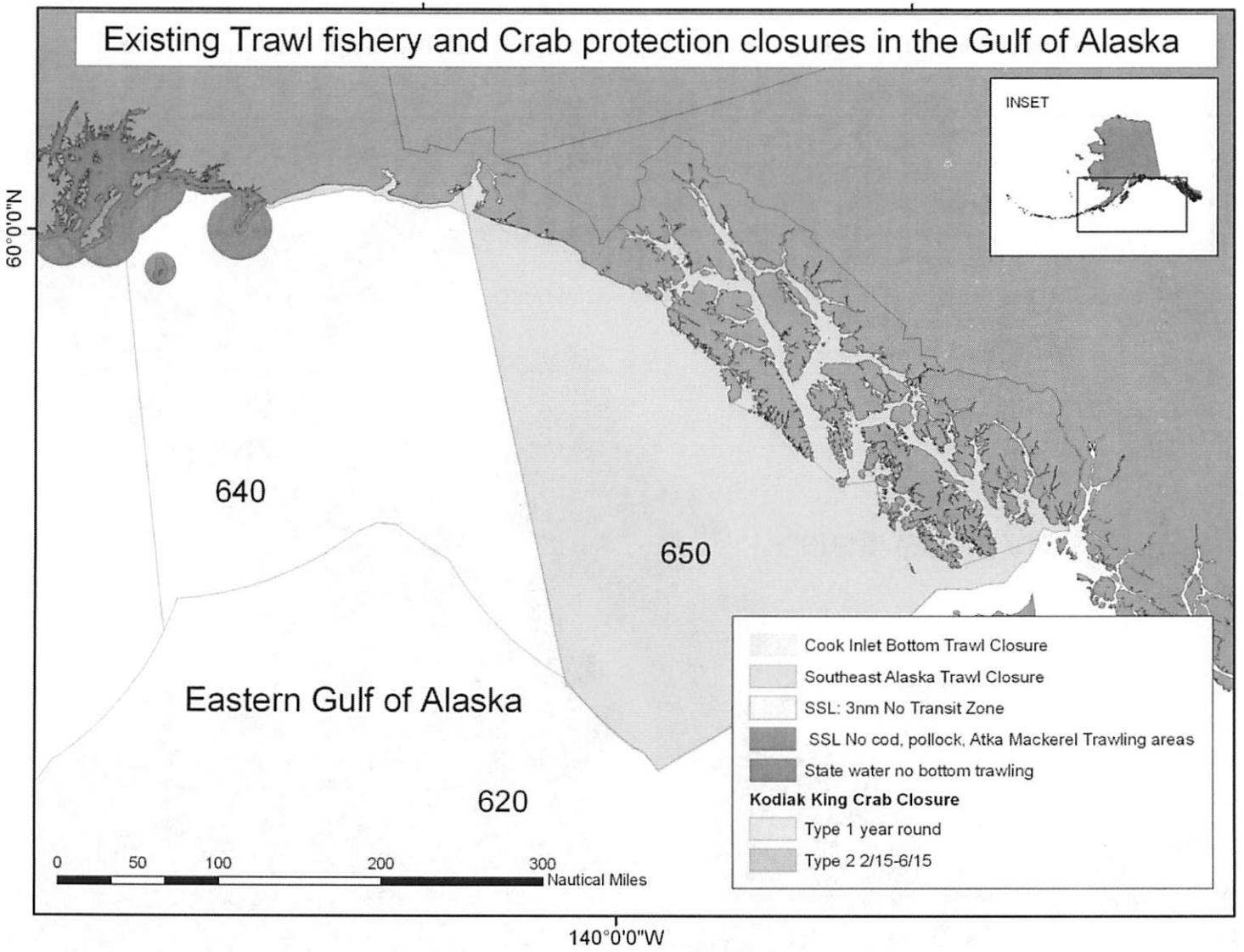

Figure 4. Locations of existing trawl fishery and crab protection closures in the Eastern Gulf of Alaska

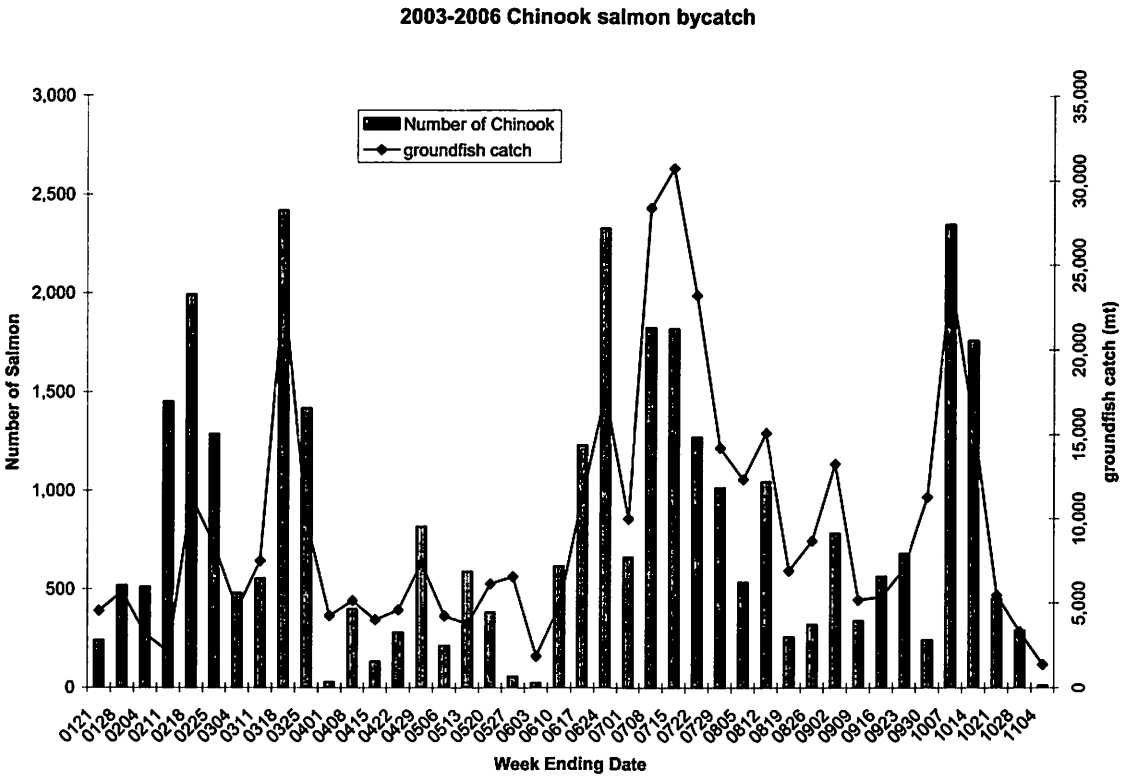

Figure 5. Chinook salmon bycatch rates within the groundfish fisheries by groundfish catch (mt) by week, 2003-2006

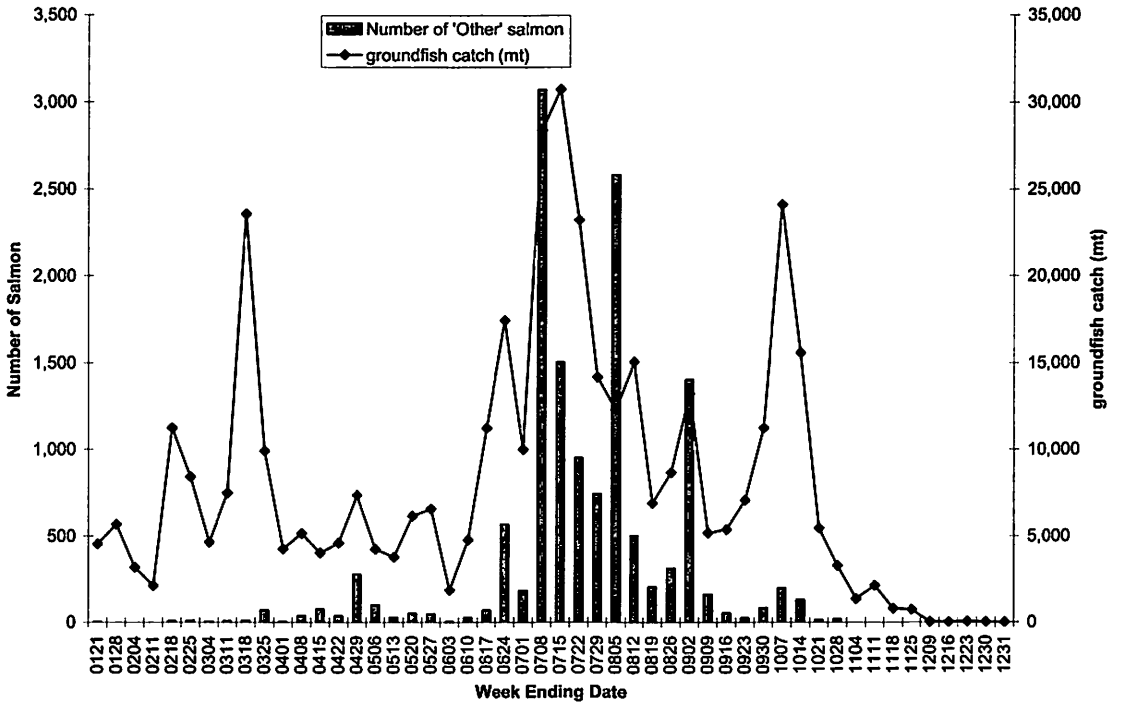

Figure 6. Other Salmon bycatch rates within the groundfish fisheries by groundfish catch (mt) by week, 2003-2006

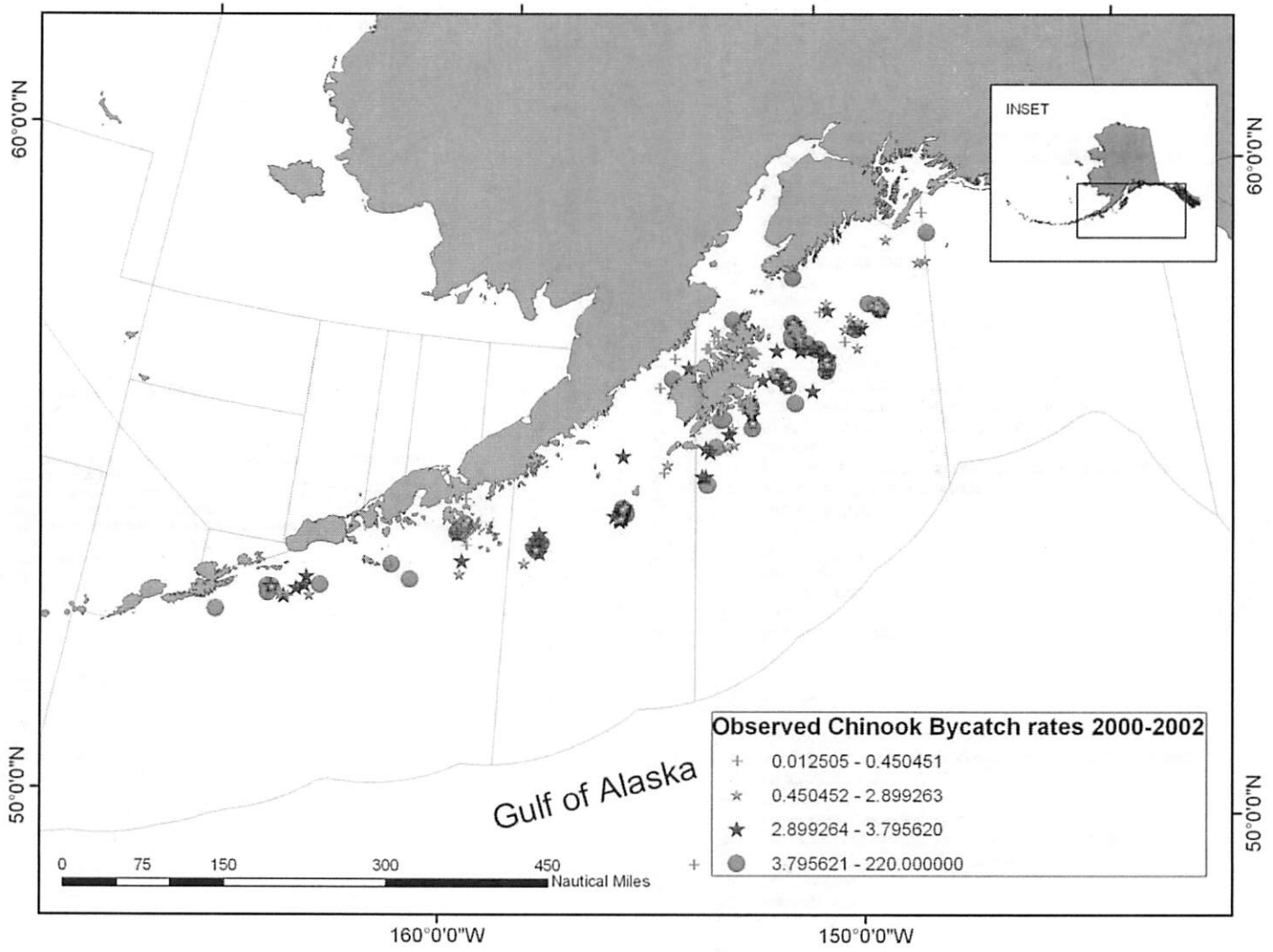

Figure 7. Locations of observed Chinook bycatch (#/mt) in all groundfish fisheries, 2000-2002

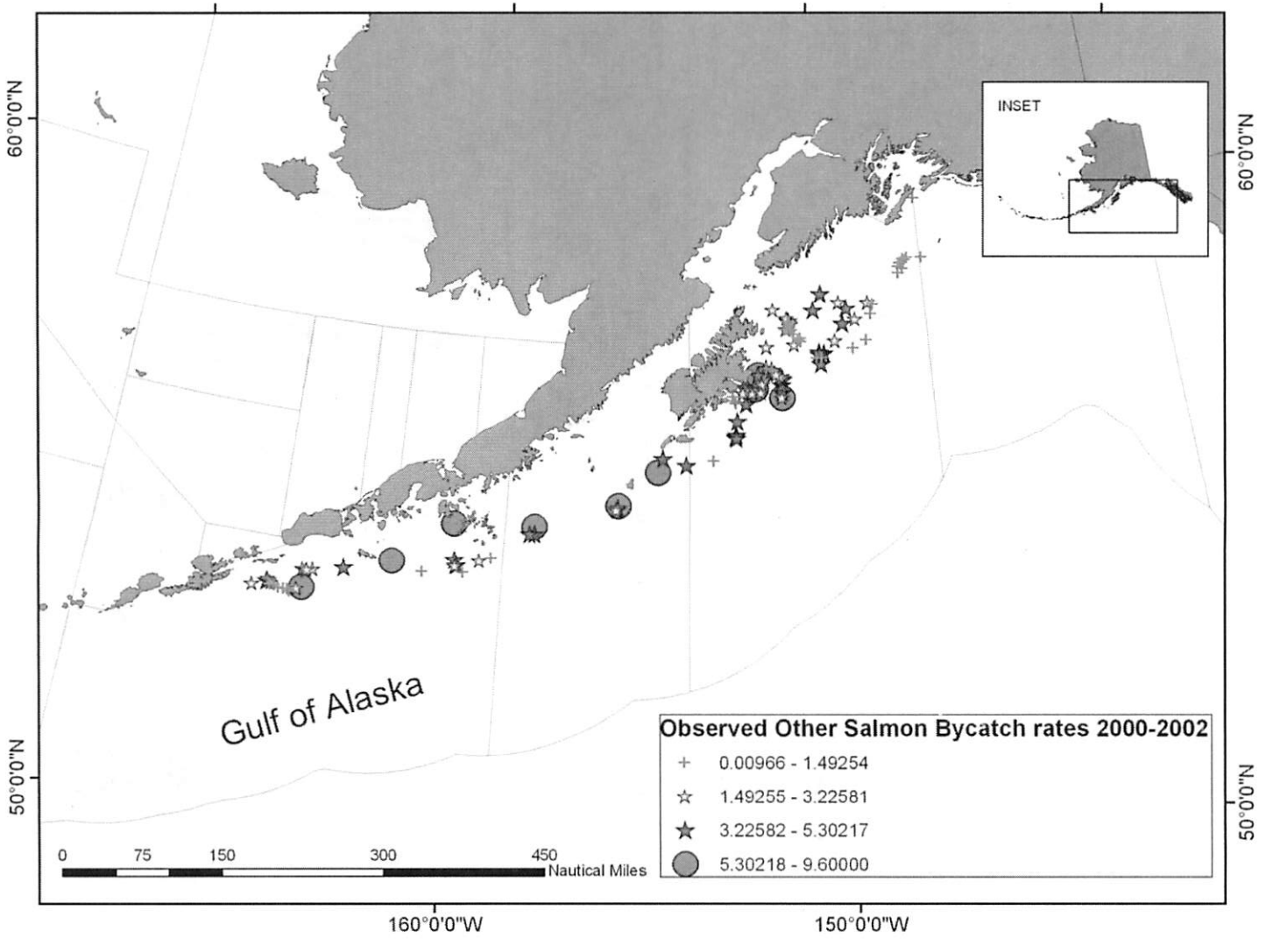

Figure 8. Locations of observed 'Other Salmon' bycatch (#/mt) in all groundfish fisheries, 2000-2002

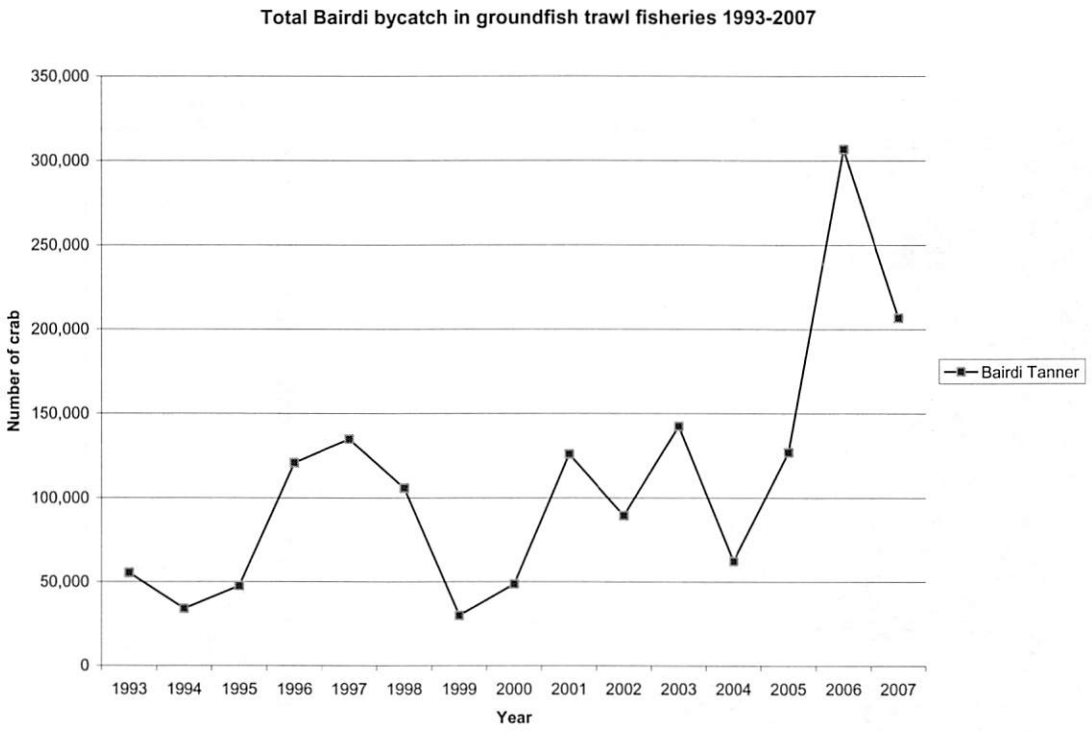

Figure 9. Total bycatch of C. bairdi Tanner crabs in all GOA groundfish trawl fisheries 1993-2007

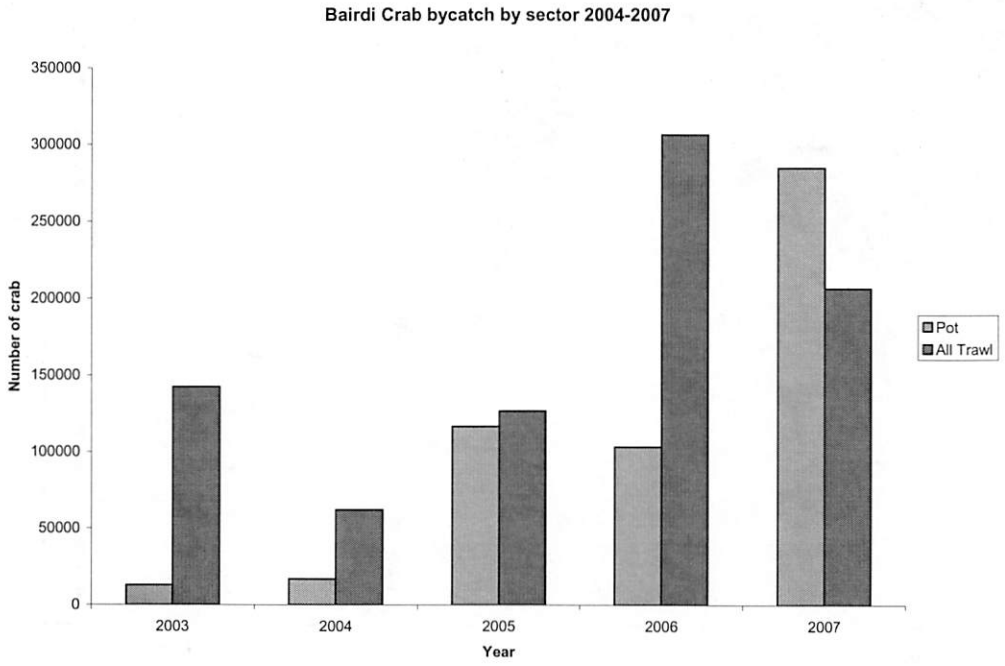

Figure 10. Overall annual bycatch of C. bairdi Tanner crab by trawl and pot fishery sectors (2004-2007)

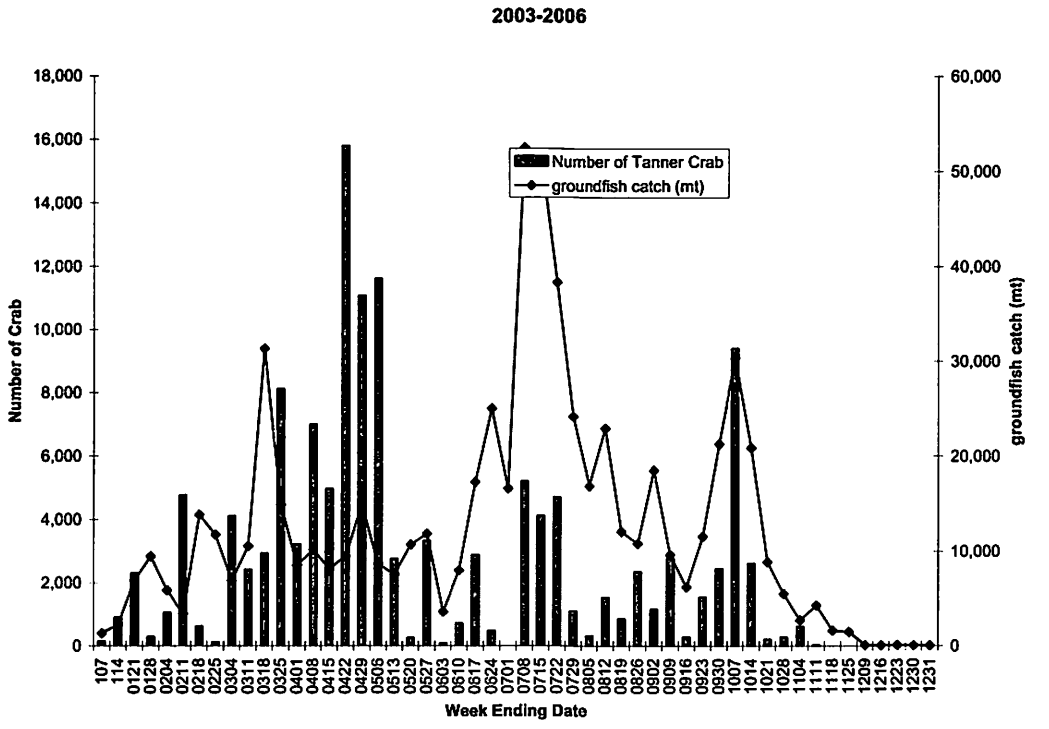

Figure 11. Bycatch of C. bairdi Tanner crab and associated groundfish catch in 2003-2006

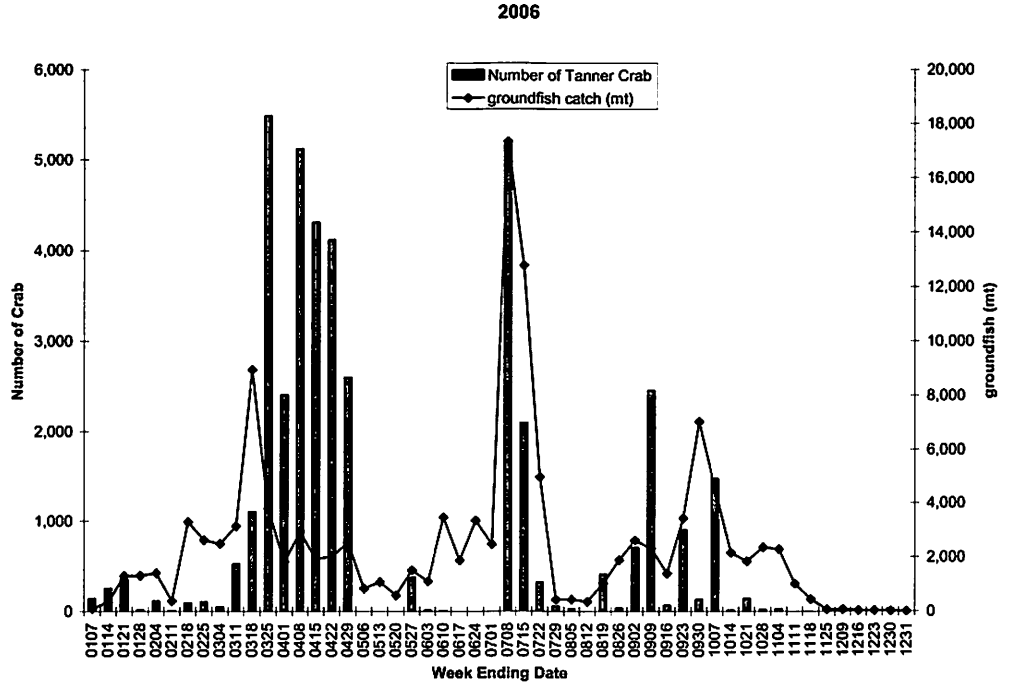

Figure 12. Bycatch of C. bairdi Tanner crab and associated groundfish catch in 2006

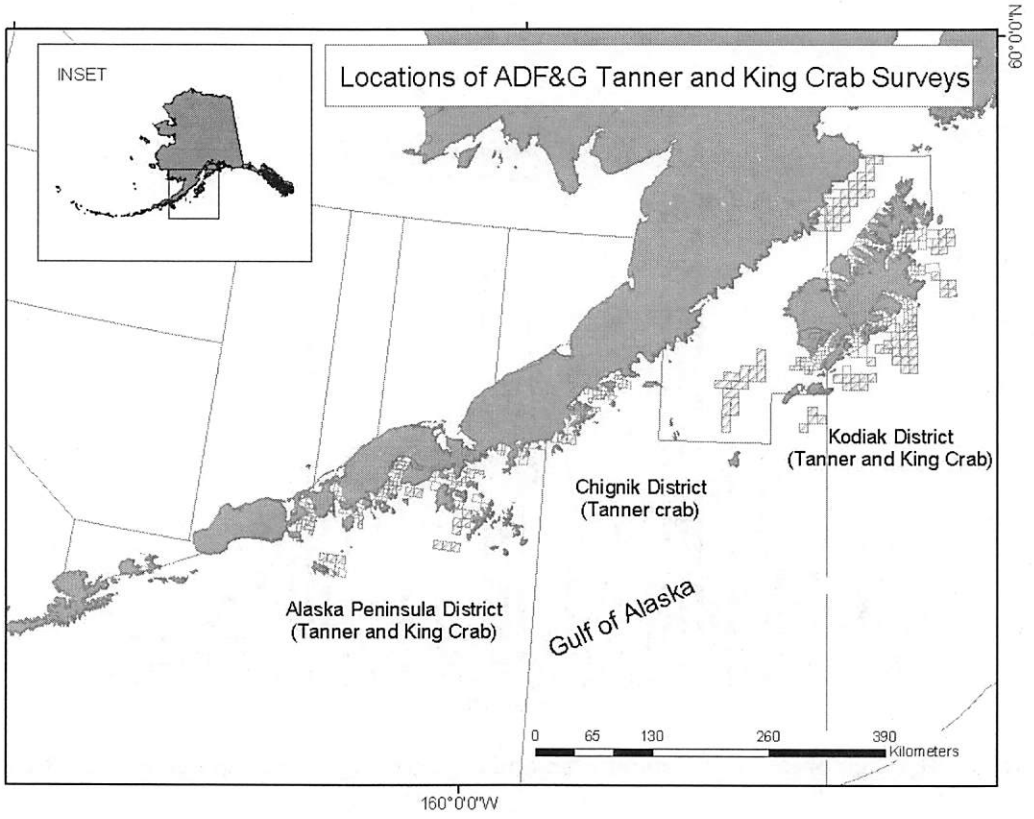

Figure 13. Locations of ADF&G trawl surveys for Tanner and king crab abundance.

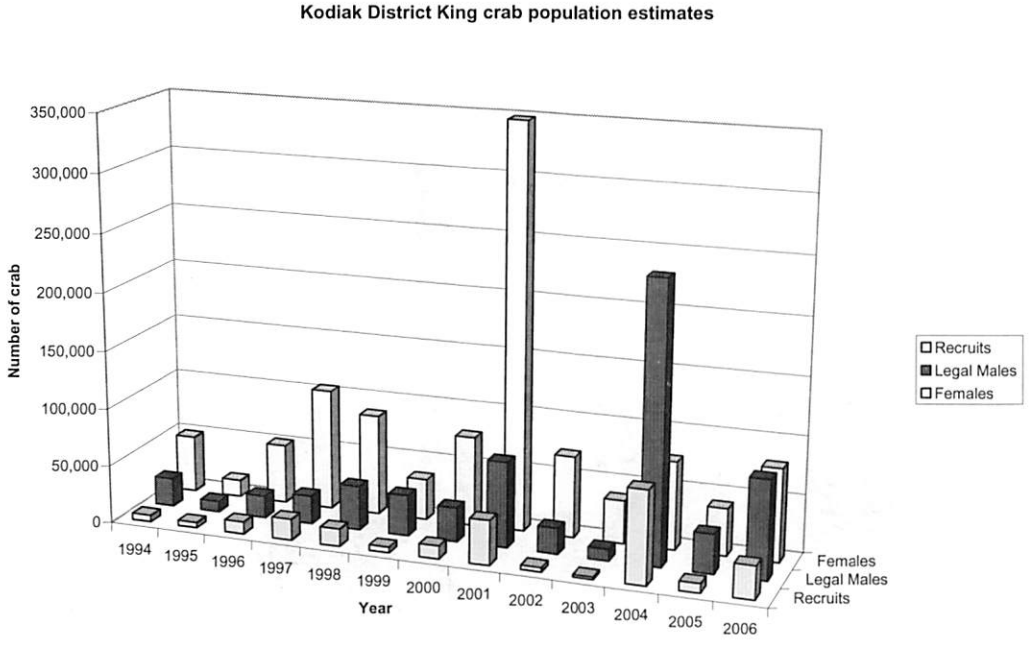

Figure 14. Red king crab population estimates Kodiak District based on ADF&G trawl surveys 1994-2006. Source: ADF&G K, Spalinger.

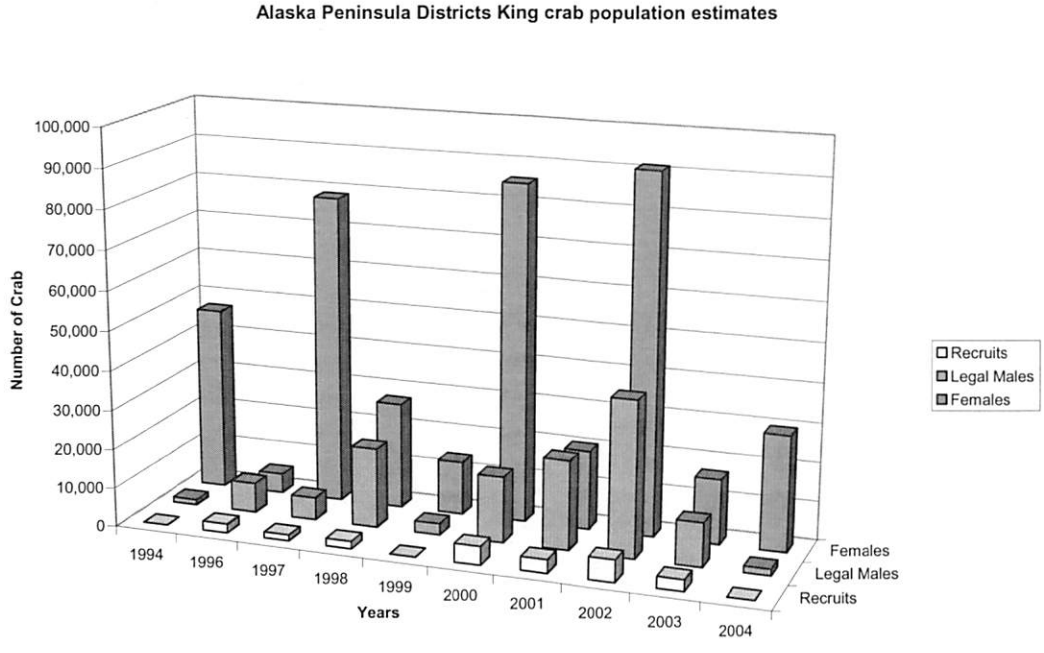

Figure 15. Red king crab population estimates for Alaska Peninsula based on ADF&G trawl surveys 1994-2004.

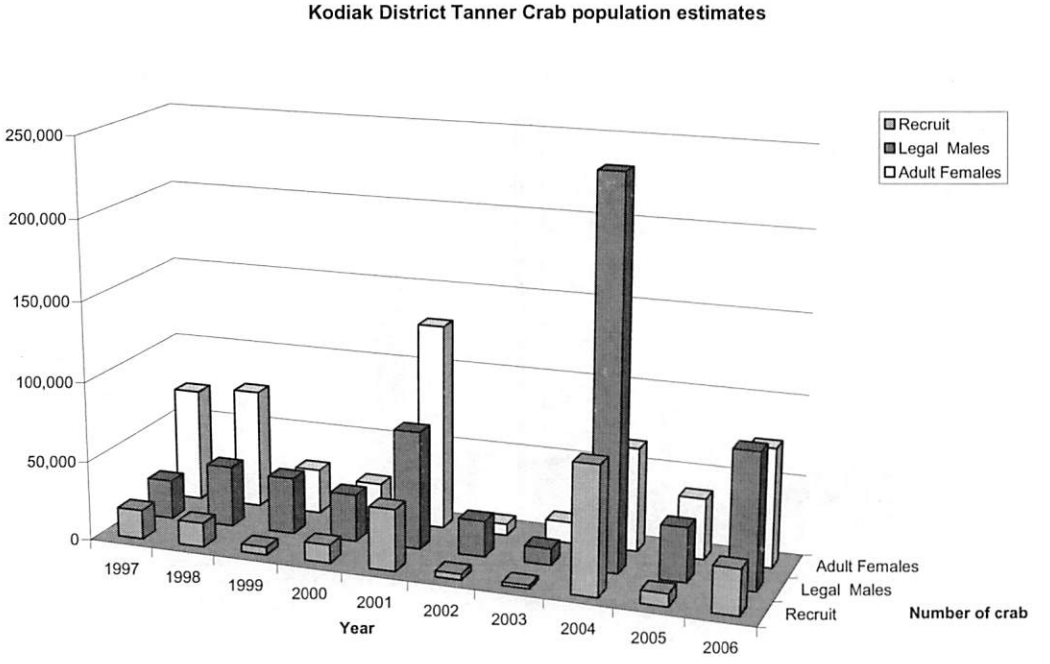

Figure 16. *C. bairdi* Tanner crab population estimates for Kodiak District based on ADF&G trawl surveys 1997-2006.

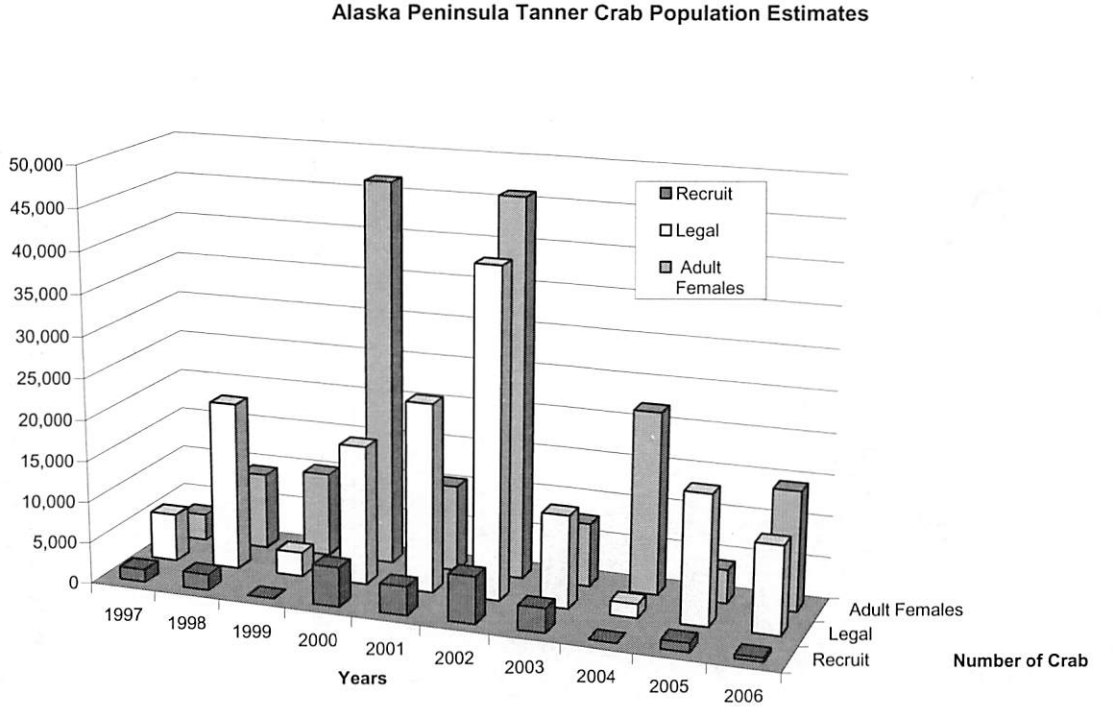

Figure 17. *C. bairdi* Tanner crab population estimates for Alaska Peninsula District based on ADF&G trawl surveys 1997-2006.

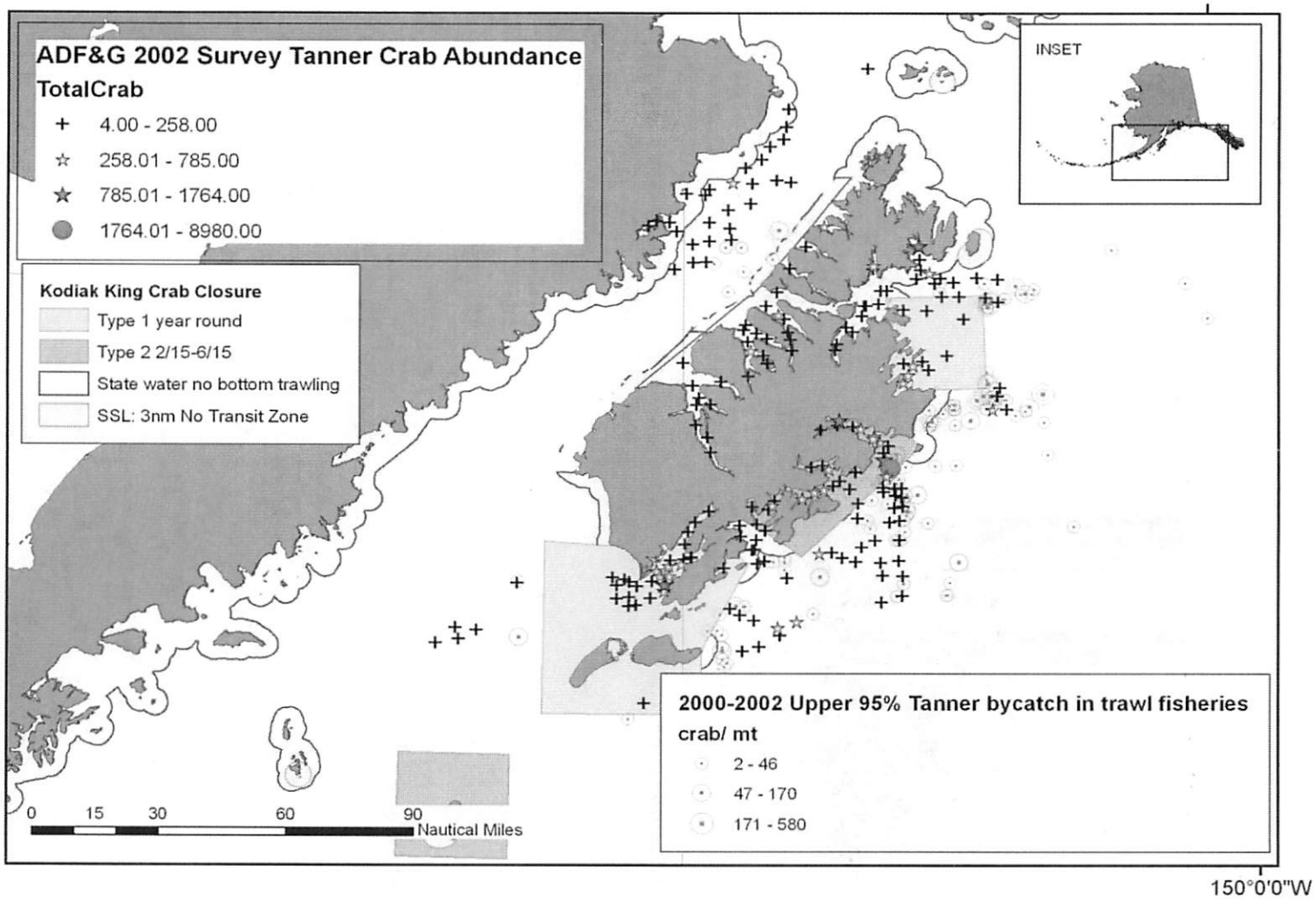

Figure 18. Locations of observed Tanner crab bycatch (#/mt) in all groundfish trawl fisheries, 2000-2002 and ADF&G Tanner Crab Abundance estimates from 2002 survey.

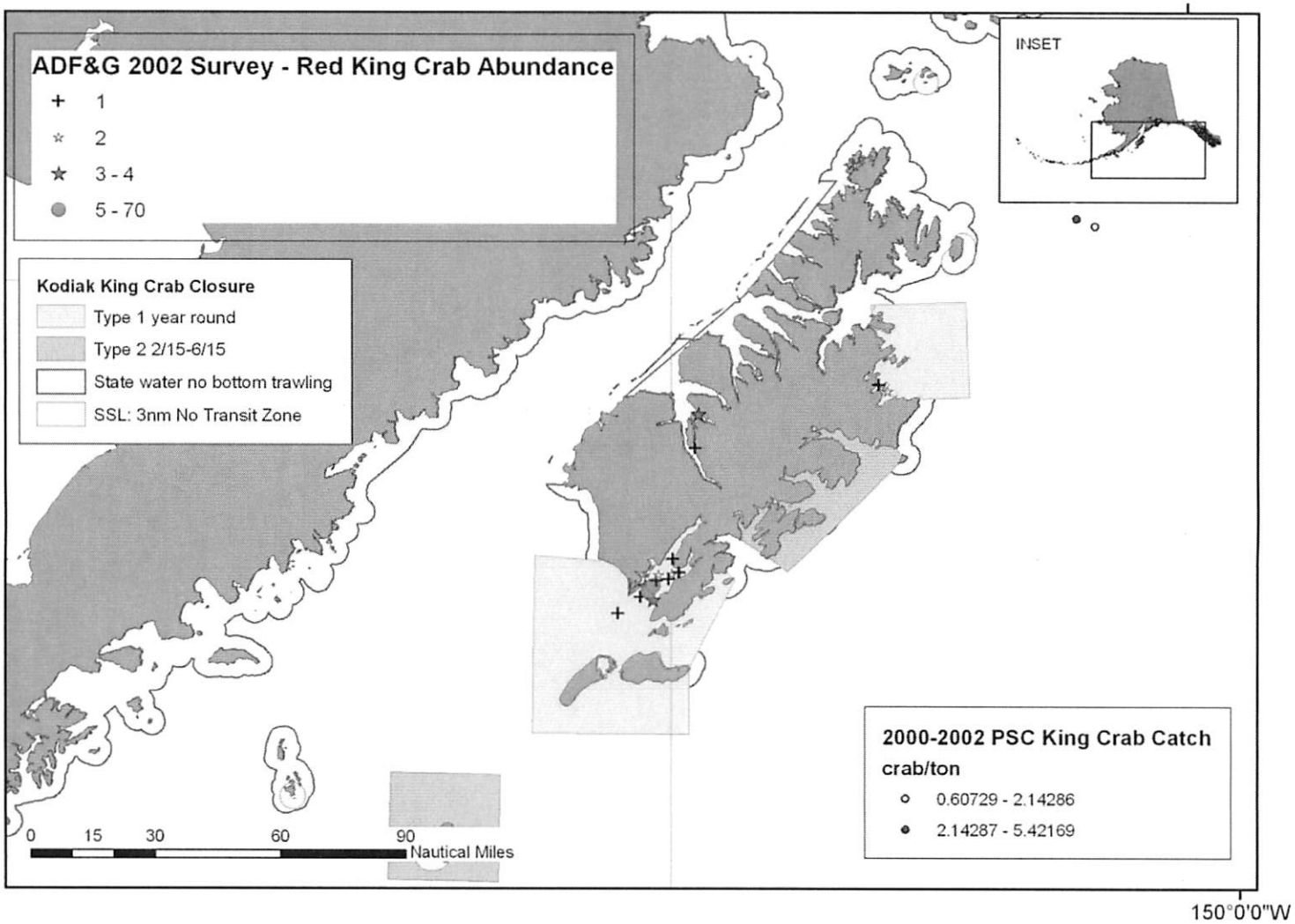

Figure 19. Locations of observed Red King crab bycatch (#/mt) in all groundfish trawl fisheries, 2000-2002 and ADF&G Red King crab Abundance estimates from 2002 survey.

D-3(d)
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June 5, 2008

VIA ELECTRONIC MAIL

Mr. Eric Olson, Chairman
North Pacific Fishery Management Council
605 West 4th Avenue – Suite 306
Anchorage, AK 99501

RE: AGENDA ITEM D-3(d), REPORT ON AMENDMENT 80 COOPERATIVES AND RELATED ISSUES

Dear Chairman Olson:

We represent The Fishing Company of Alaska ("FCA") in regulatory matters related to North Pacific groundfish fishery. At the Council's upcoming June meeting, the National Marine Fisheries Service ("NMFS") is scheduled to present a report the Council requested back in February discussing issues related to the cooperative formation criteria under Amendment 80. For the reasons explained herein, it is our hope that the Council will receive this report (which is currently listed as "tentative" on the Council's agenda) and initiate an action to modify the current Amendment 80 criteria to allow single company cooperatives similar to those authorized in the Rockfish Pilot Program. With this report already prepared, the development of an amendment (or regulatory amendment) should not require extensive staff resources.

By way of background, FCA submitted a letter in advance of the February meeting highlighting staff concerns related to a proposal that would have allowed rollovers from the Amendment 80 limited access sector to the Amendment 80 cooperative sector. The analysis noted that this provision could result in "gaming" under the current circumstances in which one company with a large allocation of Amendment 80 quota share, FCA, is consigned to the limited access sector due to a lack of available entities and vessels with which to form a second cooperative. Under these circumstances, the rollover provision would create a disincentive for others to negotiate with FCA to form or join a cooperative and, at the extreme, could entice a

company with multiple vessels to place one in the limited access sector possibly to precipitate a rollover through incautious use of prohibited species catch ("PSC").

We appreciate the Council's action to table this proposed rollover provision and to request analysis of alternatives to the current three entity/nine Amendment 80 permit criteria for forming a cooperative. The latter has become increasingly more important in light of the tragic loss of FCA's vessel, the *Alaska Ranger*, and five of its crewmembers on Easter morning. This loss has been particularly hard for the company, its employees, and the families involved, and FCA is gratified by the support that it has received from Council members, NMFS, and the industry at large. In addition to all other considerations, however, the loss of this vessel both puts at risk FCA's ability to harvest its Amendment 80 allocation and may accentuate the adverse dynamic staff identified in analyzing the rollover provision.

Additional uncertainties also face the sector next year because of the recent decision in the *Arctic Sole* case. In that case, U.S. District Court Judge Pechman invalidated the Amendment 80 rule prohibiting replacement of Amendment 80 vessels, stating: "To the extent that [NMFS] restricts access to the BSAI non-pollock groundfish fishery to qualifying vessels without allowing a qualified owner to replace a lost qualifying vessel with a single substitute vessel, the regulations are arbitrary, capricious, and otherwise not in accordance with law." The judge did not define what she meant by "lost."

The *Arctic Sole* decision presents two issues. First, it may provide FCA with the means to replace the *Alaska Ranger*, but it is likely some regulatory clarification will be required to implement a court-ordered vessel replacement provision. Furthermore, from a practical perspective, it is far from clear if FCA will be able to find a suitable replacement for its 203-foot *Alaska Ranger*. This involves finding an appropriate existing vessel with a fishery endorsement, as it appears that no new vessels greater than 165-feet may be able to be built without explicit approval from the Council and NMFS.

Second, the decision may open the door for other companies to bring new capacity into the sector. For instance, there are Amendment 80 license limitation program ("LLP") permits whose qualifying vessels are permanently ineligible to reenter the fishery. A possible interpretation of the decision could be to allow these permits to be placed on new steel in order to compete in the limited access fishery.

Both the continuing uncertainty of FCA's ability to replace the *Alaska Ranger*, and the potential for new limited access entrants either from the Amendment 80 cooperative sector or new vessels under the *Arctic Sole* decision, argue for the Council to provide some additional flexibility on the cooperative rules. As to the latter point, unless the sector is more fully rationalized, the real possibility continues to exist – and it is increasing – that there could be a

wasteful race-for-fish in the limited access sector. Providing a means for moving FCA's allocation into a cooperative would **greatly** diminish the incentive for others to abandon the cooperative sector or bring new capacity into the fishery, as the competing vessels would have insignificant allocations in the limited access common pool.

The reason the Council enacted Amendment 80 was to provide a tool for the head-and-gut sector to meet the new groundfish retention standard ("GRS") by ending this race-for-fish and the waste it entails. A rationalized sector also helps the fleet slow effort and reduce its use of PSC, particularly halibut, which is slated to be significantly reduced over the next few years. For its part, the Rockfish Pilot program, which provides for single entity cooperatives has been both administratively feasible and shown impressive results in better utilization of those resources. In short, FCA strongly believes that by reviewing and revising the cooperative formation criteria, the Council can better meet all of the objectives it set forth in Amendments 79 and 80.

FCA can identify a new set of criteria that will prevent the proliferation of an unmanageable number of cooperatives by requiring each cooperative to have a minimum allocation of Amendment 80 species. For instance, if that percentage were set at 20 percent, a maximum of four cooperatives could be formed given the current distribution of quota share. In reality, it would be more likely that only two or three would, in fact, result, based on the amounts allocated and current arrangements. Not only would such an approach allow vessels more choices in forming partnerships, but it would also give effect to the post-delivery transfer provision adopted by the Council earlier this year.

Another, related concept that appears to have some support in the sector would be to establish a system by which retention rates could be "averaged out" among cooperatives. The idea is that if a cooperative exceeds the retention rate in a given year and another cooperative falls just short, then the "excess" retention from the former could be shifted to possibly help put the other into compliance. In this sense, it is similar to the post-delivery transfer rule in that it could help prevent inadvertent violations. It is offered as a means to foster the formation of additional cooperatives and provide smaller vessels that may have a difficult time meeting the GRS with bargaining leverage in the cooperative formation process. Council and NMFS staff would have to work out the details, but the basic idea is to calculate the excess tonnage retained, and integrate that into retention rates of one or more cooperatives that may have fallen short.

Such a system would not undermine the improved retention/improved utilization objectives. All cooperatives would have a strong incentive to meet the targets on an individual basis because there would be no guarantee that there would be overages by one cooperative, or that they will be large enough to put another cooperative into compliance. It also differs from early proposals the Council considered which would have calculated the GRS on a fleet-wide basis. While superficially similar, under this proposal there is a responsible, sanctionable party if

the standard is not achieved. Allowing the averaging of retention would simply provide a safety net and give the smaller vessels the opportunity to negotiate on an equal footing with other potential cooperative partners.

We appreciate your time and attention to this important matter, and sincerely hope that the Council will take this issue up at the June meeting. FCA will be happy to provide any further information you may require, and look forward to working with the Council as it seeks to address these issues of concern.

Sincerely,

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D-3(b)

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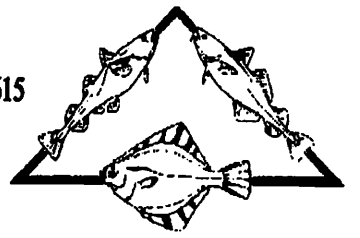

GOA BYCATCH – CRAB AND SALMON

OBSERVER PROGRAM ISSUES

Both the AP and SSC recognize that the Council needs to develop a robust GOA observer program before the Council considers moving forward with a GOA bycatch measures amendment package.

AP motion, "The AP feels that the available data in the GOA does not provide adequate reliability to support developing bycatch limitation programs. Therefore, the AP recommends the Council delay further action on this agenda item and focus on development of more reliable observer coverage and a feasible electronic monitoring program."

SSC minutes, "The SSC is concerned about the low levels of observer coverage in the GOA groundfish fisheries. There appear to be high levels of uncertainty in the bycatch estimates of salmon and crab in the GOA, and this should be discussed relative to the ability to properly identify the impacts of alternatives. Furthermore, implementation of a trigger-dependent bycatch program is likely to be ineffective, due to the large portion of the fleets that are unobserved."

The Council passed a motion regarding the observer program at their April meeting tasking the Council, NMFS, IPHC, and ADF&G staff to review the alternatives that examine restructuring the North Pacific Observer program. It appears that the Council will head down the road of fixing the GOA observer program.

CHANGES IN OBSERVER COVERAGE REQUIREMENTS SUGGESTING SOME IMPROVEMENTS IN DATA

Observer coverage requirements have changed – meaning that the quality of PSC data should improve in the coming years. The increased coverage requirements are only a band-aid and not the wholesale fix that the GOA observer program needs.

(1) In 2007, for the Rockfish Pilot Program, 100% observer coverage is required for RPP qualified vessels for the sideboarded flatfish fisheries in the GOA during the month of July.

(2) In 2007, for the Rockfish Pilot Program (RPP), 100% and 200% observer coverage is required for vessels that participate in the RPP fishery.

(3) In 2008, for the amendment 80 trawl CP fleet participating in the GOA fisheries, 100% observer coverage is required.

(4) At the 2008 April Council meeting, final action was taken by the Council to reduce the amount of non-representative fishing events for both the H&L and Trawl sectors. Changes in the definition of fishing day to meet observer vessel requirements will increase the amount of observer coverage in the GOA and is expected to be in place for the 2009 or 2010 fishing year.

IS THERE A CONSERVATION CONCERN?

Both the AP and SSC believe that the Council needs to remain aware of bycatch issues in the GOA and determine if there is a pressing conservation issue for any of the species considered in Staff discussion paper, "Salmon and Crab bycatch measures for the GOA Groundfish Fisheries".

AP motion, "We further recommend that the bycatch document should be updated annually so the Council maintains awareness of bycatch issues in the GOA."

SSC minutes, "The SSC concludes that the document does not provide sufficient information to assess whether current trends in salmon or crab bycatch are either conservation or an economic concern."

Salmon Bycatch: The average Chinook salmon bycatch has ranged from 12,921 salmon in 2002 to 40,130 salmon in 2007, with an average of 21,488 salmon for the period 1990 to 2007 and an average of 27,195 salmon from 2004 to 2007. The incidental Chinook salmon take statement under the ESA is 40,000 fish. The only year that this amount was exceeded was in 2007; it is know that the number of Chinook salmon incidentally caught in 2007 is not an accurate representation of the effect of the GOA groundfish fishery on Chinook salmon. According to a letter to the NMFS North West Region from NMFS Alaska region, "Approximately half of the 40,153 Chinook salmon estimated for 2007 is based on two consecutive hauls from a single vessel in a single day." If the 2007 salmon catch estimate was revised to remove this single vessel's estimate then the average from 2004 to 2007 is very similar to the 1990 to 2007 time period (i.e. salmon bycatch in the GOA is not increasing for the time period 1990 to 2007).

The BSAI pollock fishery is undergoing a large initiative for salmon bycatch management to reduce Chinook salmon bycatch. In this fishery the incidental Chinook salmon take statement under the ESA ranges from 36,000 to 87,500 fish. The BSAI groundfish fisheries have exceeded the upper limit of the range several years in a row, thus the pressing need to address Chinook salmon bycatch as a conservation concern.

There are many lessons that can be learned by the type of salmon bycatch measures instituted in the BSAI trawl groundfish fisheries that could be applied to the GOA groundfish fisheries in the future. According to the Council staff document, "Given that the Council is currently revising bycatch reduction measures for salmon in the BSAI, any measures evaluated for bycatch reduction in the GOA should consider and build upon lessons learned in the BSAI. Some of the issues in the BSAI that are being raised in conjunction with evaluating hard caps on the pollock fisheries are sector-specific observer requirements in order for these to be appropriately maintained. As discussed earlier in this paper, observer coverage in the GOA is much more limited than in the BSAI, thus any measures under discussion would need to likewise consider the management and monitoring issues which are raised accordingly." Moving forward with fixes to the observer program first and learning from the adopted BSAI salmon bycatch measures is the most reasonable approach at this time.

C. bairdi crab bycatch: Tanner Crab total biomass numbers for GOA for 2006 based on Alaska Department of Fish and Game crab survey results are as follows:
Kodiak District = 165 million crab
South Peninsula District = 77 million crab
Chignik District = 42 million crab
Grand Total = 284 million crab

This amount compares to total bycatch in the 2007 federal groundfish fisheries of 489,523 crabs – 293,133 crabs by the pot sector and 196,124 crabs by the trawl sector.

For comparison purposes, for C. bairdi in the BSAI the PSC limit of C. bairdi crabs caught by trawl vessels while engaged in directed fishing for groundfish in Zones 1 and 2 during any fishing year based on total abundance of C. bairdi crabs as indicated by the NMFS annual bottom trawl survey are as follows:

For Zone 1:

When the total abundance of C. bairdi crab is…	The PSC limit will be …
(1) 150 million animals or less	0.5 percent of the total abundance minus 20,000 animals
(2) Over 150 million to 270 million animals	730,000 animals
(3) Over 270 million to 400 million animals	830,000 animals
(4) Over 400 million animals	980,000 animals

For Zone 2:

When the total abundance of C. bairdi crab is…	The PSC limit will be …
(1) 175 million animals or less	1.2 percent of the total abundance minus 30,000 animals
(2) Over 175 million to 290 million animals	2,070,000 animals
(3) Over 290 million to 400 million animals	2,520,000 animals
(4) Over 400 million animals	2,970,000 animals

Based on the present GOA biomass of C. bairdi the total bairdi cap limit in the GOA would be 3,350,000 animals if a similar cap structure as for the BSAI was adopted. This compares to actual trawl bycatch estimate of 196,124 crabs in the 2007 GOA fisheries. For the BSAI, the actual crab bycatch for C. bairdi is much lower than the cap and the confidence of the crab bycatch numbers is high since virtually the entire fleet has 200% observer coverage requirements. The comparison is an attempt to demonstrate that reported bycatch numbers suggest that there is not a conservation concern.

Additionally, data provided by Alaska Department of Fish and Game for crab biomass abundance shows that the present GOA no bottom trawl zones do a very good job of protecting the high abundance areas of spawning biomass of C. bairdi (adult Male and Female biomass) from trawl gear. See attached maps of the 2006 crab trawl survey around Kodiak Island. Based on conversation with Alaska Department of Fish and Game Staff in Kodiak they do not have conservation concern with regards to the amount of crab bycatch in the GOA fisheries at this time.

WHY HASN'T THE CRAB FISHERIES REBUILT TO LEVELS SEEN IN THE 1970's AND 1980's

It has been well documented that a regime shift occurred that lead to increased abundance of groundfish (particularly flatfish, cod and pollock) in the mid 1980's. Crab stock survival typically is best in a cold regime while groundfish stocks do best in a warm regime. These groundfish species are large predators of crab. According to Alaska Science Center Staff (ASC) the ecosystem model that examines who eats who in the GOA system suggest that Pacific cod eat 35,000 MT of crab and Halibut eat 21,000 MT of crab on an annual basis. Flatfish are also known predators of crab but no estimate of consumption was given by ASC staff. Predation has kept stocks depressed.

LIMITED TOOLS FOR BYCATCH MANAGEMENT

It is important to note that the GOA Bycatch measure package of possible alternatives for bycatch reduction was developed by the Council in 2005. The Council at that time believed that the fleet would be given the appropriate management tools via rationalization that creates individual vessel accountability by allocating the target fishery quotas. GOA rationalization has been postponed until further notice thus the fleet does not have the appropriate tools to deal with a comprehensive bycatch plan.

References:

Memorandum for Robert Lohn, Administrator, Northwest Region from Dr. James W. Balsiger, Administrator, Alaska Region, "2007 Annual Report for the Alaska Groundfish Fisheries Salmon Incidental Catch and Endangered Species Act Consultation, Jan 14, 2008.

Fishery Management Report No. 07-52, Bottom trawl Survey of Crab and Groundfish: Kodiak, Chignik, South Peninsula, and Eastern Aleutian Management Districts, 2006, by Kally Spalinger, October 2007.

Federal Fisheries Regulations, 50 CFR 679: fisheries of the Exclusive Economic Zone off Alaska, Prohibited species bycatch management section 679.21, page 5 of 14.

Attachments:

Adult C. bairdi abundance maps for females and males provided by the Alaska Department of Fish and Game for Kodiak Island

Two examples of extrapolation problems for the GOA pollock fishery:

Case 1: Bairdi Crab – Non-pelagic trawl gear for Pelagic Pollock target fishery in 2006

Species	Gear	Area	Target	Week	Sector	Groundfish (MT)	# of Crab	Rate Crab #/mt
BTCR	NPT	630	P	11-Feb-06	S	26.061	10,424	400
BTCR	NPT	630	P	18-Feb-06	S	96.708	38,683	400
BTCR	NPT	620	P	4-Mar-06	S	66.868	26,747	400
BTCR	NPT	All	P	Annual	S	189.637	75,854	400

Extrapolation based on virtually no data: Explanation — In 2006, the total amount of Bairdi crab taken in the GOA non-pelagic pollock trawl fishery was 83,598 (see table 12) on which 75,854 crab were generated by one observation. The amount of crab contributed to this target over the years has been close to zero.

Case 2: Chinook salmon – 2007 Pelagic Pollock target fishery – Week ending March 24

SNumInSample	SpeciesName	Sample Wt	Sample Type	SWtInSample	Pct Retained	OTC
8	ARROWTOOTH FLOUNDER	6.5	B	4.64	100	0.01
1	KING SALMON (CHINOOK)	6.5	B	1.52		0.01
1	SQUID - UNIDENT.	6.5	B	0.34	100	0.01

Extrapolation based on observed and unobserved tows with a calendar day:
Explanation – In 2007, the total amount of Chinook salmon taken in the GOA trawl fisheries was 40,130 salmon (see table 1 in Council analysis). The one observer sample above generated over 21,000 Chinook salmon applied to one vessel for a 24-hour period.