


MEMORANDUM

TO: Council, SSC and AP Members

FROM: Clarence G. Pautzke
Executive Director 

DATE: June 3, 1996

SUBJECT: BSAI Crab Bycatch Issues

ESTIMATED TIME
8 HOURS

ACTION REQUIRED

- (a) ADF&G report on status and management of Bristol Bay red king crab.
- (b) Final review of analysis of crab caps and trawl closure areas in Bristol Bay.

BACKGROUND

Status and Management of Crab Stocks

The Council, SSC, and AP requested that ADF&G provide a presentation on the State's efforts regarding crab assessment and rebuilding at the April or June Council meeting. Staff from ADF&G will be on hand to summarize their findings.

Final Review of Proposed Crab Bycatch Management Measures

In January, the Council identified three potential management measures to reduce crab bycatch in Bering Sea trawl fisheries:

1. Revise the trawl closure time period for the Bristol Bay Red King Crab Savings Area,
2. Modify existing crab PSC bycatch limits, and initiate bycatch limits for snow crab, and
3. Establish a trawl closure area in nearshore waters of Bristol Bay.

At the April meeting, the Council reviewed a draft Environmental Assessment/Regulatory Impact Review (EA/RIR) for these management measures, and released it for public review with several modifications suggested by the Advisory Panel. Modifications include the addition of two closure options that would continue to allow trawling in a portion of northern Bristol Bay, a 7-month closure for the Red King Crab Savings Area, options for further reduced PSC caps, and rescision of the trawl exemption area off Port Moller. A revised analysis was distributed to the public on May 10. The executive summary is attached as Item C-4(a).

Note that management measure 1 examines changing the closure duration for the Bristol Bay Red King Crab Savings Area. The Council previously adopted a January 1 to March 31 closure for Amendment 37 in September, 1995. Though the amendment has not been sent to Secretarial review, it does represent a Council final action, and thus is considered status quo. No additional action would be required if the Council were to keep these dates as the preferred option. If a change in closure duration is desired, the Council would need to rescind their previous action (by majority vote) before making a motion to modify Amendment 37.

Management measures 2 and 3 are proposed as a separate amendment, tentatively identified as Amendment 41. The suite of management measures has been examined together in one package, so that the impacts of these proposed measures can be analyzed comprehensively. At this meeting, the Council will take final action on a preferred alternative for each management measure. If adopted and approved, management measures would be implemented in January 1997.

The revised crab bycatch analysis was reviewed by the crab plan team, and their recommendations are included in their minutes (Item C-4(b)). Recommendations from the Crab Rebuilding Committee are attached as Item C-4(c). Comments received on crab bycatch issues are under Item C-4(d).

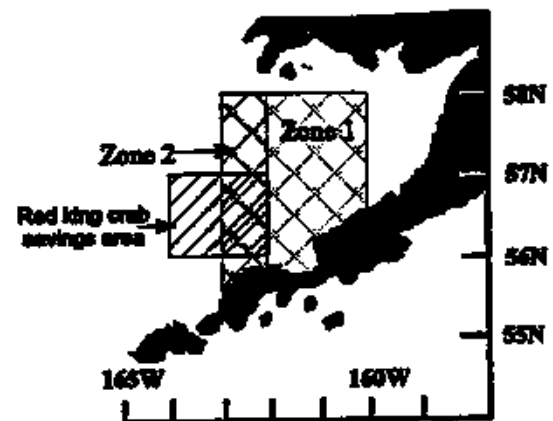
Executive Summary

Bering Sea crab stocks are currently at relatively low levels based on recent National Marine Fisheries Service (NMFS) bottom trawl surveys. Crab fisheries have been impacted by these low stock sizes, such that no Bristol Bay red king crab fishery occurred in 1994 or 1995, and harvests of Tanner and snow crabs have been much reduced. In January 1995, the Council initiated analysis of several proposals designed to reduce impacts of trawling on crab stocks and thus promote rebuilding of crab resources. The Council is considering three management measures for the current crab bycatch management regime for Bering Sea trawl fisheries. Specifically, these management measures are:

1. Revise the trawl closure time period for the Bristol Bay Red King Crab Savings Area;
2. Modify existing crab PSC bycatch limits, and initiate bycatch limits for snow crab; and
3. Close nearshore waters of Bristol Bay to trawling.

The Council requested that staff examine the suite of management measures in one package, so that the impacts of these measures can be analyzed in a comprehensive manner. These measures, and potential impacts and interactions, are described below.

Bristol Bay Red King Crab Savings Area: The non-pelagic trawl closure period adopted by the Council in September 1995 for Amendment 37 (Bristol Bay Red King Crab Savings Area) does not encompass the entire molting and mating period of red king crabs. The Bristol Bay red king crab stock remains at low abundance levels, and the Council recommended that NMFS implement an emergency rule to continue the closure through June 15, 1996. Because unobserved impacts of trawling on softshell crab may impact crab rebuilding and future crab harvests by pot fisheries, the Council requested additional information be examined before they reconsider the previous preferred alternative (January 1 - March 31) for Amendment 37.



Three alternatives were examined. In addition to the status quo, Alternative 1, additional impacts of seasonal closures were examined as well as a modified closure area. These alternatives and options are detailed below.

Alternative 1: Status quo, no action. Amendment 37 would be submitted to the Secretary based on the closure period adopted by the Council in September 1995. The Bristol Bay Red King Crab Savings Area (162° to 164° W longitude, 56° to 57° N latitude) would be closed to non-pelagic trawling from January 1 through March 31. The area bounded by 56° to 56°10' N latitude would remain open during the years in which a guideline harvest level for Bristol Bay red king crab is established.

Alternative 2: Extend closure period for the Bristol Bay Red King Crab Savings Area to provide increased protection for red king crab. Amendment 37 would be submitted to the Secretary based on one of the closure period options considered. [Note: The area bounded by 56° to 56°10' N latitude would remain open during the years in which a guideline harvest level for Bristol Bay red king crab is established.]

Option A: Six month closure. Close the Bristol Bay Red King Crab Savings Area to non-pelagic trawling from January 1 through June 15. The June 15 date corresponds to the opening date for Area 516, which is the area from 162° to 163° W longitude that is closed March 15 to June 15 annually.

Option B: Year-round closure. Close the Bristol Bay Red King Crab Savings Area to non-pelagic trawling from January 1 through December 31.

Option C: Seven month closure. Close the Bristol Bay Red King Crab Savings Area to non-pelagic trawling from January 1 through August 1.

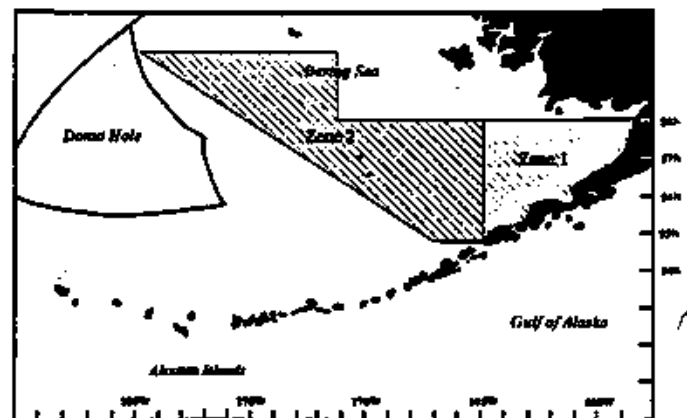
Alternative 3: Close the area based on a modified version of the old pot sanctuary. Boundaries of the closure would close all waters in the Bering Sea east of a line originating at Cape Constantine, extending to 58°10' N, 160°W to 57°10'N, 163°W to 56°30'N, 163°W to 56°30'N, 164°W, then south to 56°N. After April 1, this closure would extend south to the Alaska Peninsula. This option would require 100% observer coverage for fishing north of 58°N and east of 162°W and would be limited to May and June. Further, the area between 163° and 164°W between 56°30'N and 57°00'N would not open until April 1 and would be closed upon reaching a red king crab cap in a range of 5,000 to 15,000 red king crab. (Note this alternative deals with both Bristol Bay Red King Crab Savings Area and nearshore Bristol Bay Trawl Closure Area.)

As a supplement to Amendment 37 (Bristol Bay Red King Crab Savings Area) which examined a year round closure of the red king crab savings area, the Bering Sea Fishery Simulation model was run to estimate the net benefits to the nation from a three-month, six-month, or a seven-month closure to all trawling. Model runs predicted no substantial change in net benefits to the nation under any closure option.

The additional analysis provided by the model was based on data from 1993 and 1994 when there was essentially no trawling in the closure area between April and June. Thus the model was unable to predict the magnitude of red king crab savings by extending the closure to June 15. However, in some years, Zone 1 has remained open to yellowfin sole trawling until May or June, and there remains a potential for vessels to trawl in the proposed area. Because this area contains a significant number of molting adult red king crab during this time period, Alternative 2 (Options A, B, and C) may reduce the potential for bycatch and unobserved mortality, which may be higher when crabs are in softshell condition. Alternative 2, Option C (7-month closure) covers the duration of the molting period and an additional month to allow for shell hardening. Alternative 2, Option B (year-round closure) provides the maximum protection of crab and habitat.

Alternative 3 would provide more fishing opportunities for the yellowfin sole and rock sole trawl fisheries, as well as provide habitat protection for red king crab in nearshore areas. However, because areas containing a sizable portion of the mature red king crab stock would be open to trawling, Alternative 3 may result in increased impacts on red king crab.

Modify Existing Crab PSC Bycatch Limits, and Initiate Bycatch Limits for Snow Crab: Bycatch limits for red king crab and Tanner crab established for Bering Sea fisheries may be too high given current status of crab stocks, and bycatch may impact crab rebuilding and future crab harvests by pot fisheries. Bycatch limits for snow crab have not been established. Three main alternatives, developed by



the Council's Advisory Panel and the State of Alaska, were examined for each crab species separately. An additional option for stairstep PSC limits for Tanner crab, proposed by the Alaska Crab Coalition in January 1996, was also examined at the request of the Council. The alternatives to the status quo included a reduced bycatch limit for crab and a crab PSC limit that fluctuates with crab abundance. Potential impacts of instituting a new bycatch limit for snow crab were also examined. The alternatives and options were as follows:

RED KING CRAB

Alternative 1: Status quo, no action. PSC limits would remain at 200,000 red king crab in Bycatch Limitation Zone 1.

Alternative 2: Reduce PSC limits of red king crab. PSC limits would be reduced to a fixed level at 180,000 red king crab based on a three year average (1992-1994)

Option A: Further reduce the red king crab PSC limit in Zone 1 to 35,000 crab, which was the number of red king crab bycaught in 1995 within Zone 1.

Alternative 3: Establish PSC limits for crab that fluctuate with crab abundance. Annual PSC limits would be set as a percentage of the total population indexed by the NMFS bottom trawl survey. Limits would be established based on a rate specified, within the range 0.1-1.0% of red king crab in the Bristol Bay District.

Option A: Set a fixed upper limit for crab PSC at 200,000 red king crab in Zone 1.

TANNER CRAB

Alternative 1: Status quo, no action. PSC limits would remain at 1,000,000 Tanner crab in Zone 1, and 3,000,000 Tanner crab in Zone 2.

Alternative 2: Reduce PSC limits of Tanner crab. PSC limits would be reduced to a fixed level of 900,000 Tanner crab in Zone 1, and within the range of 1,500,000 to 2,100,000 Tanner crab in Zone 2.

Alternative 3: Establish PSC limits for crab that fluctuate with crab abundance. Annual PSC limits would be set as a percentage of the total population indexed by the NMFS bottom trawl survey. Limits would be established based on a rate specified, within the range 0.10-2.0% of Tanner crab in the Eastern District, as indexed by the survey. PSC limits for each zone would be set either by apportioning the overall cap among the zones (25% to Zone 1 and 75% to Zone 2) or by setting separate PSC rates for each zone, rather than apportionment of a single rate.

Option A: Set a fixed upper limit for crab PSC at 1,000,000 Tanner crab in Zone 1, and 3,000,000 Tanner crab in Zone 2.

Option B: Establish PSC limits for Tanner crab based on abundance thresholds. Limits would be set as a percentage of population when abundance is less than 100 million crab. In years when Tanner crab abundance is more than 100 million, but less than 250 million, PSC limits would be established at 850,000 Tanner crab in Zone 1, and 1,500,000 in

Zone 2. In years when Tanner crab abundance is more than 250 million, but less than 500 million, PSC limits would be established at 900,000 Tanner crab in Zone 1, and 2,300,000 in Zone 2. In years when Tanner crab abundance exceeds 500 million, PSC limits would be established at 1,000,000 Tanner crab in Zone 1, and 3,000,000 in Zone 2.

SNOW CRAB

Alternative 1: Status quo, no action. No PSC limits would be set for snow crab.

Alternative 2: Establish a fixed PSC limit for snow crab. Based on a three year average (1992-1994), a PSC limit would be established at a fixed level of 11,000,000 snow crab in Zone 2. No snow crab PSC limit would be established for Zone 1, as bycatch in this area has been minuscule by comparison.

Option A: Establish PSC limit at 6 million snow crab in Zone 2.

Alternative 3: Establish PSC limits for snow crab that fluctuate with crab abundance. Annual PSC limits would be set as a percentage of the NMFS bottom trawl survey index. Limits for Zone 2 would be set at a percentage within the range 0.005 to 0.25% of the snow crab total population index (all districts combined). No snow crab PSC limit would be established for Zone 1.

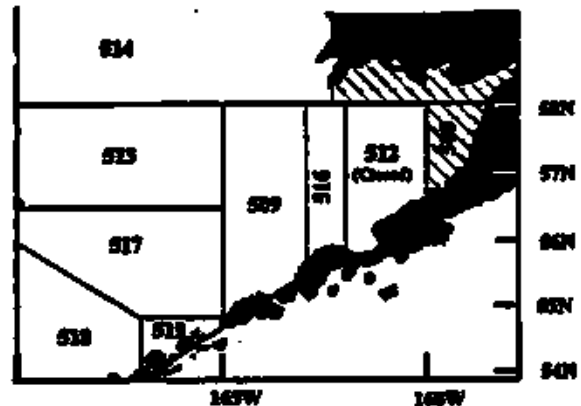
Option A: Set fixed upper limit for PSC at 12 million snow crab in Zone 2.

The biological impacts of this management measure on crab populations were measured on the basis of adult equivalents. The adult equivalent formula incorporated data from groundfish and crab fisheries including bycatch numbers, size and sex of catch and bycatch, discard mortality, and natural mortality. Results indicated that, assuming only observed crab are impacted, bycatch in groundfish fisheries has relatively small impact on crab populations, and therefore reducing PSC limits as proposed under Alternatives 2 and 3 may not drastically improve or rebuild crab stocks. For example, under the most restrictive PSC limit considered for red king crab (red king crab Alternative 2, Option A), the abundance of female spawning stock would be expected to be about 0.75% higher than under Alternative 1, based on average bycatch 1993-1995. It should be noted, however, that any reduction in mortality would slow the decline of the Bristol Bay stock. PSC limits for Tanner crab proposed under Tanner crab Alternative 2 would increase female spawning stock by about 0.38%.

The economic impacts of this management measure depend on the alternative chosen. If the Bristol Bay Red King Crab Savings Area is approved as an FMP amendment, reduced PSC limits for red king crabs in Zone 1 (as proposed under Alternative 2) may not further impact trawl fisheries, as bycatch was at or below this level in 1995 and 1996. For Tanner crab, recent data indicated that the current PSC limits (status quo) could be reduced from existing levels, yet not impact groundfish fisheries if the available PSC is optimally allocated. However, because PSC allocation becomes fixed for the year during the annual specification process, optimal allocation may be impossible to achieve. Bycatch of Tanner crab was much reduced in 1995, suggesting that the PSC limit proposed under Alternative 2 may be achievable without substantially impacting trawl fisheries. One major assumption regarding assessment of impacts for Alternative 2 is that crab stock abundance will remain relatively stable in future years.

The impacts of Alternative 3 depend on the PSC rate chosen for each crab species. On average 1992-1995, groundfish fisheries bycaught crab at the following rates (bycatch as percentage of total crab survey abundance): red king crab (Zone 1, 0.40%), Tanner crab (Zone 1, 0.39%; Zone 2, 0.79%), snow crab (Zone 2, 0.10%). As with other alternatives, PSC limits set at these rates (current bycatch use) would not impact groundfish fisheries if the available PSC is optimally allocated. Fixed upper limits would further constrain trawl fisheries when crab abundance is high. The threshold limits proposed for Tanner crab may also do the same. The potential benefit of threshold limits is that while they allow bycatch levels to fluctuate with crab abundance, they also would temper year-to-year variability in PSC limits caused by trawl survey abundance estimates. Some stability may also be beneficial to long-term financial planning for trawl companies.

Nearshore Bristol Bay Trawl Closure Area: Existing trawl closure areas in Bristol Bay were designed to protect adult and sub-adult red king crab from trawling. However, protection of juvenile habitat, which may be negatively impacted by trawling, may provide for improved recruitment and subsequent stock rebuilding. A trawl closure area may also provide additional protection for Pacific herring and Pacific halibut. In addition to the status quo, Alternative 1, the impacts of prohibiting trawling in three areas were examined.



Alternative 1: Status quo, no action.

Alternative 2: Establish a Northern Bristol Bay Closure Area, which would prohibit all trawling, on a year-round basis, in the area east of 162° W longitude and north of 58° N latitude.

Option A: Continue to allow bottom trawling within the area north of 58° N and bounded by 159° and 160° W longitude. This option may require 100% observer coverage for trawl vessels fishing in the area.

Alternative 3: Prohibit all trawling in Bristol Bay, on a year-round basis, in the area east of 162° W longitude. Because much of Bristol Bay (statistical area 512) is already closed to trawling year-round, the additional area encompassed by this alternative is statistical area 508 in eastern Bristol Bay and the area described under Alternative 2.

Option A: Continue to allow bottom trawling within the area north of 58° N and bounded by 159° and 160° W longitude. This option may require 100% observer coverage for trawl vessels fishing in the area.

Alternative 4: Prohibit all trawling on a year-round basis the area north of 58°43' N and east of 162° W longitude. The area north of 58° N and east of 162° W longitude, exclusive of the area closed year-round, would be open to trawling during the period April 1 to June 15 each year. This alternative may require 100% observer coverage for trawl vessels fishing in the area.

Option A: Also prohibit all trawling on a year-round basis in Statistical Area 508, which is the area east of 160° W longitude and south of 58° N latitude.

All Alternatives to the status quo would include a regulatory amendment change that would rescind the trawl closure exemptions for the Pacific cod fishery off Port Moller (§ 675.22, paragraphs c,d,e). These regulations appear to be out-of-date given the current best scientific information on juvenile crab habitat and status of the Bristol Bay red king crab stock.

This analysis suggests that a nearshore trawl closure area designed to protect juvenile red king crab habitat may be a significant action managers can take to maintain and possibly increase recruitment of red king crab. Young-of-the-year red king crab require cobble or living substrate (such as sea onions and bryozoans) on which to settle and provide protection from predators. Much of this habitat is already protected by the area 512 trawl closure. Additional habitat for age-0 red king crab has been found to occur in the shallow waters (<50 m) of Area 508, and in the area north of 58° N latitude. By age 2, juvenile red king crab begin to form pods in deeper water (>50m) adjacent to settlement areas in Bristol Bay. Although Alternative 2 encompasses some habitat and podding areas, Alternative 3 would provide maximum habitat protection for young red king crab of the Bristol Bay stock. A trawl closure area in nearshore Bristol Bay may also provide some additional benefits for seabirds, herring, halibut, and marine mammals, but potential benefits remain unquantified.

Yellowfin sole are targeted by trawl fisheries in Bristol Bay (concentrated to the west of Cape Constantine), and consequently this fishery would be somewhat impacted by the proposed closure areas, particularly the northern Bristol Bay area (Alternative 2). A high of 50% of the yellowfin sole observed catch was taken in 1991 in Bristol Bay, however, this percentage has declined annually until only 2% of the directed catch was taken in Bristol Bay in 1994. The percentages of prohibited species bycatch taken in the Bristol Bay area are generally similar to the catch percentages with the exception of herring which generally constitutes a very high percentage of the total yellowfin sole bycatch of herring.

Estimates based on the Bering Sea fishery simulation model indicate that adoption of any of the Alternatives would lead to a slight decrease in the net benefits to the Nation over status quo based on both the 1993 and 1994 data. The approximately \$1.1 million decrease in net benefits (1993 data) and \$1.3 million decrease in net benefits (1994 data) result in approximately a 0.4% and a 0.5% decrease of the net benefits to the Nation under status quo from 1993 and 1994 data, respectively. Given the accuracy inherent in the data, and in the model procedures, these predicted changes in net benefits to the nation are probably not great enough to indicate an actual change from status quo. As with any closure, the tradeoffs between foregone groundfish catch, and savings in bycatch species are apparent in the model results. A closure of northern Bristol Bay would result in a slight decrease in retained catch and herring bycatch and an increase in Tanner crab bycatch. The minimal directed fishing activity in Area 508 during 1993 and 1994 resulted in minute changes in the model results due to the closure of this area.

**DRAFT Minutes of the
Bering Sea/Aleutian Islands Crab Plan Team
Meeting, May 17 and 20, 1996**

Members Present:

Peggy Murphy (ADF&G, chair)
Ron Berg (NMFS)
Joshua Greenberg (UAF)
Ken Griffin (ADF&G)

Rance Morrison (ADF&G)
Bob Otto (NMFS)
Doug Pengilly (ADF&G)
Dave Witherell (NPFMC)

The Bering Sea/Aleutian Islands (BSAI) Crab Plan Team met by teleconference on May 17 and again on May 20, 1996. The Team meeting was conducted based on the following agenda:

Introductions
Review of Crab Bycatch Management EA/RIR dated May 10, 1996
Approval of 4/3/96 minutes
Upcoming meetings

Review of EA/RIR on Crab Bycatch Management

The primary focus of the teleconference was to review the draft EA/RIR of proposed crab bycatch management measures, dated May 10, 1996. The team had reviewed the previous draft in April, and was apprised of the new Alternatives and options examined as well as revisions made to the analysis. The Team discussion focused on recommending a preferred Alternative.

Red King Crab Savings Area:

The Team reviewed the additional analysis for Amendment 37 (Bristol Bay red king crab savings area). The Team reiterated their concerns for the depressed stock of red king crab in Bristol Bay as evidenced by low abundance and the stock's severely contracted distribution. The Team stressed the importance of protecting red king crabs year-round in the remaining habitat they occupy by prohibiting trawling year-round. The Team did step through the new Alternative time/area closures and cap that were proposed in April 1996 and balanced it against combinations of other Alternatives and management measures.

The team's discussion addressed each of the three variants of time and area closures of Alternative 3 separately. Closure of the area south of the red king crab protection zone to the Alaska Peninsula after April 1 was viewed as a minimal cost to the domestic trawl industry because less than a fifth of the flatfish catch is taken in the area on average and less than 7% of the catch taken in the area is caught after April 1. The NMFS survey places only a single tow in this area to assess resource abundance. Average percentage of crabs from the survey in the area from 1993-1995 was zero. However, previous studies of the area consider it to be important king crab habitat. The Team viewed this April 1 to Dec. 31 closure area as a poor tradeoff to the accompanying opening of the triangle area comprising the northwest corners of area 516 and 512; an area considered part of a yellowfin sole migration corridor. The Team adamantly opposed opening of any portion of area 512 to trawling. Analysis of

NMFS trawl survey data from the triangle area indicates over 90% of the average abundance of male and female crabs in the area from 1993 to 1995 were mature crabs. Review of the distribution of yellowfin sole blocks with the highest average catch per tow and highest number of tows by month from 1987 to 1994 showed the northern blocks of area 516 and the two blocks above area 512 were not production areas for the yellowfin sole trawl fleet. In fact, nearly the entire catch of yellowfin sole east of 162° came from the two blocks between 159° and 160°W and north of 58°N. Additionally, flatfish trawl hauls with observed bycatch of 50 or more red king crabs clustered along the northern boundary of area 512 (58°N) in 1992 and 1993 which corresponds with the northern distribution of crabs as mapped by the NMFS survey. The Team also noted that in 1987, one of the few years when the yellowfin sole trawl fleet directed fishing in area 516, 77% of the observed bycatch of red king crab was taken in the portion of area 516 that is north of the red king crab savings area during the month of April. Last, the team reviewed consequences of opening the northwest corner of the red king crab saving area to trawling April 1 with closure triggered by a red king crab cap in the range of 5000 to 15,000 red king crabs. The NMFS survey found an average of 21% of the mature male red king crab in Bristol Bay from 1992 to 1995 were located in this area. The area had a high density of observed flatfish hauls in 1992 with a bycatch greater than 50 crabs. In 1992 and 1993 all trawl effort by the yellowfin sole fleet in the red king crab savings area concentrated in the northwest corner yielding 27% and 17% of the red king crab bycatch of the fleet for those years. This corner of the red king crab savings area also yielded increasing percentage of yellowfin sole catch per tow from 1986 to 1989 but also had corresponding increases in percentage of the annual bycatch of the fleet.

Alternative 3 would sacrifice more mature male and female crab than the other Alternatives while the gain in flatfish harvest is limited. Team members remain concerned that the impacts of trawling are greater than just the number of crab counted as bycatch. Degradation of habitat and potential unobserved mortality of crabs contacted by the trawl are of particular concern. Important red king crab habitat would be open to trawling under Alternative 3. The Team concluded that Alternative 3 would not improve protection of Bristol Bay red king crab or contribute to rebuilding of the stock. The Team recommended that the Council Adopt Alternative 2, Option B for a year-round closure in the Bristol Bay Red King Crab Savings Area. The team continues to have serious conservation concerns about the Bristol Bay red king crab stock and the Team feels Alternative 2 option B provides the most protection to red king crab and crab habitat.

Crab Bycatch Limits:

The Team noted the SSC also had concerns with PSC limits based on an index of the entire crab population abundance and concurred with the SSC that new PSC limits should be analyzed in the future using more representative "currency". Peggy suggested a currency based on both number and weight of crab similar to the State's definition of threshold for Bristol Bay red king crab. Subsequent discussion of currency touched on assumed crab bycatch mortality, observer measurement of crab bycatch, survey measurement errors, variability of trawl catchability, etc.

In April the Team declined to recommend specific Alternative PSC limits as they felt a precedent existed for industry negotiation of PSC limits. Industry participating in this meeting were polled and indicated to the Team no negotiation of bycatch caps had occurred nor had they been contacted concerning potential negotiations. Therefore, the Team felt some comparison of the advantages and disadvantages of Alternative options for crab bycatch limits in groundfish trawl fisheries would be beneficial. The merits of fixed PSC limits versus rate based limits were discussed. A rate based PSC limit could be biased high or low depending on distribution and abundance of component portions of the population (e.g. mature males, females, juveniles etc.) and effects of numerous variables on the current broadly defined PSC currency. The Team determined that a fixed rate or staircase approach was preferable at this time for specifying crab PSC limits. The following were identified as

the Teams preferred Alternative for each crab species:

Red King Crab: The Team recommends adoption of a stairstep based PSC limit for red king crab in Zone 1, as modified from Alternative 2.

The following steps were recommended by the team:

<u>Abundance</u>	<u>Zone 1 PSC limit</u>
Below Threshold = 8.4 million mature crabs + Effective Spawning Biomass (ESB) <14.5 million lb.	35,000
Above Threshold + ESB < 55 million lb.	100,000
ESB > 55 million lb.	200,000

In years when red king crab in Bristol Bay are below threshold and the guideline harvest level (GHL) is set at zero (meaning no directed fishery), a PSC limit of 35,000 red king crab would be established in Zone 1. This limit was based on the level of bycatch observed in the 1995 flatfish fisheries operating in Zone 1 with the Red King Crab Savings Area closed to trawling. In years when the stock is above threshold but below the target rebuilding level of 55 million lb. effective spawning biomass, a PSC limit of 100,000 red king crab would be established. Increasing the PSC limit from 35,000 to 100,000 would be contingent on implementation and continuance of a year-round closure of the Red King Crab Savings Area. The 100,000 crab PSC limit corresponds to a 50% reduction from the current PSC limit, the same percentage reduction as applied by the Alaska Board of Fisheries in 1996 to the harvest rate for the directed red king crab fishery when the stock is above threshold but below 55 million pounds effective spawning biomass. A 200,000 PSC limit would be established in years when the Bristol Bay red king crab stock is rebuilt (above threshold and above 55 million lb. effective spawning biomass). The Team agreed the closure areas and PSC limits should be reexamined as the Bristol Bay red king crab stock approached rebuilt status.

Tanner Crab: The Team recommends adoption of a stairstep based PSC limit for Tanner crab, as modified from Alternative 3 Option B.

The following steps were recommended by the team:

<u>Abundance (millions of crab)</u>	<u>Zone 1</u>	<u>Zone 2</u>
0-100	375,000	650,000
100-250	750,000	1,300,000
250-500	900,000	2,300,000
500+	1,000,000	3,000,000

The team felt that a step between crab abundance ranging from zero to 100 million crabs was preferable to a rate based limit at or below an abundance of 100 million crab. An additional step (step 1) was developed based on an abundance level that approximates a situation when a directed crab

fishery is unlikely to be prosecuted (0-100 million crab). The Team also recommended lower PSC limits for Step 2 (100-250 million crab) than proposed. Limits for Step 2, 750,000 crabs in Zone 1 and 1,300,000 crabs in Zone 2, represent attainable bycatch levels observed in BSAI groundfish fisheries from 1992 to 1995. Additionally, these caps better reflect the current proportional distribution of mature male (52%, 45%) and female (41%, 58%) Tanner crabs in Zone 1 and Zone 2. The current split of 25% of the PSC limit in Zone 1 and 75% of the PSC limit in Zone 2 was based on the distribution of crabs in 1988. The remaining steps are the same as proposed in Alternative 3, Option B, and the PSC percentages by zone (25%, 75%) correspond to proportional distribution of Tanner crabs at higher abundance. The Team recognized PSC limits particularly at higher Tanner crab abundance may require review given any new analysis of PSC currency, effects of trawling on bycatch mortality, and change in stock distribution.

Snow Crab: The Team recommends adoption of Alternative 2, establishing a PSC limit of 11,000,000 snow crab in Zone 2. The Team recommends that a PSC limit for snow crab be established to minimize the impacts of trawling on this stock. Recruitment of a few strong year classes to the larger fishable size class has been anticipated for several years but has yet to occur. Currently, recruitment to larger sizes is not sufficient to offset declines due to natural and fishing mortality. The Team members agreed that the average bycatch of snow crabs observed in Zone 2 from 1992 to 1994 would be a good starting point for a PSC limit. This limit could be revised in the future as more information becomes available regarding PSC currency, unobserved mortality and how the trawl fleet operates within a cap. The team noted the average size of trawl bycatch of snow crab corresponds to mature animals and nearly 50% of the mature male and female snow crab but only 24% of the total snow crab abundance are located in Zone 2 according to the NMFS survey. Therefore, the Team concluded PSC limits based on a rate of the total population of snow crab would result in disproportionately high harvest of mature crabs in Zone 2.

Nearshore Bristol Bay Closure Area: The Team recommends adoption of Alternative 3, Option A, with modifications. Specifically, the Team recommends that the Council prohibit all trawling, on a year-round basis, in the area east of 162° W, with the exception of an area bounded by 159° to 160° W and 58° to 58°43'N that would remain open to trawling during the period April 1 to June 15 each year. It was felt that such a closure area would protect known areas of juvenile red king crab habitat while at the same time allow trawling in an area that can have high catches of flatfish and low bycatch of other species. The area north of 58°43'N was suggested to be closed to reduce bycatch of herring, as indicated in the document. The time window was specified to reduce bycatch of halibut, which move into the nearshore area in June. The Teams preferred Alternative differs from Alternative 4 in that the area east of 159° W and the area west of 160° W should be closed to protect known areas of juvenile red king crab and halibut habitat.

Other Business

Peggy reminded team members of their work assignments for the FMP update and agreed to send out a tasking list. Peggy suggested a few revisions be made to the April 3 draft minutes, and noted several upcoming meetings: NPFMC June 10-16, PNCLAC June 11, and a Lowell Wakefield Symposium, Fishery Stock Assessment Models for the 21st Century: Combining Multiple Information Sources. The symposium is scheduled for Oct 8-11, 1997.

Others in attendance were David Ackley, Lisa Pelito, Phil Rigby, Jeff Stephan, and Arni Thompson.

Crab Rebuilding Committee Recommendations on Crab Bycatch EA/RIR

Measure 1: Revise Time Period for Bristol Bay Red King Crab Savings Area

- If the Council's objective was to reduce mortality on softshell crab, a closure through July 1 would provide more protection. However, a year-round closure to bottom trawling could be justified as a way to protect habitat and reduce unobserved mortality. Regardless of what option is chosen, closure areas should be re-evaluated on a regular basis because crab abundance and distribution change over time.
- A full economic analysis of tradeoffs among crab and groundfish fisheries should be performed if possible when data become available.

Measure 2: Modify Existing Crab PSC Bycatch Limits

- The problem statement and list of alternatives should be presented separately for each crab species.
- Alternative 3 would have less problems if PSC limits were based on survey abundance of large crab rather than the total index of all size groups.
- The analysis provides sufficient information for industry representatives to negotiate bycatch limits.

Measure 3: A Trawl Closure Area in Nearshore Bristol Bay

- It would be prudent to prohibit trawling from areas containing juvenile red king crab habitat.
- The area between 159° and 160°W, and north of 58°N should be included as a suboption to continue trawling in this area.
- The regulation allowing trawling for Pacific cod off Port Moller should be repealed given new information on juvenile habitat and red king crab stock status. The required regulatory amendment language could be rolled into the EA/RIR for Amendment 41.

Crab Rebuilding Committee Terms of Reference

Membership: Representative members from BSAI crab and groundfish plan teams meet together under direction of Committee chair Dave Fluharty.

Problem Statement: Status of red king crab is depressed, and BSAI Tanner and snow crab are in low abundance.

Objective: Develop comprehensive plan to rebuild Bering Sea crab stocks and reverse stock declines.

Focus: Evaluate sources of mortality due to interaction of crab and groundfish fisheries, and evaluate potential management measures to reduce mortality. Measures may include closed areas, bycatch management regime, and ecosystem impacts.

Approach to Rebuilding Plan

<u>Rebuilding Plan</u>	
<u>Mortality Sources</u>	<u>Concern Knowledge Study Council Action Priority</u>
Crab Fishery	
Bycatch	
Other	
unobserved	
lost gear	
Predation	
Competition	
Parasites/Disease	
Habitat	
critical	
fishing impact	
physical env.	

Guidance from Council

- Is the Terms of Reference agreeable to the Council?
- Should the Committee examine GOA crab stocks?
- How should industry be involved in the Committee process?
- How should the rebuilding plan be approached, through staff preparation or contract?

C-46
Reprinted
Helen

**DRAFT Minutes of the
Bering Sea/Aleutian Islands Crab Plan Team
Meeting, May 17 and 20, 1996**

Members Present:

Ron Berg (NMFS)
Joshua Greenberg (UAF)
Ken Griffin (ADF&G)
Rance Morrison (ADF&G)

Peggy Murphy (ADF&G, chair)
Bob Otto (NMFS)
Doug Pengilly (ADF&G)
Dave Witherell (NPFMC)

The Bering Sea/Aleutian Islands (BSAI) Crab Plan Team met by teleconference on May 17 and again on May 20, 1996. The Team meeting was conducted based on the following agenda:

Introductions
Review of Crab Bycatch Management EA/RIR dated May 10, 1996
Approval of 4/3/96 minutes
Upcoming meetings

Review of EA/RIR on Crab Bycatch Management

The primary focus of the teleconference was to review the draft EA/RIR of proposed crab bycatch management measures, dated May 10, 1996. The team had reviewed the previous draft in April, and was apprised of the new Alternatives and options examined as well as revisions made to the analysis. The Team discussion focused on recommending a preferred Alternative.

Red King Crab Savings Area: The Team reviewed the additional analysis for Amendment 37 (Bristol Bay red king crab savings area). The Team reiterated their concerns for the depressed stock of red king crab in Bristol Bay as evidenced by low abundance and the stock's severely contracted distribution. The Team stressed the importance of protecting red king crabs year-round in the remaining habitat they occupy by prohibiting trawling year-round. The Team did step through the new Alternative time/area closures and cap that were proposed in April 1996 and balanced it against combinations of other Alternatives and management measures.

The team's discussion addressed each of the three variants of time and area closures of Alternative 3 separately. Closure of the area south of the red king crab protection zone to the Alaska Peninsula after April 1 was viewed as a minimal cost to the domestic trawl industry because less than a fifth of the flatfish catch is taken in the area on average and less than 7% of the catch taken in the area is caught after April 1. The NMFS survey places only a single tow in this area to assess resource abundance. Average percentage of crabs from the survey in the area from 1993-1995 was zero. However, previous studies of the area consider it to be important king crab habitat. The Team viewed this April 1 to Dec. 31 closure area as a poor tradeoff to the accompanying opening of the triangle area comprising the northwest corners of area 516 and 512; an area considered part of a yellowfin sole migration corridor. The Team adamantly opposed opening of any portion of area 512 to trawling. Analysis of NMFS trawl survey data from the triangle area indicates over 90% of the average abundance of male and female crabs in the area from 1993 to 1995 were mature crabs. Review of the distribution of yellowfin sole blocks with the highest average catch per tow and highest number of tows by month from 1987 to 1994 showed the northern blocks of area 516 and the two blocks above area 512 were not production areas for the yellowfin sole trawl fleet. In fact, nearly the entire catch of yellowfin sole east of 162 came from the two blocks between 159° and 160° and north of 58°. Additionally, flatfish trawl hauls with observed bycatch of 50 or more red king crabs clustered along the northern boundary of area 512 (58°) in 1992 and 1993 which corresponds with the northern distribution of crabs as mapped by the NMFS survey. The Team also noted that in 1987, one of the few years when the yellowfin sole trawl fleet directed fishing in

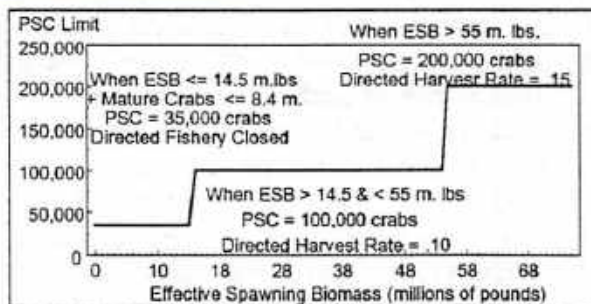
area 516, 77% of the observed bycatch of red king crab was taken in the portion of area 516 that is north of the red king crab savings area during the month of April. Last, the team reviewed consequences of opening the northwest corner of the red king crab saving area to trawling April 1 with closure triggered by a red king crab cap in the range of 5000 to 15,000 red king crabs. The NMFS survey found an average of 21% of the mature male red king crab in Bristol Bay from 1992 to 1995 were located in this area. The area had a high density of observed flatfish hauls in 1992 with a bycatch greater than 50 crabs. In 1992 and 1993 all trawl effort by the yellowfin sole fleet in the red king crab savings area concentrated in the northwest corner yielding 27% and 17% of the red king crab bycatch of the fleet for those years. This corner of the red king crab savings area also yielded increasing percentage of yellowfin sole catch per tow from 1986 to 1989 but also had corresponding increases in percentage of the annual bycatch of the fleet.

Alternative 3 would sacrifice more mature male and female crab than the other Alternatives while the gain in flatfish harvest is limited. Team members remain convinced that the impacts of trawling are greater than just the number of crab counted as bycatch. Degradation of habitat and potential unobserved mortality of crabs contacted by the trawl are of particular concern. Important red king crab habitat would be open to trawling under Alternative 3. The Team concluded that Alternative 3 would not improve protection of Bristol Bay red king crab or contribute to rebuilding of the stock. The Team recommended that the Council Adopt Alternative 2, Option B for a year-round closure in the Bristol Bay Red King Crab Savings Area. The team continues to have serious conservation concerns about the Bristol Bay red king crab stock and the Team feels Alternative 2 option B provides the most protection to red king crab and crab habitat.

Crab Bycatch Limits: The Team noted the SSC also had concerns with PSC limits based on an index of the entire crab population abundance and concurred with the SSC that new PSC limits should be analyzed in the future using more representative "currency". Peggy suggested a currency based on both number and weight of crab similar to the State's definition of threshold for Bristol Bay red king crab. Subsequent discussion of currency touched on assumed crab bycatch mortality, observer measurement of crab bycatch, survey measurement errors, variability of trawl catchability, etc.

In April the Team declined to recommend specific Alternative PSC limits as they felt a precedent existed for industry negotiation of PSC limits. Industry participating in this meeting were polled and indicated to the Team no negotiation of bycatch caps had occurred nor had they been contacted concerning potential negotiations. Therefore, the Team felt some comparison of the advantages and disadvantages of Alternative options for crab bycatch limits in groundfish trawl fisheries would be beneficial. The merits of fixed PSC limits versus rate based limits were discussed. A rate based PSC limit could be biased high or low depending on distribution and abundance of component portions of the population (e.g. mature males, females, juveniles etc.) and effects of numerous variables on the current broadly defined PSC currency. The Team determined that a fixed rate or stairstep approach was preferable at this time for specifying crab PSC limits. The following were identified as the Teams preferred Alternative for each crab species:

Red King Crab: The Team recommends adoption of a stairstep based PSC limit for red king crab in Zone 1, as modified from Alternative 2.

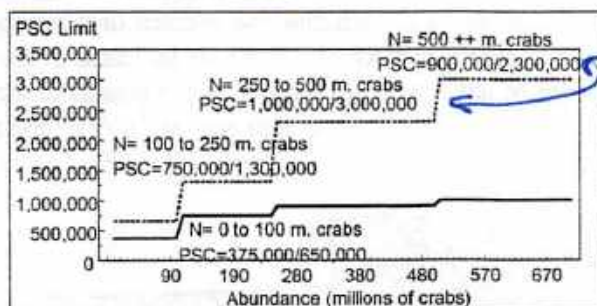


The following steps were recommended by the team:

Abundance	Zone 1
Below Threshold = 8.4 million mature crabs + Effective Spawning Biomass (ESB) <14.5 million lb.	35,000
Above Threshold + ESB < 55 million lb.	100,000
ESB > 55 million lb.	200,000

In years when red king crab in Bristol Bay are below threshold and the GHL is set at zero (meaning no directed fishery), a PSC limit of 35,000 red king crab would be established in Zone 1. This limit was based on the level of bycatch observed in the 1995 flatfish fisheries operating in Zone 1 with the Red King Crab Savings Area closed to trawling. In years when the stock is above threshold but below the target rebuilding level of 55 million lb. effective spawning biomass, a PSC limit of 100,000 red king crab would be established. Increasing the PSC limit from 35,000 to 100,000 would be contingent on implementation and continuance of a year-round closure of the Red King Crab Savings Area. The 100,000 crab PSC limit corresponds to a 50% reduction from the current PSC limit, the same percentage reduction as applied by the Alaska Board of Fisheries in 1996 to the harvest rate for the directed red king crab fishery when the stock is above threshold but below 55 million pounds effective spawning biomass. A 200,000 PSC limit would be established in years when the Bristol Bay red king crab stock is rebuilt (above threshold and above 55 million lb. effective spawning biomass). The Team agreed the closure areas and PSC limits should be reexamined as the Bristol Bay red king crab stock approached rebuilt status.

Tanner Crab: The Team recommends adoption of a stairstep based PSC limit for Tanner crab, as modified from Alternative 3 Option B.



The following steps were recommended by the team:

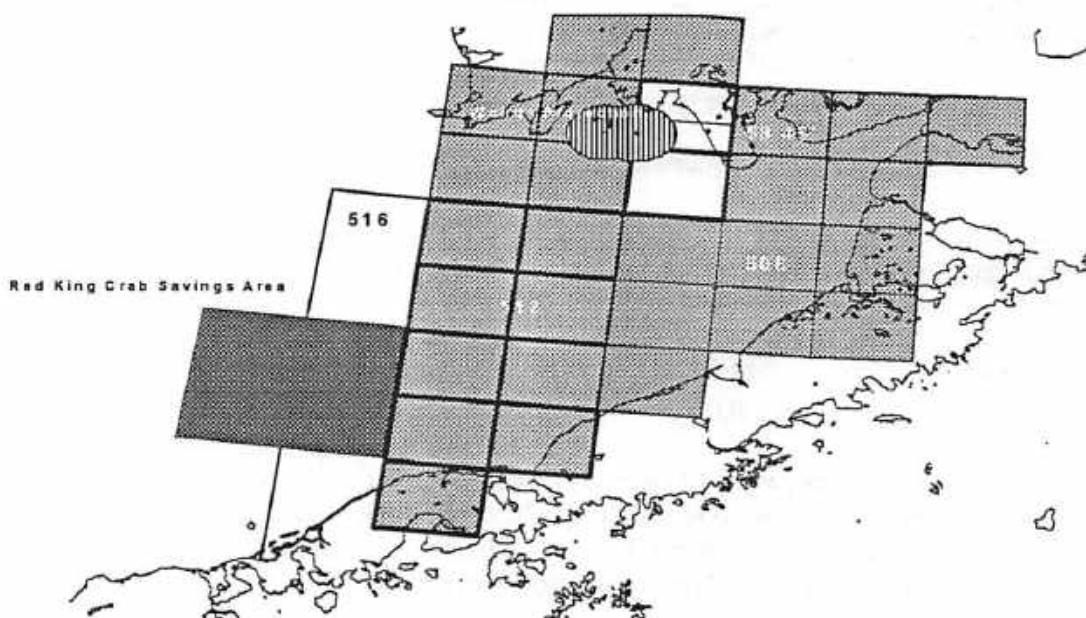
Abundance (millions of crab)	Zone 1	Zone 2
0-100	375,000	650,000
100-250	750,000	1,300,000
250-500	900,000	2,300,000
500+	1,000,000	3,000,000

An additional step (step 1) was developed based on an abundance level that approximates a situation when a directed crab fishery is unlikely to be prosecuted (0-100 million crab). The team felt that a step between crab abundance ranging from zero to 100 million crabs was preferable to a rate based limit at or below an abundance of 100 million crab. The Team also recommended lower PSC limits for Step 2 (100-250 million

crab) than proposed. Limits for Step 2, 750,000 crabs in Zone 1 and 1,300,000 crabs in Zone 2, represent attainable bycatch levels observed in BS/AI groundfish fisheries from 1992 to 1995. Additionally, these caps better reflect the current proportional distribution of mature male (52%, 45%) and female (41%, 58%) Tanner crabs in Zone 1 and Zone 2. The current split of 25% of the PSC limit in Zone 1 and 75% of the PSC limit in Zone 2 was based on the distribution of crabs in 1988. The remaining steps are the same as proposed in Alternative 3, Option B, and the PSC percentages by zone (25%, 75%) correspond to proportional distribution of Tanner crabs at higher abundance. The Team recognized PSC limits particularly at higher Tanner crab abundance may require review given any new analysis of PSC currency, effects of trawling on bycatch mortality, and change in stock distribution.

Snow Crab: The Team recommends adoption of Alternative 2, establishing a PSC limit of 11,000,000 snow crab in Zone 2. The Team recommends that a PSC limit for snow crab be established to minimize the impacts of trawling on this stock. Recruitment of a few strong year classes to the larger fishable size class has been anticipated for several years but has yet to occur. Currently, recruitment to larger sizes is not sufficient to offset declines due to natural and fishing mortality. The Team members agreed that the average bycatch of snow crabs observed in Zone 2 from 1992 to 1994 would be a good starting point for a PSC limit. This limit could be revised in the future as more information becomes available regarding PSC currency, unobserved mortality and how the trawl fleet operates within a cap. The team noted the average size of trawl bycatch of snow crab corresponds to mature animals and nearly 50% of the mature male and female snow crab but only 24% of the total snow crab abundance are located in Zone 2 according to the NMFS survey. Therefore, the Team concluded PSC limits based on a rate of the total population of snow crab would result in disproportionately high harvest of mature crabs in Zone 2.

Nearshore Bristol Bay Closure Area: The Team recommends adoption of Alternative 3, Option A, with modifications. Specifically, the Team recommends that the Council prohibit all trawling, on a year-round basis, in the area east of 162° W, with the exception of an area bounded by 159° to 160° W and 58° to 58°43'N that would remain open to trawling during the period April 1 to June 15 each year. It was felt that such a closure area would protect known areas of juvenile red king crab habitat while at the same time allow trawling in an area that can have high catches of flatfish and low bycatch of other species. The area north of 58°43'N was suggested to be closed to reduce bycatch of herring, as indicated in the document. The time window was specified to reduce bycatch of halibut, which move into the nearshore area in June. The Teams preferred Alternative differs from Alternative 4 in that the area east of 160° W and the area west of 159° W should be closed to protect known areas of juvenile red king crab and halibut habitat.



Other Business

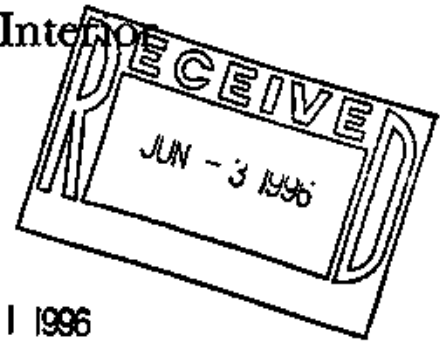
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. Tudor Rd.
Anchorage, Alaska 99503-6199



IN REPLY REFER TO:

ASM

MAY 31 1996

Mr. Clarence Pautzke, Executive Director
North Pacific Fishery Management Council
605 West Fourth Avenue, Suite 306
Anchorage, Alaska 99501-2252

Dear Mr. Pautzke:

The U.S. Fish and Wildlife Service has reviewed the alternatives presented for proposed Amendment 41 "Management of crab bycatch limits in Bering Sea trawl fisheries and establishment of a nearshore trawl closure area in Bristol Bay." The Service agrees that the proposed alternatives will have no negative effects on seabirds or marine mammals in Bristol Bay.

However, the Service does believe that one of the alternatives may benefit marine mammals and migratory birds in Bristol Bay. The alternative which closes all waters east of 162° W longitude in Bristol Bay to trawling, may allow for increased populations of seabirds and marine mammals due to increased food resources and reduction in disturbance of prime habitat areas. An analysis of the benefits to seabirds and marine mammals is enclosed.

Sincerely,

Regional Director

Enclosure

AMENDMENT #41
PROPOSED MANAGEMENT MEASURE #3
CLOSURE OF BRISTOL BAY EAST OF 162° W LONGITUDE TO
TRAWLING

The U.S. Fish and Wildlife Service has an interest in the proposed amendment, due to its probable positive impact on sea otters, walrus and seabirds in Bristol Bay. Bristol Bay, due to its high productivity serves as an important resource area for marine mammals and seabirds.

Marine mammals of interest to the Service include sea otters, which are found from the Western tip of the Alaska Peninsula to Port Moeller and walrus which haulout on identified areas in the Bay (Figure 1). These species are not at risk due to direct mortality in the fishery, but are at risk due to disturbance and/or depletion of the food resources on which they depend. Both of these species are susceptible to disturbance by vessels, and walrus appear to be especially sensitive. Research has shown that walrus will abandon a haulout completely if disturbance rates are high enough and that they are slow to begin to reuse haulouts which they have abandoned (Gol'tsev V.N. 1968). Use of the Round Island and Cape Pierce walrus haulouts has been monitored in a consistent manner since 1984. In 1986 vessels fishing for yellow-fin sole first appeared near the Round Island haulout, and in 1987 and 1988 the number of vessels fishing near the haulout increased dramatically (Moran and Wilson 1996). Due to dramatic decreases in the use of the haulouts at Cape Pierce and Round Island the North Pacific Fishery Management Council recommended that the Secretary of Commerce establish a 12 mile buffer zone around the Walrus Islands State Game Sanctuary and Cape Pierce. The amendment was accepted and was implemented in 1990. The number of walrus using the Round Island haulout in 1989 and 1990 had increased, while the number using Cape Pierce decreased (Figure 2). During the 1990 season a number of vessels were cited for fishing inside the 12 mile buffer at Round Island, resulting in additional disturbance to the walrus at the haulout. Since 1992 walrus use of the Round Island haulout has steadily increased, while use of the Cape Pierce haulout has generally increased. Although compliance with the 12 mile buffer zone has been very good in the past few years, disturbance may still be occurring due to established transit lanes, within the buffer zones, and/or disturbance on feeding grounds. Therefore closure of Bristol Bay, East of 162° W longitude, to trawling would eliminate any chance of disturbance due to the yellow-fin sole fishery.

In addition both walrus and sea otters feed on invertebrates in waters up to 100 meters deep (U.S. Fish and Wildlife Service 1994). Walrus generally feed on bivalves on soft bottoms, while sea otters prefer sea urchins, abalone, chitons, crabs, and bivalves. Trawling will obviously effect the distribution and perhaps abundance of invertebrates, in that it may disturb the bottom either covering invertebrates or removing them as bycatch. If trawling reduces abundance of important food resources, then the walrus and sea otters will be forced to move to new areas, perhaps resulting in reductions in population due to loss of preferred habitat.

Seabirds populations throughout the North Pacific and Bering Sea are thought to be declining. The causes for the decline are currently unknown but measures taken to enhance survival are encouraged. Direct mortality of seabirds, due to trawl fisheries, has not been shown to be an important contributor to the overall decline, however, trawl fisheries may be indirectly contributing to the decline (Mendenhall and Anker-Nilssen 1996).

Bristol Bay, supports large populations of nesting seabirds at a number of rookeries (Figure 3). As shown in Table (1) there are greater than 1 million seabirds at colonies in Bristol Bay. The largest colonies are found in Northern Bristol Bay and are dominated by murre, black-legged kittiwakes and

puffins. The majority of the species identified in Table (1) depend upon fish for food during the period when they are rearing young (DeGange and Sanger 1986). Furthermore, these birds are often dependant upon specific species and sizes of fish, due to nutritional and /or handling problems (Anker-Nilssen, and Lorentsen 1990). Therefore, reductions in local forage fish species may put the nestlings at risk, since the adults may be required to spend more time at sea foraging.

Data from Cape Pierce population index plots indicates that kittiwakes are currently at the lowest populations since consistent counts began in 1990 (Figure 4). Population indices appeared to peak in 1992 and have steadily declined since that time. In the case of kittiwakes, at Cape Pierce, data indicates that productivity has been low and consequently recruitment into the populations has been low since 1987 (Haggbloom 1996). The reasons for the poor productivity are not known, but nest attendance by adults is thought to be a major factor. Poor nest attendance has been correlated with low food abundance at other sites (Barrett and Runde 1980).

Cormorant populations at Cape Pierce have declined since 1992 (Figure 5). Cormorants as opposed to murres and kittiwakes are known to abandon nest sites when food abundance is low (Boekelheide and Ainley 1989). In addition dead chicks were found in nests in 1995, indicating that the adults were unable to attend the nests due to food shortages (Haggbloom 1996).

Although none of the birds mentioned above prey exclusively on yellow-fin sole, the effect of bycatch on populations of forage fish may be impacting the birds. In addition many of these birds may be disturbed either at rookeries, by boats in passage, or on feeding areas during fishing. Therefore closing of Bristol Bay to trawling would be expected to have a positive effect on bird colonies in the Bay.

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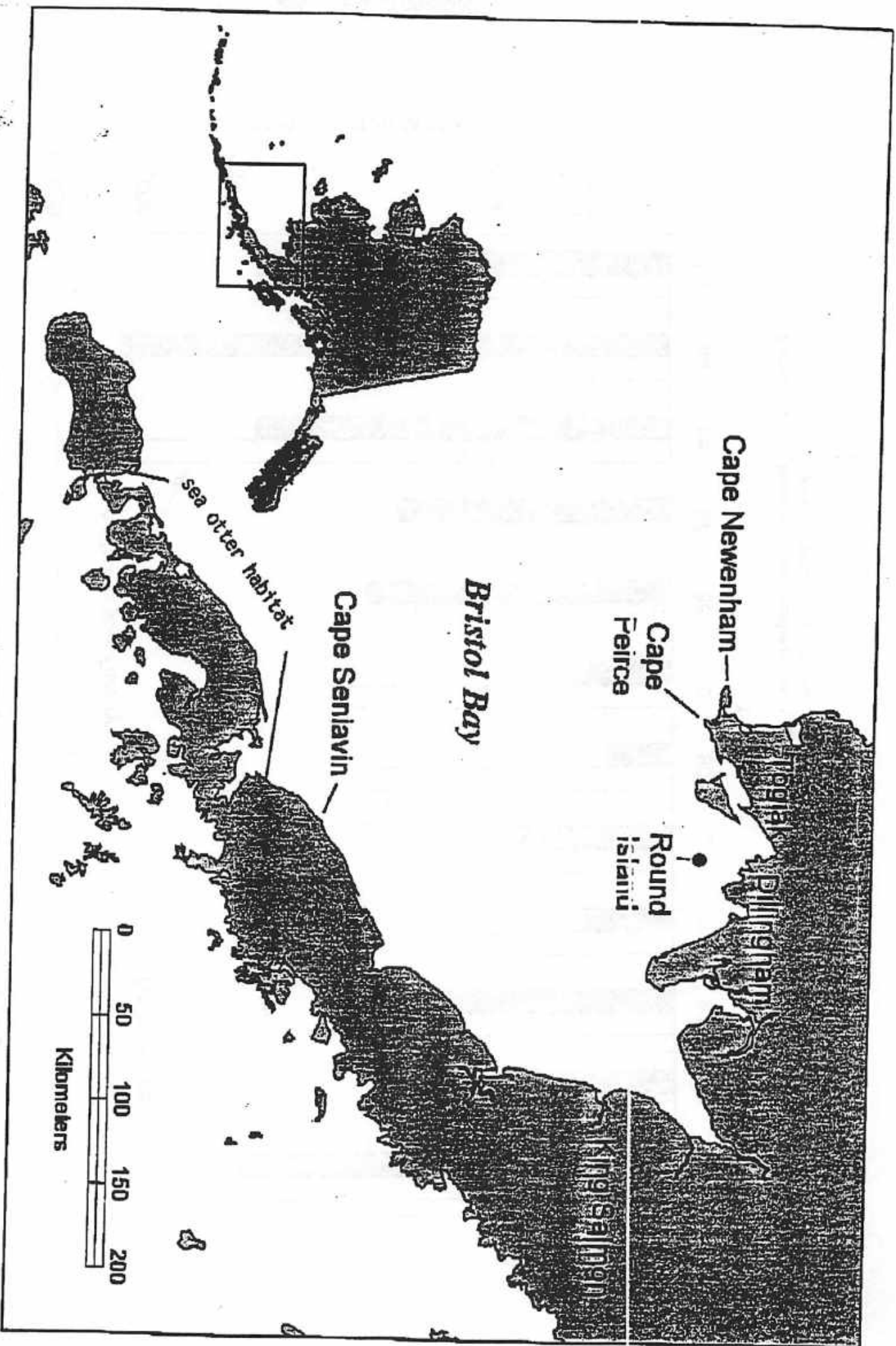


Figure 1. *Malurus* haulout sites and sea otter habitat in Bristol Bay.

Peak Walrus Numbers at Two Sites in Bristol Bay, 1984-1995

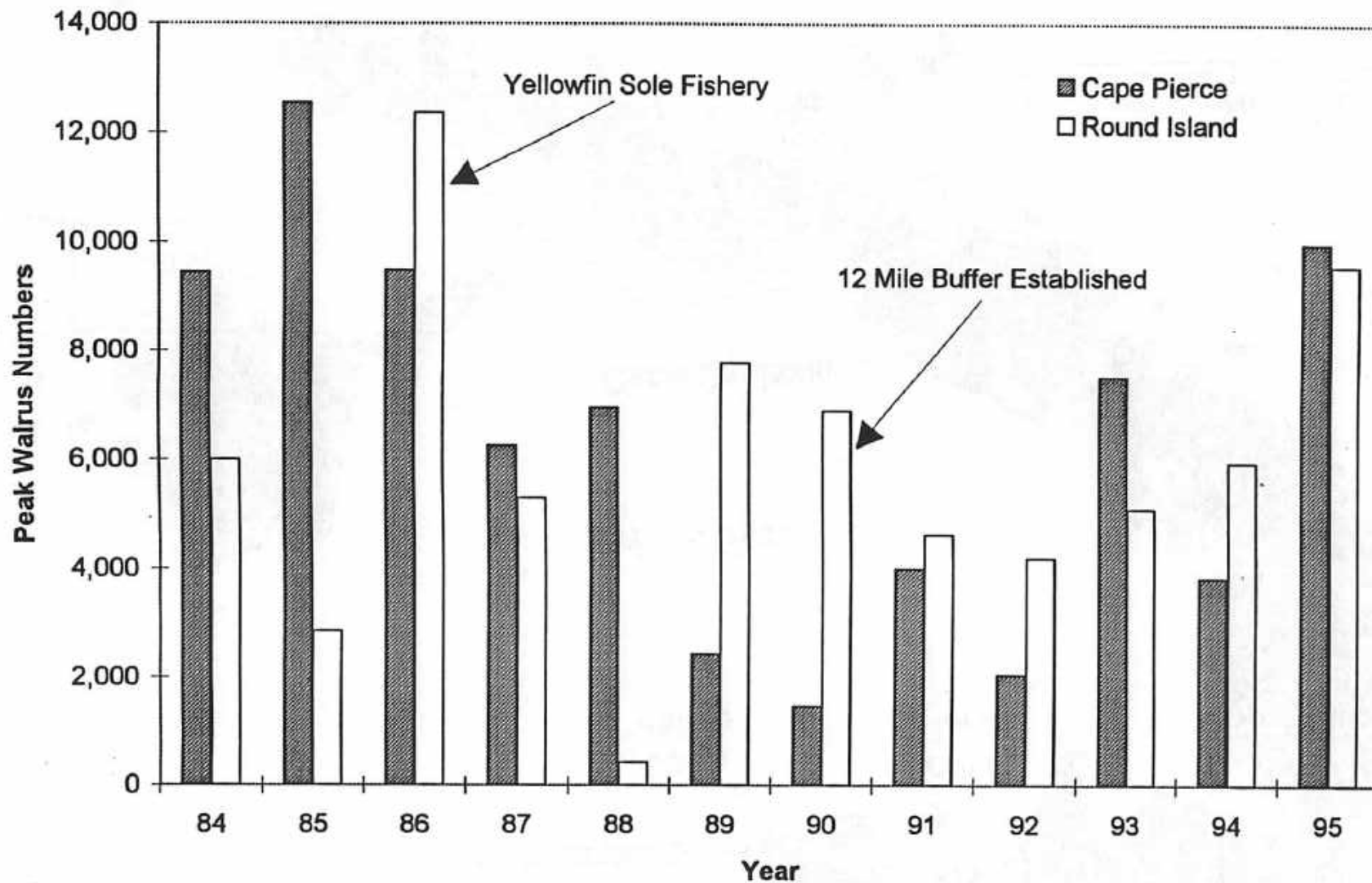


Figure 2. Peak walrus numbers at Cape Pierce and Round Island from 1984 to 1995. Data from Moran and Wilson 1996.

Alaska Seabird Colony Catalog

US Fish and Wildlife Service

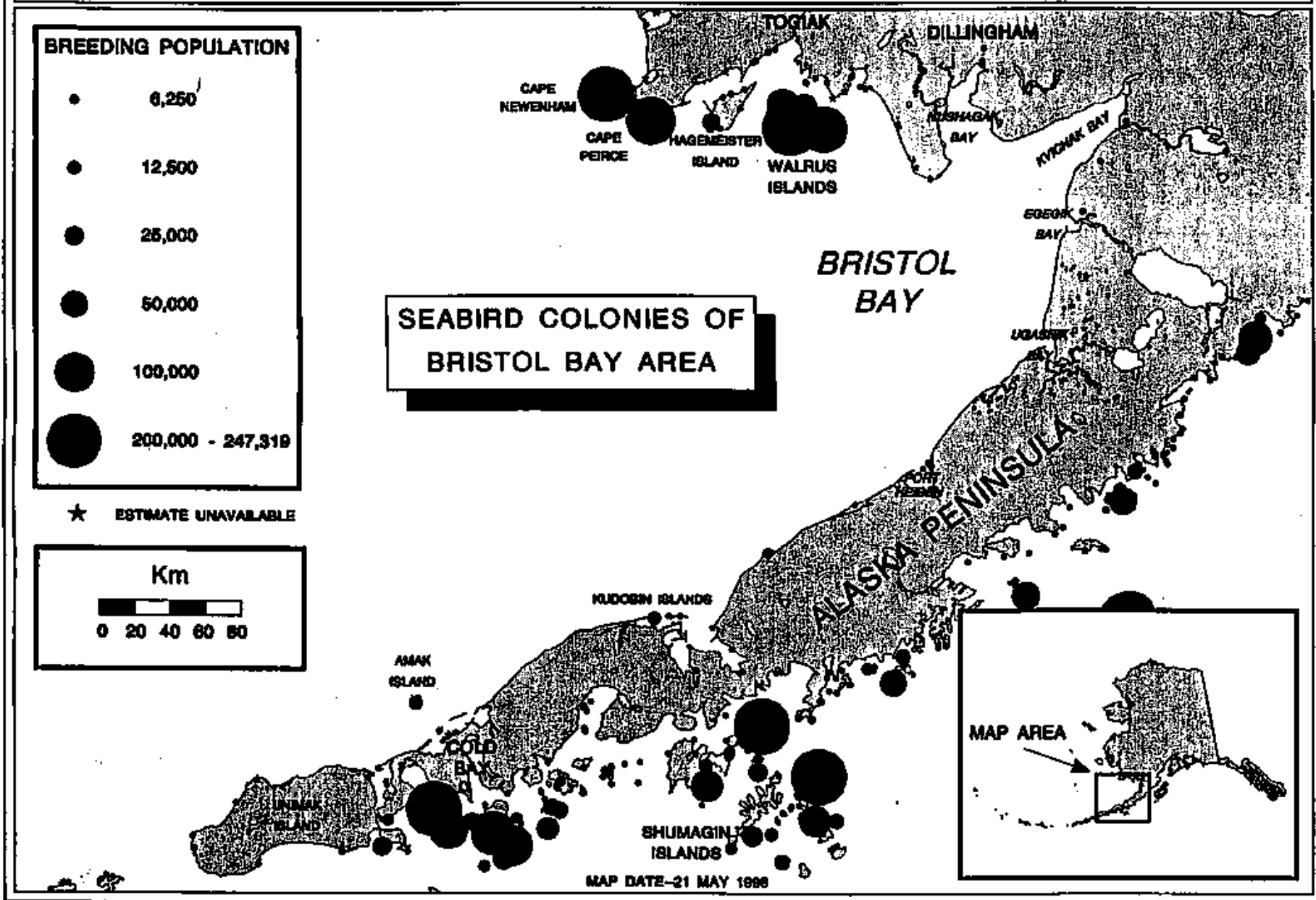


Figure 3. Seabird Colonies in Bristol Bay.

SEABIRD COLONIES OF BRISTOL BAY AREA

5/21/96

U.S. Fish and Wildlife Service
Alaska Seabird Colony Catalog

Summary Page 1

Summary of Most-Representative Estimates

Species	Population	% of Total	Minimum		Maximum	Mean	Known Sites			Possible Sites
			Minimum	Maximum			W/ Est.	W/O Est	Absent	
Fork-tailed storm-petrel	0	0.0	0	0	0	0	1	0	1	
Double-crested cormorant	1,552	.1	12	500	154	8	2	0	3	
Pelagic cormorant	13,103	1.0	4	4,416	694	19	2	0	2	
Red-faced cormorant	3,573	.3	2	2,952	510	7	2	0	0	
Unidentified cormorant	4,920	.4	50	1,700	308	16	1	0	3	
Common eider	510	.0	10	400	170	3	1	0	3	
Black oystercatcher	2	.0	2	2	2	1	0	0	0	
New gull	234	.0	1	200	79	3	0	0	0	
Herring gull	2	.0	2	2	2	1	0	0	0	
Glaucous-winged gull	29,861	2.4	2	12,600	995	30	2	0	2	
Black-legged kittiwake	210,798	16.8	8	43,000	8,432	25	1	0	1	
Unidentified gull	42	.0	2	40	21	2	0	0	0	
Arctic tern	1,956	.2	20	1,000	279	7	2	1	0	
Aleutian tern	1,218	.1	3	600	206	6	2	0	0	
Common murre	537,400	42.6	100	228,000	53,740	10	2	0	0	
Thick-billed murre	0	0.0	0	0	0	0	3	0	0	
Unidentified murre	353,266	28.1	2,300	200,000	39,252	9	0	0	1	
Pigeon guillemot	1,697	.1	4	400	113	15	1	0	1	
Least auklet	0	0.0	0	0	0	0	1	0	0	
Parakeet auklet	2,494	.2	5	1,500	356	7	1	0	1	
Crested auklet	100	.0	100	100	100	1	0	0	0	
Rhinoceros auklet	0	0.0	0	0	0	0	0	0	1	
Tufted puffin	89,249	7.1	3	80,000	4,250	21	0	0	1	
Horned puffin	4,195	.3	4	1,750	262	16	1	0	1	
Total =		1,256,272								
Total number of sites =		76								

Table 1. Number of seabirds at colonies in Bristol Bay.

KITTIAWAKES AND MURRES AT CAPE PIERCE

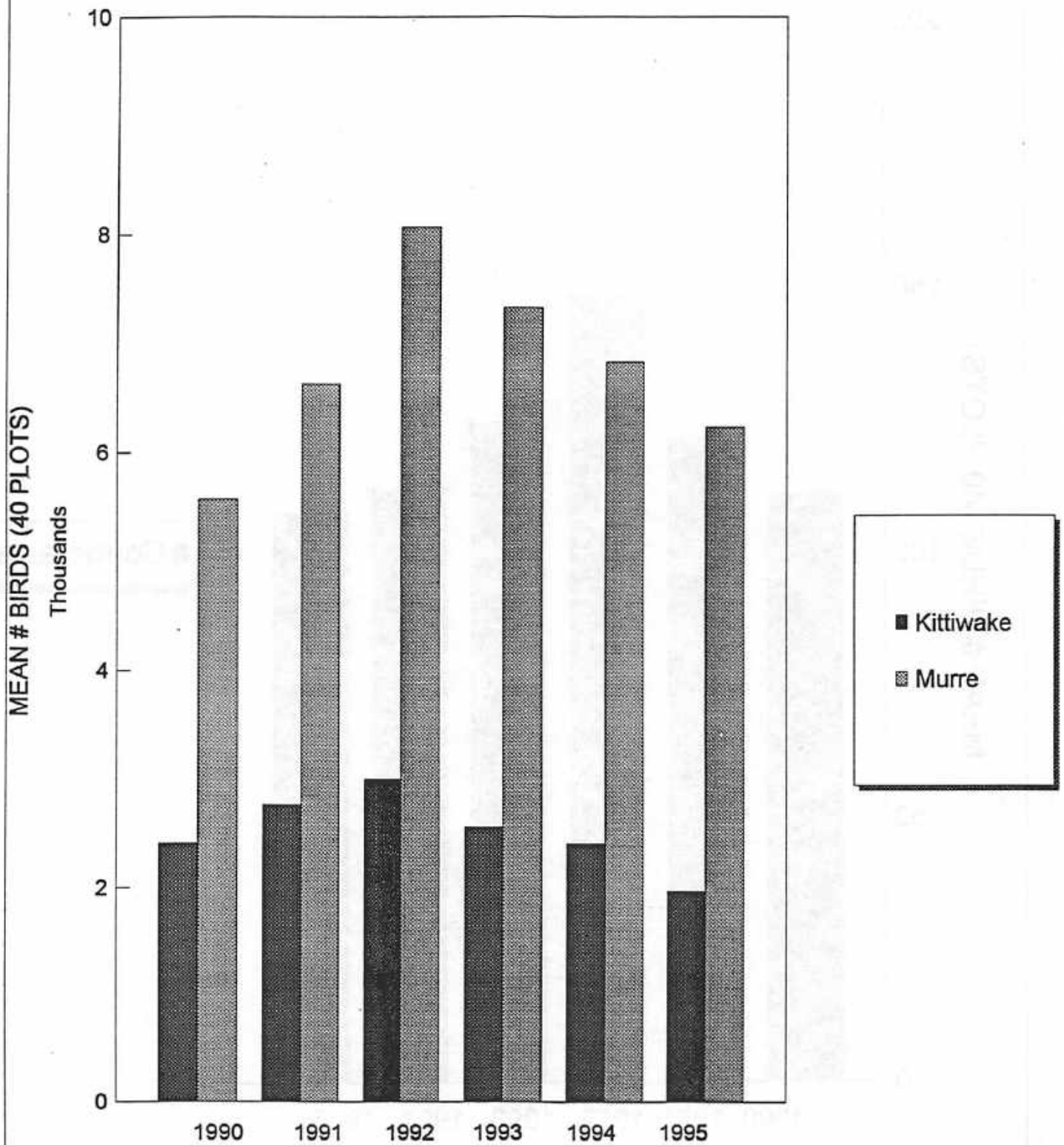


Figure 4. Mean number of kittiwakes and murre in 40 population index plots at Cape Pierce 1990 to 1995. Data from Haggblom 1996.

CORMORANTS AT CAPE PIERCE

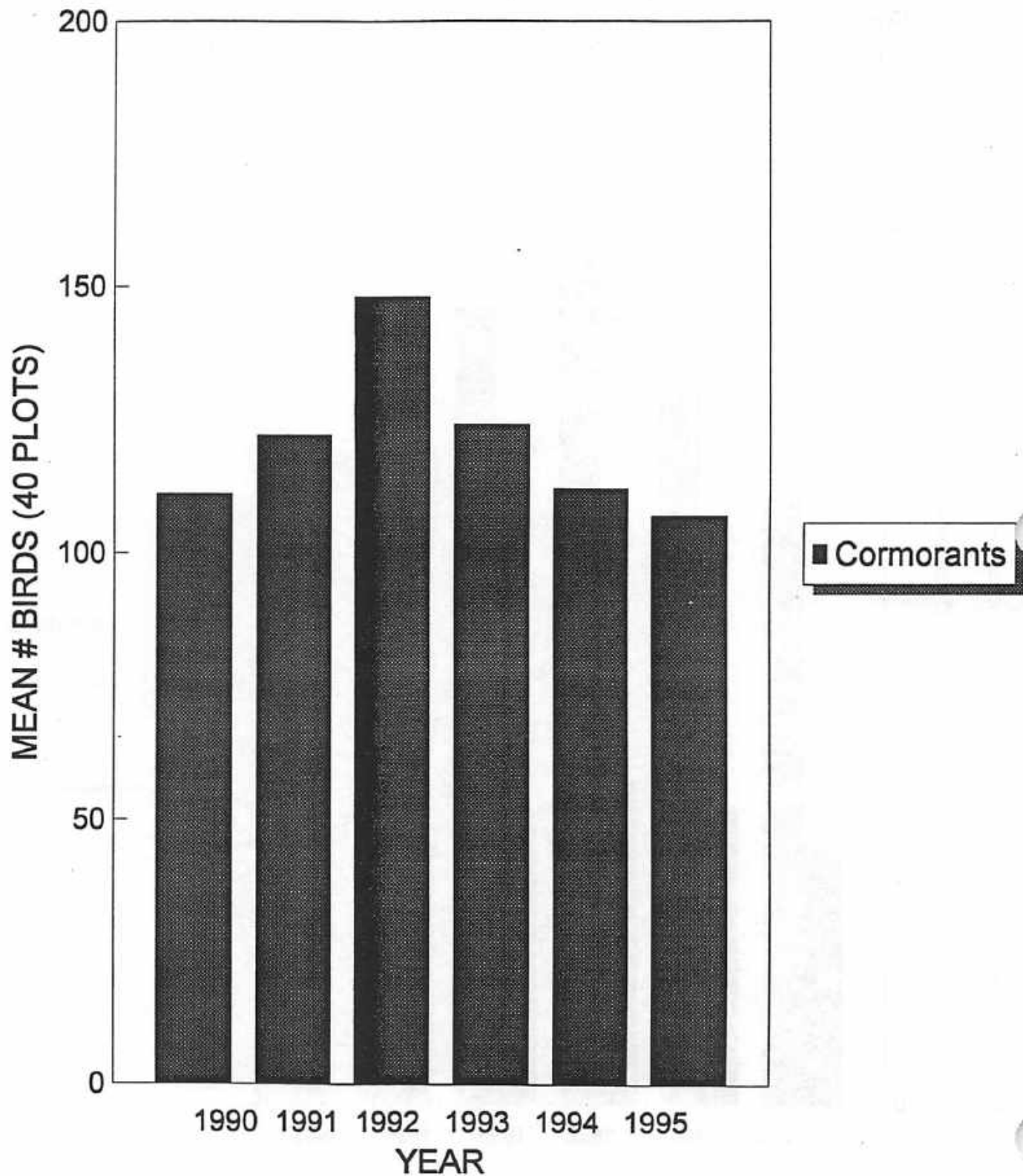
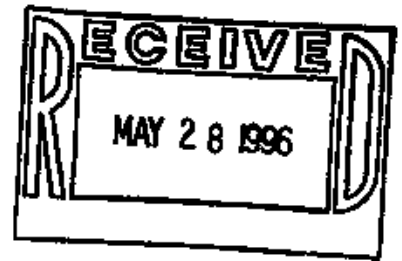


Figure 5. Mean number of cormorants in 40 population index plots at Cape Pierce 1990 to 1995. Data from Haggblom 1996.

NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
Attention: Richard Lauber

#1

DAVID HILLSTRAND
BOX 1500
HOMER, ALASKA 99603
(907) 235-8706



C-2 (c) Bycatch Compensation by area & C-4 BSAI Crab Bycatch Issues; Final decision on proposed closures and PSC limits.

Proposal: To Change and Divide the Current Regulatory and Closure Areas for the Groundfish fisheries in the BSAI. With dividing the bycatch of crab up into these areas further.

Objectives of Proposal:

- 1. To distribute the bycatch of crab over the entire area of the BSAI; thereby reducing the impact of destroying the crab species from a certain area.**
- 2. To harvest Groundfish from all parts of the BSAI and not in just one area specific.**
- 3. To reduce the closed areas that are needed to protect crab stocks. Thereby allowing trawling for Groundfish in areas of high crab bycatch.**

Need and Justification for Council Action: (Why can't the problem be resolved through other channels?)

- 1. The NPFMC is in control of establishing areas in the BSAI for regulatory purposes.**
- 2. The current Regulatory areas are to large and the ability to take a large portion of crab out of a certain area is causing excessive stress upon crab populations.**

2. Seeing continue closures of high crab bycatch, is another indicator that we need to distribute the bycatch of crab over more areas. With also having the ability to increase or decrease the bycatch of crab in certain areas. Such as the trawl fleet has asked.

Proposed Changes to the Regulatory and closure areas for the Groundfish Fisheries in the BSAI regarding Crab bycatch.

1. Zone # 1

a. An amendment to divide 509 into two sections; creating 3 sections.

1. 516; being 162* - 163* which is currently closed from March 15th - June 15th. And is consistent with soft shelled condition of crab stocks. This subsection of Zone #1 along side of 509, is an example of managing areas in a more direct sense and ensuring prudent management!

2. 517; being 163* - 164* with being closed from March 15th - June 15th.

3. 518; being from 164* - 165*]

b. An Amendment to divide the RedKing crab , and Baridi bycatch up between these three areas for a total of

1. 66,666 Red King crab for each subsection of 516, 517, 518.

2. 333,333 Barid crab for each subsection of 516, 517, 518.

c. This would be in lue of a perminate closure for the Bristol Bay Red King crab savings areas which is being hard pressed by the crab industry and the State of Alaska.

d. 512 is closed to trawling already in Zone # 1.

Foreseeable impacts if proposal (Who wins, who loses?)

1. The crab stocks; inthat bycatch of crab is spread out over a larger area; reducing the chances of taking to large of a portion of the bycatch amount out of an area specific.

2. The trawl fleet may loss by not being able to stay in one area for a greater amount of time.

3. The trawl fleet will benefit by still being able to harvest Groundfish in areas of high crab bycatch. And will have to ability to petition for changes in crab bycatch per area which has a health biomass of crab to harvest groundfish.

Are there alternative solutions? if so, what are they and why do you consider your proposal the best way to solving the problem?

1. The alternative is to remain with the current regulatory areas, and assign a wide Opilo bycatch cap for Zone 1 and 2. Such as with Red King crab and Baridi.

a. This is why the NPFMC has needed further closure areas in each Zone. And why future closure areas are being pursued by the crab industry.

2. To best solve the contentious bycatch issue and reduce the need for further area closures; such as Dr. David Fluharty has mentioned the need to spread the bycatch of any species over a greater area is needed!

Supportive Data & Other Information: what data are available and where can they be discovered?

1. The only data I have is that of seeing the trawl fleet operate. They can systematically wipe out crab in one area with extreme pressure in one area for an extended amount of time.

#4

2. Zone # 2

a. An amendment to divide Zone #2 into 5 subsections.

- 1. 165* - 167***
- 2. 167* - 169* with the current closure area of the Pribilof Islands to remain**
- 3. 169* - 173* with the current closure area of the Pribilof Islands to remain.**
- 4. 173* - 175***
- 5. 175*-180***

b. An amendment to divide the Baridi up in Zone # 2, in three of the sections. 1, 2, 3; from 165* -173*. For 1,000,000 Baridi per section.

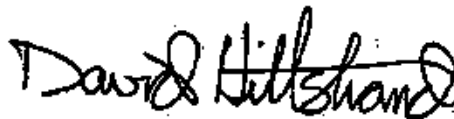
c. A 15,000,000 opilio PSC; being divided by 5 sections; with 3,000,000 opilio per subsection.

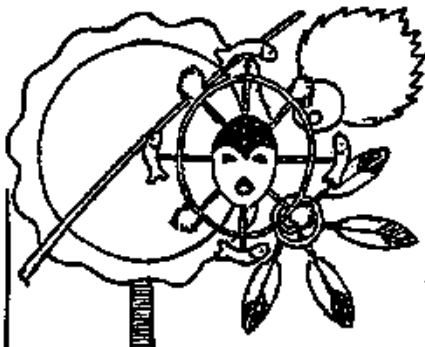
d. Or to include Zone # 1 and 2 Baridi Bycatch for a total of 4,000,000 crab and divide it between 9 sections.

- 1. 162-163**
- 2. 163-164**
- 3. 164-165**
- 4. 165-166**
- 5. 166-167**
- 6. 167-168**
- 7. 168-169**
- 8. 171-172**
- 9. 172-173**

For a total of 444,444 Baridi per section, a increase to Zone # 1 by 111,111 crab. This would be in exchange for dividing up the RedKing crab and Opilio crab into more sections.

David Hillstrand

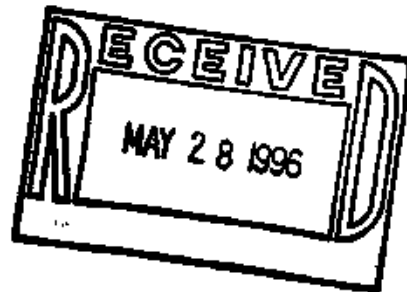




Toksook Bay Traditional Council

May 20, 1996

Mr. Richard Lauber, Chairman
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, Alaska 99501



Dear Mr. Lauber,

The Toksook Bay Traditional Council is providing these comments in regards to that portion of Amendment 41/37 that proposes the establishment of a trawl closure in nearshore waters of Bristol Bay. The final action on this proposal is scheduled for the June 1996 Council meeting in Portland. Due to the distances involved and current financial situation, the representatives of this Tribal Council will be unable to attend that meeting.

The express purpose of establishing a trawl closure area in the nearshore of waters of Bristol Bay is to maintain and possibly increase recruitment of red king crab. Given the status of those stocks, actions that will achieve these goals are desirable.

Our concern is with the potential impacts that may be felt in other areas by the displaced trawl fishery. Closing this area to trawl fishing will primarily impact the yellowfin sole fishery. Whether vessels participating in this fishery will go around at Cape Newenham and concentrate some level of effort in rest of the Area 514 in the vicinity of Nunivak Island and Nelson Island is not known. From our review of the documents, the EA/RIR does not consider possibly shifting some of this effort north and the impact it may have on the nearshore subsistence and commercial fisheries of Nunivak/Nelson Island area.

Fishermen from our areas have relied upon a wide variety of marine resources for subsistence use and limit commercial fisheries for as long as anyone can remember. Halibut, crab, herring, cod and other species are all relied upon and used by area residents. An increased effort in our area due to displacement from Bristol Bay would just end up moving a preceived problem elsewhere.

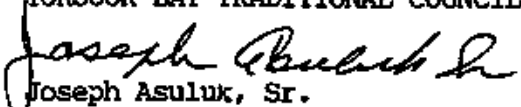
It is possible that due to high bycatch of halibut, yellowfin sole vessels won't come into our area. We would like to see a full analysis of this before the North Pacific Fishery Management Council takes final action on the proposed closure. If significantly increased effort with associated bycatch would occur in our area, we would have to oppose the closure.

PAGE TWO: North Pacific Fishery Management Council

Since we have had experienced problems in decreased size of subsistence herring catches when the Japanese Trawlers fish herring in Etolin Strait during early 1970's, between Nunivak and Nelson Island, we want to be assured before any action is taken that these kind of problems will not occur.

We thank you for this opportunity to comment on this on behalf of our Tribal members and local and area fishermen and we hope that you will make serious consideration on our behalf as subsistence fishing is very important for our survival which help us with small cash income earned from commercial fishing.

Sincerely,
TOKSOOK BAY TRADITIONAL COUNCIL


Joseph Asuluk, Sr.
Tribal Council Chairman

cc: Mr. David A. Bill, Sr., Chairman, Coastal Village Fishing Coop.
Mr. Norman Cohen, Executive Director, Coastal Village Fishing Coop.

The Tyson logo is a black oval with the word "Tyson" in white, serif font.

Tyson Seafood Group, Inc. 1900 West Nickerson Street Suite 200 Seattle, WA 98119 Phone: 206-282-3445 Fax: 206-281-8

June 5, 1996

Chairman Lauber
North Pacific Fisheries Management Council
605 West 4th Avenue
Anchorage, AK 99501



I am writing to comment on the EA/RIR for Amendments 37 (Bristol Bay Red King Crab Savings Area) and 41 (Crab Bycatch Limits in Trawl Fisheries, Nearshore Bristol Bay Trawl Closure).

Red king and hairdi crab stocks are at currently at a low level. Bycatch of these species in trawl fisheries can be reduced. The bottom trawl industry has shown with its voluntary Seastate program, voluntary area closures and voluntary gear restrictions that vessel operators support any reasonable method of decreasing bycatch. However, it has not been proven that decreasing the trawl bycatch of crab will increase the probability of crab stock rebuilding. In fact, the EA/RIR acknowledges that "bycatch in the groundfisheries has a relatively small impact on crab populations, and therefore reducing the [bycatch caps] may not drastically improve or rebuild crab stocks." Unfortunately, the Council has chosen to focus on trawl closures and trawl bycatch caps of crab to decrease impact on crab stocks. As the EA/RIR points out, trawl fisheries are by no means the only source of crab mortality.

A well-balanced approach to the EA/RIRs problem statement of needing to increase the probability of crab stocks rebuilding should deal with all fishery-related sources of crab mortality. In addressing this part of its problem statement, the EA/RIR should discuss the impacts of a broader range management measures on the crab stocks as well as on both the groundfish and crab fishing industries. Benefits of potential closed areas for groundfish pots and caps on crab bycatch in groundfish pot and longline fisheries must also be considered as part of the overall management scheme. The scallop fishery has had imposed on it an annual cap of as low as 500 red king crab which when attained, per force, closes all scallop fishing in the BSAI. Yet to date in 1996 (week ending 5/30/96), the groundfish pot fishery has taken 14,994 red king crab (124% of the trawl bycatch) and 100,992 hairdi tanner crab, mostly in areas that are closed to trawling to protect crab. Yet there are no caps for the pot fisheries to minimize crab mortality, nor are the crab protection areas closed to pot gear. I do not consider the Council's actions to date as a well-balanced, logical, scientifically supportable approach to minimizing bycatch and maximizing yield.

The EA/RIR points out that if PSC caps were optimally allocated between groundfish fisheries, these proposals would have no significant impact on those fisheries; it also notes that under the current regulatory scheme of annual specifications of PSC caps, optimal allocation may be impossible to achieve. It is clear that if the Council wants to attain optimal yield of groundfish with reduced impact on PSC stocks, the Council must proceed with implementing Individual Bycatch Quotas. Only with this type of regulatory scheme will optimal allocation of PSC be achieved.

Comments on Crab Management Measures
06/05/96 Page 2 of 4

These proposed management measures individually might have only a marginal negative impact on the trawl industry. However, the EA/RIR points out that the potential cumulative impacts of these three management measures could be significant, particularly on the flatfish fisheries. Bycatch of other species will likely increase as trawl effort is pushed into other areas, as we saw with early closures of the rocksole fleet in 1995 and 1996 due to higher halibut bycatch. The model predicts that the nearshore Bristol Bay closure would similarly increase the yellow fin sole fishery's bycatch of halibut and Bairdi tanner crab. A further cumulative effect of these trawl closures, which the EA/RIR doesn't even discuss, is that trawl effort is being pushed into increasingly smaller areas. This increased effort per area is likely to result in more impact on both groundfish and PCS species. Trawl area closures may thus have negative environmental and biological consequences.

Unfortunately, the EA/RIR does not contain data from model runs that examine the effects of cumulative trawl closures. Each new proposed trawl closure provides only an analysis of the additional effects of that closure. Once a closure is in place, no modeling is ever done again with that area open to trawl. Thus the cumulative effects of trawl closure in the Bering Sea are likely to be significantly understated. There is never any reevaluation of closed areas to review if they are still an appropriate management tool considering new biological data about the species they purport to protect. This is a significant failing both of the EA/RIR and of the Council approach to bycatch management in general.

RED KING CRAB SAVING AREA: YEAR ROUND CLOSURE

The EA/RIR suggests that only 30% of all male Red king crab are found in the Red king crab savings area. There is not sufficient available data to pinpoint the actual crab mortality in trawl and pot bycatch. If crab rebuilding is to be a major focus of groundfish management, significantly better data on fishery-induced mortality is needed. The EA/RIR cites studies that show that both soft shell mortality and hardshell mortality to trawl-caught crab may be as low as 21% and 1.2 - 19% respectively. Unseen mortality may be around 2.6%. Previous NPFMC analyses have used a considerably higher number, 80%, to calculate impacts. Trawl mortality calculation are not discounted by the value of natural mortality, as is directed crab fishery-induced mortality. This suggests that we are already overstating the mortality of trawl-caught crab. A very small amount of red king crab, only have been taken in the RKCSA between April 1 and August 1 in 1995. It is an unfair burden on the trawl fishery to lengthen the seasonal closure. It would be more appropriate to have other fisheries, such as the Bairdi fishery and the pot cod fishery, sharing in the conservation burden by not fishing in that area. This would provide us with even greater decreases in fishery-induced crab mortality.

Above all, we support the equity of having at least the ten minute strip from 56° 00'N to 56° 10'N open to directed groundfish fishing, as well as review of the necessity of the entire RKCSA closure, in years following a directed king crab fishery. It would be an unfair burden to allow harvest of Red king crab, but to prevent access to rocksole and other flatfish stocks which are such a vital part of the small H&G vessel's livelihood.

Comments on Crab Management Measures
06/05/96 Page 3 of 4

CRAB BYCATCH LIMITS

The Crab Plan Team at its April meeting indicated there was currently no biological basis for setting caps and that they felt there would be difficulty establishing such a basis. The original caps were negotiated by the crab and groundfish industries. To date, the Council has not directed the industry to negotiate any cap reduction, nor to negotiate any preliminary cap for opilio.

The EA/RIR does not establish sufficient justification for the proposed range of crab caps, and particularly for the proposed opilio range. The range for an opilio cap used the analysis and the model runs for an opilio cap is inappropriate. Average bycatch should not be considered as a ceiling. The cap should be set as a ceiling that allows for conservation while optimizing yield.

Alternative 2, Option A for Red king crab would decrease the trawl cap to 35,000 individuals, the number that were caught in 1995. This Alternative fails to take into account that the abundance of king crab has been low since 1994 and the bycatch is consequently lower. In years of high abundance, trawl vessels may not be able to avoid king crab bycatch, and would be unnecessarily constrained from achieving optimal yield of groundfish.

Furthermore, Alternative 2 for Tanner crab specifies the range of 0.10% to 2.0 % for a cap, but the model was run at 0.39%. This means the EA/RIR has not analyzed the lower or upper bounds of Alternative 2.

NORTHERN BRISTOL BAY CLOSURE

Herring Bycatch

The problem statement is inappropriate because there is no evidence that the herring bycatch in the trawl fishery negatively impacts the stock nor the directed fishery. A management tool in the form of a trawl cap is already in place. Decreasing herring bycatch does not provide more for the directed fishery and is therefore not a gear allocation. Furthermore, herring bycatch in the yellowfin fishery is only a small percentage of the total trawl bycatch, a point which the analysis fails to adequately illuminate.

Marine Mammal and Seabird Concerns

There are already marine mammal protection areas in the form of "no trawl zones" in effect in Northern Bristol Bay. The EA/RIR does not provide any information regarding a benefit to increasing the size of the areas. The analysis does not establish that gear interaction with the trawl fishery causes any significant mortality to marine mammals or seabirds in this area. The analysis does not establish that flatfish are a source of food for marine mammals or seabirds nor that any potential localized depletion of flatfish species which the trawl fishery takes from this area negatively effect these mammal and bird populations.

PSC Bycatch

Trawl bycatch of either mature or juvenile king crab in this area is almost nil. Halibut bycatch is very low. Closing any of the alternative areas would decrease directed groundfish catch and possibly herring bycatch. But the model does predict that a closure in these area would likely result in increased tanner bycatch and possibly increased halibut bycatch if the fleet moved northwest.

Comments on Crab Management Measures
06/05/96 Page 4 of 4

Crab Habitat

The EA/RIR does not provide sufficient evidence to correlate trawl gear with negative impacts on crab habitat. Although the analysis claims that trawling in this area may disrupt clustering juvenile king crab pods, there is no bycatch of such pods or crabs by trawl gear in the proposed areas. The trawl fleet does not tow on gravel substrate areas, but on sandy bottom that is unlikely to harbor juvenile king crab because it contains no protective environment. The trawl fleet works in such areas because they have higher concentrations of target flatfish at certain times of the year. To address the juvenile habitat concern, it would be appropriate to close specifically those areas that have already been identified as rocky substrate. The EA/RIR does not contain this alternative.

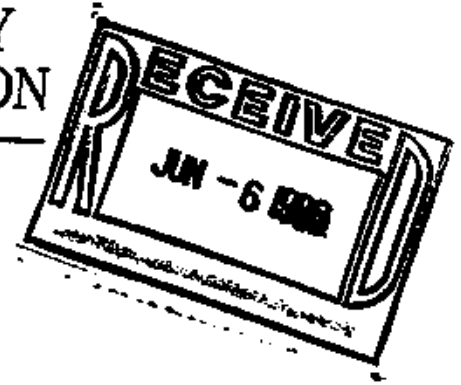
Specific Closure Alternatives

All the alternatives except status quo specify broad closures which incorporate areas that historically have little or no crab bycatch and no established crab habitat (such as rocky substrate or sea onion patches), but do have areas of significant groundfish catch. It is inappropriate to make such sweeping closures just to include a few areas that may have important crab habitat or high bycatch areas. Rather, the goal of optimum yield would be better served by smaller, more specific closures that directly address the problems at hand (assuming those problems can be adequately identified and substantiated). The EA/RIR too broadly defines proposed closure areas and does not provide adequate justification for those closures.

Thank you for this opportunity to comment.


Laura Jansen
Assistant Director, Government Affairs

AMERICAN FACTORY TRAWLER ASSOCIATION



Mr. Richard Lauber
Chairman
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, AK 99501-2252

June 4, 1996

RE: EARIR for Amendment 41: Management of Red King, Tanner, and Snow crab in the Bering Sea Groundfish Trawl Fisheries

Dear Mr. Lauber:

The American Factory Trawler Association's general comments on Amendment 41 and the draft EARIR are followed by some specific comments on the proposed management measures.

General Approach

The primary shortcoming of the Council's proposed actions is that the focus is entirely on the groundfish trawl fishery when there is no evidence that trawl is creating or substantially contributing to the depressed state of crab stocks. The decline in crab stocks may be attributable to changes in environmental conditions, predation on juvenile and adult crabs by groundfish, and past harvest strategies in the directed crab fisheries that are not known to be sustainable and have not always included the potential effects of handling mortality in the directed crab fishery.

Some restrictions on the trawl industry are merited, but some of the measures included in past and current management measures are needless restrictions on trawling where the costs to the trawl industry clearly outweigh benefits to crab stocks or the nation.

We feel that the Council's efforts to reverse the decline of crab stocks have not been balanced. The Council could attempt to reduce the effects of predation by minimizing unnecessary restrictions on trawlers so as to maximize the harvest of groundfish within the constraint of the 2 million ton cap. Yet the Council's course continues to impose more impediments to increasing groundfish catches.

The Council could also play a stronger role in advising ADF&G to review its harvest strategies and the effects of handling mortality for the directed crab fisheries. We view ADF&G's recent adoption of a more conservative harvest strategy for red king crab and the incorporation of handling mortality from the directed fishery into the population assessment as a step in the right direction.

Crab Bycatch in the Crab Pot Fishery

In neglecting to consider measures other than closed areas to trawling and reductions in trawl bycatch caps, the Council has failed to even evaluate a considerable source of red king and bairdi crab bycatch within the fisheries it manages. According to current NMFS data, boats using pot gear for Pacific cod have caught approximately 15,000 red king crab and 100,922 bairdi as of May 25th 1996. This translates into a rate of 4.9 bairdi per ton of Pacific cod, a very high rate for bairdi.

The cod pot boats' red king crab bycatch is higher this year than the bycatch of red king crab in all trawl fisheries in Zone 1 (trawl totals to 12,107 RKC as of May 25th). Why are crab caps for pot boats not being considered, as well as a requirement for 100% observer coverage on pot boats fishing inside of the Red King Crab Savings area?

Inherent Bias in the Council's Approach

The EARIR demonstrates an inherent bias in the Council's approach to developing measures to rebuild crab stocks. There is a strong tendency to assume that trawl impacts on crab are greater than available evidence suggests- even the evidence presented in the EARIR itself. The array of studies of trawl crab bycatch mortality cited in the EARIR indicate that scientists disagree on the effects of trawls on crabs that are bycaught. Estimated trawl mortalities for king and tanner crabs range from 1.2 % to 80% for king crabs and 12.6 % to 80% for tanners. Yet all the operating assumptions in the EARIR and the Council's plan presuppose that trawl mortality is at the upper end of the range-or greater.

Further, the EARIR document admits that the proposal to lower the trawl bycatch caps can have little effect because, at best, the result will be a 0.75% increase in female red king crabs and a 0.38% increase in female tanner crab (page 4). Yet despite this recognition, management measures to lower the caps are proposed.

Also conspicuous is the notion that even if observed trawl crab mortalities are low, there must be a great effect from unobserved interactions between crabs and trawls. The proof offered is a study by Donaldson (1990) where injury to crabs not captured by the trawl occurred at a rate of 2.6%. This doesn't appear to be evidence that unobserved mortality is even a factor.

The other source of evidence of unobserved mortality offered is the NMFS/AKR gear research division's research (Craig Rose et al.) where underwater video was made of trawl gear. The Council will recall from the NMFS presentation last August that the gears used for flatfish fishing in the study appeared to create little or no unobserved mortalities because crabs in the path of the sweeps were generally caught or escaped with little or no harmful effect. Yet despite the dearth of evidence, the document persistently states and implies that there is the additional factor of unobserved mortality that must be considered in any management measure.

Comments on Management Measures

Bristol Bay Red King Crab Savings Area

AFTA supports Alternative 2, Option B (year round closure to bottom trawling) with three small modifications. Given the depressed condition of the red king crab stocks and the fact that a directed fishery has not occurred for two years, closure of the Red King crab Savings Area to bottom trawling on a year round basis is warranted until RKC stocks recover.

With the seasonal closure in place last year, trawl red king crab bycatch in Zone 1 was reduced to about 20,000 animals: a ten fold reduction from 1994 levels. AFTA had proposed that the Savings area remain open on a seasonal basis with a separate cap of 15,000 RKC for the flatfish fisheries within the area. The separate area cap was to be monitored by Seastate in conjunction with a requirement for 100% observer coverage within the area.

This request was not adopted by the Council in January. Although we continue to believe that our earlier proposal would not have resulted in any appreciable increase in red king crab bycatch for the trawl fisheries over the 1995-1996 level, we have come to understand that the area is of acute interest to the directed fishery and have therefore modified our position.

AFTA has decided to accept the year round closure with the following conditions. Access to the lower 10 minutes of latitude of the Savings area must be allowed in years when there is a harvest guideline for Bristol Bay red king crab. Further, access to the western block of the area (the portion within statistical area 509) must be allowed for the yellowfin sole fishery after April 15th, in years when there is a harvest guideline for Bristol Bay red king crab. A separate cap for red king crab in the Savings area would apply when bottom trawling was allowed within the area.

We believe these provisions to allow trawlers to regain access are important compensation to trawlers who are willing to sacrifice access to one of the best groundfish areas in Bristol Bay in order to share the conservation burden with the crab fishery. Further, these provisions for regaining access will work as powerful incentives for good citizenship by trawlers. They will be effective incentives to avoid red king crab in areas outside the RKC Savings Area where red king crabs are found.

Modify Crab PSC Bycatch Limits

AFTA does not support any of the options proposed to reduce PSC caps for red king or bairdi crab or the creation of a cap for opilio (snow) crab. There is no scientific rationale for reducing caps for red king and bairdi at this time. This is because caps represent such a small fraction of the respective crab populations that the effect of taking the cap as bycatch has no measurable impact on stocks. Nor is there any

scientific rationale for an opilio cap. The average trawl bycatch (1992-1994) represents 0.11% of the estimated population size and the number of bycaught opilio crab has been decreasing in recent years.

In our judgment, the crab PSC caps are purely an allocation issue. The caps were first set by industry negotiations at levels that the trawl industry felt could be accomplished to avoid crab bycatch. Any future adjustments should be arrived at via industry negotiations, and the Council's role in that process should be to encourage the differing industry groups to reach an accord.

An industry negotiation process for crab PSC caps was endorsed by the BSAI Crab Plan Team and the Crab Rebuilding Team in April as the best means to resolve conflicts between user groups. This process has not been given an opportunity to take place. AFTA supports the negotiation process, although we also believe that a NMFS crab biologist should be made available to industry negotiators so that caps can be indexed to relevant stock abundance criteria, should industry elect to pursue floating caps.

In the case of red king crab, the cap 200,000 animals is approximately ten times greater than the actual 1995 bycatch and the expected 1996 bycatch in the trawl fisheries. The combined effect of the red king crab savings area and the industry bycatch avoidance efforts is responsible for the great reduction in red king crab bycatch. That the cap is currently much higher than the actual bycatch is commendable and is not a reason to attempt to punish the trawl industry by reducing the cap. To lower the cap just because the actual bycatch numbers are down sends the wrong message to the trawl industry. The message would be: "don't participate in voluntary programs and make sure you never fail to take available caps or they will be reduced".

In the future, as red king crab numbers increase and a directed crab fishery resumes, the trawl industry expects to regain access to portions of the RKC Savings Area. Higher abundance of king crab will likely involve some increase in king crab bycatch from the current levels and thus the trawl industry will need a cap that is larger than the current actual bycatch of red king crab (< 35,000) after rebuilding occurs.

Limitations in the Analysis of the Impacts of Reducing PSC Caps

The model runs of the Bering Sea Fishery Simulation model use 1993 and 1994 fishery data to evaluate cap reduction alternatives. For bairdi, the reductions that were incorporated into the model do not represent significant differences from bycatch numbers for bairdi in 1993 and 1994. Under the options that were analyzed for the 1994 fishery data, however, the model predicted reductions in net economic benefit ranging up to \$4 million per year as a result of trawl fishing effort shifts from areas with relatively high red king crab rates to the west where bairdi rates are generally higher. In fact, the shift of fishing effort to the west predicted by the model has occurred and this is why reductions in bairdi caps would create even larger losses than are currently occurring with the implementation of the RKC Savings Area.

The model used for the analysis is apparently incapable of being used to simulate the effects of caps that vary with changes in abundance of crab stocks. It is very important to recognize that because of this limitation, there is no analysis of cap reductions in the lower end of the range specified for floating caps. Those impacts would have been extraordinarily high and devastating to the bottom trawl industry. The Council should remove options and ranges of options that cannot be analyzed because it would be foolhardy to undertake cap reductions with no knowledge of the expected effects on the industry.

The model run that predicted the greatest reduction in net benefit was the scenario where an opilio cap of 6 million animals is in place and the other (status quo) constraints on bairdi and red king crab are in force. That scenario produced an estimate of net economic benefit loss of \$11 million per year with the 1994 fishery data. The large net loss results from the inability to make up for lost fishing opportunities for flatfish, or said another way, there is nothing left that is not hopelessly restricted. We feel this estimate of \$11 million in net economic losses is probably low for that proposed reduction.

Although model limitations mean the analysis does not quantify the combined effects of the red king crab closed area and the alternatives that are real reductions in bairdi crab PSC caps, the analysts did point out that losses would be expected to be very large. Their qualitative assessment is that:

"The impacts of trawl closed areas on the trawl fleet may be further exacerbated by reduced crab PSC limits. ...With reduced PSC limits, all trawl fisheries could be affected, as fisheries may be shut out of better fishing areas sooner. Flatfish fisheries may be forced to shift effort into Area 514 (west of 162 degrees W. longitude), which typically has higher bycatch rates of halibut (Narita et al. 1994). Because attainment of halibut caps shuts down fishing in the entire Bering Sea for the affected fishery, the combination of closed areas and reduced PSC limits may have significant negative effects on certain trawl fisheries, particularly those targeting flatfish." (page 69)

Optimal Allocation of PSC Caps

A statement is made in the EARIR analysis that cap reductions could occur without real impacts on the trawl fleet- if crab PSC caps were only allocated optimally. The trawl industry is well aware of this. The problem is that we do not have a system to allocate PSC optimally! The common property approach to bycatch management means that industry-wide caps will continually result in less than optimal performance in trawl fisheries. This is because a few companies routinely pursue only incentives for their individual gain. This results, year after year, in sub-optimal allocations of PSC and this situation can never be remedied by improved specification of the common caps. It can only be resolved by adoption of a system of individual incentives-IBQs.

Nearshore Bristol Bay Trawl Closure Area

AFTA continues to support the adoption of Alternative 4. The area that would remain open under this alternative is one of the cleanest areas in terms of PSC species available to the yellowfin sole fishery. It also represents an area where discards of non-target groundfish are minimized by virtue of the dense concentrations of yellowfin sole during the time period when this area would be open. The Togiak Bay area (north and east of Cape Constantine to 58 degrees 43 minutes) is mud bottom habitat which is not the gravel or cobble bottom habitat that has been associated with nursery areas for red king crab. The data from the stock assessment surveys using beam trawls at numerous stations within the area in question confirms that there is no evidence of juvenile red king crab or other PSC species (page 162). The area the trawl industry wants to keep fishing has mainly yellowfin sole and the worms and bivalves upon which yellowfin feed.

Further, we believe the northern boundary incorporated into this option also responsibly minimizes any conflicts with nearshore herring fisheries and sensitive habitats that might occur or be perceived to occur.

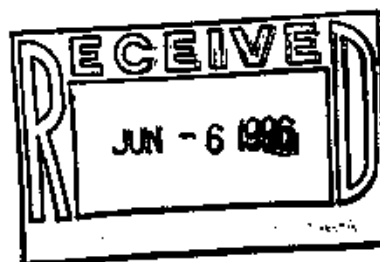
Lastly, there is a statement in the summary of the EARIR that must be clarified. It is stated that the yellowfin fishery within the northern Bristol Bay area has had relatively low king, bairdi, and opilio crab bycatch rates, as well as low halibut bycatch rates, but has had somewhat high herring bycatch. Yellowfin sole fishing in the area is responsible for a large proportion of the herring bycaught by the yellowfin sole fishery, but the yellowfin sole fishery accounts for only a small amount of trawl herring bycatch: approximately one-eighth of the overall cap. Further, with the northern border of the open area drawn a 58 degrees, 43 minutes, a considerable portion of the herring bycatch would be expected to be decreased because the area north of that line has a higher herring bycatch rate.

Thank you for considering our comments. Please call us if you have any questions or require clarification.

Sincerely,



John R. Gauvin



June 5, 1996

Mr. Rick Lauber, Chairman
Dr. Clarence Pautzke, Executive Director
North Pacific Fishery Management Council
Post Office Box 103136
Anchorage, Alaska 99510

Re: Amendment 41

Dear Rick,

Amendment 41 is a complex package with many interacting components. There is probably no one 'right' combination of options, but some make more sense than others.

Area 508

The EA/RIR provides an strong rationale for closing area 508 to trawl. Armstrong's conclusion on the importance of the "nearshore spawning area from Unimak Island to east of Port Mollier (being) more important to maintaining the stock than areas within the midshelf basin of Bristol Bay" is one factor. Another is the location of the epifaunal habitat and living substrate critical to successful settling of larvae and survival as juveniles. Based on the Figure 4.5 & 4.6 plots of distribution of these species, extending the area 512 to the east makes good sense.

There has not been much trawling in the area. However, given the possibility of other actions contemplated in this amendment being imposed, there is a risk that displaced effort could shift into 508 causing far worse consequences than the other actions were intended to prevent.

Caps - Conservation or Allocation?

When the cap was originally set, it was set at a level that represented roughly 1/2% of the survey population of RKC. While the trawlers had requested a floating cap that would vary with changes in the survey population estimate, the council chose a fixed cap. There has been some variation in the RKC population estimate since the cap was set, but it still represents only slightly more than 1/2%. At the time the cap was set the SSC said that at anything less than 1% it was essentially background noise.

A major constraint on the RKC populations recovery is probably predation on larvae and juveniles by sole and cod respectively. Flatfish populations are at high levels of abundance. Thus measures which would reduce the harvests of flatfish TACs may actually impeded recovery of RKC stocks. On the one hand the EA/RIR seems to make little of groundfish predation (pg. 41) stating that removals by cod were "small and declining". However, on pg 31 it refers to the range of 1.4-3.8% in the early 80's when crab was high and cod was low. It continues, stating that by the late 80's cod predation had increased to account for 3.8-14.3% of the female RKC. Cod populations are even higher now than they were in the 80's and rocksole populations have sky rocketed. (see Figure 7 & 9 from Changes in

Geographic Dispersion of Eastern Bering Sea Flatfish Associated with Changes in Population Size, McConnaughey 1995)

The EA/RIR for Amendment 12A (Sept. 16, 1988) page 21, stated that a 1% bycatch rate on RKC would reduce the harvestable amount of RKC in the pot fishery by a maximum of 2.9% after accounting for natural mortality given the age structure of the crabs taken as bycatch. On page 59 it indicated that for each 1000 crab allowed as bycatch there was a \$14,835 impact on the pot fishery. The cost benefit ratio of lowering caps is clearly negative. The current EA/RIR shows similar information.

The EA/RIR tables 6.1 and 6.2 show the total value of the RKC fishery has ranged from \$50-100M vs the value of the flatfish fishery (even at current TACs which are only about 40% of ABC) at \$123M. If it were an all or nothing trade between the two fisheries it isn't clear that RKC would be the winner. Clearly it doesn't have to be such a choice. Table 6.18 shows a total cost benefit ratio between groundfish vs all PSC bycatch in the range of 15:1 to 19:1 (net vs gross).

There is no conservation justification for lower caps when the analysis shows that even an 82.5% reduction in the RKC cap would only result in a 0.75% increase in female spawner abundance. In the case of RKC, given the measures to protect the area encompassing almost all female distribution and (if 508 is closed) the critical nursery areas. Unless there are insufficient males to fertilize the female population, it is really a question of who is going to catch surplus males - trawlers or pot fishermen. Again, it is not an all or nothing choice. A floating cap at .5% limits the impact on the pot fishery to around 2% over time.

Chronic Problems with the By-Sim Model

In order for time area closures to achieve the maximization of groundfish harvests within a fixed PSC cap it is necessary to use an optimization model to examine the impacts of efforts redistribution resulting from an area closure. The council has been using the "By-Sim" a model first developed by Terry Smith in the late 1980's. It has been refined by a number of subsequent users, but its is still not up to the task of predicting the impacts of combined area closures and cap adjustments.

According to the EA/RIR (Appendix 8, by Dave Ackley) the ability of the model to predict such impacts "is severely limited" due to:

- "spatial and temporal variability of bycatch rates"
- "uncertainty about future TACs"
- "the use of historical catch data to predict distribution of future catch by time and area means there no data from times and areas that were closed"
- "not redistribut(ing) catch among fisheries"
- "not estimat(ing) the change in groundfish harvesting costs"

A major deficiency in the EA/RIRs reliance on the model, is that it uses current TACs. While pollock has appears to have had a fairly stable TAC over the last few years, its ABC and biomass has been declining. There is a very real possibility that there may be pollock TACs closer to 1M tons than 1.3M tons in the future. Flatfish ABCs exceed flatfish TACs by nearly 500,000 tons. A finding that proposed actions will not significantly effect the ability to take the current TACs, dramatically understates the potential net cost of those actions.

To be an informed decision maker the council must either employ such a computer model, or feel it has sufficient understanding of the parameters and data to make these calculations on the "back of the envelope".

Given the severe limitations of the By-Sim model, the analysis places undo reliance upon it to estimate the costs of the proposed actions to the groundfish fleet.

Expanding the Analysis of Impacts on the Groundfish Fishery

Faced with these constraints we have acquired NMFS haul by haul data set for the 1990 - 1995 fishery from the Observer Program. 141,655 hauls were examined, 36,596 from the flatfish fisheries, 17,885 from YFS. This review focused on YFS since that is the fishery most effected by the proposed measures (and because the 95 data did not become available until June 1st).

Goodness Badness Index

The attached tables were prepared based on the "Goodness/Badness Index" formula developed by Norris, et al, for the "Fishermen's Guide to Chinook Salmon bycatch Data. This index compares the average bycatch rate in a time/area cell to the BSA wide annual or monthly rate. If the G/B Index for halibut in an area is 2.6, then the rate is 2.6 times better than the BS average for that month. If it -2.6, then the rate is 2.6 time worse than the average. If the rate is equal to the overall rate, the index is 0, and if the rate itself is 0 in the cell, then the index says "Best".

Looking at these data with the GB Index on a monthly basis provides a different perspective from the annual summaries in the EA/RIR. There is temporal and spatial variability in bycatch rates and in CPUE of target. Given areas can be optimal locations for a fishery for a limited time period, and then worsen dramatically over the period of a couple weeks.

Between the 12 years of JV/TALFF data and 6 years of DAP observer data, it is possible to see patterns in the time/area bycatch and target catch. Use of these data time series in a revised By-Sim model would be far superior to use of a single year of data which limits the "simulation" to little more than a hindcast.

GIS and "Optimize Index"

In choosing a fishing location a skipper must optimize amongst a large number of factors: CPUE, avoiding 2 different VIP species violations, avoiding triggering 6 PSC species cap closures, etc. Each time a broadly drawn area closure is imposed the ability to successfully optimize amongst these factors is constrained.

The same data set has been reviewed with GIS data mapping software and a video presentation will be made to the council using the SeaState software. These records were grouped by month, by target, and 1/10th degree (6 mile by 3 mile) area cells to obtain average bycatch rates and surrogate CPUE (# of tows and average duration) into about 3500 cells. Using that information, one can construct a sort of "Optimized G/B Index" of the 3 most "sacred species-to-be-avoided". The new Index is based on whether all 3 have 0 bycatch rates, all are below VIP standards (and i imposed a surrogate VIP rate of 20 tanner/mt because rates in excess would be likely to lead to triggering caps), or whether some combination

or all three are above the VIP standard.

This value can be plotted in a color coded map by month for cell locations. (the results of which are in the following table, where H is halibut, R is RKC, and T is all tanners - opilio and bardii, because that is how NMFS provides the data.)

Optimize Index Value	PSC Rates less than VIP standard	PSC Rates exceed VIP standard	Number of Cells
-2 (Great)	h,r,t		388
0 (Good)	h,r,t		941
1 (kinda bad)	h,t	r	46
2 (kinda bad)	h,r	t	1237
3 (kinda bad)	t,r	h	676
4 (kinda bad)	r	h,t	357
5 (kinda bad)	h	r,t	44
6 (kinda bad)	t	r,h	27
8 (do not pass GO, go straight to jail)		t,r,h	28

Given the relatively few number of Good or Great cells, the council ought to have some idea of the amount of effort that occurs in those cells and what proportion of those cells are in the various proposed closure areas before it acts. Unless the council has fully considered the impacts, it may well be putting the fishers in a situation where there is no solution to the optimization equation.

If deciding where to go fishing were a logic problem it could be written like this:

```

IIF([116 HALIBUT kg/mt]<5 And [118 KING CRB #/mt]<2.5 And [119 TANNERS #/mt]<20),0,
IIF([116 HALIBUT kg/mt]<5 And [118 KING CRB #/mt]>2.499 And [119 TANNERS #/mt]<20),1,
IIF([116 HALIBUT kg/mt]<5 And [118 KING CRB #/mt]<2.4999 And [119 TANNERS #/mt]>20),2,
IIF([116 HALIBUT kg/mt]>4.999 And [118 KING CRB #/mt]<2.5 And [119 TANNERS #/mt]<20),3,
IIF([116 HALIBUT kg/mt]>4.999 And [118 KING CRB #/mt]<2.5 And [119 TANNERS #/mt]>19.999),4,
IIF([116 HALIBUT kg/mt]<5 And [118 KING CRB #/mt]>2.4999 And [119 TANNERS #/mt]>19.999),5,
IIF([116 HALIBUT kg/mt]>4.999 And [118 KING CRB #/mt]>2.5 And [119 TANNERS #/mt]<20),6))))))
Then IIF([116 HALIBUT kg/mt]>4.999 And [118 KING CRB #/mt]>2.4999 And [119 TANNERS #/mt]>19.999),8,
IIF([116 HALIBUT kg/mt]=0 And [118 KING CRB #/mt]=0 And [119 TANNERS #/mt]=0),2, [125 Target]))
-Yields Index - Then
If IndexValue is < 1, and CPUE is >x, and area IsOpen, Then AreaCPUEGood,
Else If AreaCPUEGood IsClosed, and CPUE is >0 and Fuel IsFree, Then At Area,
Else If IndexValue is > 1 and CPUE is >x, And You-have-a-yard-date And Don't-care-if-the-fishery-closes- And Discount-the-likelihood-of-NOAA-GC-making-VIP-cases, Anywhere-Not-Closed-today

```

Long term, the best solution to the optimization equations within fixed PSC and TAC constraints is achieved by shifting the responsibility to individual fishers through vessel bycatch accounts (VBAs) and ITQs for target species. Short of that, the council needs to take greater responsibility for seeing OY is achieved while protecting bycatch species.

The council cannot simply say "where not to fish", without evaluating where fishers should fish. In fact, maybe the council should take the opposite tack, and rather than doing closed areas, they should make the decisions for the fleet, on "where to fish" and accept responsibility for the consequences. If the council is going to make all the decisions for the fleet on "where not to fish", perhaps caps and VIP standards are unnecessary.

We have been going down a path for several years, wherein we take an action one year to protect RKC, which causes halibut problems, so the next year we take an action to deal with the halibut problem, and cause a herring problem...and on through the list of species, until we have come full circle.

The Factors Necessary to Attain OY for YFS

In 1994 the YFS fishery came close to attaining OY. It closed when the halibut PSC cap was reached. It is the halibut PSC which is the primary determinant as to whether the TAC will be reached. In order for the halibut cap to be optimized, it is essential that the YFS fishery be pursued during times and areas where halibut by catch can be kept at or below the VIP rate of .5 kg/mt.

There are two key time/area windows of opportunity to fish YFS at very low halibut rates, which if not utilized will result in a halibut based closure of YFS before the TAC is reached. This is a function of the migration patterns of YFS and halibut in the spring. YFS migrate out of the deeper water, traveling NE toward Togiak, Bristol Bay and the Kuskokwim delta. This pattern can be seen by reviewing the JV effort during the mid-80's and tracking the tows by location during April and May. This movement of YFS occurs just ahead of a similar migration of halibut, which seem to wait about a couple weeks or a month later for water temperatures to warm up slightly. This phenomenon can be verified by comparing bycatch rates in a given location by in weekly time steps during the spring YFS fishery.

- a. One of these time area windows is from about May 10 through early June in the area north of 58, primarily in the Round Island area.
- b. The other time/area window occurs in late April and the first week of May in the area between 163-164 and between 56-40 and 57-00.
- c. A third time/area window has been precluded by previous management actions which close the area between 57 and 58 and 160 and 163. Access to the area would allow the fishery to move with the movement of the fish, and thus avoid scratch fishing which is almost always associated with higher by catch rates. The relatively high rates of bycatch during this time period along the 58 line are in part a function of fishing where the target fish has not yet arrived.
- d. Another time/area windows occurs in late April - early May in the NW portion of the new Pribilof closure area. That closure extended unnecessarily far to the NW (as it is an area with no King Crab bycatch problem).

If the NW corner of the new RKC saving area is closed in late April and early May one of the primary time/area windows of low halibut bycatch will be foregone. Together with the Pribilof closure and the constraints of the ice edge, this leaves the fleet with only very limited area to fish YFS during late April and early May. The remaining areas have low YFS CPUE and high tanner crab and halibut bycatch rates.

The likely result is a premature closure of the YFS fishery due the halibut PSC apportionment for the first semester being attained. Such a closure may well occur just about the time in early May that the YFS arrive in the area north of 58, toward Round Island. This in turn means the second primary time/area window of low halibut PSC will be foregone as well.

The next window of opportunity to avoid halibut does not occur until late summer early fall when the YFS and halibut segregate as the YFS move back out toward the mid shelf. This segregation usually lasts until sometime in October when the halibut begin to "catch up" with the sole as they too move back

to their deeper wintering grounds. The ability of the fleet to "stay ahead" of the halibut will be constrained by the excessive northerly extent of the new Pribilof area.

Round Island Area and NW Corner of RKC Savings Area

The combination of these factors make it critical that the harvest of YFS be maximized during the times/area that halibut PSC rates are lowest (i.e. the northern west 1/2-1 degree block of the RKC Savings Area closure in late April and early May and the Round Island fishery in mid May to early June.)

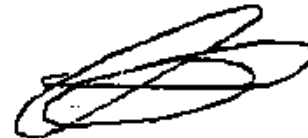
The RKC stocks are protected by the mating/molting closure that expands the primary RKC protection zone between 160-162 out to 163 during the second quarter. The 160-163 area encompass over 92% of the female RKC population distribution according to the council's analysis in Table 2.1. The additional seasonal closure of the SW portion of the RKC Savings Area provides even more protection.

Any incremental gains from closing the NW corner of the RKC Savings area in late April and early May are very small compared to the other consequences of such an extension. By imposing a small subarea cap of around 10,000 RKC for this area any potential impact would be quite limited. This allowance for a window of opportunity for the YFS fishery would be consistent with ADF&G's allowance of a Bardii fishery in the area between 163-164. Clearly, ADF&G has determined that it isn't necessary to protect every RKC in every fishery that imposed bycatch mortality.

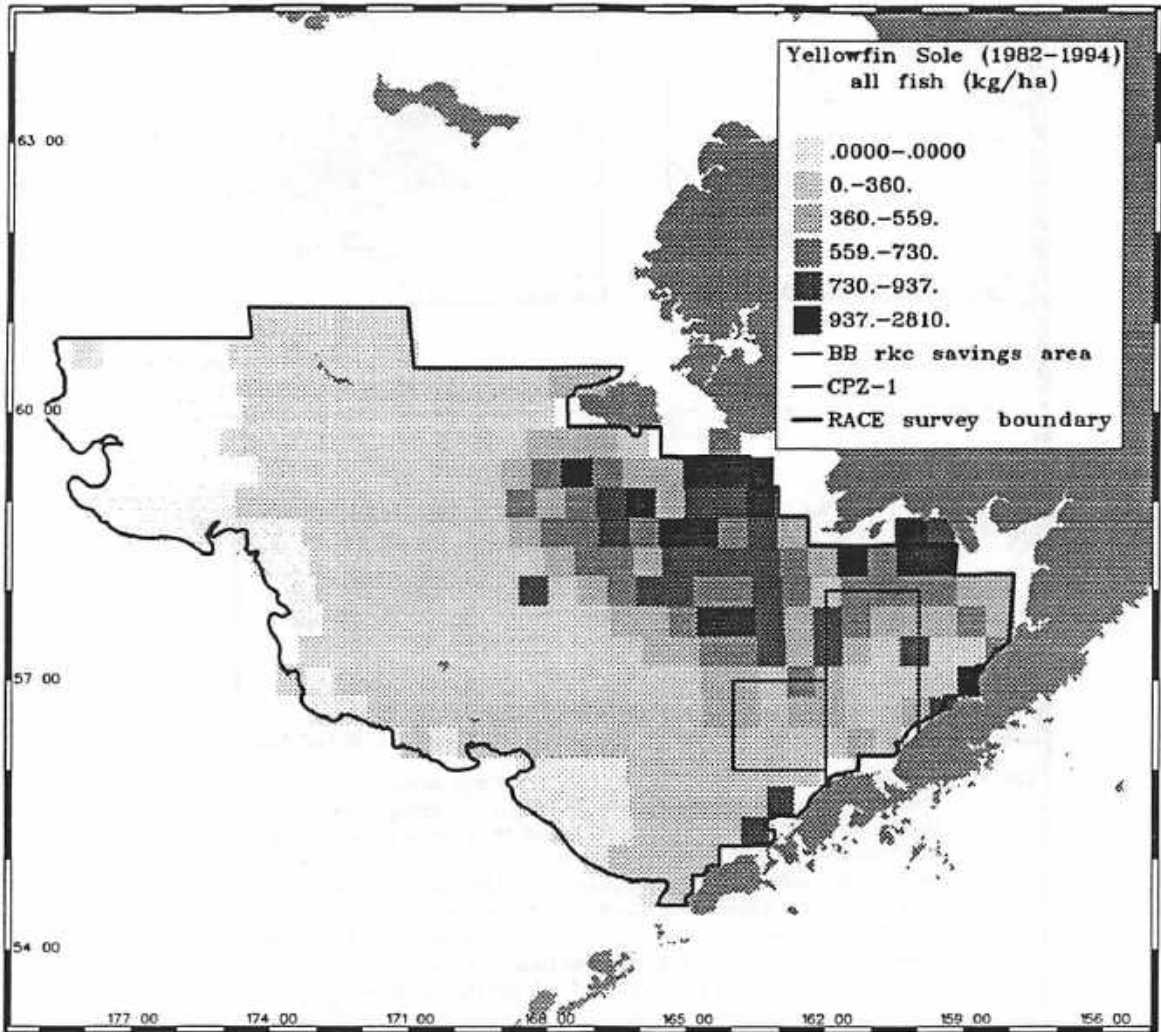
Conclusion

1. *Adopt a Floating RKC cap at 0.5% level.*
2. *Impose a closure East of 160 degrees.*
3. *Close the RKC Savings area year round - except for the NW corner.*
 - a. *open the NW corner for late April and early May*
 - b. *adopt a sub area cap of 10,000 RKC*
4. *Adopt a Floating Bardii cap at 2%.*
5. *An opilio cap is not necessary, but if adopted, a floating cap at 0.2%*

Sincerely yours,



david fraser
F/V Muir Milach
PO. Box 771
Port Townsend, Washington



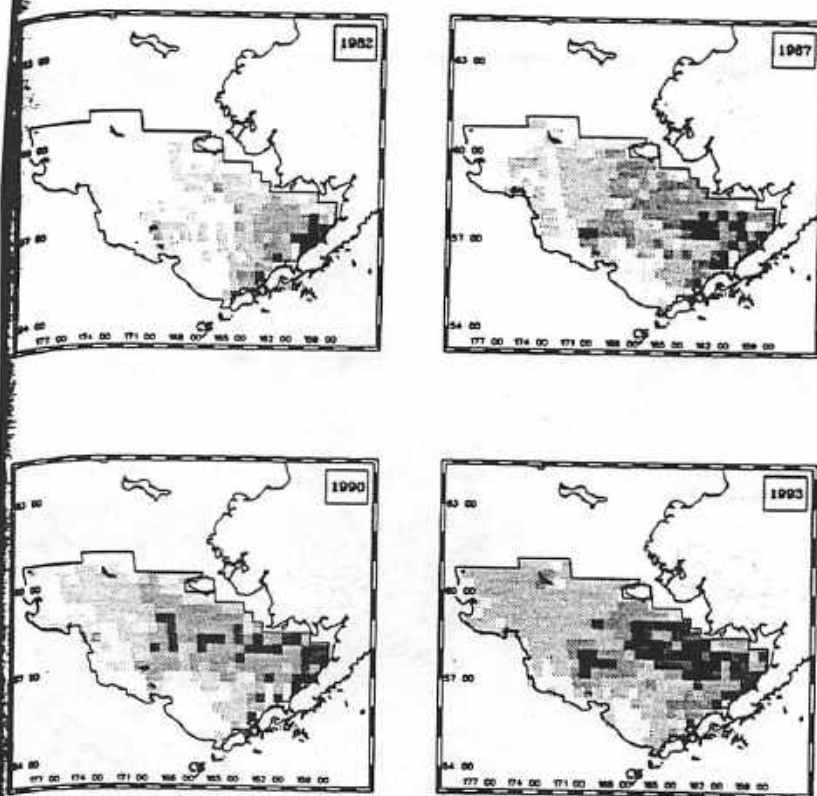


Figure 9. Distribution maps for eastern Bering Sea rock sole demonstrating increasing levels of dispersion during a period of steadily increasing population size (1982-1993). Plotted values represent average densities (no./unit area) for the period 1982-1993. Fixed cutpoints (0, 100, 500, 1000, 1500, > 1500) are used to indicate absolute changes in abundance. Higher densities are represented by denser shade patterns, with zero-catches shaded the same as the land mass. Note in particular that expansion of the high density area over time and the concurrent movement into previously unoccupied habitat proceeded in a generally northwesterly direction.

YFS Fishery Observer Data 1990-1995

Annual PSC Rates, Effort and CPUE for Entire Bering Sea (except Prib. Closure)								
Month	# Tows number	HERRING kg/mt	HALIBUT kg/mt	RK CRAB #/mt	TANNERS #/mt	CHIN #/mt*100	OSAL #/mt*100	Duration minutes
all	17885	2.1	4.7	0.1	51.0	0.1	0.5	211

The following tables were prepared based on the "Goodness/Badness Index" formula developed by Norris, et al. for the "Fishermen's Guide to Chinook Salmon Bycatch Data. This index compares the average bycatch rate in a time/area cell to the BSA wide annual or monthly rate. If the rate is lower in the particular cell the index is a positive number, if higher it is a negative, if the same the index is 0, and if the rate itself is 0 in the cell then the index says 'Best'.

The Goodness/Badness Index is a means of projecting the impact of closing an area using the simplifying assumption that the % of monthly effort moved out of a closure area will redistribute proportionately throughout the remaining open area, and the change in the PSC catch of a species will be represented by the G/B index. Negative G/B index numbers for multiple PSCs in a monthly area cell, argue for closing that time/area, positive numbers argue for leaving it open.

The first table uses the G/B Index as a means of looking at BS wide seasonality.

Annual Goodness/Badness Index for Entire Bering Sea (except Pribolof Closure)								
Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	0%	Best	Best	-1.1	6.9	Best	Best	1.8
2	0%	Best	1.4	10.4	5.9	Best	Best	2.2
3	4%	270.3	2.6	-1.9	5.5	Best	Best	2.4
4	6%	14.5	2.1	1.7	3.3	Best	Best	1.8
5	17%	-1.2	1.6	-2.9	2.3	-1.1	7.2	1.3
6	14%	-4.7	-1.7	1.5	2.6	-2.5	-2.9	-1.0
7	5%	1.0	-1.6	1.9	3.0	Best	-4.0	-1.0
8	14%	3.3	-1.3	1.5	-1.9	Best	-2.5	-1.1
9	17%	5.2	2.3	3.7	-1.5	1.7	5.8	-1.2
10	15%	25.9	1.2	2.6	-1.2	1.2	239.2	-1.2
11	6%	1273.1	-2.0	1.2	-1.5	-3.4	Best	-1.2
12	2%	Best	-1.4	1.8	-1.8	Best	Best	1.3

Monthly Goodness/Badness Index for Area North of 58 and East of 162								
Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	na	na	na	na	na	na	na	na
3	na	na	na	na	na	na	na	na
4	na	na	na	na	na	na	na	na
5	50%	-1.3	2.7	2.3	455.4	-2.0	Best	1.1
6	61%	-1.4	1.6	2.1	5102.8	-1.2	6.2	1.2
7	33%	-1.8	1.0	5.3	1336.4	0.0	-2.2	1.0
8	14%	-3.1	-1.8	7.9	Best	0.0	86.8	-1.1
9	3%	2.0	-3.5	1.2	Best	Best	Best	-1.3
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area North of 58.72 and between 159-162								
Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	na	na	na	na	na	na	na	na
3	na	na	na	na	na	na	na	na
4	na	na	na	na	na	na	na	na
5	3%	-3.2	2.1	11.2	Best	Best	Best	1.3
6	7%	-2.4	3.7	Best	Best	Best	-1.3	-1.0
7	2%	-5.6	1.5	Best	Best	0.0	Best	-1.2
8	0%	1.1	1.5	Best	Best	0.0	Best	1.0
9	0%	Best	-4.4	Best	Best	Best	Best	1.1
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area between 58-58.72 & 159-160 (Round Is.)								
Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	na	na	na	na	na	na	na	na
3	na	na	na	na	na	na	na	na
4	na	na	na	na	na	na	na	na
5	43%	-1.2	2.8	3.2	813.7	-2.3	Best	1.1
6	54%	-1.3	1.5	2.6	4504.4	-1.3	59.6	1.2
7	37%	-1.6	1.0	5.1	1266.0	0.0	-2.3	1.0
8	13%	-3.3	-1.6	258.8	Best	0.0	81.1	-1.1
9	3%	2.0	-3.5	1.2	Best	Best	Best	-1.3
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for NW 1/4 RKC Saving Area (56.5-57 & 163-164)								
Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	20%	0.0	0.0	-5.0	15.4	0.0	0.0	2.1
2	na	na	na	na	na	na	na	na
3	8%	-1.4	-2.8	-1.7	2.2	0.0	0.0	-1.1
4	0%	Best	Best	Best	4.6	0.0	0.0	-1.7
5	9%	4.0	1.4	-4.7	3.8	Best	Best	2.0
6	na	na	na	na	na	na	na	na
7	na	na	na	na	na	na	na	na
8	na	na	na	na	na	na	na	na
9	na	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for RKC Saving Area (between 56-57 and 162-164)

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	40%	0.0	0.0	-2.5	30.8	0.0	0.0	1.4
2	3%	0.0	-3.9	-28.3	Best	0.0	0.0	1.6
3	11%	1.0	-2.1	-2.4	2.4	0.0	0.0	-1.1
4	0%	Best	Best	Best	6.8	0.0	0.0	-1.3
5	9%	4.0	1.4	-4.7	3.8	Best	Best	2.0
6	0%	1.1	Best	-34.7	Best	Best	Best	1.2
7	na	na	na	na	na	na	na	na
8	na	na	na	na	na	na	na	na
9	na	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area 508 (East of 160 And South of 58)

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	na	na	na	na	na	na	na	na
3	na	na	na	na	na	na	na	na
4	na	na	na	na	na	na	na	na
5	2%	1.3	-1.1	-2.4	93.6	Best	Best	-1.1
6	na	na	na	na	na	na	na	na
7	na	na	na	na	na	na	na	na
8	0%	-3.7	-6.5	Best	Best	0.0	Best	1.1
9	na	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area South of 56 and 162-164

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	20%	0.0	0.0	Best	Best	0.0	0.0	-1.2
2	10%	0.0	-1.8	1.1	1.3	0.0	0.0	-1.6
3	na	na	na	na	na	na	na	na
4	na	na	na	na	na	na	na	na
5	0%	1.5	-1.5	-6.2	24.3	Best	Best	1.3
6	na	na	na	na	na	na	na	na
7	na	na	na	na	na	na	na	na
8	na	na	na	na	na	na	na	na
9	na	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area between 56.5-58 and 164-165

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	61%	0.0	-1.1	Best	-1.4	0.0	0.0	1.5
3	30%	3.2	1.7	-1.9	1.1	0.0	0.0	1.0
4	16%	Best	-1.3	-2.7	1.5	0.0	0.0	-1.2
5	6%	4.4	2.5	-3.7	1.2	Best	Best	1.2
6	2%	192.6	1.9	-3.6	1.7	Best	Best	-1.0
7	na	na	na	na	na	na	na	na
8	0%	Best	Best	Best	49.4	0.0	Best	1.2
9	0%	Best	1.5	Best	5.2	Best	Best	-1.0
10	2%	Best	4.0	-14.0	10.1	Best	Best	2.1
11	9%	Best	1.3	1.2	5.8	Best	0.0	2.6
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area South of 56.5 and 164-165

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	13%	0.0	Best	Best	Best	0.0	0.0	-1.5
3	44%	-1.3	-1.2	2.8	-1.0	0.0	0.0	1.1
4	1%	Best	-2.8	-4.9	1.4	0.0	0.0	-1.2
5	na	na	na	na	na	na	na	na
6	na	na	na	na	na	na	na	na
7	na	na	na	na	na	na	na	na
8	na	na	na	na	na	na	na	na
9	na	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area North of 58 and 162-165 (Kuskokwim)

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	na	na	na	na	na	na	na	na
3	na	na	na	na	na	na	na	na
4	na	na	na	na	na	na	na	na
5	14%	2.1	-2.6	2.1	465.7	Best	-7.2	-1.8
6	25%	1.9	-1.9	4.3	3203.2	-1.2	-2.3	-1.3
7	2%	-1.3	-2.4	Best	3.6	0.0	Best	1.3
8	1%	-2.3	-25.7	Best	314.3	0.0	-52.8	2.3
9	na	na	na	na	na	na	na	na
10	na	na	na	na	na	na	na	na
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area between 56.5-58 and 165-168.5

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	na	na	na	na	na	na	na	na
2	na	na	na	na	na	na	na	na
3	6%	-3.1	96.1	Best	-1.6	0.0	0.0	-1.5
4	28%	-3.4	1.6	4.1	-1.1	0.0	0.0	-1.2
5	9%	1.2	-3.0	39.1	-3.1	Best	Best	1.1
6	9%	63.9	1.1	-6.1	-9.7	Best	Best	1.0
7	6%	66.6	13.2	2.2	-8.0	0.0	Best	1.1
8	55%	2.2	10.1	1.2	-1.2	0.0	Best	1.0
9	77%	2.7	1.9	1.1	1.2	Best	-1.2	1.0
10	61%	1.1	1.2	2.1	1.5	-1.2	Best	1.0
11	76%	1.1	1.1	-1.1	1.1	-1.3	0.0	-1.1
12	93%	0.0	-1.0	-1.1	1.0	0.0	0.0	-1.0

Monthly Goodness/Badness Index for Area North of 59 and East of 162

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
2	na	na	na	na	na	na	na	na
2	10%	0.0	Best	Best	1.6	0.0	0.0	-1.1
3	6%	Best	1.5	Best	-1.3	0.0	0.0	1.2
4	44%	15.5	-1.3	1.9	1.4	0.0	0.0	1.2
5	na	na	na	na	na	na	na	na
6	na	na	na	na	na	na	na	na
7	na	na	na	na	na	na	na	na
8	na	na	na	na	na	na	na	na
9	0%	Best	Best	Best	10.9	Best	Best	1.2
10	0%	Best	-2.9	Best	2.4	Best	Best	-1.8
11	na	na	na	na	na	na	na	na
12	na	na	na	na	na	na	na	na

Monthly Goodness/Badness Index for Area Between 56.5-57.95 and 168.5-171 (Prize)

Month	# Tows	HERRING	HALIBUT	RK CRAB	TANNERS	CHIN	OSAL	Duration
1	20%	0.0	Best	Best	Best	0.0	0.0	-1.5
2	3%	0.0	Best	Best	Best	0.0	0.0	-1.5
3	0%	Best	Best	Best	-2.3	0.0	0.0	-1.0
4	na	na	na	na	na	na	na	na
5	3%	7.1	-1.3	Best	3.9	Best	Best	2.6
6	na	na	na	na	na	na	na	na
7	0%	Best	Best	-12.2	-21.6	0.0	Best	-1.3
8	4%	2.1	30.5	-10.2	-1.9	0.0	Best	1.2
9	4%	-7.6	1.8	-68.0	-2.1	Best	Best	1.4
10	3%	-3.7	2.6	-3.3	-2.7	Best	Best	1.1
11	12%	Best	1.0	-27.8	-2.8	Best	0.0	1.1
12	9%	0.0	-1.1	Best	-2.2	0.0	0.0	-1.1

INDEX_YF.XLS

Number of Hubs, Bypass Rights, and Duration of Tow data for YFS fishery 1990-1996, summarized by tow area cells

Goodness/Badness Index = IF(Small Area < All Area And Small Area Not 0, Small Area/All Area, IF(Small Area = All Area, 0, Best))

AREA	Month	# Tows			HERRING			HALIBUT			K CRAB			RK CRAB			
		Count	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month
ad (yr0)	1	5	6	17885	1.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
al (yr0)	2	31	31	17885	1.0	0.0	0.0	2.1	0.0	0.0	3.4	4.7	0.0	0.1	0.0	0.1	0.0
al (yr1)	3	724	724	17885	1.0	0.0	0.0	2.1	0.0	270.3	1.8	1.8	4.7	0.2	0.2	0.1	0.0
al (yr2)	4	992	992	17885	1.0	0.1	0.1	2.1	0.0	145	2.2	4.7	0.0	0.1	0.1	0.0	0.0
al (yr3)	5	9064	9064	17885	1.0	0.2	2.6	2.1	0.0	-1.2	2.9	2.9	4.7	0.4	0.4	0.1	0.0
al (yr4)	6	2832	2832	17885	1.0	0.1	0.0	2.1	0.0	-0.7	7.9	7.9	4.7	0.1	0.1	0.0	0.0
al (yr5)	7	830	830	17885	1.0	0.0	0.0	2.1	0.0	1.0	7.8	7.8	4.7	0.1	0.1	0.0	0.0
al (yr6)	8	2478	2478	17885	1.0	0.1	0.6	2.1	0.0	3.3	6.2	6.2	4.7	0.1	0.1	0.0	0.0
al (yr7)	9	8107	8107	17885	1.0	0.2	0.4	2.1	0.0	5.2	2.1	4.1	4.7	0.0	0.0	0.1	0.0
al (yr8)	10	2870	2870	17885	1.0	0.1	0.1	2.1	0.0	25.9	4.1	4.1	4.7	0.0	0.0	0.1	0.0
al (yr9)	11	1161	1161	17885	1.0	0.1	0.0	2.1	0.0	1273.1	9.2	9.2	4.7	0.0	0.0	0.1	0.0
al (yr10)	12	291	291	17885	1.0	0.0	0.0	2.1	0.0	Best	6.6	6.6	4.7	0.1	0.1	0.0	0.0
all year																	

AREA	Month	# Tows			HERRING			HALIBUT			K CRAB			RK CRAB			
		Count	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month
al 162 n 50	1	na	6	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 162 n 50	2	na	31	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 162 n 50	3	na	724	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 162 n 50	4	na	992	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 162 n 50	5	1537	3064	17885	0.5	0.1	3.1	2.1	na	-1.3	1.1	2.8	4.7	0.4	0.4	0.1	0.0
al 162 n 50	6	1636	2632	17885	0.6	0.1	14.0	2.1	na	-1.4	4.8	7.9	4.7	0.1	0.1	0.0	0.0
al 162 n 50	7	323	830	17885	0.4	0.0	8.8	2.1	na	-1.6	7.4	7.8	4.7	0.1	0.1	0.0	0.0
al 162 n 50	8	848	2478	17885	0.1	0.0	0.0	2.1	na	-0.1	11.2	6.2	4.7	0.1	0.1	0.0	0.0
al 162 n 50	9	86	3107	17885	0.0	0.0	0.2	2.1	na	10.6	7.2	2.1	4.7	0.0	0.0	0.1	0.0
al 162 n 50	10	na	2870	17885	na	na	na	2.1	na	na	na	4.1	4.7	na	na	na	na
al 162 n 50	11	na	1161	17885	na	na	na	2.1	na	na	na	9.2	4.7	na	na	na	na
al 162 n 50	12	na	291	17885	na	na	na	2.1	na	na	na	6.6	4.7	na	na	na	na

AREA	Month	# Tows			HERRING			HALIBUT			K CRAB			RK CRAB			
		Count	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month
al 58.72 e > 160. < 162	1	na	6	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	2	na	31	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	3	na	724	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	4	na	992	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	5	97	3064	17885	0.0	0.0	7.6	2.1	na	-3.7	1.4	2.9	4.7	0.1	0.1	0.0	0.0
al 58.72 e > 160. < 162	6	169	2632	17885	0.1	0.0	24.0	2.1	na	-2.4	2.1	7.9	4.7	0.0	0.0	0.1	0.0
al 58.72 e > 160. < 162	7	77	830	17885	0.0	0.0	11.7	2.1	na	-5.8	6.2	7.6	4.7	0.0	0.0	0.1	0.0
al 58.72 e > 160. < 162	8	1	2478	17885	0.0	0.0	0.6	2.1	na	1.1	3.6	4.0	4.7	0.0	0.0	0.1	0.0
al 58.72 e > 160. < 162	9	1	3107	17885	0.0	0.0	0.0	2.1	na	Best	9.1	2.1	4.7	0.0	0.0	0.1	0.0
al 58.72 e > 160. < 162	10	na	2870	17885	na	na	na	2.1	na	na	na	9.2	4.7	na	na	na	na
al 58.72 e > 160. < 162	11	na	1161	17885	na	na	na	2.1	na	na	na	6.6	4.7	na	na	na	na
al 58.72 e > 160. < 162	12	na	291	17885	na	na	na	2.1	na	na	na	6.6	4.7	na	na	na	na

AREA	Month	# Tows			HERRING			HALIBUT			K CRAB			RK CRAB			
		Count	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month	BS Wide annual	G/R In vs annual	light by month
al 58.72 e > 160. < 162	1	na	6	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	2	na	31	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	3	na	724	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	4	na	992	17885	na	na	na	2.1	na	na	na	na	na	na	na	na	na
al 58.72 e > 160. < 162	5	1321	3064	17885	0.4	0.1	2.9	2.1	na	-1.2	1.0	2.9	4.7	0.1	0.1	0.0	0.0
al 58.72 e > 160. < 162	6	1956	2632	17885	0.5	0.1	12.9	2.1	na	-1.3	6.2	7.9	4.7	0.1	0.1	0.0	0.0
al 58.72 e > 160. < 162	7	398	830	17885	0.4	0.0	3.4	2.1	na	-1.6	7.6	7.6	4.7	0.1	0.1	0.0	0.0
al 58.72 e > 160. < 162	8	325	2478	17885	0.0	0.0	2.1	2.1	na	-3.3	10.0	6.2	4.7	0.0	0.0	0.1	0.0
al 58.72 e > 160. < 162	9	86	3107	17885	0.0	0.0	0.2	2.1	na	2.0	10.5	2.1	4.7	0.0	0.0	0.1	0.0
al 58.72 e > 160. < 162	10	na	2870	17885	na	na	na	2.1	na	na	na	4.1	4.7	na	na	na	na
al 58.72 e > 160. < 162	11	na	1161	17885	na	na	na	2.1	na	na	na	6.6	4.7	na	na	na	na
al 58.72 e > 160. < 162	12	na	291	17885	na	na	na	2.1	na	na	na	6.6	4.7	na	na	na	na

Month	# Tows Count	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HERRING kg/m	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HALIBUT kg/m	BS wide by month	BS wide annual	G/B In by month	G/B In vs annual	CRAB #/m	BS Wide by month	BS wide annual	G/B In by month	
66-67, 163-164	1	1	6	17885	0.2	0.0	0.0	0.0	2.1	0.0	Best	0.0	0.0	4.7	0.0	Best	0.7	0.1	0.1	-5.0
66-67, 163-164	2	na	31	17885	na	na	na	0.0	2.1	na	na	na	3.4	4.7	na	na	na	0.0	0.1	na
66-67, 163-164	3	60	724	17885	0.1	0.0	0.0	0.0	2.1	-1.4	195.5	5.1	1.8	4.7	-2.8	-1.1	0.4	0.2	0.1	-1.7
66-67, 163-164	4	2	992	17885	0.0	0.0	0.0	0.1	2.1	Best	Best	0.0	2.2	4.7	Best	Best	0.0	0.1	0.1	Best
66-67, 163-164	6	284	3064	17885	0.1	0.0	0.8	2.5	2.1	4.0	3.4	2.1	2.9	4.7	1.4	2.9	1.8	0.4	0.1	-4.7
66-67, 163-164	8	na	2632	17885	na	na	na	na	2.1	na	na	na	7.9	4.7	na	na	na	0.1	0.1	na
66-67, 163-164	7	na	830	17885	na	na	na	2.1	2.1	na	na	na	7.6	4.7	na	na	na	0.1	0.1	na
66-67, 163-164	8	na	2478	17885	na	na	na	0.6	2.1	na	na	na	6.2	4.7	na	na	na	0.1	0.1	na
66-67, 163-164	9	na	3107	17885	na	na	na	0.4	2.1	na	na	na	2.1	4.7	na	na	na	0.0	0.1	na
66-67, 163-164	10	na	2670	17885	na	na	na	0.1	2.1	na	na	na	4.1	4.7	na	na	na	0.0	0.1	na
66-67, 163-164	11	na	1161	17885	na	na	na	0.0	2.1	na	na	na	9.2	4.7	na	na	na	0.0	0.1	na
66-67, 163-164	12	na	291	17885	na	na	na	0.0	2.1	na	na	na	6.6	4.7	na	na	na	0.1	0.1	na

AREA

Month	# Tows Count	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HERRING kg/m	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HALIBUT kg/m	BS Wide by month	BS wide annual	G/B In by month	G/B In vs annual	CRAB #/m	BS Wide by month	BS wide annual	G/B In by month	
66-67, 163-164	1	2	6	17885	0.4	0.0	0.0	0.0	2.1	0.0	Best	0.0	0.0	4.7	0.0	Best	0.4	0.1	0.1	-2.8
66-67, 163-164	2	1	31	17885	0.0	0.0	0.0	0.0	2.1	0.0	Best	13.4	3.4	4.7	-3.9	-2.8	0.3	0.0	0.1	-28.3
66-67, 163-164	3	80	724	17885	0.1	0.0	0.0	0.0	2.1	1.0	279.3	3.7	1.8	4.7	-2.1	1.3	0.6	0.2	0.1	-2.4
66-67, 163-164	4	3	992	17885	0.0	0.0	0.0	0.1	2.1	Best	Best	0.0	2.2	4.7	Best	Best	0.0	0.1	0.1	Best
66-67, 163-164	6	285	3064	17885	0.1	0.0	0.8	2.5	2.1	4.0	3.4	2.1	2.9	4.7	1.4	2.9	1.8	0.4	0.1	-4.7
66-67, 163-164	8	na	2632	17885	0.0	0.0	0.0	0.0	2.1	1.1	-4.3	0.0	7.9	4.7	Best	Best	3.0	0.1	0.1	-34.7
66-67, 163-164	7	na	830	17885	na	na	na	2.1	2.1	na	na	na	7.6	4.7	na	na	na	0.1	0.1	na
66-67, 163-164	8	na	2478	17885	na	na	na	0.6	2.1	na	na	na	6.2	4.7	na	na	na	0.1	0.1	na
66-67, 163-164	9	na	3107	17885	na	na	na	0.4	2.1	na	na	na	2.1	4.7	na	na	na	0.0	0.1	na
66-67, 163-164	10	na	2670	17885	na	na	na	0.1	2.1	na	na	na	4.1	4.7	na	na	na	0.0	0.1	na
66-67, 163-164	11	na	1161	17885	na	na	na	0.0	2.1	na	na	na	9.2	4.7	na	na	na	0.0	0.1	na
66-67, 163-164	12	na	291	17885	na	na	na	0.0	2.1	na	na	na	6.6	4.7	na	na	na	0.1	0.1	na

AREA

Month	# Tows Count	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HERRING kg/m	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HALIBUT kg/m	BS Wide by month	BS wide annual	G/B In by month	G/B In vs annual	CRAB #/m	BS Wide by month	BS wide annual	G/B In by month	
area 508	1	na	6	17885	na	na	na	0.0	2.1	na	na	na	0.0	4.7	na	na	na	0.1	0.1	na
area 508	2	na	31	17885	na	na	na	0.0	2.1	na	na	na	3.4	4.7	na	na	na	0.0	0.1	na
area 508	3	na	724	17885	na	na	na	0.0	2.1	na	na	na	1.8	4.7	na	na	na	0.2	0.1	na
area 508	4	na	992	17885	na	na	na	0.1	2.1	na	na	na	2.2	4.7	na	na	na	0.1	0.1	na
area 508	6	52	3064	17885	0.0	0.0	1.6	2.5	2.1	1.3	1.1	3.1	2.9	4.7	-1.1	1.6	0.9	0.4	0.1	-2.4
area 508	8	na	2632	17885	na	na	na	0.0	2.1	na	na	na	7.9	4.7	na	na	na	0.1	0.1	na
area 508	7	na	830	17885	na	na	na	2.1	2.1	na	na	na	7.6	4.7	na	na	na	0.1	0.1	na
area 508	8	6	2478	17885	0.0	0.0	2.3	0.6	2.1	-3.7	-1.1	40.6	6.2	4.7	-6.6	-6.6	0.0	0.1	0.1	Best
area 508	9	na	3107	17885	na	na	na	0.4	2.1	na	na	na	2.1	4.7	na	na	na	0.0	0.1	na
area 508	10	na	2670	17885	na	na	na	0.1	2.1	na	na	na	4.1	4.7	na	na	na	0.0	0.1	na
area 508	11	na	1161	17885	na	na	na	0.0	2.1	na	na	na	9.2	4.7	na	na	na	0.0	0.1	na
area 508	12	na	291	17885	na	na	na	0.0	2.1	na	na	na	6.6	4.7	na	na	na	0.1	0.1	na

AREA

Month	# Tows Count	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HERRING kg/m	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HALIBUT kg/m	BS Wide by month	BS wide annual	G/B In by month	G/B In vs annual	CRAB #/m	BS Wide by month	BS wide annual	G/B In by month	
Z1 5-56 + 5-164	1	1	6	17885	0.2	0.0	0.0	0.0	2.1	0.0	Best	0.0	0.0	4.7	0.0	Best	0.0	0.1	0.1	Best
Z1 5-56 + 5-164	2	3	31	17885	0.1	0.0	0.0	0.0	2.1	0.0	Best	8.1	3.4	4.7	-1.8	-1.8	0.0	0.0	0.1	1.1
Z1 5-56 + 5-164	3	na	724	17885	na	na	na	0.0	2.1	na	na	na	1.8	4.7	na	na	na	0.2	0.1	na
Z1 5-56 + 5-164	4	na	992	17885	na	na	na	0.1	2.1	na	na	na	2.2	4.7	na	na	na	0.1	0.1	na
Z1 5-56 + 5-164	6	8	3064	17885	0.0	0.0	1.6	2.5	2.1	1.5	1.3	4.5	2.9	4.7	-1.6	1.1	2.3	0.4	0.1	-6.2
Z1 5-56 + 5-164	8	na	2632	17885	na	na	na	0.0	2.1	na	na	na	7.9	4.7	na	na	na	0.1	0.1	na
Z1 5-56 + 5-164	7	na	830	17885	na	na	na	2.1	2.1	na	na	na	7.6	4.7	na	na	na	0.1	0.1	na
Z1 5-56 + 5-164	8	na	2478	17885	na	na	na	0.6	2.1	na	na	na	6.2	4.7	na	na	na	0.1	0.1	na
Z1 5-56 + 5-164	9	na	3107	17885	na	na	na	0.4	2.1	na	na	na	2.1	4.7	na	na	na	0.0	0.1	na
Z1 5-56 + 5-164	10	na	2670	17885	na	na	na	0.1	2.1	na	na	na	4.1	4.7	na	na	na	0.0	0.1	na
Z1 5-56 + 5-164	11	na	1161	17885	na	na	na	0.0	2.1	na	na	na	9.2	4.7	na	na	na	0.0	0.1	na
Z1 5-56 + 5-164	12	na	291	17885	na	na	na	0.0	2.1	na	na	na	6.6	4.7	na	na	na	0.1	0.1	na

GRB In vs annual	TAINERS #/mt	BS Wide annual	BS Wide by month	Duration minutes	GRB In vs annual	GRB In by month	BS Wide annual	BS Wide by month	GRB In vs annual	GRB In by month	CHIM # BS Wide /mt	CHIM # BS Wide by month	OSAL BS Wide /mt	OSAL BS Wide by month	GRB In vs annual	GRB In by month
-0.6	0.5	7.4	51.0	15.4	106.3	na	6.7	119	211	2.1	3.7	0.0	0.0	0.0	0.0	na
na	na	8.6	51.0	na	na	na	na	94	211	na	na	na	na	na	na	na
-3.3	4.2	9.8	51.0	2.2	12.2	na	90	87	211	-1.1	1.1	0.0	0.0	0.0	0.0	na
Best	3.4	16.4	51.0	4.6	15.1	na	198	118	211	-1.7	2.1	0.0	0.0	0.0	0.0	na
-13.7	6.9	22.4	51.0	3.8	6.7	na	85	167	211	2.0	2.6	0.0	0.0	0.0	0.0	na
na	na	19.9	51.0	na	na	na	na	216	211	na	na	na	na	na	na	na
na	na	17.3	51.0	na	na	na	na	226	211	na	na	na	na	na	na	na
na	na	99.1	51.0	na	na	na	na	230	211	na	na	na	na	na	na	na
na	na	78.5	51.0	na	na	na	na	266	211	na	na	na	na	na	na	na
na	na	60.4	51.0	na	na	na	na	244	211	na	na	na	na	na	na	na
na	na	74.2	51.0	na	na	na	na	248	211	na	na	na	na	na	na	na
na	na	90.6	51.0	na	na	na	na	167	211	na	na	na	na	na	na	na
-2.8	0.2	7.4	51.0	30.8	212.7	na	8.4	119	211	1.4	2.6	0.0	0.0	0.0	0.0	na
-2.7	0.0	8.6	51.0	Best	Best	na	80	84	211	1.6	3.6	0.0	0.0	0.0	0.0	na
-4.7	3.8	9.8	51.0	2.4	13.1	na	82	87	211	-1.1	2.3	0.0	0.0	0.0	0.0	na
Best	2.3	16.4	51.0	6.9	22.7	na	163	118	211	-1.3	1.4	0.0	0.0	0.0	0.0	na
-13.8	6.9	22.4	51.0	3.8	6.7	na	85	167	211	2.0	2.6	0.0	0.0	0.0	0.0	na
-28.6	0.0	19.9	51.0	Best	Best	na	180	216	211	1.2	1.2	0.0	0.4	0.1	0.6	na
na	na	17.3	51.0	na	na	na	na	220	211	na	na	na	na	na	na	na
na	na	99.1	51.0	na	na	na	na	230	211	na	na	na	na	na	na	na
na	na	78.5	51.0	na	na	na	na	266	211	na	na	na	na	na	na	na
na	na	60.4	51.0	na	na	na	na	244	211	na	na	na	na	na	na	na
na	na	74.2	51.0	na	na	na	na	248	211	na	na	na	na	na	na	na
na	na	90.6	51.0	na	na	na	na	167	211	na	na	na	na	na	na	na

GRB In vs annual	TAINERS #/mt	BS Wide annual	BS Wide by month	Duration minutes	GRB In vs annual	GRB In by month	BS Wide annual	BS Wide by month	GRB In vs annual	GRB In by month	CHIM # BS Wide /mt	CHIM # BS Wide by month	OSAL BS Wide /mt	OSAL BS Wide by month	GRB In vs annual	GRB In by month
na	na	7.4	51.0	na	na	na	6.7	119	211	na	na	na	na	na	na	na
na	na	8.6	51.0	na	na	na	na	94	211	na	na	na	na	na	na	na
na	na	9.8	51.0	na	na	na	na	87	211	na	na	na	na	na	na	na
na	na	16.4	51.0	na	na	na	na	118	211	na	na	na	na	na	na	na
-7.0	0.2	22.4	51.0	38.8	213.2	na	177	167	211	-1.1	1.2	0.0	0.2	0.1	0.6	na
na	na	19.9	51.0	na	na	na	na	216	211	na	na	na	na	na	na	na
na	na	17.3	51.0	na	na	na	na	220	211	na	na	na	na	na	na	na
Best	0.0	99.1	51.0	Best	Best	na	217	230	211	1.1	-1.0	0.0	0.0	0.1	0.0	na
na	na	78.5	51.0	na	na	na	na	266	211	na	na	na	na	na	na	na
na	na	60.4	51.0	na	na	na	na	244	211	na	na	na	na	na	na	na
na	na	74.2	51.0	na	na	na	na	248	211	na	na	na	na	na	na	na
na	na	90.6	51.0	na	na	na	na	167	211	na	na	na	na	na	na	na
na	na	90.6	51.0	na	na	na	na	167	211	na	na	na	na	na	na	na
11.7	6.4	8.6	51.0	1.3	7.9	na	147	94	211	-1.6	1.4	0.0	0.0	0.0	0.0	na
na	na	9.8	51.0	na	na	na	na	87	211	na	na	na	na	na	na	na
na	na	15.4	51.0	na	na	na	na	118	211	na	na	na	na	na	na	na
-10.1	0.9	22.4	51.0	24.3	56.4	na	128	167	211	1.3	1.6	0.0	0.2	0.1	0.6	na
na	na	19.9	51.0	na	na	na	na	216	211	na	na	na	na	na	na	na
na	na	17.3	51.0	na	na	na	na	220	211	na	na	na	na	na	na	na
na	na	99.1	51.0	na	na	na	na	230	211	na	na	na	na	na	na	na
na	na	78.5	51.0	na	na	na	na	266	211	na	na	na	na	na	na	na
na	na	60.4	51.0	na	na	na	na	244	211	na	na	na	na	na	na	na
na	na	74.2	51.0	na	na	na	na	248	211	na	na	na	na	na	na	na
na	na	90.6	51.0	na	na	na	na	167	211	na	na	na	na	na	na	na

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GIB In vs annual	TAMMERS	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	Duration minutes	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	CHIM # BS Wide annual	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	OSAL BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual
Best	12.2	8.6	61.0	-1.4	4.2	63	94	211	na	na	3.4	0.0	0.1	na	na	0.0	0.0	na	na
Best	-3.8	9.3	61.0	1.1	6.8	88	87	211	1.6	1.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	-1.8	10.5	61.0	1.5	4.9	118	118	211	1.0	2.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	-10.8	18.4	61.0	1.2	2.6	136	167	211	-1.2	1.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	-2.6	12.0	61.0	1.7	4.3	222	218	211	1.2	1.6	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	na	17.3	61.0	na	na	na	220	211	-1.6	-1.1	0.0	0.4	0.1	na	na	0.0	0.0	0.0	Best
Best	2.0	8.1	61.0	48.4	26.5	183	230	211	na	na	na	na	0.1	na	na	2.0	0.0	na	na
Best	14.8	76.5	61.0	5.2	3.6	257	265	211	1.2	1.1	0.0	0.0	0.1	0.0	0.0	1.3	0.0	0.0	Best
Best	-5.9	6.0	60.4	10.1	8.5	113	244	211	-1.0	-1.2	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	Best
Best	1.4	12.9	74.2	51.0	5.8	4.0	246	211	2.8	2.2	0.0	0.6	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	na	na	80.5	61.0	na	na	167	211	na	na	na	na	0.0	0.0	na	0.0	0.0	na	na

GIB In vs annual	TAMMERS	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	Duration minutes	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	CHIM # BS Wide annual	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	OSAL BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual
Best	0.0	8.6	61.0	na	na	na	119	211	na	na	1.6	0.0	0.1	na	na	0.0	0.0	na	na
Best	1.6	9.5	61.0	-3.0	5.4	148	87	211	-1.8	1.1	2.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	-2.8	11.4	61.0	1.4	4.5	148	118	211	-1.2	1.4	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	na	na	22.4	61.0	na	na	167	211	na	na	na	0.2	0.1	na	na	0.0	0.0	0.0	Best
Best	na	na	19.9	61.0	na	na	216	211	na	na	na	0.4	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	17.9	61.0	na	na	220	211	na	na	na	0.0	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	80.1	61.0	na	na	250	211	na	na	na	0.0	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	78.5	61.0	na	na	265	211	na	na	na	0.1	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	60.4	61.0	na	na	244	211	na	na	na	0.1	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	74.2	61.0	na	na	248	211	na	na	na	0.6	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	90.5	61.0	na	na	167	211	na	na	na	0.0	0.1	na	na	0.0	0.0	0.0	na

GIB In vs annual	TAMMERS	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	Duration minutes	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	CHIM # BS Wide annual	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	OSAL BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual
Best	7.4	8.6	61.0	na	na	na	119	211	na	na	na	0.0	0.1	na	na	0.0	0.0	na	na
Best	na	8.6	61.0	na	na	na	94	211	na	na	na	0.0	0.1	na	na	0.0	0.0	na	na
Best	na	9.3	61.0	na	na	na	87	211	na	na	na	0.0	0.1	na	na	0.0	0.0	na	na
Best	na	15.4	61.0	na	na	na	118	211	na	na	na	0.0	0.1	na	na	0.0	0.0	na	na
Best	-1.4	0.0	22.4	61.0	486.7	306	167	211	-1.8	-1.6	0.0	0.2	0.1	Best	0.6	0.1	0.0	-1.2	0.0
Best	6.4	0.0	19.9	61.0	3200.2	6197.7	216	211	-3.8	-3.3	0.4	0.4	0.1	-1.2	-2.9	3.4	1.6	0.0	-0.0
Best	4.9	17.3	61.0	3.6	10.6	171	220	211	1.3	1.2	0.0	0.0	0.1	0.0	0.0	2.0	0.0	0.0	Best
Best	0.9	98.1	61.0	314.3	161.8	162	230	211	2.8	2.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	na	na	78.6	61.0	na	na	265	211	na	na	na	0.1	0.1	na	na	0.0	0.0	0.0	-1.93.8
Best	na	na	90.4	61.0	na	na	244	211	na	na	na	0.1	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	74.2	61.0	na	na	248	211	na	na	na	0.6	0.1	na	na	0.0	0.0	0.0	na
Best	na	na	90.5	61.0	na	na	167	211	na	na	na	0.0	0.1	na	na	0.0	0.0	0.0	na

GIB In vs annual	TAMMERS	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	Duration minutes	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	CHIM # BS Wide annual	BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual	OSAL BS Wide annual	BS Wide annual	GIB In vs annual	GIB In vs annual
Best	7.4	8.6	61.0	na	na	na	119	211	na	na	na	0.0	0.1	na	na	0.0	0.0	na	na
Best	14.7	8.9	61.0	-1.8	3.6	132	87	211	-1.5	1.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	16.4	15.4	61.0	-1.1	3.1	137	118	211	-1.2	1.6	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	8.9	22.4	61.0	-3.1	-1.4	166	167	211	1.1	1.4	0.0	0.2	0.1	Best	0.0	0.1	0.0	0.0	Best
Best	-4.1	102.8	19.9	61.0	-8.7	215	216	211	1.0	-1.0	0.0	0.4	0.1	Best	0.0	1.6	0.0	0.0	Best
Best	1.8	187.6	89.1	61.0	-8.0	-2.7	196	211	1.1	1.1	0.0	0.6	0.1	0.0	0.0	2.0	0.0	0.0	Best
Best	116.4	76.5	61.0	-1.2	-2.3	221	230	211	1.0	-1.0	0.0	0.0	0.1	0.0	0.0	1.3	0.0	0.0	Best
Best	4.1	61.8	76.5	61.0	1.2	248	255	211	1.0	-1.2	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.0	Best
Best	5.6	41.7	60.4	61.0	1.6	1.2	288	244	1.0	-1.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	Best
Best	1.0	67.9	74.2	61.0	1.1	-1.3	278	248	211	-1.1	-1.3	0.7	0.6	0.1	-1.3	-4.6	0.0	0.0	Best
Best	1.7	86.5	90.5	61.0	-1.7	168	167	211	-1.0	3.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	Best

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AREA	Month	# Tows Count	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HERRING kg/ml	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HALIBUT kg/ml	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	K CRAB #/mt	BS Wide by month	BS Wide annual	G/B In by month
2s<50 5, 165-168 6		na	5	17885	na	na	na	0.0	2.1	na	na	na	0.0	4.7	na	na	na	0.1	0.1	na
2s<50 5, 165-168 5	2	3	31	17885	0.1	0.0	0.0	0.0	2.1	0.0	Best	0.0	3.4	4.7	Best	0.0	0.0	0.1	0.1	na
2s<50 5, 165-168 5	3	58	724	17885	0.1	0.0	0.0	0.0	2.1	Best	Best	1.2	18	4.7	1.5	4.0	0.0	0.2	0.1	Best
2s<50 5, 165-168 5	4	440	992	17885	0.4	0.0	0.0	0.1	2.1	155	2248	2.8	22	4.7	-1.3	1.7	0.0	0.1	0.1	1.9
2s<50 5, 165-168 5	5	na	3054	17885	na	na	na	2.5	2.1	na	na	na	2.9	4.7	na	na	na	0.4	0.1	na
2s<50 5, 165-168 5	6	na	2532	17885	na	na	na	9.9	2.1	na	na	na	7.9	4.7	na	na	na	0.1	0.1	na
2s<50 5, 165-168 5	7	na	830	17885	na	na	na	2.1	2.1	na	na	na	7.6	4.7	na	na	na	0.1	0.1	na
2s<50 5, 165-168 5	8	na	2478	17885	na	na	na	0.6	2.1	na	na	na	0.2	4.7	na	na	na	0.1	0.1	na
2s<50 5, 165-168 5	9	2	3107	17885	0.0	0.0	0.0	0.4	2.1	Best	Best	0.0	2.1	4.7	Best	Best	0.0	0.0	0.1	Best
2s<50 5, 165-168 5	10	2	2670	17885	0.0	0.0	0.0	0.1	2.1	Best	Best	11.6	4.1	4.7	-2.9	-2.6	0.0	0.0	0.1	Best
2s<50 5, 165-168 5	11	na	1181	17885	na	na	na	0.0	2.1	na	na	na	9.2	4.7	na	na	na	0.1	0.1	na
2s<50 5, 165-168 5	12	na	291	17885	na	na	na	0.0	2.1	na	na	na	6.6	4.7	na	na	na	0.1	0.1	na

AREA	Month	# Tows Count	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HERRING kg/ml	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HALIBUT kg/ml	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	K CRAB #/mt	BS Wide by month	BS Wide annual	G/B In by month
35-57 95, 168 5-171	1	1	6	17885	0.2	0.0	0.0	0.0	2.1	0.0	Best	2.6	0.0	4.7	Best	1.9	0.0	0.1	0.1	Best
35-57 95, 168 5-171	2	1	31	17885	0.0	0.0	0.0	0.0	2.1	0.0	Best	0.0	3.4	4.7	Best	Best	0.0	0.0	0.1	Best
35-57 95, 168 5-171	3	2	724	17885	0.0	0.0	0.0	0.0	2.1	Best	Best	0.0	18	4.7	Best	Best	0.0	0.2	0.1	Best
35-57 95, 168 5-171	4	na	992	17885	na	na	na	0.1	2.1	na	na	na	2.2	4.7	na	na	na	0.1	0.1	na
35-57 95, 168 5-171	5	84	5064	17885	0.0	0.0	0.9	2.6	2.1	7.1	6.1	3.7	2.9	4.7	-1.3	1.3	0.0	0.4	0.1	Best
35-57 95, 168 5-171	6	na	2532	17885	na	na	na	9.9	2.1	na	na	na	7.9	4.7	na	na	na	0.1	0.1	na
35-57 95, 168 5-171	7	4	830	17885	0.0	0.0	0.0	2.1	2.1	Best	Best	0.0	7.6	4.7	Best	Best	0.9	0.1	0.1	-12.2
35-57 95, 168 5-171	8	104	2478	17885	0.0	0.0	0.9	0.6	2.1	2.1	7.1	0.2	6.2	4.7	30.5	23.0	0.9	0.1	0.1	-10.2
35-57 95, 168 5-171	9	109	3107	17885	0.0	0.0	9.1	0.4	2.1	-7.6	-1.6	1.1	2.1	4.7	1.6	4.2	2.4	0.0	0.1	-66.0
35-57 95, 168 5-171	10	89	2670	17885	0.0	0.0	0.8	0.1	2.1	-9.7	7.0	1.4	4.1	4.7	2.6	3.3	0.2	0.0	0.1	-8.9
35-57 95, 168 5-171	11	142	1181	17885	0.1	0.0	0.0	0.0	2.1	Best	Best	6.9	9.2	4.7	1.0	-1.9	0.1	0.1	0.1	-27.8
35-57 95, 168 5-171	12	26	291	17885	0.1	0.0	0.0	0.0	2.1	0.0	Best	7.8	6.6	4.7	-1.1	-1.6	0.9	0.1	0.1	Best

AREA	Month	# Tows Count	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HERRING kg/ml	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	HALIBUT kg/ml	BS Wide by month	BS Wide annual	G/B In by month	G/B In vs annual	K CRAB #/mt	BS Wide by month	BS Wide annual	G/B In by month
all yfs	1	5	5	17885	1.2	0.0	0.0	0.0	2.1	0.0	Best	0.4	0.0	4.7	Best	11.0	0.1	0.1	0.1	1.2
all yfs	2	32	31	17885	1.0	0.0	0.0	0.0	2.1	0.0	Best	9.3	3.4	4.7	1.0	1.4	0.0	0.0	0.1	1.0
all yfs	3	728	724	17885	1.0	0.0	0.0	0.0	2.1	1.0	271.0	9.6	1.8	4.7	1.0	2.6	0.2	0.2	0.1	1.0
all yfs	4	992	992	17885	1.0	0.1	0.1	0.1	2.1	0.0	14.5	2.2	2.2	4.7	0.0	2.1	0.1	0.1	0.1	0.0
all yfs	6	8148	3054	17885	1.0	0.2	2.4	2.5	2.1	1.0	-1.1	2.9	2.9	4.7	-1.0	1.6	0.4	0.4	0.1	1.0
all yfs	6	2632	2532	17885	1.0	0.1	9.9	9.9	2.1	0.0	-4.7	7.9	7.9	4.7	0.0	-1.7	0.1	0.1	0.1	0.0
all yfs	7	834	830	17885	1.0	0.0	2.1	2.1	2.1	1.0	1.0	7.6	7.6	4.7	1.0	-1.6	0.1	0.1	0.1	-1.1
all yfs	8	2682	2478	17885	1.0	0.1	0.6	0.6	2.1	1.0	3.4	6.0	6.2	4.7	1.0	-1.3	0.1	0.1	0.1	-1.4
all yfs	9	8216	3107	17885	1.0	0.2	0.5	0.4	2.1	-1.2	4.2	2.0	2.1	4.7	1.0	2.3	0.1	0.0	0.1	-3.3
all yfs	10	2759	2670	17885	1.0	0.2	0.1	0.1	2.1	-1.1	23.0	4.0	4.1	4.7	1.0	1.2	0.1	0.0	0.1	-1.1
all yfs	11	1803	1181	17885	1.1	0.1	0.0	0.0	2.1	1.1	1429.0	0.2	9.2	4.7	1.0	-1.9	0.4	0.1	0.1	-9.9
all yfs	12	316	291	17885	1.1	0.0	0.0	0.0	2.1	0.0	Best	8.7	6.6	4.7	-1.0	-1.4	0.1	0.1	0.1	1.1
all yfs	all year	18448					2.1	0.0	2.1	0.0	Best	4.7	6.6	4.7	-1.0	-1.4	0.2	0.1	0.1	1.1

EFFECTS OF MAN AND NATURE ON BRISTOL BAY RED KING CRABS

*Oral Report to the North Pacific Fishery Management Council
June 10-16, 1996*

An outline map of the state of Alaska, showing its coastline and major islands. The map is centered on the page and serves as a background for the text.

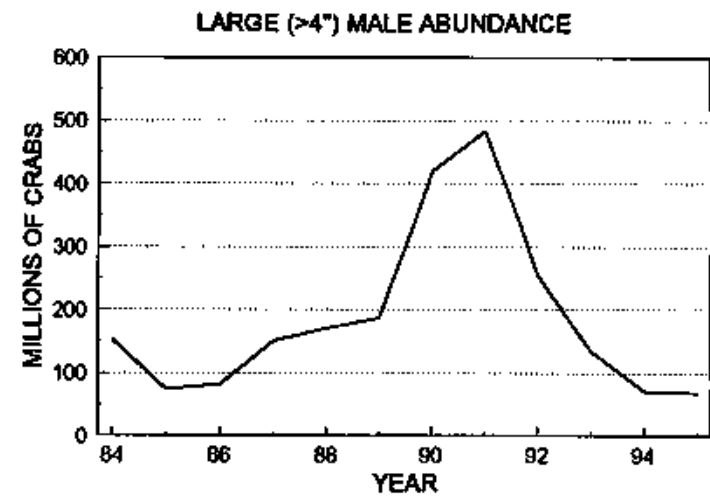
**COPIES OF
PRESENTATION OVERHEADS**

Gordon H. Kruse
Alaska Department of Fish and Game
Juneau, AK

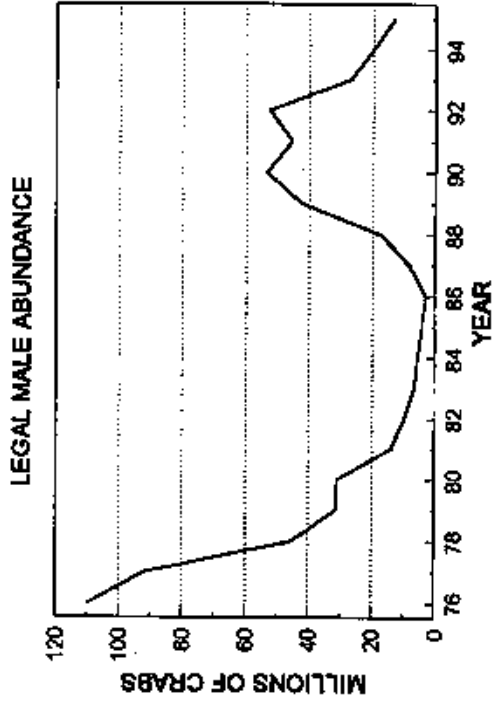
PURPOSE

- Summarize Crab Stock Changes
- Evaluate Potential Causes
- Review Relevant Fishery Management Actions

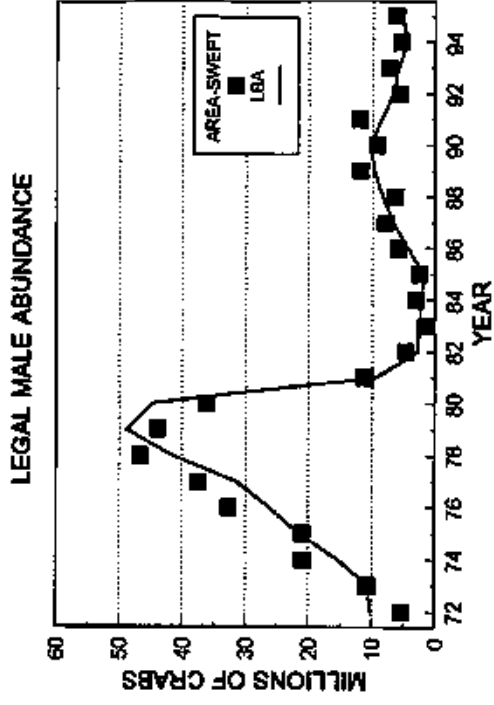
ABUNDANCE: SNOW CRABS



ABUNDANCE: TANNER CRABS

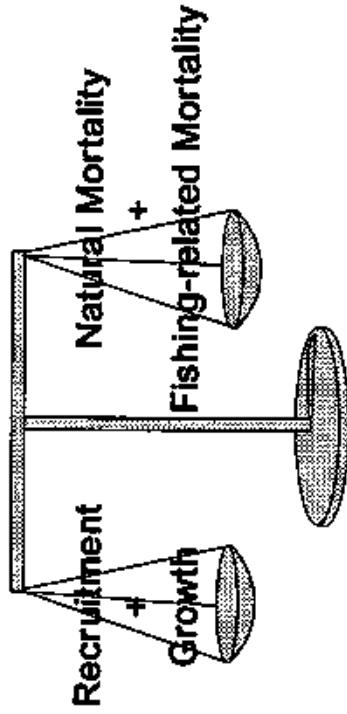


ABUNDANCE: RED KING CRABS

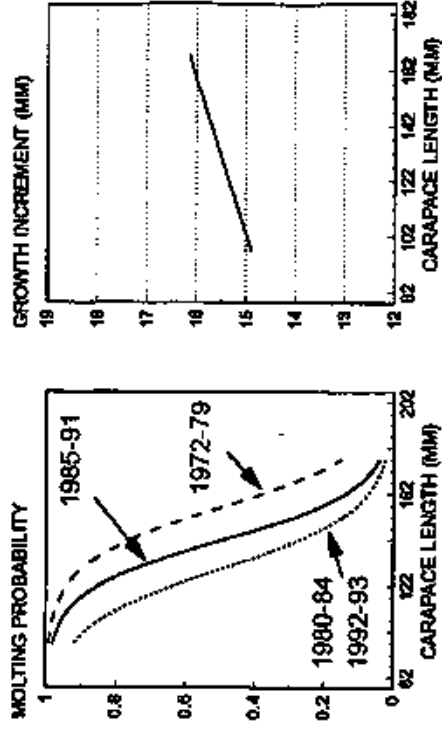


STOCK PRODUCTIVITY

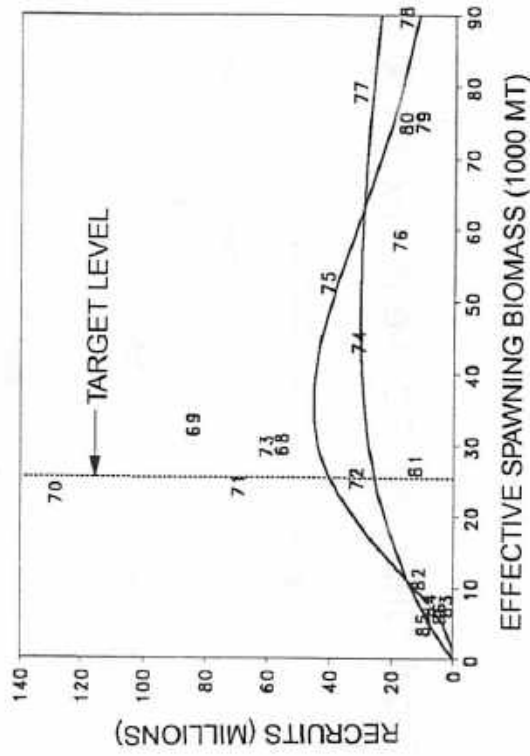
Stock Change = Additions - Removals



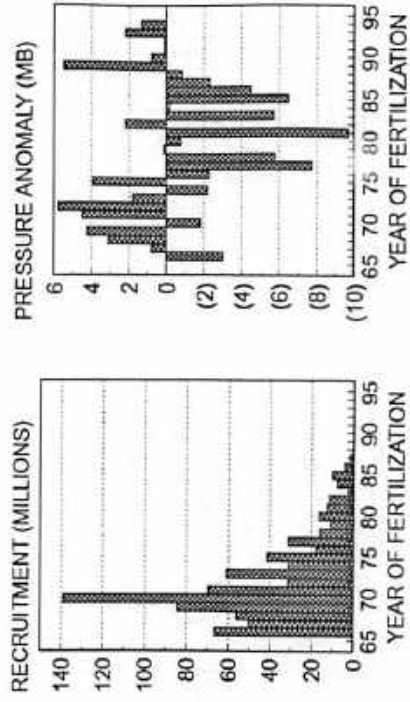
GROWTH



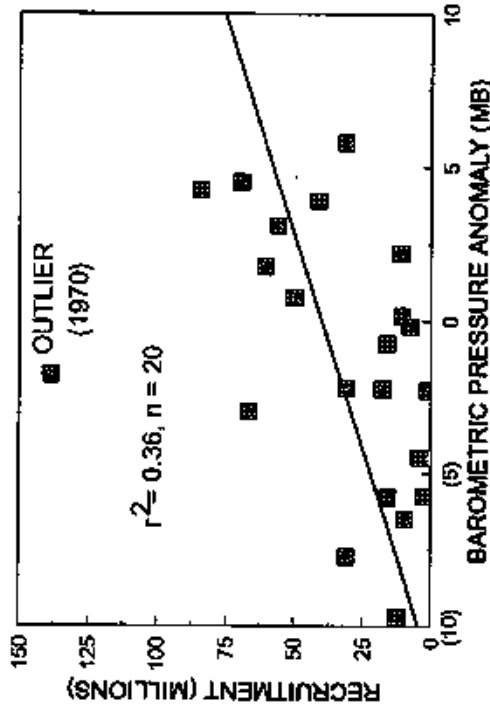
STOCK-RECRUIT RELATIONSHIP



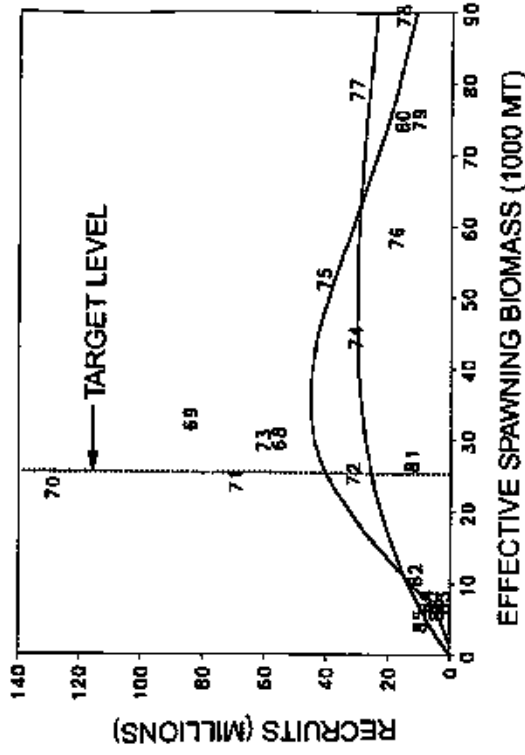
RECRUITMENT AND AIR PRESSURE



RECRUITMENT VS. AIR PRESSURE



STOCK-RECRUIT RELATIONSHIP

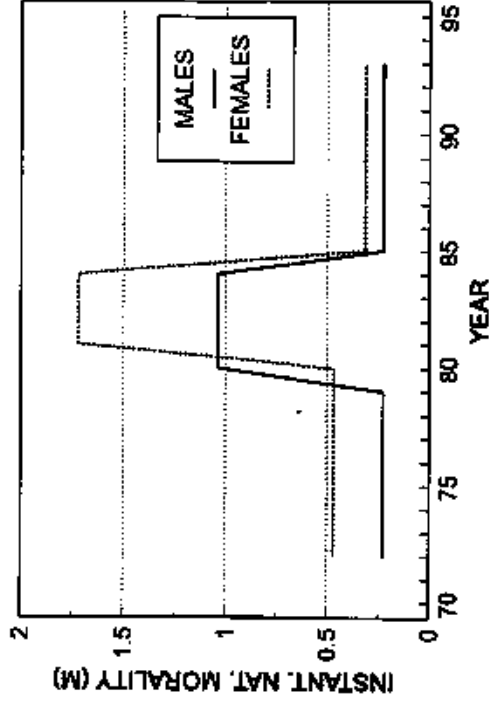


Note: Stock-recruit curve does not fully account for complex reproductive behavior of red king crabs.

BENEFITS OF LARGE MALES

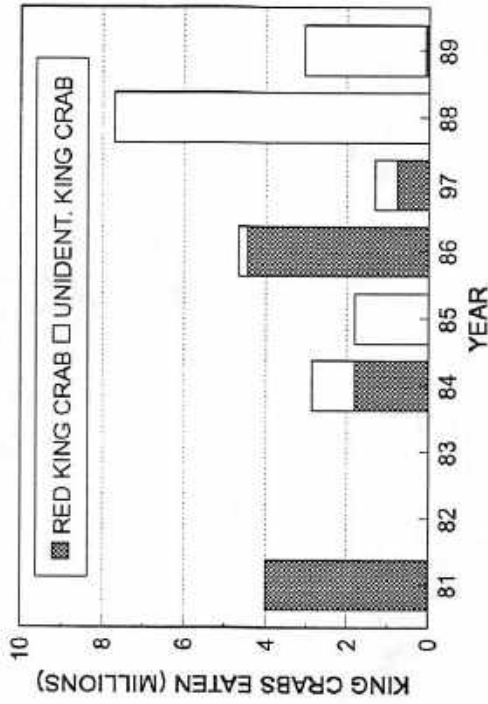
- Sperm produced at 50-59 mm CL, but only males >130 mm CL in mating pairs
- Most males >163 mm CL in mating pairs
- Males (80-89 mm CL) mate with 1 female and males (>120 mm CL) mate with 4 females
- Females mated by larger males have higher percentage of fertilized eggs

NATURAL MORTALITY



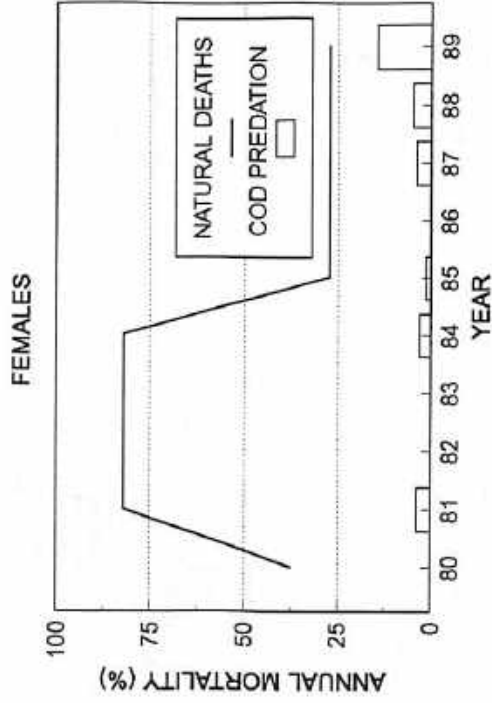
Note: Red king crabs are generally long-lived with maximum age > 20 years.

GROUNDFISH PREDATION



Note: Most red king crabs are softshell females eaten by Pacific cod in May.

COD PREDATION & CRAB MORTALITY



Note: High female red king crab mortality during the early 1980s appears unrelated to known levels of predation by Pacific cod.

COD DIET (PERCENT BY WEIGHT)

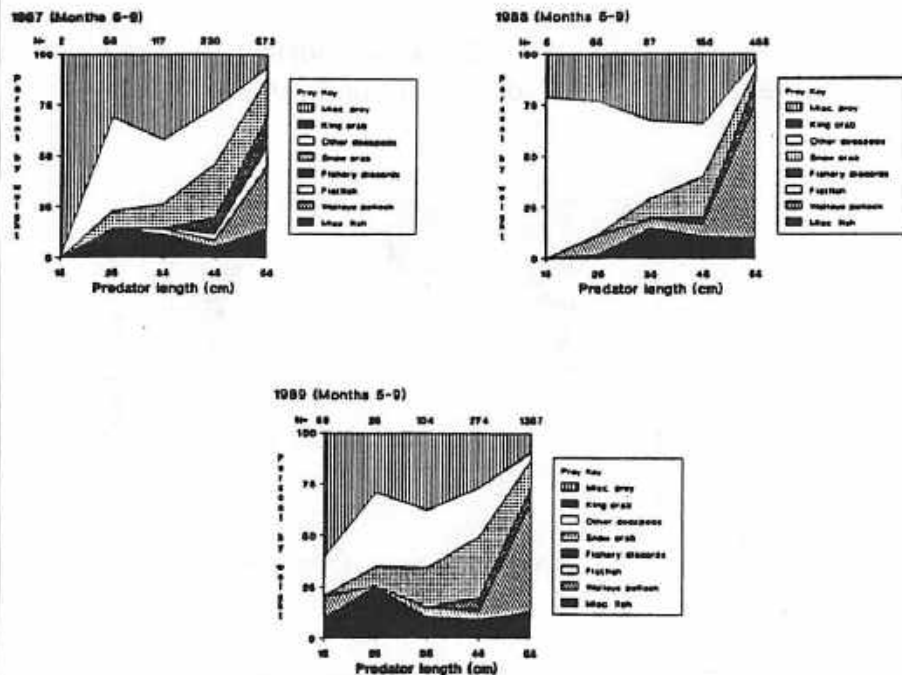


Figure B-1.--Diet composition of Pacific cod, in terms of percent by weight, during months 5 to 9 by year and predator size in the eastern Bering Sea. N = number of stomachs.

COD DIET

Table 1.--Diet of Pacific cod, *Gadus macrocephalus*, in the eastern Bering Sea expressed in percent frequency of occurrence (FO), percent number (N), and percent weight (W).

Prey name*	FO	N	W
Polychaeta (worm)	46.30	6.17	1.16
Gastropoda (snail)	9.89	0.74	0.69
Bivalvia (clam)	6.63	0.53	0.18
Cephalopoda (squid & octopus)	5.51	0.27	1.64
Crustacea	3.53	1.04	0.01
Mysidacea (mysid)	17.33	3.93	0.09
Amphipoda (amphipod)	42.81	14.90	0.23
Euphausiacea (euphausiid)	13.20	25.51	0.48
Decapoda (shrimp & crab)	5.74	0.31	0.32
Caridea (shrimp)	9.81	1.34	0.10
Pandalidae (shrimp)	9.06	1.11	0.96
Crangonidae (shrimp)	16.93	7.08	0.97
Paguridae (hermit crab)	23.31	1.20	1.98
Lithodidae (king crab)	0.31	0.01	0.04
<i>Paralithodes</i> sp. (king crab)	1.18	0.05	0.43
<i>Paralithodes camtschatica</i> (red king crab)	0.81	0.04	1.28
<i>Paralithodes platypus</i> (blue king crab)	0.01	0.00	0.01
<i>Chionoecetes</i> sp.	11.97	1.10	1.49
<i>Chionoecetes opilio</i> (snow crab)	12.06	1.63	4.93
<i>Chionoecetes bairdi</i> (Tanner crab)	13.74	2.08	2.42
Echiura (marine worm)	15.39	1.74	1.00
Osteichthyes Teleostei (fish)	30.50	17.71	4.96
<i>Clupea harengus pallasii</i> (Pacific herring)	0.50	0.05	0.99
<i>Oncorhynchus</i> sp. (salmon)	0.01	0.00	0.01
Osmeridae (smelts)	0.32	0.07	0.23
Gadidae (gadid fish)	6.63	0.38	4.76
<i>Gadus macrocephalus</i> (Pacific cod)	0.39	0.03	0.69
<i>Theragra chalcogramma</i> (walleye pollock)	15.52	1.28	19.33
Zoarcidae (eelpout)	2.79	0.19	1.64
Cottidae (sculpin)	1.02	0.05	0.36
Agonidae (poacher)	1.57	0.09	0.11
Stichaeidae (prickleback)	0.89	0.05	0.08
<i>Ammodytes</i> sp. (sandlance)	2.71	0.63	0.66
Fleuronectidae (flatfish)	6.96	0.50	3.60
<i>Atheresthes stomias</i> (arrowtooth flounder)	0.21	0.01	0.15
<i>Hippoglossoides glassodon</i> (flathead sole)	0.61	0.03	0.40
<i>Lepidopsetta bilineata</i> (rock sole)	1.21	0.10	1.32
<i>Limanda aspera</i> (yellowfin sole)	2.43	0.24	6.01
<i>Limanda proboscidea</i> (longhead dab)	0.07	0.00	0.08
<i>Hippoglossus stenolepis</i> (Pacific halibut)	0.01	0.00	0.09
Fishery discards	5.22	0.57	13.14
Miscellaneous and unidentified prey	12.91	7.23	1.00

SOURCES OF FISHING MORTALITY

DIRECTED FISHERIES

- Commercial Catch
- "Catching Mortality"
- Handling Mortality of Non-legals

NON-DIRECTED FISHERIES

- Handling Mortality of Bycatch
- Trawl/dredge Effects on Non-captured Crabs
- Trawl/dredge Effects on Habitats

LOST FISHING GEAR

- Ghost Fishing

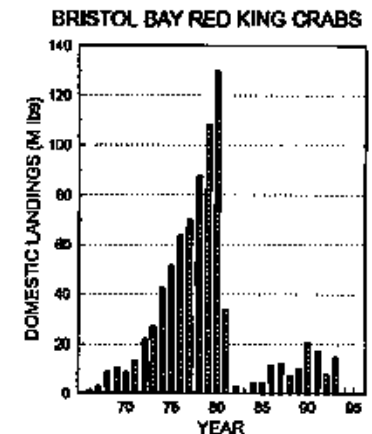
COMMERCIAL CATCH

Definition

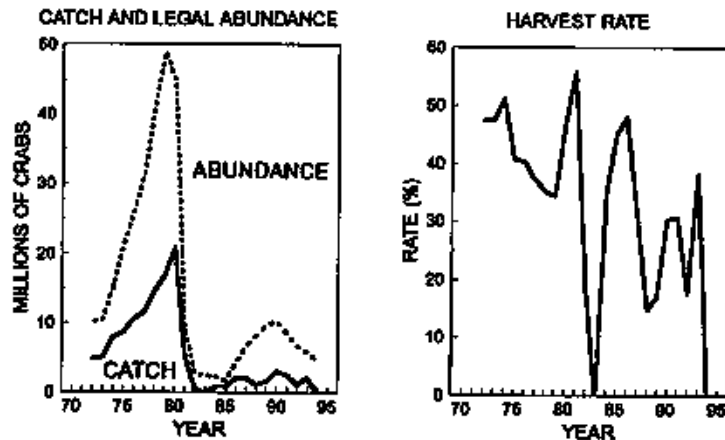
Landings of legal-sized male crabs of average age 5-12 years.

Knowledge

Excellent fish ticket, observer, and dockside sampling programs.



HARVEST RATE



Management Actions

Catch (GHL) is set by exploitation rate, and fishery closed when stock below threshold. A rebuilding plan has been implemented based on comprehensive analysis of population dynamics.

CATCHING MORTALITY

Definition

Mortality that occurs in pot prior to retrieval during fishing operations (e.g., failure to tend pots).

Knowledge

Cannibalism on molting crabs - lab/field studies.
Predation by octopi, fishes - anecdotal evidence.

Management Actions

Red king crab fishing seasons set to avoid molting periods. Shorter seasons and pot limits encourage pot tending.

TRAWL/DREDGE EFFECTS ON NON-CAPTURED CRABS

Definition

Trawls and dredges interact with some benthic animals (including crabs) that may suffer injuries but are not caught by the gear.

Knowledge

Revealed by underwater videos, but magnitude remains unquantified.

Management Actions

Trawl/dredge closures in areas of high crab density or during sensitive crab life history periods such as mating and molting.

TRAWL/DREDGE EFFECTS ON HABITAT

Definition

Trawls and dredges plow bottom, suspend sediments, and may alter bio-physical features.

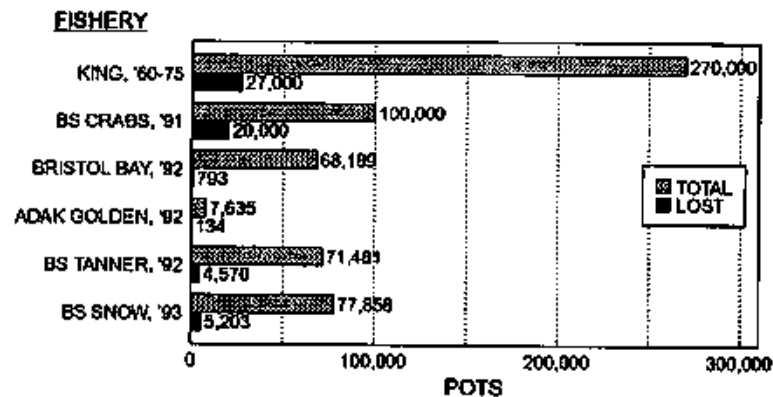
Knowledge

Young red king crabs require specific habitat (e.g., rocks, shell hash, worm tubes, sea onions, bryozoans, and mussels) for survival. Trawl effects not studied in Alaska, but studies elsewhere show effects from minimal to severe. Effects depend on depth, bottom type, ocean currents, weight of gear, and degree of contact.

Management Actions

Some waters closed to trawling/dredging, in part, due to habitat concerns. Geographic Information Systems (GIS) used to identify critical areas.

GHOST FISHING



Definition

Lost gear catches crabs that later die.

Knowledge

- 10% - King crab, 1960-1975
- 20% - All BS crabs, 1991
- 1.2% - Bristol Bay red king crab, 1992
- 1.7% - Adak golden king crab, 1992
- 6.4% - BS Tanner crab, 1992
- 6.7% - BS snow crab, 1993

GHOST FISHING (continued)

Knowledge

- 92% sublegal, 80% legal king crabs escape lost gear

Management Actions

- 1974 - BOF adopted first biodegradable regulation in Southeast Alaska
- 1976/77 - Alaska Statute/BOF adopted 120 cotton thread regulation
- 1990 - BOF adopted 30 cotton thread for pot gear
- 1993 - BOF allowed 30 day galvanic timed release (GTR) and adopted pot limits in Bering Sea crab fisheries

BYCATCH IN TRAWL FISHERIES

Definition

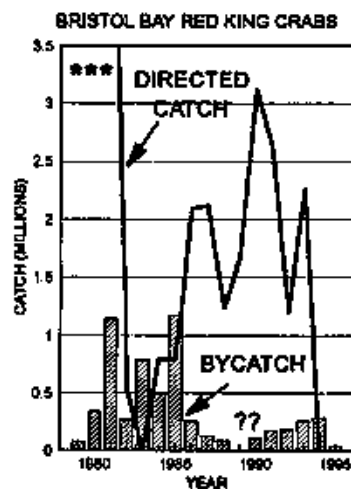
Incidental capture of crabs by trawls.

Knowledge

Onboard observer data. Size/sex data could be improved.

Management Actions

Area closures (e.g., Pribilof Is.) and bycatch caps (e.g., Bristol Bay).



* NOTE - Catch was 16.8, 20.8 & 5.3 million crabs in 1979, 1980 & 1981.

BYCATCH IN CRAB FISHERIES

Definition

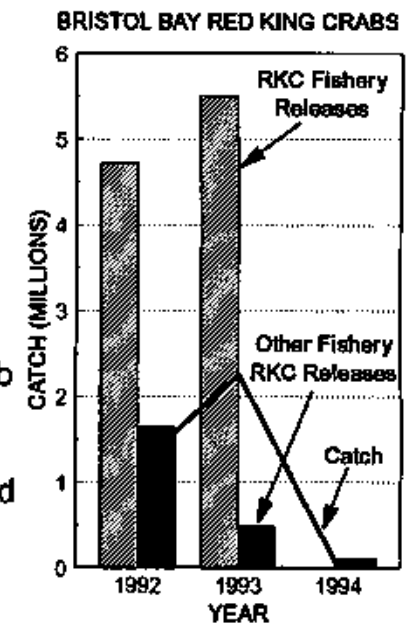
Incidental catch of female and sublegal male crabs.

Knowledge

Onboard observer data.

Management Actions

Gear design (3" tunnels), concurrent king/Tanner crab openings, Tanner crab fishery closed east of 163 W when king/Tanner crab fisheries conclude and if no king crab fishery.



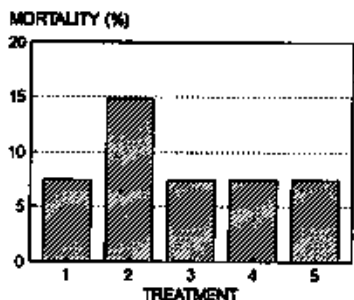
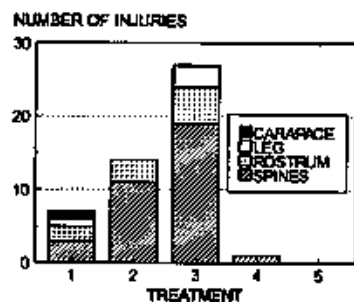
LAB STUDY OF HANDLING EFFECTS ON RED KING CRAB

Treatment (N=27 X 5)

1. Handled 1X
2. Handled 2X
3. Handled 3X
4. Modified Handling
5. Control

Results

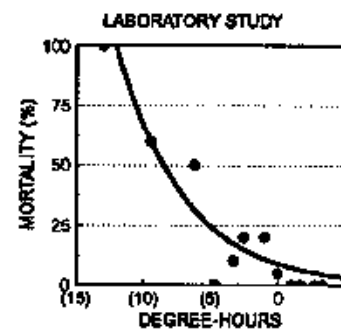
- Effect on *Injury Rate*
- No Effect on:
 - ▶ Vigor
 - ▶ Feeding
 - ▶ Growth
 - ▶ Mortality



LAB STUDY OF COLD AIR EXPOSURE ON RED KING CRAB

DEGREE-HOUR COMBINATIONS
TEMPERATURE C(F)

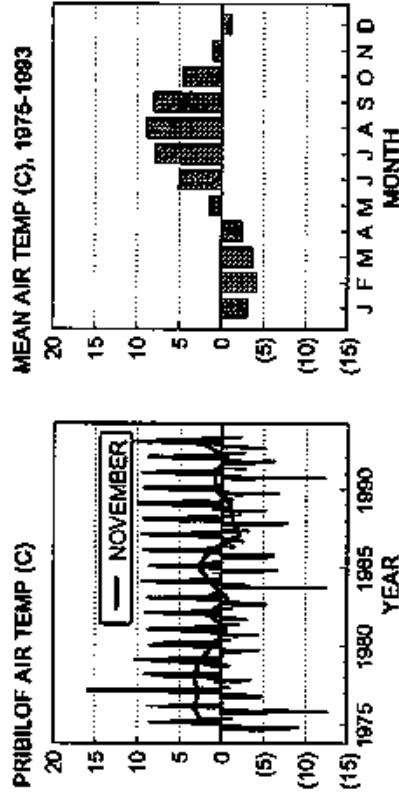
TIME (MINUTES)	-25(-13)	-15(5)	-5(23)	0(32)
2.5	-1.0	-0.6	-0.2	0
5	-2.1	-1.3	-0.4	0
15	-6.3	-3.8	-1.3	0
30	-12.5	-7.5	-2.5	0
60	-25.0	-15.0	-5.0	0



Results

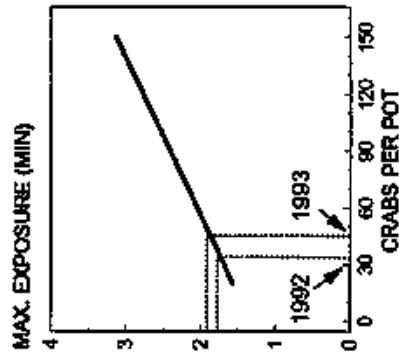
- No mortality above 0 degree-hours
- 0-20% mortality between 0 to -5 degree-hours
- High mortality below -5 degree-hours

CRAB FISHERY EXPOSURE TEMPERATURE AND DURATION



Findings:

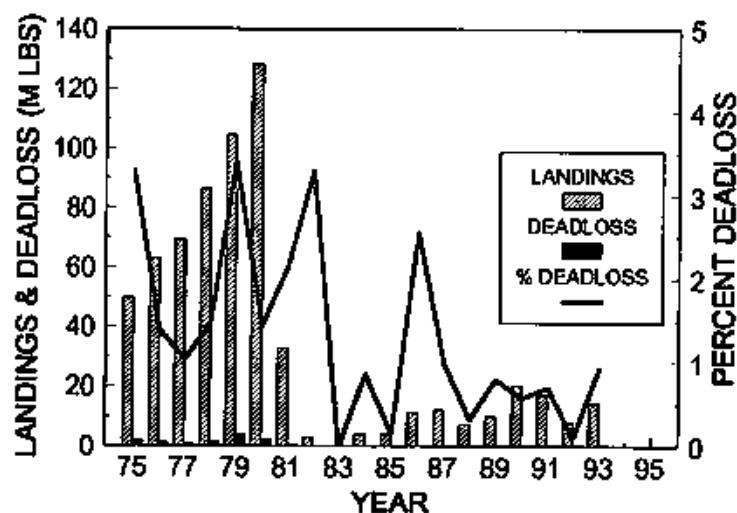
- Mean Nov. temp. = 1.1 C
- Temp. varies by day and year
- Other months fished previously
- Short exposure duration
- Mean degree-hour exposure likely causes little mortality in November king crab fishery



FIELD STUDIES OF HANDLING EFFECTS ON RED KING CRAB

- **Release Method** - no effect on lag recovery rate (control: 27.1%, treatment: 27.4%)
- **Historical Tag/Recapture Studies** - high rates of tag return from commercial fishery
- **Observed Injury Rate** - 0.2% of crabs had fresh injuries in 1991-1993
- **Observed Death Rate** - 0.02% of crabs were dead in 1991-1993
- **Trawl Effects** - 79% of trawled king crabs died in 2 days, but mortality depends on tow length and time aboard. Study was conducted on joint-venture sole trawler and may not be representative of current domestic fishery

DEADLOSS IN BRISTOL BAY RED KING CRAB FISHERY

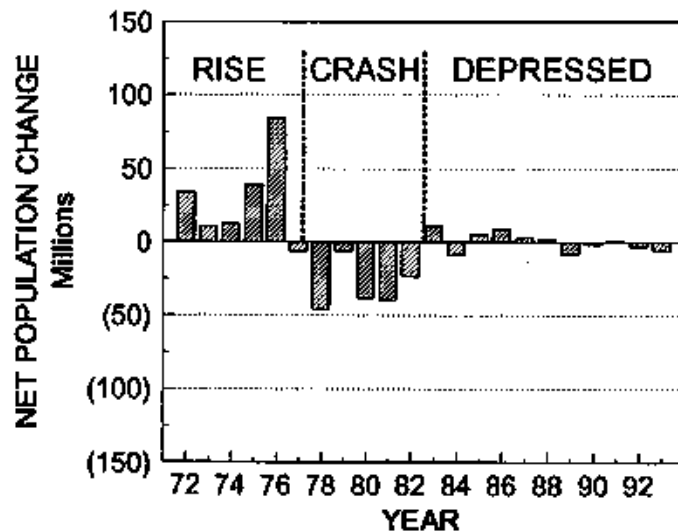


SUMMARY OF FISHING-RELATED MORTALITY

- **Fishing-related mortality** - affects fishery productivity and should be fully accounted
- **Commercial catch/bycatch** - generally well documented
- **Catching mortality** - unknown, but probably low for red king crab fishery
- **Extremely cold air exposure** - leads to lethal and sublethal effects on king crabs, and extreme conditions most likely in January to April
- **Repeated handling of hardshell crabs** - effects on mortality of king crabs not substantiated
- **Handling softshell crabs** - causes high mortality, but directed fishery closed during molting
- **Trawling** - likely causes higher mortality than pot-caught crabs
- **Trawling effects on habitat/non-captured crabs** - likely, but not studied in Alaska
- **Ghost fishing** - unquantified, but likely to be low under current regulations

SUMMARY OF STOCK CHANGES

NET CHANGE = RECRUITS - M - CATCH - BYCATCH



CAUSES OF STOCK CHANGES

RISE

- Optimal stock size
- Favorable ocean conditions

CRASH

- Reduced recruitment due to high crab density
- Less favorable ocean conditions
- High catches
- High "natural mortality"

DEPRESSED

- Depressed spawning stock
- Unfavorable ocean conditions

OTHER CONTRIBUTORS

Handling, trawl effects, ghost fishing, predation, ecosystem-level changes

SUMMARY OF CRAB FISHERY MANAGEMENT ACTIONS

CATCH RESTRICTIONS

- Reduced harvest rate, fishery threshold
- Implementation of stock rebuilding plan

GHOST FISHING

- 30 d GTR or 30 thread cotton twine
- Pot limits

BYCATCH

- Crab observer program
- Concurrent king and Tanner crab fishery
- Closure east of 163 W if no king crab fishery
- Reduced Tanner crab pot tunnel from 5" to 3"

HANDLING MORTALITY

- Incorporated into harvest strategy
- Fishery closed during molting/mating periods

SUMMARY OF TRAWL/DREDGE FISHERY MANAGEMENT ACTIONS RELATIVE TO CRABS

BYCATCH

- Groundfish/scallop observer program
- Bycatch caps
- Area closures

RECOMMENDATIONS

RESEARCH

- Reproductive biology
- Fishery oceanography
- Shallow-water predation on crabs
- Other handling effects
- Trawl effects on non-captured crabs
- Trawl effects on critical crab habitat

FISHERY MANAGEMENT

- Cannot manipulate weather and ecosystems
- Red king crab are slow to recover due to life history traits (e.g., complex reproductive behavior, age of functional maturity, age of recruitment, low natural mortality, and longevity)
- Rebuilding to optimal spawning levels requires that total mortality is reduced below additions from recruitment and growth
- Conservative approach is warranted

OVERVIEW OF KING AND TANNER CRAB RESEARCH

*An Oral Report to the Scientific and Statistical Committee
June 10, 1996*

An outline map of the state of Alaska, showing its coastline and major islands. The map is centered on the page and serves as a background for the text.

**COPIES OF
PRESENTATION OVERHEADS**

Gordon H. Kruse
Alaska Department of Fish and Game
Juneau, AK

1

KEY RESEARCH QUESTIONS (RESEARCH AREAS)

Question 1: What are the stocks?

→ *Stock Identification*

Question 2: How abundant are they?

→ *Population Estimation*

Question 3: What is their productivity?

→ *Stock Productivity*

Question 4: How best to harvest them?

→ *Harvest Strategies*

2

STOCK IDENTIFICATION

MAJOR SUCCESSES TO DATE:

Allozymes (Tanner and Red King Crabs)

- Regional Stock Separation
- Enforcement Tool
- Better Understanding of Hybrids

DNA-Level Markers (Tanner/Snow Crabs)

- Development of Techniques

CURRENT ACTIVITIES:

- Publication of Work Completed
- Pilot Study of Golden King Crabs
- Transfer of DNA Technology to Lab

WHAT'S NEXT?

- Apply Promising Techniques
- Collect Baseline Data on New Fisheries

3

POPULATION ESTIMATION

MAJOR SUCCESSES TO DATE:

Development of Technology

- Catch-length Analysis
- Catch-survey Analysis
- Length-based Analysis

Application of Methods

- Red King Crabs -- Kodiak, Bristol Bay
- Tanner Crabs -- Bristol Bay

CURRENT ACTIVITIES:

- Publication of Work Completed

WHAT'S NEXT?

- Other Bering Sea King Crabs
- Kodiak Tanner Crabs
- Develop Fishery-based Assessments

4

STOCK PRODUCTIVITY

MAJOR SUCCESSES TO DATE:

Tanner Crabs

- Effects of Shell Condition on Breeding
- Stock-Recruit Curve for Bristol Bay
- Growth & Mortality Estimates

Red King Crabs

- Stock-Recruit Curve for Bristol Bay
- Growth & Mortality Estimates
- Conceptual Model of Recruitment

CURRENT ACTIVITIES:

- Red King Crab Breeding Study

WHAT'S NEXT?

- Tanner Crab Recruitment Model
- Tanner Crab Growth & Temperature
- Terminal Molt Analysis

HARVEST STRATEGIES

MAJOR SUCCESSES TO DATE:

Red King Crabs

- Study of Handling Effects
- Laboratory Gear Study
- Analysis of Harvest Strategy (BBay)
- Analysis of Rebuilding Strategies (BBay)
- Changes in Management Strategy (BBay)

CURRENT ACTIVITIES:

- Analysis of Reduced Size Limit (BBay)
- Field Studies of Gear Design (BBay, Kod)
- Biol. Ref. Pts. (Kodiak, Nort. Sd., BBay)

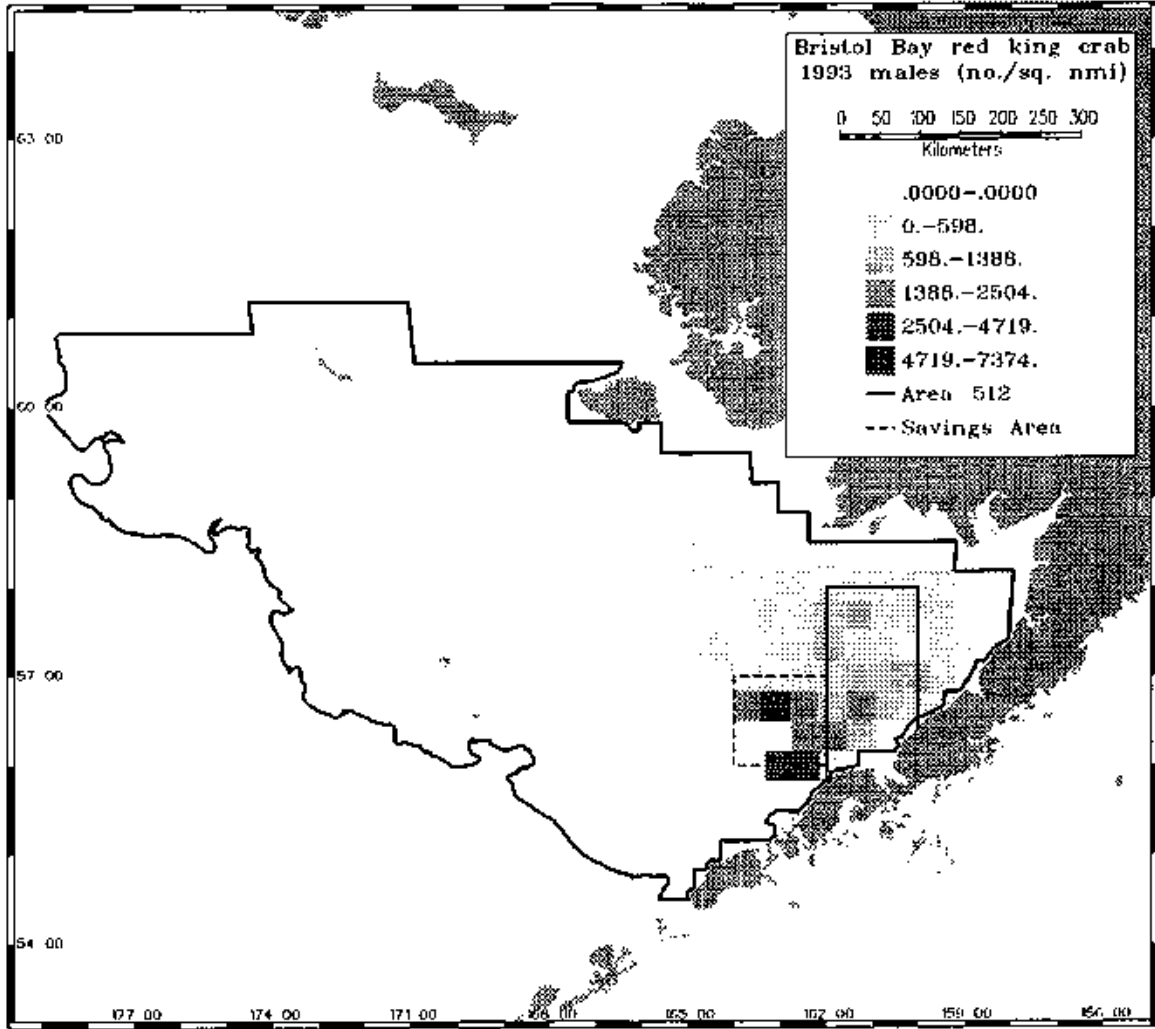
WHAT'S NEXT?

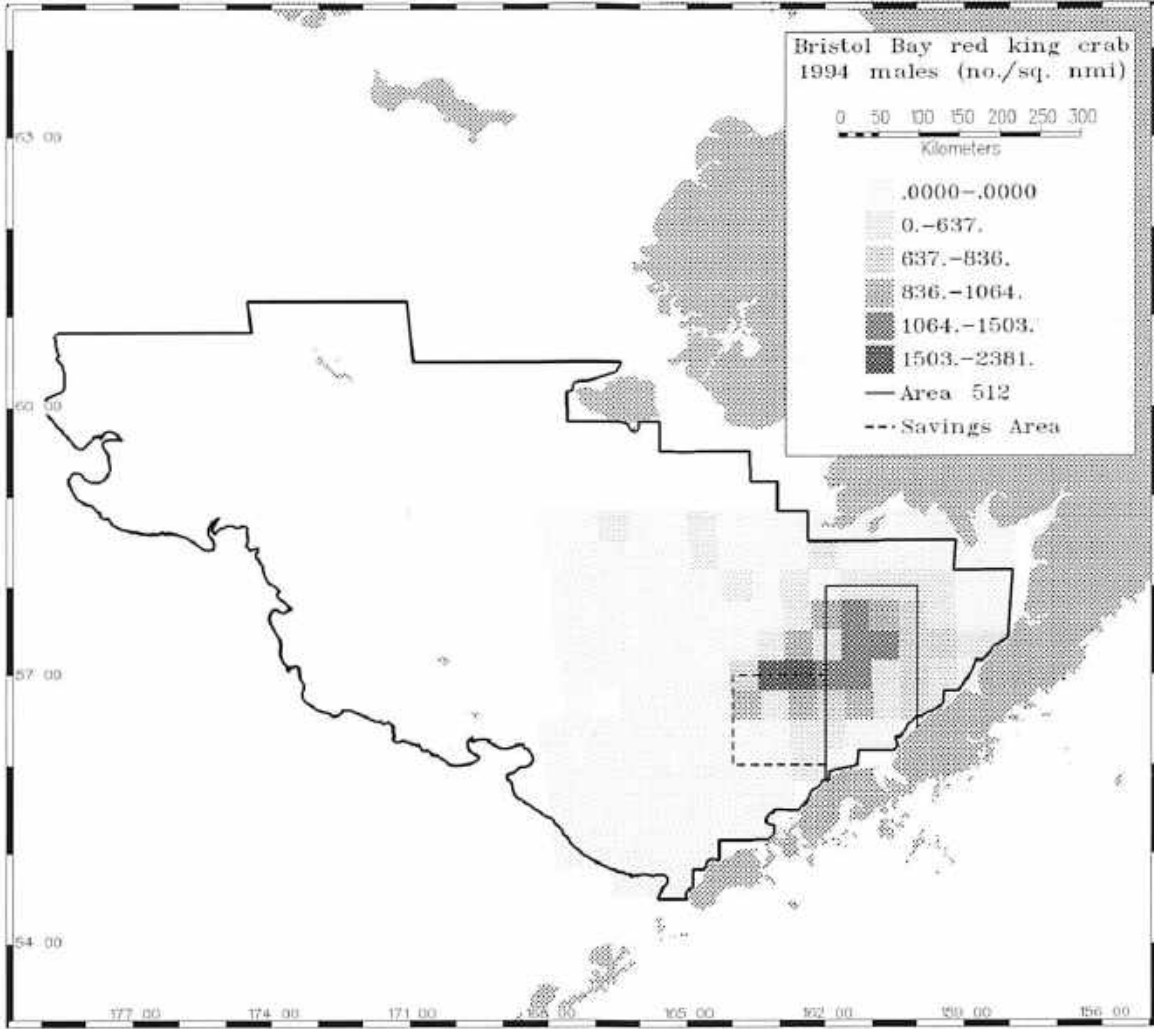
- Analyses of Other Stocks
- Consider New Other Approaches

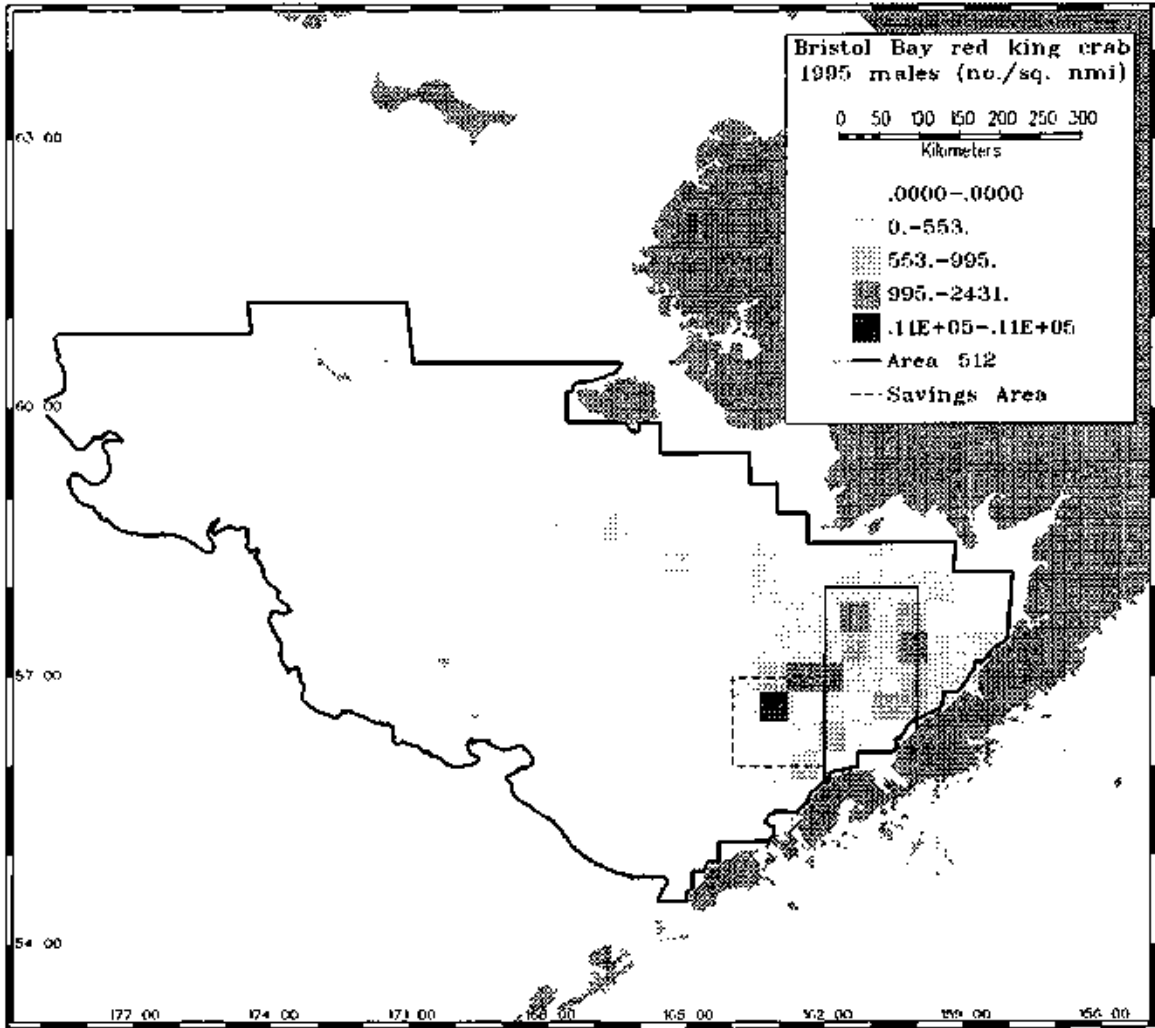
PUBLICATIONS

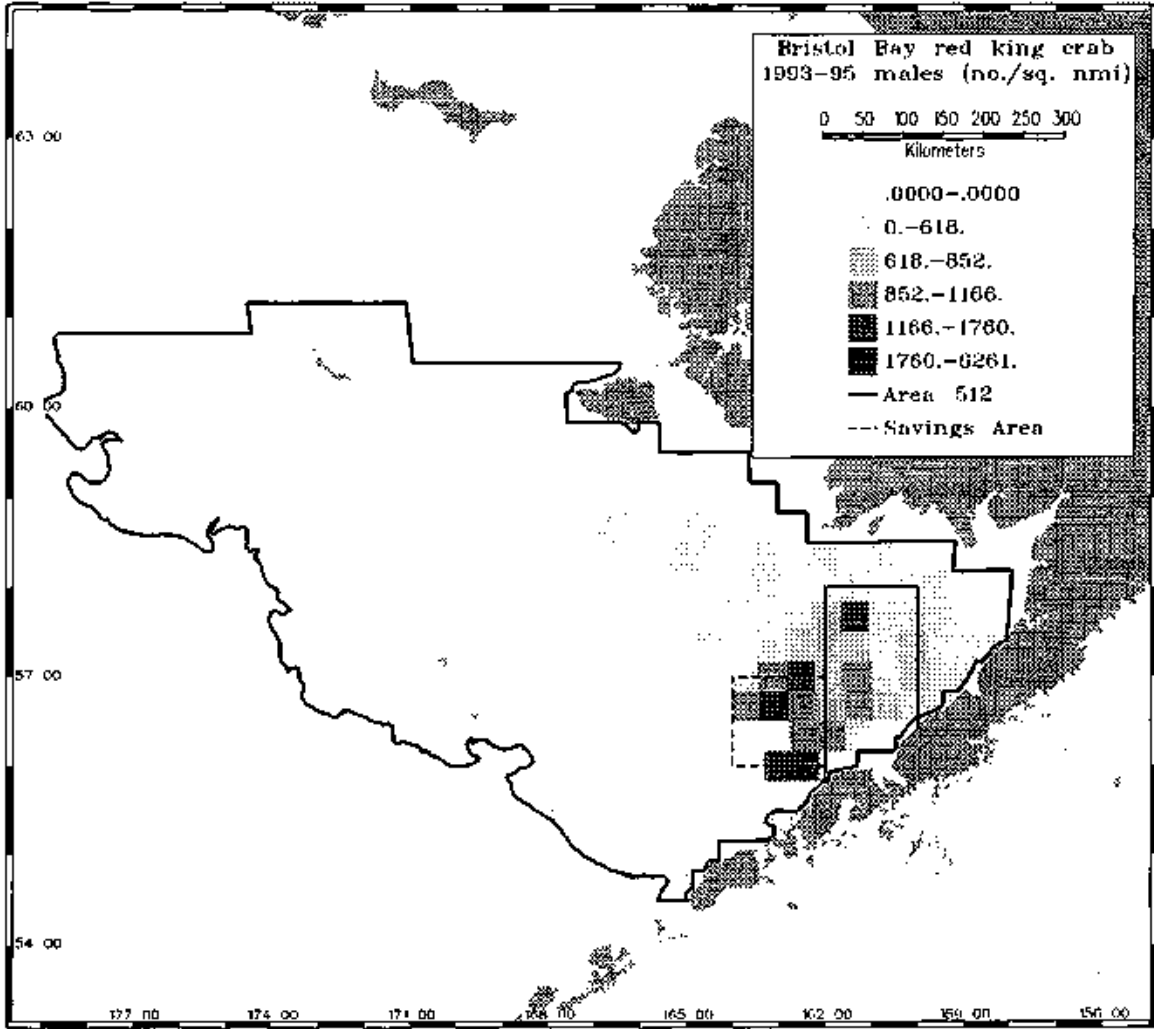
- "Estimating king crab abundance from commercial..."*
Collie and Kruse
- "An annotated bibliography of capture and handling..."*
Murphy and Kruse
- "Report on modeling workshop on year-class..."*
Tyler and Kruse
- "Conceptual modeling of brood strength of red king..."*
Tyler and Kruse
- "A length-based approach to estimate population..."*
Zheng, Kruse and Murphy
- "Comparisons of abundance estimation methods for..."*
Zheng, Kruse and Murphy
- "A catch-length analysis for crab populations"*
Zheng, Murphy and Kruse
- "A length-based population model and stock-recruit..."*
Zheng, Murphy and Kruse
- "An update of the length-based population model..."*
Zheng, Murphy and Kruse

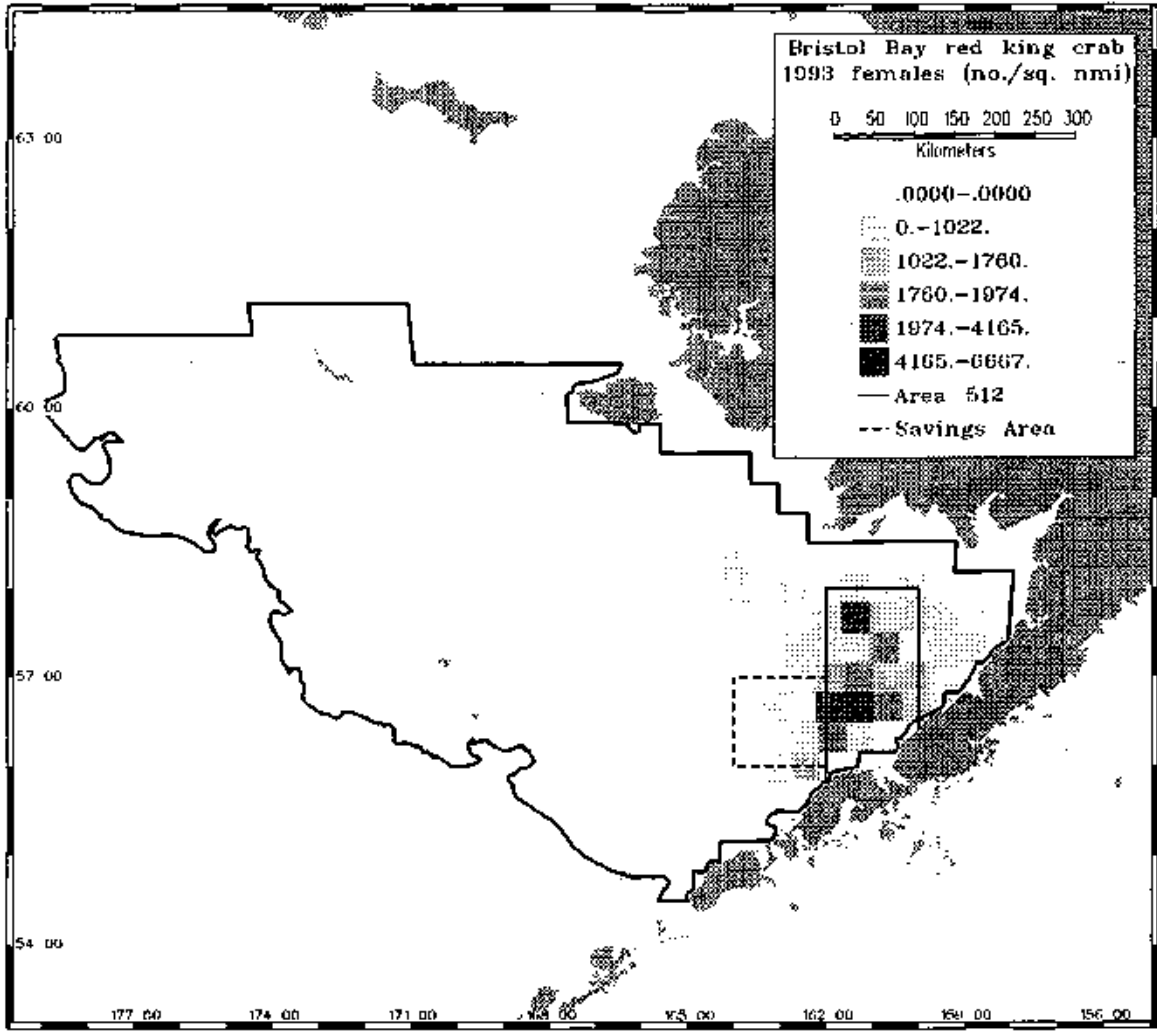
AGENDA
C-4

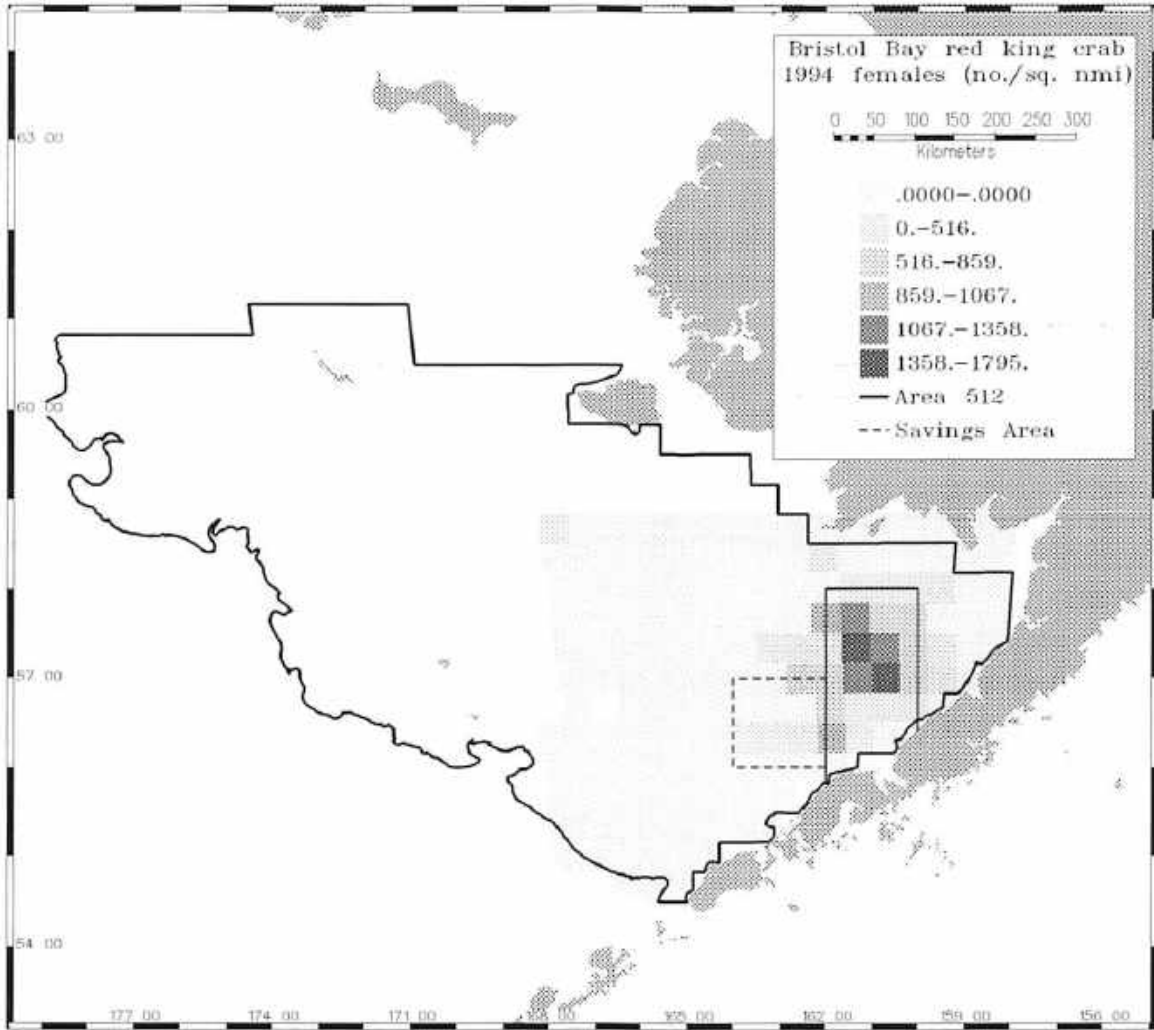


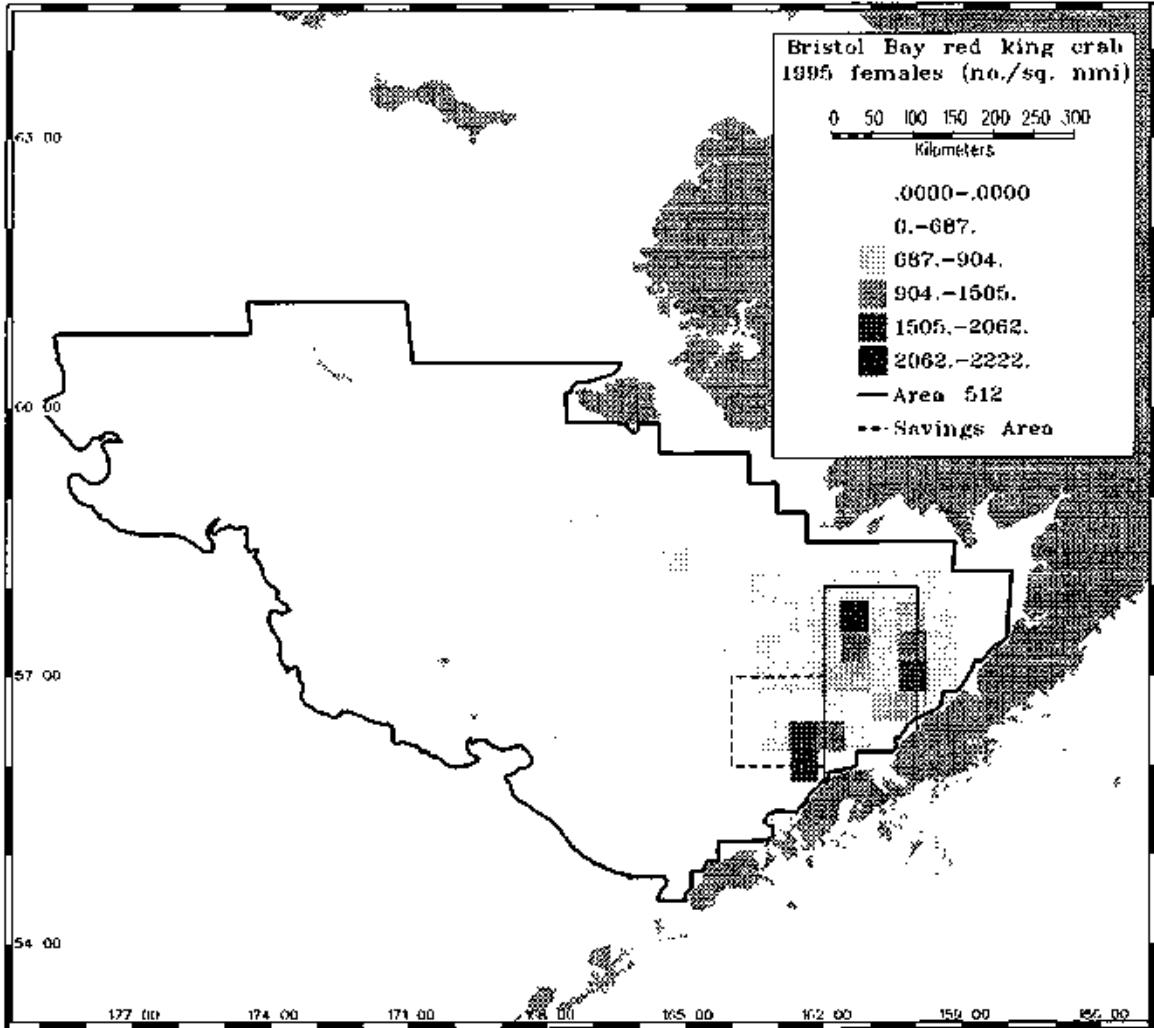


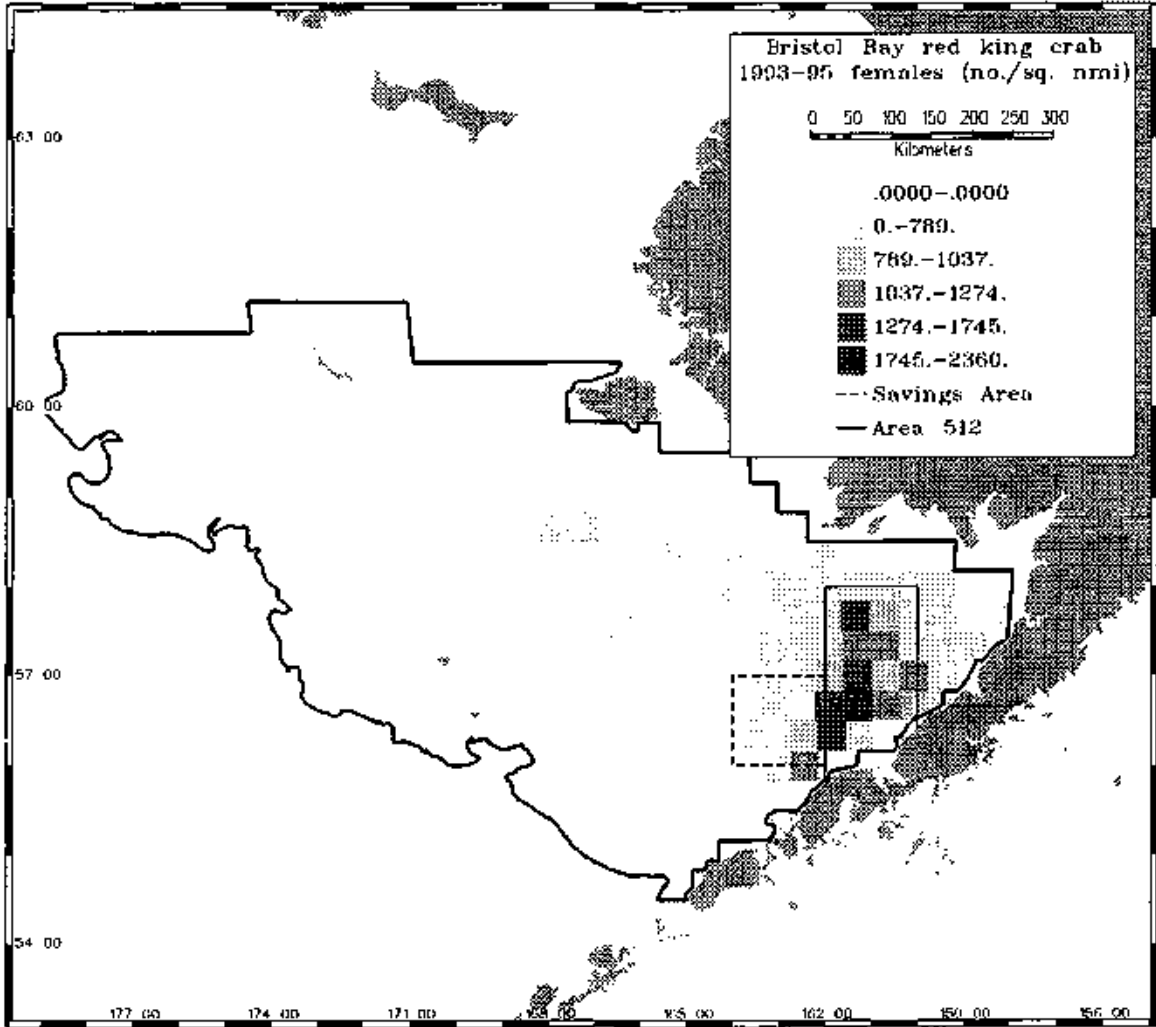


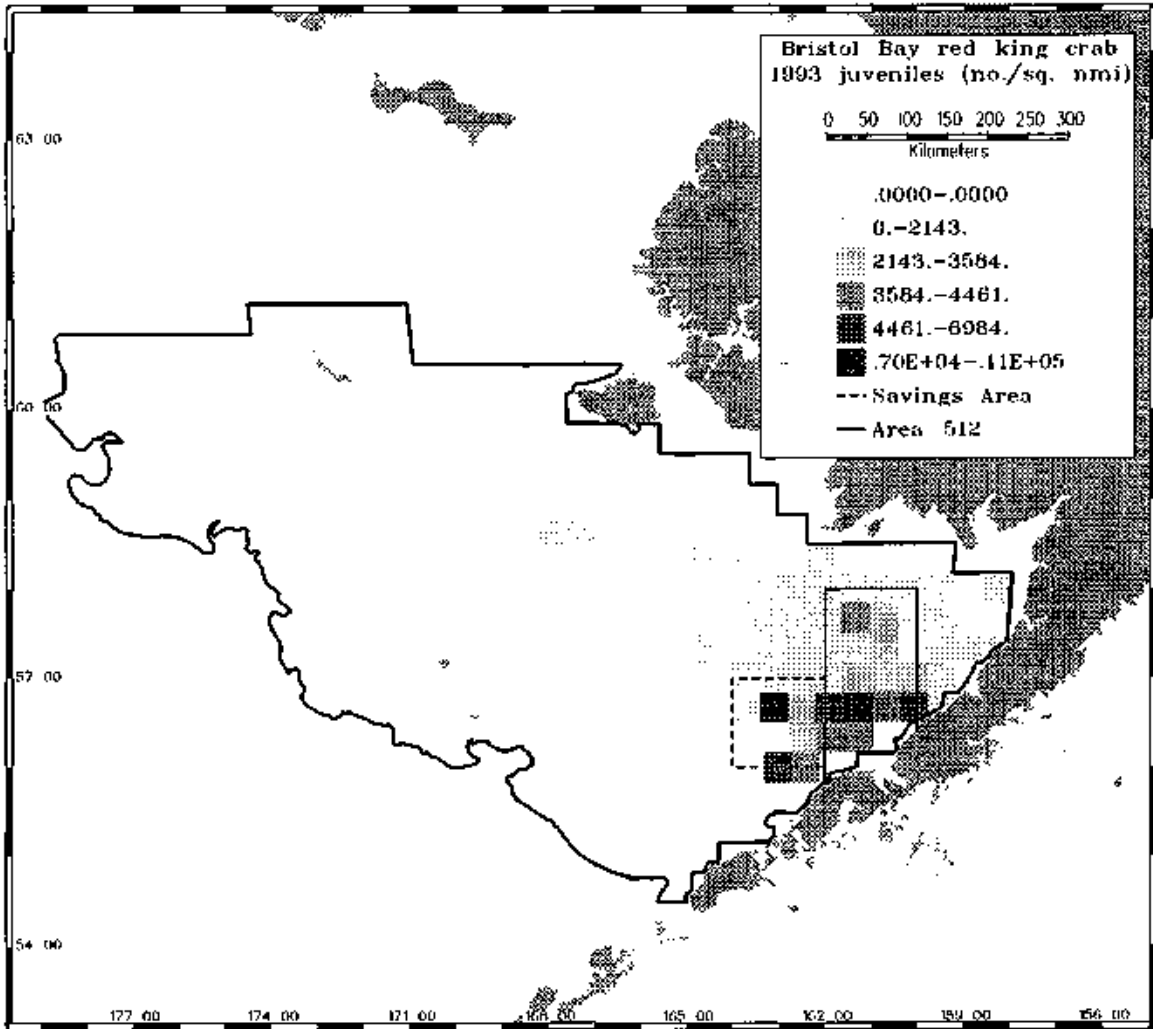


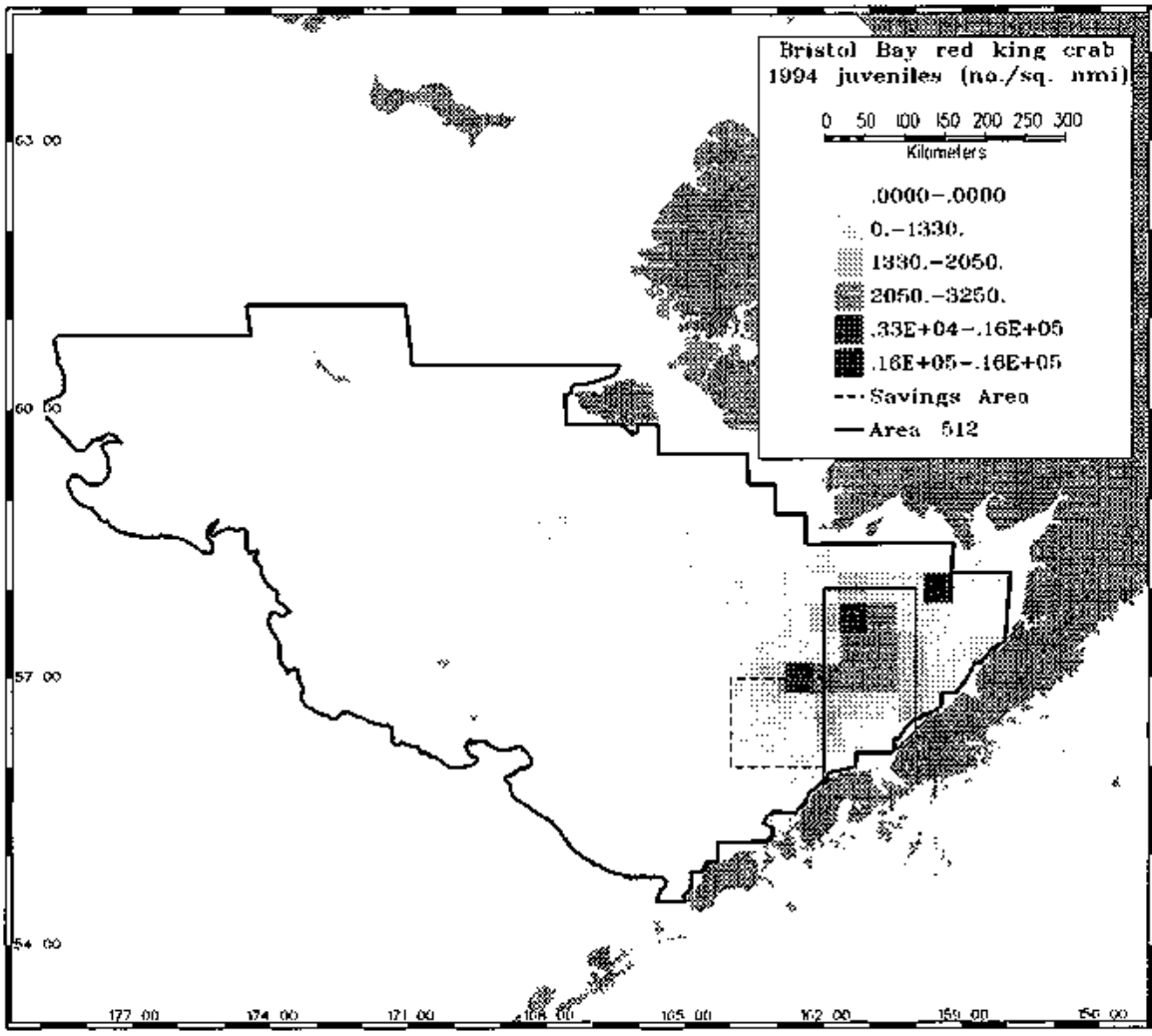


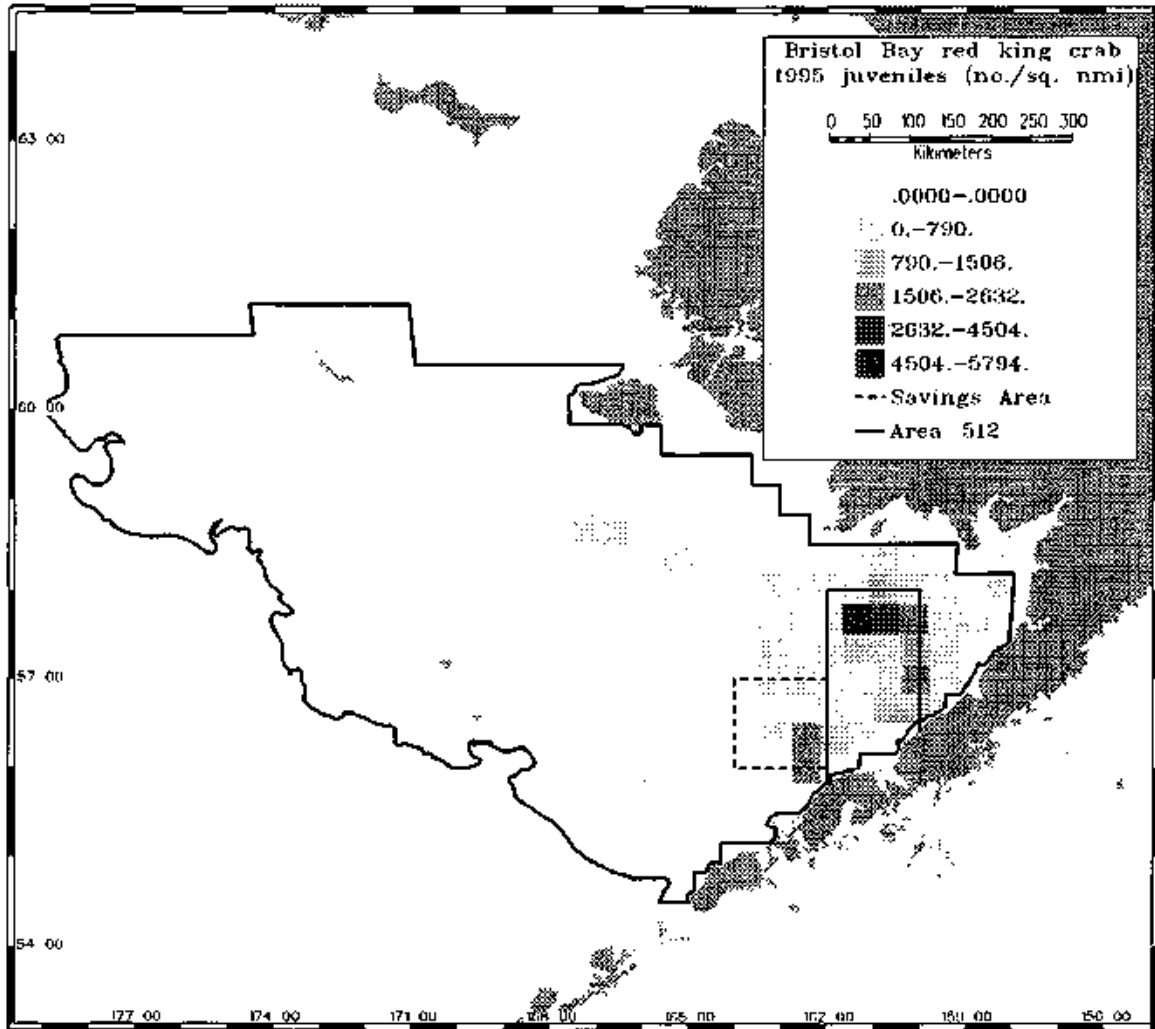


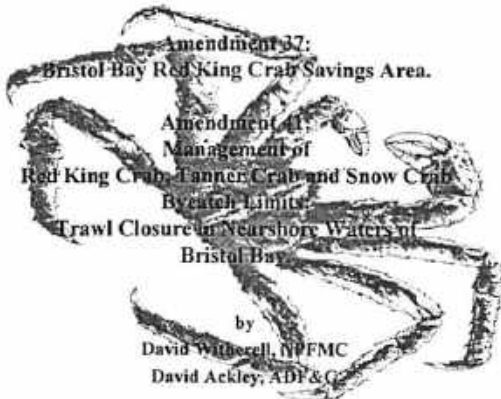












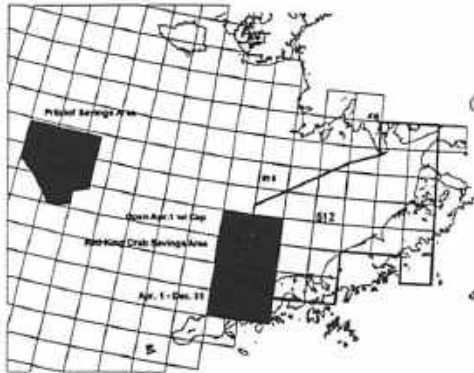
BSAI crab bycatch management measures

- 1 Revise the trawl closure time period for the Bristol Bay Red King Crab Savings Area.
- 2 Modify existing crab PSC bycatch limits, and initiate bycatch limits for snow crab.
- 3 Establish a trawl closure area in nearshore waters of Bristol Bay.

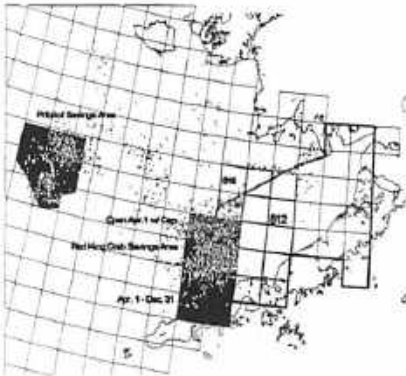
**Management Measure 1 Alternatives
(Bristol Bay Red King Crab Savings Area)**

- 1 *Status Quo*, Jan.1 - Mar. 31 closure.
- 2 Extend Closure Period.
 - Option A: Six month closure.
 - Option B: Year-round closure.
 - Option C: Seven month closure.
- 3 Modified Pot Sanctuary closure.

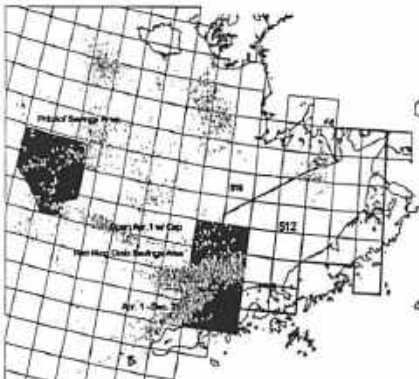
Management Measure 1



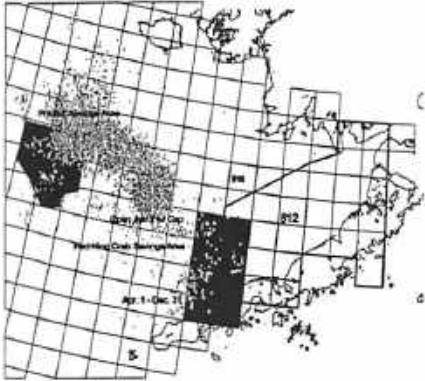
King crab bycatch > 50, 1986 - 1994 flatfish fisheries.



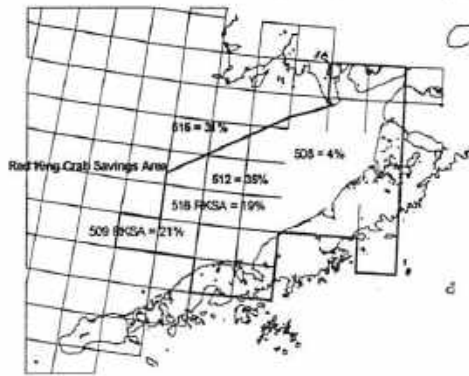
Halibut bycatch > 200, 1986 - 1994 flatfish fisheries.



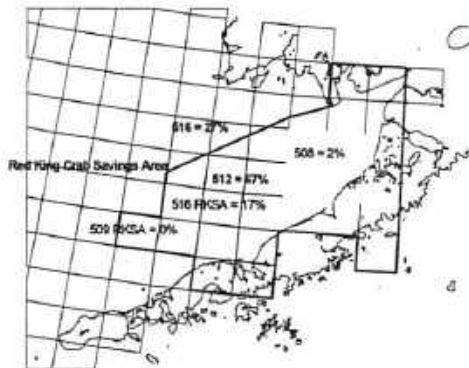
Tanner crab bycatch > 1000, 1986 - 1994 flatfish fisheries.



Percent of mature male red king crab (1993-95 survey)



Percent of mature female red king crab (1993-95 survey)



**Management Measure 1:
Economic impacts**

- Bering Sea Fishery Simulation Model runs made with 1993 and 1994 data as reported in Amendment 37.
- Seasonal closures resulted in no significant change in net benefits to the Nation.
- The primary fishery in the area is concluded prior to April 1, with little additional fishing effort in the area for the remainder of the year.

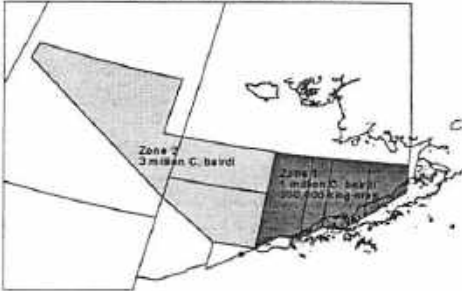
Summary of Management Measure 1

- Amendment 37 adopted in September, 1995 closes the RKC savings area through March 31.
- 1996 emergency rule extended closure to June 15 to protect molting and mating red king crab.
- Alternative 2 options are for Status Quo (3 month), 6 month, 7 month, or year round closure.
- The area north of 56 and south of 56 10' would be open when GHJ for red king crab is established.
- Alternative 3 opens portions of Areas 512 and 516 and NW block of Alt. 2 to trawling.

Management Measure 2 Alternatives
(Modify crab PSC bycatch limits)

1. Red king crab
2. Tanner crab (*C. bairdi*)
3. Snow crab (*C. opilio*)

Crab PSC Management Zones

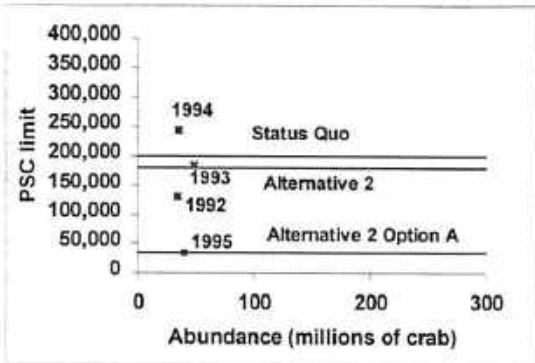


Management Measure 2 Alternatives
(Modify crab PSC bycatch limits)

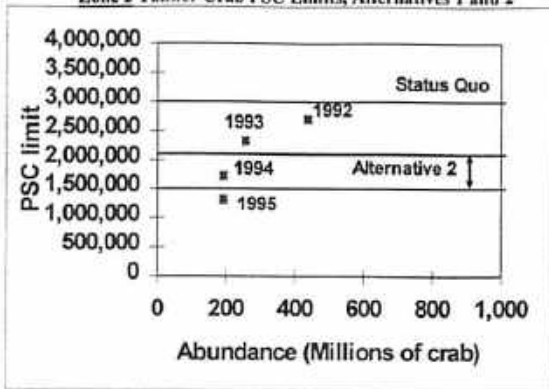
• RED KING CRAB

1. *Status Quo*, 200,000 Zone 1 cap.
2. Reduce PSC limits for red king crab.
 - Option A. Reduce PSC limit to 35,000.
3. PSC limits which change with abundance.
 - Option A. Fixed upper limit of 200,000 crab.

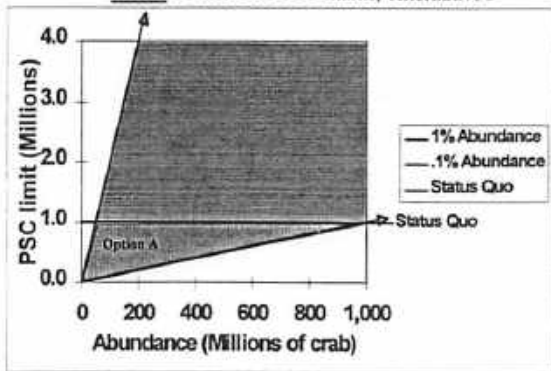
Red King Crab PSC Limits, Alternatives 1 and 2



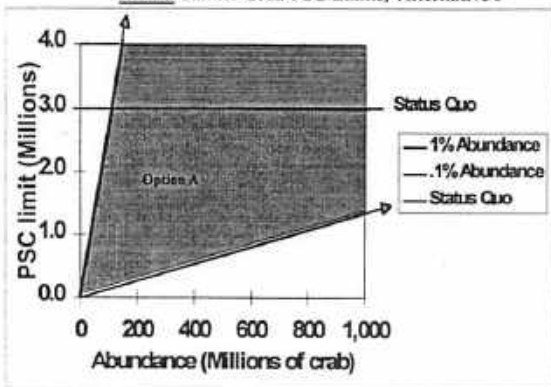
Zone 2 Tanner Crab PSC Limits, Alternatives 1 and 2



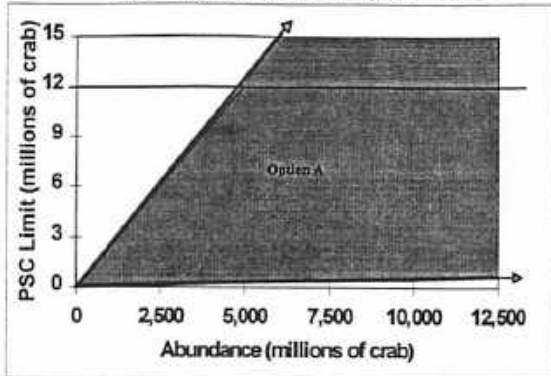
Zone 1 Tanner Crab PSC Limits, Alternative 3



Zone 2 Tanner Crab PSC Limits, Alternative 3



Zone 2 Opilio Crab PSC Limits, Alternative 3



Average adult equivalent crab bycatch in groundfish fisheries as a percentage of total crab abundance, 1993-1995.

	<u>MALE</u>	<u>FEMALE</u>
Bristol Bay Red King Crab	0.64%	0.90%
EBS Tanner Crab	4.73%	1.50%
EBS Snow Crab	1.47%	0.09%

**Management Measure 2:
Economic impacts**

- Bycatch model data were updated with opilio crab values, and caps assigned based on 3 year average bycatch.
- Reduced caps resulted in little change in estimated net benefits to the Nation.
 - Bycatch of Tanner and opilio crab were similar to lower PSC limits in 1993 and 1994.
 - Model estimates of red king crab bycatch were greater than 35,000, and the greatest impacts resulted under this cap.
- A 6 million opilio crab PSC limit, in combination with all proposed closures and most restrictive PSC limits resulted in the greatest decrement in net benefits.

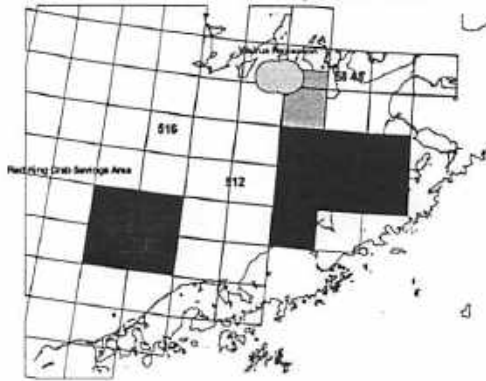
Summary of Management Measure 2

- Reducing the red king crab cap to 35,000 may not have trawl impacts at current abundance levels:
 - 1995 bycatch = 35,638
 - 1996 bycatch = 12,107 through May.
- Reducing the Tanner crab caps may not have trawl impacts if:
 - Abundance remains similar to current levels.
 - PSC limits are optimally allocated.
- PSC limits based on percentages of the population would have greater trawl impacts the smaller the percentages used.
- Stairstep PSC limits based on crab abundance would buffer against year to year variability in abundance estimates.

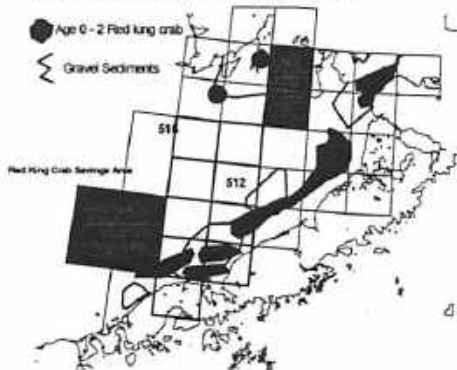
Management Measure 3 Alternatives
(Nearshore Bristol Bay trawl closure area)

- 1 *Status Quo*, no closure.
- 2 Northern Bristol Bay Closure.
 - Option A: Allow trawling north of 58 Lat. and between 159 and 160 Long.
- 3 Prohibit all trawling in Bristol Bay.
 - Option A: Allow trawling north of 58 Lat. and between 159 and 160 Long.
- 4 Prohibit all trawling east of 162 Long. and north of 58 43' Lat. The area north of 58 and east of 162 open annually April 1 - June 15.
 - Option A: Also close statistical area 508.

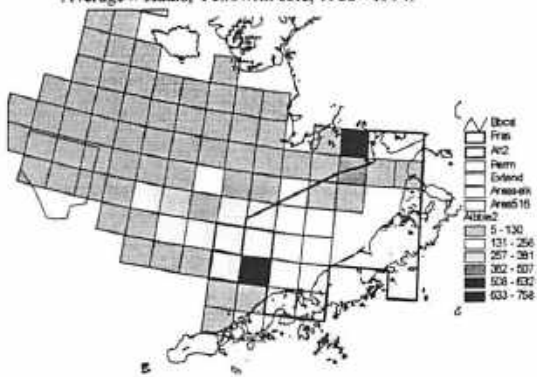
Alternative Nearshore Bristol Bay Closure Areas



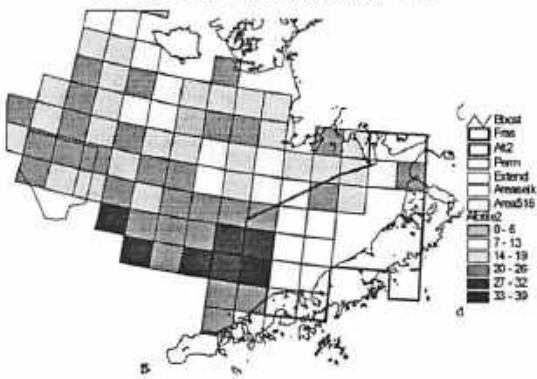
General location of small crab and gravel habitat



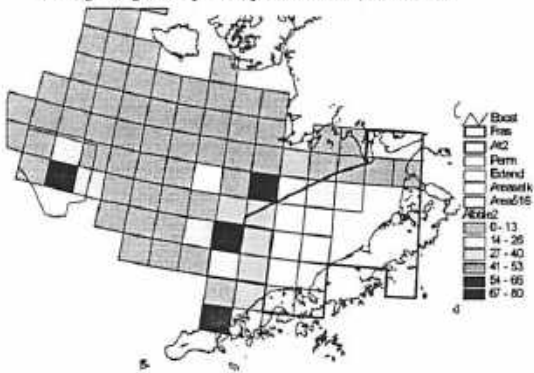
Average # Hauls, Yellowfin sole, 1986 - 1994.



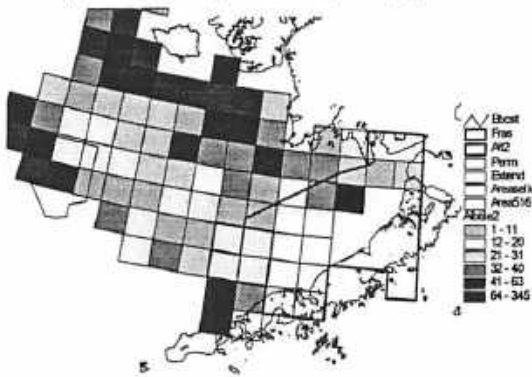
Average Catch, Yellowfin sole, 1986 - 1994



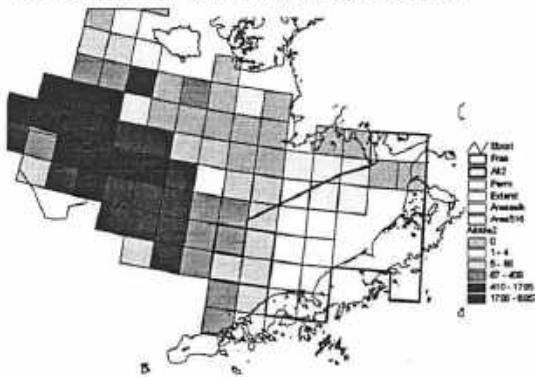
Average king crab bycatch, yellowfin sole, 1986 - 1994



Average halibut bycatch, yellowfin sole, 1986 - 1994



Average Tanner crab bycatch, yellowfin sole, 1986 - 1994

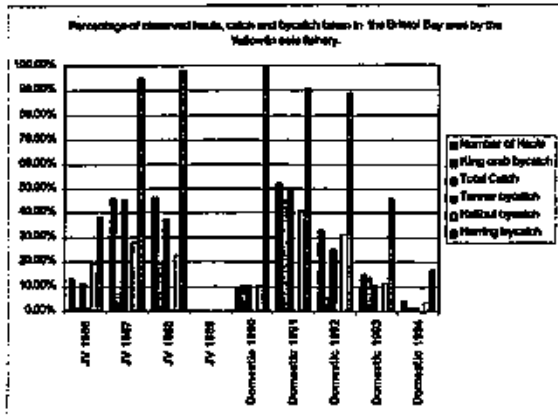


**Management Measure 3:
Economic impacts**

- Bering Sea Fishery Simulation Model runs made with 1993 and 1994 data.
- Closure of northern Bristol Bay resulted in small decrements in net benefits to the Nation.
- Addition of Area 508 resulted in no change.
- Trade-offs in foregone catch and bycatch were apparent.
 - decreased retained directed catch.
 - decreased herring bycatch.
 - increased halibut and Tanner crab bycatch.

Summary of Management Measure 3

- Age 0-2 red king crabs and important juvenile red king crab habitat are located in the nearshore waters of Bristol Bay, including Area 508.
- Some savings to Pacific herring, Pacific halibut and marine mammals may result.
- Model estimates indicate little impact by the proposed closure, however, in concert with other bycatch measures, cumulative impacts may be greater.
- The area north of 58 Lat. and between 159 and 160 Long. is historically important to the yellowfin sole fishery, and bycatch in this area is relatively low.
- Restricting trawling to south of 58 43' Lat. reduces trawl impacts on Pacific herring.



Bycatch in the Yukon-Charley estuary as a percentage of the RKC harvest.

Yukon-Charley estuary landings				Total groundfish bycatch and cap				Yukon-Charley Percent of Total
Year	Bycatch	Cap	% of cap	Year	Bycatch	Cap	% of cap	
1986	35	140	25%	1986	350	1,400	25%	2%
1987	35	140	25%	1987	1,350	1,400	96%	9%
1988	35	140	25%	1988	700	1,120	63%	6%

Bairdi Tanner Zone 1				Bairdi Tanner Zone 1				Yukon-Charley Percent of Total
Year	Bycatch	Cap	% of cap	Year	Bycatch	Cap	% of cap	
1986	100,000	200,000	50%	1986	100,000	1,000,000	10%	1%
1987	200,000	1,000,000	20%	1987	700,000	1,000,000	70%	7%
1988	100,000	1,000,000	10%	1988	1,000,000	1,000,000	100%	10%

Bairdi Tanner Zone 2				Bairdi Tanner Zone 2				Yukon-Charley Percent of Total
Year	Bycatch	Cap	% of cap	Year	Bycatch	Cap	% of cap	
1986	1,000,000	1,000,000	100%	1986	1,000,000	1,000,000	100%	10%
1987	1,000,000	1,000,000	100%	1987	1,000,000	1,000,000	100%	10%
1988	1,000,000	1,000,000	100%	1988	1,000,000	1,000,000	100%	10%

Red King Crab Zone 1				Red King Crab Zone 1				Yukon-Charley Percent of Total
Year	Bycatch	Cap	% of cap	Year	Bycatch	Cap	% of cap	
1986	1,000	10,000	10%	1986	10,000	10,000	100%	1%
1987	1,000	10,000	10%	1987	10,000	10,000	100%	1%
1988	1,000	10,000	10%	1988	10,000	10,000	100%	1%

Summary of model results captions key:

3 month RKC = 3 month closure of the red king crab savings area
 6 month RKC = 6 month closure of the red king crab savings area

Northern Bristol Bay

NBB + 508 = closure of both Northern Bristol Bay and Area 508

Bairdi = Bairdi caps only (850,000 Zone 1, 1.5 million Zone 2).

Red = red king crab caps only (35,000 Zone 1).

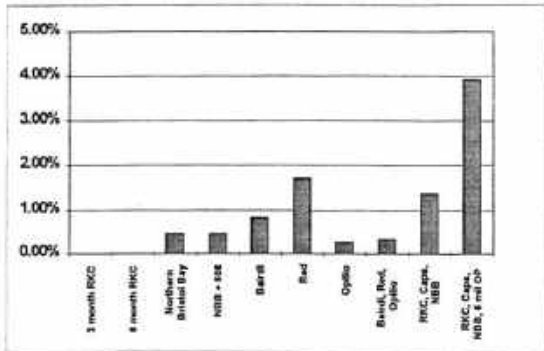
Opilio = opilio caps only (1.1 million Zone 2)

Bairdi, Red, Opilio = all three caps above

RKC, Caps, NBB = closure of the red king crab savings area, the 3 caps above, and the Northern Bristol Bay, 508 closure.

RKC, Caps, NBB, 6 mil. OP = the above model run with the opilio cap reduced to 6 million crab in Zone 2.

Percent change in estimated net benefits from status quo
 - 1994 data set



ALASKA MARINE CONSERVATION COUNCIL

Box 101145 Anchorage, Alaska 99510
(907) 277-5357; 277-5975 (fax); amcc@igc.apc.org

June 11, 1996

Rick Lauber, Chairman
North Pacific Fishery Management Council
605 W. 4th Ave., Suite 306
Anchorage, Alaska 99501

Dear Rick,

The Alaska Marine Conservation Council has the following comments on the Environmental Assessment/Regulatory Impact Review (EA/RIR) for Amendment 37 and proposed Amendment 41 addressing crab bycatch and habitat protection in Bristol Bay and the Bering Sea.

AMENDMENT 37

We continue to support a year-round closure in the Bristol Bay Red King Crab Savings Area to non-pelagic trawling, Alternative 2, Option B. As stated in our comments submitted in September of 1995 to the North Pacific Fishery Management Council (Council), we feel strongly that we must protect critical habitat for crab settlement and survival in the crab's early stages of their life cycle as well as their molting and mating cycle. The EA/RIR indicated that molting and soft shell king crab are still present in June 22, the last day of the survey. Since the survey didn't continue into July, and it takes one month for shells to harden, there is reason to suspect that soft shell conditions persist beyond June. If we are to take precautionary steps to assist in crab stocks recovery, then an expansive trawl closure is appropriate. It bears reiterating that observer reports of crab bycatch may only be telling a partial story. With a number of vessels requiring only 30% observer coverage and minimal attention given to effects of disruption to podding behaviors and king crab habitat, the numbers of observed crab mortality can at best be incomplete.

Conservation of the stocks is paramount. With the admitted negligible economic effects of the various alternatives, the direction of the Council should be in the maximum protection for recovering stocks of crab.

The crab fisheries of the Bering Sea are in trouble. One by one - king, then tanner, now opilio - are disappearing from a commercially viable status. It is important to look at all sources of mortality. All human influence must be examined. Concern grows over bycatch from groundfish fisheries and habitat disruption as crab populations remain in decline.

AMENDMENT 41

AMCC remains committed to overall bycatch reduction in Alaska's groundfish fisheries. Lowering prohibited species catch (PSC) caps is one way to encourage fishermen to do their utmost to lower their bycatch. Having bycatch limits set when overall (bycatch

species) biomass is high does nothing to deter continued mortality of those bycatch species when their numbers are in decline. While we prefer to see positive economic incentives in place, we will not object to effective tools currently being considered by the Council.

PSC caps for red king crab and tanner crab in the Bering Sea should be lowered; they were set when crab abundance was greater than it is today. Conceptually, it seems appropriate that these caps would fluctuate with crab abundance. However, we agree with the SSC that should this be the option chosen by the Council, a separate analysis must be prepared to address questions concerning uncertainties and different measures used in crab surveys.


We recommend the Council establish a cap for opilio or snow crab so that any exacerbation of snow crab decline by groundfishery bycatch is minimized. With the above caveats, having this cap fluctuate with snow crab abundance may be the best alternative. We highly recommend a conservative figure below the recent year bycatch averages. The fleet must be encouraged to avoid bycatch.

Given the discussion above, bycatch reduction and habitat protection remain significant concerns warranting a trawl closure in northern Bristol Bay. Absent in the analysis was a thorough discussion of the impacts to subsistence activities by trawl fisheries in nearshore waters. The U.S. Fish & Wildlife Service is expressing concerns about habitat and forage disturbance to important seabird and marine mammal populations in northern Bristol Bay from trawl fisheries. We recommend the Council to adopt Alternative 3: year round closure east of 162 degrees longitude. This kind of closure will serve to protect marine habitat vital to the productivity of marine mammals, seabirds, juvenile halibut, and crab.

We caution that if an exception to this area-wide closure is made to allow limited trawling, then it must be accompanied by a mandate for 100% observer coverage and annual review of groundfish effort and levels of bycatch. In addition, an analysis to determine impacts from the displaced trawl fleet should be undertaken. Displacing trawl bycatch and habitat disruption to another coastal location is not the intent of this closure. Some form of safeguard or scrutiny must be employed to observe what if any bycatch of important commercial and subsistence fish is increased in another geographic location.

We encourage and applaud all actions taken by the Council to minimize bycatch and to protect habitat essential to many components of the North Pacific ecosystems.

Sincerely,



Fran Bennis
Field Coordinator

ARNT

BERING SEA CRAB FISHING VESSEL

FIVE-YEAR AVERAGE CATCH AND REVENUES FOR BERING SEA KING AND TANNER CRAB FISHERIES FOR THE MOST RECENT FIVE-YEAR PERIOD, (1991-1995), TO ILLUSTRATE THE EFFECTS OF DECLINING QUOTAS ON CRAB FISHING VESSEL REVENUES

JUNE 1, 1996

SPECIES/FISHERY	5 YR AVGE CATCH (MILLIONS-LBS.)	5 YR AVGE FLEET REV	5 YR AVGE NO. BOATS	5 YR AVGE REV PER BOAT
Bristol Bay King ¹	14.0	\$ 59.4 M	265	\$ 224,150
Bering Sea Opilio	217.8	172.6	250	690,400
Bering Sea Bairdi	27.0	44.4	246	180,487
Prib./St. Mat King ²	5.3	19.8	200	99,000
ANNUAL FLEET & VESSEL 5 YR AVGES		\$ 296.2 Million	247 Boats	\$1,194,037 Average/Vessel

¹ Most recent 5 year period for fishery, 1989-1993; no fishery 1994-1995.

² Covers period 1993-1995, combined opening dates began in 1993 and Pribilofs reopened. Five year averages do not include Adak king crab fisheries: Avges. \$17 mill; 16 boats;

1995 ONLY, FLEET CATCHES AND REVENUES

Bristol Bay King	---	NO COMMERCIAL FISHERY		
Bering Sea Opilio	74.0	\$ 180.0 million	253 boats	\$ 711,462 Average/Vessel
Bering Sea Bairdi	4.2	11.7	196	60,000
Prib/St Mat King	5.2	13.5	209	64,590
1995 FLEET & VESSEL AVERAGES		\$ 205.2 Million	245 Boats	\$ 836,052 Average/Vessel (30% Less than 5 yr avge)

1996 PROJECTION, FLEET CATCHES AND REVENUES

Bering Sea Opilio	65.0	\$ 86.0 Million	235 Boats	\$ 365,957 Average/Vessel
Bristol Bay King	---	SEASON IS DOUBTFUL		
Bering Sea Bairdi	---	SEASON IS DOUBTFUL		
Prib/St Mat King	5.0	\$ 12.5 Million	235 Boats	\$ 53,191 Average/Vessel
1996 FLEET & VESSEL AVERAGES		\$ 98.5 Million	235 Boats	\$ 419,148 Average/Vessel (65% Less than 5 yr avge)

Reference: Alaska Dept. of Fish & Game, Westward Region Shellfish Econ. Performance Rpts.

North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on sea stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We Implore you to take immediate action!

PRINTED NAME ADDRESS SIGNATURE

PRINTED NAME	ADDRESS	SIGNATURE
Robert Lee Gould	550 Park Ave 2nd Floor ^{King Cove AK}	Robert Lee Gould
Wm BENDIXEN	P.O. Box 27 King Cove AK	Edwin Bendixen
Wm HANSON Sr	P.O. 169 King Cove	Wm Hanson Sr
DAVIN D. HOFF	P.O. Box 32 KING COVE ⁹⁹⁶¹²	Marvin D. Hoff
Glen Mack	P.O. Box 54 King Cove AK 99612	GLEN MACK
Wesley R. Newman	P.O. Box 34 King Cove, AK	Wesley R. Newman
Glen Mack	P.O. Box 176 King Cove, AK	Glen Mack
Wm C Wilson	P.O. Box 126 King Cove AK	Wm C Wilson
Garren Wilson	Box 151 King Cove AK	Garren Wilson
Allen Mack	P.O. 164 King Cove AK	Allen Mack
Don Gould	Box 124 King Cove AK	Don Gould
Jim Keneguyeff	Box 93 King Cove AK	Jim Keneguyeff
Henry Mack	Box 224 King Cove, AK 99612	Henry Mack
Richard Koro	P.O. Box 11 King Cove AK 99612	Richard Koro
Wm Dowman	Box 153 King Cove, AK 99612	Wm Dowman
Harman Bendixen	Box 88 King Cove Alaska	Harman Bendixen
David Fry	Box 119 King Cove AK	David Fry
Wm Nezeroff	Box 22 King Cove AK	Wm Nezeroff
Claude R. Kuytinski	Box 113 KING COVE AK 99612	Claude R. Kuytinski
Arnold R. Newman	P.O. Box 135 King Cove AK 99612	Arnold R. Newman
Arthur L. Newman	P.O. Box 233 King Cove AK 99612	Arthur L. Newman
Wm Anderson	P.O. Box 27 King Cove AK 99612	Wm Anderson
Wm Christensen	P.O. Box 203 King Cove AK 99612	Wm Christensen
Marie Newman	P.O. Box 86 King Cove AK 99612	Marie Newman
Ernest Weiss	P.O. Box 165 King Cove AK 99612	Ernest Weiss
BEVERLY MACK	P.O. Box 54 King Cove AK	Beverly Mack

FROM : FISH BEL AIR LU DOCHTERMAN PHONE NO. : 907 486 5450

Mary Fisher

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Cristy J. Somers	P.O. Box 119 King Cove AK	<i>Cristy J. Somers</i>
Shona Wheeler	Po Box 126 King Cove AK	<i>Shona Wheeler</i>
Lawrence E Babcock	Po Box 123 King Cove AK	<i>Lawrence E. Babcock</i>
Edward R. Mack Jr	Box 178 King Cove AK	<i>Edward R. Mack Jr</i>
Jocelyn S. McCollum	PO Box 96 King Cove, AK	<i>Jocelyn S. McCollum</i>
Rodney J. C. Jell	Box 13 King Cove AK	<i>Rodney J. C. Jell</i>
Rhonda Gould	Box 145 King Cove AK	<i>Rhonda Gould</i>
JANE Trumble	Box 238 King Cove, AK	<i>Jane Trumble</i>
RICHARD BETTAS	Box 231, King Cove AK	<i>Richard Bettas</i>
Joe Harrison	Box 119 King Cove AK	<i>Joe Harrison</i>
Lillian L. Dossal	Box 41 King Cove AK	<i>Lillian L. Dossal</i>
Sharon E. Gould	Box 124 King Cove AK	<i>Sharon E. Gould</i>
David Haskins	P.O. Box 16 King Cove AK	<i>David Haskins</i>
Kathleen Truitt	P.O. Box 178 King Cove, AK	<i>Kathleen Truitt</i>
Joe Miller		
Aileen C. Mullin		
Vicki Perzuroff	Box 22 King Cove AK	<i>Vicki Perzuroff</i>
Marilyn J. Hutchins	Box 22 King Cove	<i>Marilyn J. Hutchins</i>
Edward Johnson Jr	Box 142 King Cove	<i>Edward Johnson Jr</i>
George Mack	Box 212 King Cove	<i>George Mack</i>
Sharon Haskins	P.O. Box 3886 Kodiak, AK	<i>Sharon Haskins</i>
Charles Rosen	P.O. Box 31 King Cove AK	<i>Charles Rosen</i>
Chris Wenzel	1429 Park St S. Juneau AK 99801	<i>Chris Wenzel</i>
Sammye John Maynard	1430 A St Juneau AK 99801	<i>Sammye John Maynard</i>
Ann Haskins	P.O. Box 98 King Cove AK 99812	<i>Ann Haskins</i>

PHONE NO. 907 486 5459

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1995

King Crab Stocks in Bristol Bay are depressed, and the directed fishery these stocks has been closed during 1994 & 1995. The Baird Fishery been closed East of 163 degree W Longitude during 1994 & 1995 protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is also wreaking havoc in the King Crab Savings Area between 163 and 162 degree longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME

ADDRESS

SIGNATURE

①

ROB TRUMBUE

BOX 232 KING COVE AK

Rob Trumbue

65 FROM KING COVE

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We Implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Dan Richardson	P.O. Box 3103, Homer, AK, 99603	Dan Richardson
Alan Anderson	1204 Ocean Dr Homer AK 99603	[Signature]
JAY ARMSTRONG	PO Box 14K7 HOMER AK	[Signature]
Kenneth Schaad	53198 McNeil Pt, Homer AK	[Signature]
Alan Parks	P.O. Box 3339	[Signature]
CHARLES M. BROWN	P.O. Box 381 Homer AK 99603	Charles M. Brown
KAY Bellamy	60080 Styline Dr.	Kay Bellamy
Kim Szymanski	996 Hill Fair Court	[Signature]
Michael Parks	PO Box 4332 Homer	Michael Parks
JAMES R. Niemela	Box 2382 Homer, AK.	J.R. Niemela
JAMES E BECKER	41955 KACHENAK DR. HOMER	James E Becker
DANNY M. MURPHY	P.O. Box 2304 Homer AK	[Signature]
SHAWN A. MACLANE	47007 Kunz Dr. Homer AK.	Shawn A. MacLane
Charles G Keim	HC 67 Box 1263 Anchor Pt, AK	Charles G Keim
Fred J Fischer	1904 Bucks Dr Fairbanks 99701	Fred J Fischer
GREG WIAN	568 Galapago St. Denver CO 80204	Greg Wian
STAN STONOROV	51795 E. End Rd Homer AK 99603	[Signature]
Michael Stubblefield	3600 Crittenden, Homer AK	Michael Stubblefield
PHILIP K. CHRISTENSEN	4306 Spit Rd Homer AK	[Signature]
RICHARD A. ALBA	P.O. Box 693 Homer 99603	[Signature]
Matt Stover	PO Box 921 Homer AK	Matt Stover
Steve Reichel	1298 Lake Shore Dr.	Steve Reichel
Tim Ferrell	164 Mountain View, Homer	Tim Ferrell
Roberta Mike	P.O. Box 2628 Homer	Roberta Mike
JEFFRY L. SLEAR	40 Saffwater Ave 549 E Street Suite 202 Anchorage AK	[Signature]
Chris Arc	172 Ark Ave W.C. Ullrich MS 2006	[Signature]
JOHN W. HILLSTRAND	Box 674 HOMER ALASKA	John Hillstrand

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. **THIS MUST BE STOPPED NOW.**

We implore **you** to take immediate action!

PRINTED NAME

ADDRESS

SIGNATURE

PRINTED NAME	ADDRESS	SIGNATURE
Don Hall	Box 3084 Homer 99603	Donald J Hall
Steve Zimmerman	Box 1271 Homer 99603	Steve Zimmerman
J. Kierst Thompson	CR350N MUNCIE 47303	J. Kierst Thompson
BEAR AMUNDSEN	Box 3812 Homer 99603	B Amundsen
OREG COLLINS	Box 144 Homer 99603	Oreg Collins
JON WETZEL	PO BOX 1260 HOMER 99603	Jon Wetzel
LENE VILLAREAL	box 770 Saldak rd #9 99603	Lene Villareal
Johnathan M. Hillstrand	P.O. Box 3186 Homer 99603	Johnathan Hillstrand
IAN GILBERT	PO BOX 1375 HOMER 99603	Ian Gilbert
Paul SEATON	58360 Bruce Dr Homer AK	Paul Seaton
KEN HALPIN	Box 2448 HOMER AK 99603	Ken Halpin
GLEN CARROLL	Box 551 Homer AK 99603	Glen Carroll
Dave Poffar	Box 64 Mulchak 99639	Dave Poffar
SEAN GENSON	PO BOX 1418 HOMER 99603	Sean Genson
Victor Yakunin	P.O. Box 5009 Nikolaevsk AK	Victor Yakunin
BRUCE HANBRIKSON	Box 1431 Homer AK 99603	Bruce Hanbrikson
DAN WILSON	Box 1272, Homer AK	Dan Wilson
ARMIN PERSON	P.O. BOX 3186 HOMER AK	Armin Person
Larry Person	221 Tacoma Blvd S Pacific WA	Larry Person
Emil Nelson	Box 130 Homer AK	Emil Nelson
Margaret Boone	Box 261 Homer AK	Margaret J. Boone
MARVIN PETERS	Box 2623 Homer AK	Marvin Peters
John Kettle	4631 Early Spring St Homer	John Kettle
Therese Rudisill	Box 2793 Homer 99603	Therese Rudisill
Sylvia Harris	PO Box 2427 Homer 99603	Sylvia Harris
HARRY FORQUET	P.O. Box 1187 Homer 99603	Harry Forquet

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 160 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

If The Bering Sea Trawl Fleet Is Closed Then *[Handwritten Signature]*

PRINTED NAME ADDRESS SIGNATURE

<i>David L Campbell</i>	<i>PO Box 112 Ouzinkie</i>	<i>[Signature]</i>
<i>Prince Wolfe</i>	<i>Box 2206 Kodiak</i>	<i>[Signature]</i>
<i>Paul Harder</i>	<i>1427 Quincy St Port P... Alaska</i>	<i>[Signature]</i>
<i>FOLS MCGARRY</i>	<i>Box 8393 KODIAK</i>	<i>[Signature]</i>
<i>ALEXIS KWACHKA</i>	<i>Box 9280 KODIAK AK</i>	<i>[Signature]</i>
<i>STAN SARKENT</i>	<i>Box 574</i>	<i>[Signature]</i>
<i>Bruce Smith</i>	<i>[Blank]</i>	<i>[Signature]</i>
<i>PETER GOLINVA</i>	<i>11 GONDUM BRIDGE</i>	<i>[Signature]</i>
<i>Arto Kacalski</i>	<i>PO [Blank]</i>	<i>[Signature]</i>

To: North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hand-on-bottom drag, the most destructive and dirtiest harvesting segment of the fishing industry, is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. **THIS MUST BE STOPPED NOW.**

We implore you to take immediate action.


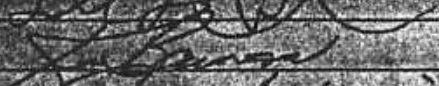




PRINTED NAME	ADDRESS	SIGNATURE
Richard F. Seigel	PO Box 644, Sitka, AK 99801	[Signature]
Bob [unclear]	PO Box 3, [unclear]	[Signature]
[unclear]	PO Box 2521, [unclear]	[Signature]
John Lovstam	[unclear]	[Signature]
GAIL M. HENNING	8636 [unclear] Circle, Anchorage, AK 99504	[Signature]
LEE ASHAWAK	Box 100, Old Harbor, AK 99801	[Signature]
George [unclear]	[unclear]	[Signature]
ANDREW LINDGREN	Box 287, Kodiak, AK 99588	[Signature]
TRISTAN FURRIE	PO Box 2202, Kodiak, AK 99588	[Signature]
MATT MULLY	PO Box 400, Kodiak, AK 99588	[Signature]
Bob Thompson	PO Box 2546, Kodiak, AK 99588	[Signature]
JAMES R. MORTON	PO Box 44, Kodiak, AK 99588	[Signature]
ROBT. GUNDERSEN	PO Box 4, Port Lions, AK 99801	[Signature]
[unclear]	PO Box 4, Port Lions, AK 99801	[Signature]
[unclear]	2057 Bristol, AK 99801	[Signature]
ROBERT D. BROOKS	Box 200, Kodiak, AK 99588	[Signature]
DONALD H. PARRIS	Box 200, Kodiak, AK 99588	[Signature]
DEAN B. [unclear]	[unclear]	[Signature]
James [unclear]	[unclear]	[Signature]
WILLIAM K. KINCH	PO Box 45, Kodiak, AK 99588	[Signature]
James [unclear]	[unclear]	[Signature]
John [unclear]	[unclear]	[Signature]
Wendy [unclear]	PO Box 45, Kodiak, AK 99588	[Signature]
Edmund [unclear]	[unclear]	[Signature]
MAR [unclear]	[unclear]	[Signature]

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baited Fishery is being closed East of 157 degree W longitude starting 1996 to 1995 to protect King Crab Stocks. The hard-on-bottom drag used in the most destructive and dirtiest harvesting segment of the fishing industry is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. **THIS MUST BE STOPPED NOW.**

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Cyril Chindler	1998 M... ..	
John Bauman	P.O. Box 1912... ..	
Terry McKennie	P.O. Box 373... ..	
Darrell Short	P.O. Box 2134... ..	
STAN SARGE-T	Box 574... ..	
MIKE STEELMAN	Box 2603... ..	

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-core bottom area, the most destructive and dirtiest harvesting segment of the fishing industry, is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. **THIS MUST BE STOPPED NOW.**

We implore to you to take immediate action!

PRINTED NAME ADDRESS SIGNATURE

PRINTED NAME	ADDRESS	SIGNATURE
John H. Schroeder	Box 9 Kodiak	[Signature]
Duane Freema	PO Box 912 Kodiak	[Signature]
MATTHEW MURPHY	PO Box 3050 Kodiak	[Signature]
Edward Turtan	PO Box 2514 Kodiak	[Signature]
John Gilbert	PO Box 2912 Kodiak AK	[Signature]
Nathaniel Scott	PO Box 1051 Kodiak	[Signature]
DAVID FURBUE	PO Box 298 Kodiak	[Signature]
John D. Hill	PO Box 345 Kodiak	[Signature]

To: North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 161 degree W longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME

ADDRESS

SIGNATURE

Bill Stain	Box 4253 Kodiak AK	<i>Bill Stain</i>
Kim Parker	240 Pillar Mountain	<i>Kim Parker</i>
Jane Williams	Box 3223 Kodiak	<i>Jane Williams</i>
George Owen	6nd Kodiak AK	<i>George Owen</i>
John McLaughlin	PO Box 103 Kodiak	<i>John McLaughlin</i>
David Hendley	PO Box 8009 Kodiak	<i>David Hendley</i>
John C. Houston	Box 1635 Kodiak AK	<i>John C. Houston</i>
Jeff D. McDowick	Box 6593 Kodiak AK	<i>Jeff D. McDowick</i>
William Matthews	PO Box 2140 Kodiak AK	<i>William Matthews</i>
Jane Fegan	544 L St #202 Anchorage	<i>Jane Fegan</i>
Erik Batchart		<i>Erik Batchart</i>

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. **THIS MUST BE STOPPED NOW.**

We implore to you to take immediate action.

PRINTED NAME	ADDRESS	SIGNATURE
CHAD ABELL	P.O. Box 2050 Kodiak	Chad Abell
Gene Erwin		
Gene Erwin	P.O. Box 1247 Kodiak	Gene Erwin
Roger Johnson	Box 100 Kodiak	Roger Johnson
Russ Kurler	Box 351 Anchorage Pt	Russ Kurler
Patrick Palmer	Box 351 Anchorage Pt	Patrick Palmer
TTM MARTIN	1016 MADISON AVE SEASIDE	
David Johnson	P.O. Box 1727 Kodiak	David Johnson
DONNIE LAMHEAD	P.O. Box 436 Kodiak	Donnie Lamhead
JEFF POWERS	Box 2932 Kodiak	Jeff Powers
Don Gallagher	P.O. Box 4428 Kodiak	Don Gallagher
JOHN SVENSSON	P.O. Box 2527 GEMMETT WA.	John Svensson
Judy Weitschick	P.O. Box 491 Kodiak	Judy Weitschick
Jim Bruce	P.O. Box 5050 Kodiak	Jim Bruce
Thomas Fisher	P.O. Box 74 Old Harbor	Thomas Fisher
Valerie Ellis	P.O. Box 1092 Kodiak	Valerie Ellis
Cathy Cordry	1940 Marmot Drive Kodiak	Cathy Cordry
Sally Brown		
Steve Arand	Box 2550 Kodiak	Steve Arand
David Jentley	Box 3128 Kodiak, AK	David Jentley
John Johnson	Box 2500 Kodiak	John Johnson
John Egan	Box 1000 Kodiak	John Egan
Paul Jentley	Box 1017 Kodiak	Paul Jentley
Bob Verduyn	Box 2000 Kodiak	Bob Verduyn
Chris Hargrave	Box 2000 Kodiak	Chris Hargrave

To: North Pacific Fishery Management Council

Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 153 degree W Longitude during 1994 & 1995 to protect King Crab stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW

We implore you to take immediate action!

PRINTED NAME

ADDRESS

SIGNATURE

Clifford J. Rasmussen

For Dr. Frank R. ...

[Signature]

To: North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Thomas W. Pope	Box 8238 Kodiak	Thomas W. Pope
Diane McKenley	Rome 634 Kodiak	Diane McKenley
Linda DeLaur	P.O. Box 175 Kodiak	Linda DeLaur
Kelly W. Allen Field	Box 2706 Kodiak	Kelly W. Allen Field
Kimberly J. Jaker	31178 Pope St	Kimberly J. Jaker
John W. Kenney	83534 Kodiak AK	John W. Kenney
Rita S. Abila	P.O. Box 108 Kodiak	Rita S. Abila
Charles Olson	P.O. Box 877013 Wasilla AK 99687	Charles Olson
Tom Miller	Box 3755 Kodiak AK	Tom Miller
Jay Anderson	Box 2369 Kodiak	Jay Anderson
Louis Barclay	1454 M+U View Dr	Louis Barclay
Linda J. Benton	Kodiak AK 99615	Linda J. Benton
Heather Graves Anderson	Kodiak AK	Heather Graves Anderson
Carol Ann Kunkrat	Box 1374	Carol Ann Kunkrat
Ed Alvestad	16577 Kodiak AK	Ed Alvestad
Ann		
Ernie Johnson	P.O. Box 8940 Kodiak AK	Ernie Johnson
Alan Hill	5615 Stone Dr Kodiak	Alan Hill
Michael J. Brown	P.O. Box 877013	Michael J. Brown
Michael J. Brown	P.O. Box 877013	Michael J. Brown
Russell Richardson	Box 3755 Kodiak	Russell Richardson
John W. Kenney		John W. Kenney
John W. Kenney		John W. Kenney

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1996 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. **THIS MUST BE STOPPED NOW**

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
LIBBY HANSEN	PO 1794 Kodiak	Libby Hansen
Dennis Martin	1658 Longview Northway	Dennis Martin
James Monroe	PO 1202 Kodiak	James Monroe
John Lotquist	PO Box 213 Kodiak	John Lotquist
Mark T. Nelson	PO Box 1731 Kodiak	Mark T. Nelson
Dean Fox	PO Box 4356 Kodiak	Dean Fox
Joe Mc	PO Box 1057 Kodiak	Joe Mc
Larry Tom Dooly	PO Box 2195 Kodiak	Larry Tom Dooly
Tom	PO Box 3017 Kodiak	Tom
James	PO 151518 Kodiak	James
JOHN H BENNETT	221 MAPLE KODIAK	John H Bennett
KATHLEEN ORHEIM	Box 685 Kodiak	Kathleen Orheim
ANTHONY M BURKE	Box 3869 Kodiak	Anthony M Burke
Dan Cook	Box 8576 Kodiak	Dan Cook
Pete Christoffersen	Box 1219 Kodiak	Pete Christoffersen
Douglas Douglas	Box 199 Kodiak	Douglas Douglas
Nadine Enderson	Box 97 Kodiak AK	Nadine Enderson
James H HEATER	Box 2029 Kodiak	James H Heater
George	PO 1101 Kodiak	George
David	PO 48 Kodiak	David
Carl	PO 1101 Kodiak	Carl
Andrew	PO 1101 Kodiak	Andrew
John	PO 1101 Kodiak	John

To: North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME ADDRESS SIGNATURE

PRINTED NAME	ADDRESS	SIGNATURE
Ben Russell	P.O. Box 1748 Kodiak	[Signature]
GERRIE ANDERSON	PO Box 1201 Cosmos Dr Kodiak AK 99517	[Signature]
Khanta Khongsavan	70 Box 1025 Kodiak AK	[Signature]
DAVID K. SIMON	227 RETAUF W. #3 KODIAK AK	[Signature]
PETER J THOMPSON	BOX 3037 KODIAK	[Signature]
Victor Muller	Box 2717 Kodiak	[Signature]
Tom Staci Fel	Box 2076 Kodiak	[Signature]
DAVE LAZURUK	Box 1816 Kodiak	[Signature]
DAVID J. FURBERWOOD	614 FORTY-NINTH ST Kodiak	[Signature]
Edward Libke	Box 2158 Kodiak AK	[Signature]
Evert Schmebeubach	920 E Rozumof Kodiak AK	[Signature]
FRANK HUMPHREYS	#1897 "L" ST Kodiak AK	[Signature]
Kevin Anzick	Box 2338 Kodiak AK	[Signature]
GARY JOHNSON	1390 BURNING RIVER Rd	[Signature]
Jennifer Miller	2744 Thurston Ln	[Signature]
Rob Bostack	1626 S. MARSHALL CIR Kodiak	[Signature]
Ken Young	P.O. Box 4356 Kodiak	[Signature]
Mark J. [unclear]	P.O. Box 1111 Kodiak AK	[Signature]
GARY PETERSON	PO Box 1063 Kodiak AK	[Signature]
GARY S. PETERSON	[unclear]	[Signature]
[unclear]	[unclear]	[Signature]
[unclear]	[unclear]	[Signature]
[unclear]	[unclear]	[Signature]
BOB SCHAFFER	Box 8748 Kodiak	[Signature]
MARK L. MOMBERSER	Box 909 Kodiak	[Signature]
Randy [unclear]	Box 1122 Kodiak	[Signature]
CLARK SPARKS	PO Box 419 Homer	[Signature]
Dore Fromong	Box 2173 Homer	[Signature]

To: North Pacific Fishery Management Council

Alaska Board of Fisheries

MAY 28 1996

King Crab stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 162 degree W Longitude during 1994 & 1995 to protect King Crab stocks. The hard-bottom drag fleet, the most destructive and illegal harvesting method in the fishing industry, is allowed to wreck havoc in the King Crab Savings Area between 160 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Peter M. Thumack	Box 2808	Peter M. Thumack
Debra Davis	P.O. Box 1099, Kodiak	Debra Davis
Cheryl Mynick	P.O. Box 1323	Cheryl Mynick
Adella Mynick	P.O. Box 1323	Adella Mynick
Carla Ellison	1120 FATHER HERMAN ST.	CARLA ELLISON
Steven W. Russell	552 Road 14, Long	Steven W. Russell
Robert Smith	Box 8948 Kodiak AK	Robert Smith
Robert Reed	Box 1272 Kodiak AK	Robert Reed
ROBERT EKISTRAND	Box 7140 ZINKIE, AK	Robert Ekstrand
Kandy Shell	Box 681 Kodiak AK	Kandy Shell
KEVIN BUNDY	Box 1624 KODIAK AK	Kevin Bundy
FRED FOGEE	Box 3809 KODIAK	Fred Fogg
Seung Markoski	Box 1343 Kodiak	Seung Markoski
ALP BROWN	105 Cape St. Nicholas St.	ALP BROWN
Mark Montello	202 Center St Kodiak AK 99612	Mark Montello
Walter R. Rieker	Box 107 King Cove AK 99612	Walter R. Rieker
Boris Basov	PO Box 420 Burlingame	Boris Basov
BALDON TASSER	2807 ESCOURRE KINGSPORT AK 99602	Baldon Tasser
Nelson	Box 2000 Kodiak AK 99612	Nelson
Robert Gustafson	Box 4997 Kodiak	Robert Gustafson
John Steek	1811 Level 3 Terrace	John Steek
JOHN W. BROWN	60 Kodiak AK	John W. Brown
TRAVIS BROWN	PO Box 4911 Kodiak	Travis Brown

To: North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed east of 163 degree W longitude during 1994 & 1995 to protect King Crab stocks. The harbor bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Gene Walter LeDoux	714 Hillside	Gene W. LeDoux
Armin Picowitz	Box 2483 Kodiak	Armin Picowitz
TERRY K MURPHY	Box 1568 Kodiak	Terry K. Murphy
Thomas Wharrell	Box 2000 Kodiak	Thomas Wharrell
Robert Riggs	Box 4831 Kodiak	Robert Riggs
John Collins	PO Box 2750 Kodiak	John Collins
Adrian Santos	PO BOX 505 Kodiak	Adrian Santos
Denard Smedley II	1218 Seward St. Kodiak	Denard Smedley II
Maria Mvalera	PO BOX 422 Kodiak	Maria Mvalera
Darrell Berntsen	Box 97, Old Harbor AK	Darrell Berntsen
Harold Christensen Jr.	Box 114, Old Harbor AK	Harold Christensen Jr.
Charles A. Mattsson		
Eric HARDER	Box 1106 Kodiak AK	Eric Harder
Margaret Helen	305 Cop St. Kodiak	Margaret E. Helen
Ernest Gould	PO Box 1214 Kodiak	Ernest Gould
Jim VENABLE	PO Box 4712 Kodiak	Jim Venable
Larry Dickson	216 Seward St. Kodiak	Larry Dickson
FRANK THOMPSON	PO Box 2776 Kodiak AK 99501	Frank Thompson
Robert GARDNER	PO Box 3229 Kodiak	Robert Gardner
Michael J. Fucina	Box 2187 Kodiak	Michael J. Fucina
Philip Sporn	Box 27 Kodiak	Philip Sporn
Claudia Anderson	POB 310 Kodiak	Claudia Anderson
Mike Shuman	POB 3213 Kodiak	Mike Shuman
Chris Kerns	Box 26 Kodiak AK	Chris Kerns
DAVID KOSIAK	PO Box 2084 Kodiak	David Kosiak

To: North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery of these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 152 degree W longitude during 1994 & 1995 to protect King Crab Stocks. The hard bottom trap fleet - the most destructive and direct harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Howard Torsen	Box 2855 Kodiak, AK 99615	Howard Torsen
Aarna Anderson	Box 2 Ozuzkie Ar 99649	Aarna Anderson
Jampy Beckwith	Box 589 Kodiak 99615	Jampy Beckwith
Tammy Yagve	Box 3108 Kodiak Alaska	Tammy Yagve
Arvo La Cluze	Box 8253 Kodiak	Arvo La Cluze
BOB MCGARRY	Box 8393 Kodiak AK	Bob McGarry
Harris Anderson	Box 2093 Kodiak 99615	Harris Anderson
Hazel Malutin	Box 8307 Kodiak	Hazel Malutin
James Torsen	Box 8307 Kodiak	James Torsen
Suzanne-Kenoul-King	P.O. 1877 Kodiak	Suzanne-Kenoul-King
Sandra Wilberys	Box 8393 Kodiak	Sandra Wilberys
John Poljola	P.O. 2020 Kodiak	John Poljola
John Wright	P.O. Box 1002 Kodiak	John Wright
Sonny Anderson	P.O. Box 67 Ozuzkie	Sonny Anderson
Fran Helmer	" "	Fran Helmer
Gail Smith	P.O. Box 1639 Kodiak	Gail Smith
WALTER ERICKSON	P.O. Box 3116	Walter Erickson
FRANCES FRENCH	P.O. Box 82 OZHARRE	Frances French
Mark Haas	1351 West 79	Mark Haas
M V	P.O. Box 524	M V
ORLANDO SANTO	WAIKANA WAY BOX 10	Orlando Santo
Ladluu Kalle	Waihana Way Box 10	Ladluu Kalle
Felipe Rentes	P.O. Box 2395	Felipe Rentes
William Thompson	P.O. Box 1144	William Thompson
W. W. Williams	827 Tokovak	W. W. Williams

To: North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard on bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME ADDRESS SIGNATURE

PRINTED NAME	ADDRESS	SIGNATURE
LUDWIG P. DOCHTERMANN	P.O. Box 714 Kodiak AK	Ludwig P. Dochtermann
ALBERT HARDY	421 E. WINDING DR. AUSTON, TX	Albert Hardy
TROY BERGER	1050 MATEVISTA CARMEL, CA	Troy Berger
KURT SCHUBERT	603 FIR ST. M.D.	Kurt Schubert
Harold Maketta	18 Mission Rd Kodiak	Harold Maketta
Frank Moore	P.O. Box 207 Kodiak AK	Frank Moore
Pat O'Connell	606 1/2 St. Kodiak AK	Pat O'Connell
Dan Walker	1415 Seward St Kodiak AK	Dan Walker
John House	P.O. Box 8781 Kodiak AK	John House
JUSTIN MATTHEWS	207 C. RACE ROCK CT.	Justin Matthews
Lyn Gilbert	Box 3950 Kodiak AK	Lyn Gilbert
HOWARD PETERSON	P.O. Box 1063 Kodiak AK	Howard Peterson
Stephen Childers	Box 3724 Kodiak AK	Stephen Childers
Robert Green	PO 8082 Kodiak AK	Robert Green
Geoff Peterson	PO Box 8082 Kodiak AK	Geoff Peterson
Kim Cozwell	Box 3573 Kodiak AK	Kim B. Cozwell
Mils P. Nelson	276 Thurston Dr. Kodiak AK	Mils P. Nelson
Chris Whiting	2999 Spencer Lane #4 Kodiak AK	Christopher P. Whiting
Douglas Miller	General Delivery old Harbor	Douglas Miller
VACANT KRAMBRAND	Ismaior Kodiak AK	Vacant Krambrand
STEVIE HERTING	GENERAL DELIVERY, Kodiak	Stevie Herting

To: North Pacific Fishery Management Council

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Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore to you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
JUDITH HELLER	PO Box 430 Kodiak	Judith Heller
Jim Kesperich	P.O. Box 1424 Kodiak	Jim Kesperich
Ray Kuckbauer	P.O. Box 148 Kodiak	Ray Kuckbauer
Allen Parks	PO Box 73 Kodiak AK	Allen Parks
Ken Hollander	PO Box 608 Kodiak AK	Ken Hollander
STACY L. CASTRO	101 E. EMERALD	Stacy L. Castro
Stephen McLaughlin	Box 1554 Kodiak	Stephen McLaughlin
Mark Blakeslee	PO Box 3696 Kodiak	Mark Blakeslee
CO. CO. FRICOW	BOX 2187 KODIAK	CO. CO. FRICOW
TIM SUMNER	BOX 2494 UDOT AK	Tim Sumner
ERIC MANZER	Box 2687 Kodiak AK	Eric Manzer
Dan Nelson	1522 Konstantinofskiy St	Dan Nelson
DAT QUINLAN	18301 NW REDDICK RD. PORTLAND OR	Dat Quinlan
ERIC GROOMER	2079 FLEISHAUER LN. McMINNVILLE OR	Eric Groomer
Della S. (S) ...	PO Box 92 - OLLIHANNA, ALASKA - 99543	Della S. (S) ...
...	632 W 14th Anchorage AK	...
...	Rv 2886 Kodiak	Shirley Nielsen
...	Box 495 Kodiak	...
STEVE PRICE	1004 3 SISTERS WAY Kodiak	Steve Price
Michael A. Katchin	Box 1511 Kodiak	Michael A. Katchin
Michael D. Brown	Box 934 UNALASKA AK	Michael D. Brown
Garland Wilson	Box 2699 Kodiak AK	Garland Wilson
James Hubert	3110 12th Ave E Duluth MN	James Hubert
W. W. Higgins	Kodiak AK	W. W. Higgins
Mike A. ...	Box 331 Kodiak AK	Mike A. ...
26 Y. KILLIN	Box 7968 Kodiak AK	Mike Killin

To: North Pacific Fishery Management Council

Alaska Board of Fisheries

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MAY 28, 1996

King Crab Stocks in Bristol Bay are depleted, and the directed fishery for these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed east of 162 degree W longitude during 1994 & 1995 to protect King Crab Stocks. The haul-on-bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 165 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore to you to take immediate action.

PRINTED NAME	ADDRESS	SIGNATURE
Colin Trueman	3475 Pittman, AK	Colin Trueman
Ronald Broughton	Box 967 Seward AK	Ronald Broughton
Adrian Doran	MANASHEVA, AK	Adrian Doran
Brian Wilson	Box 2831 Kodiak	Brian Wilson
Kathy Cole	Box 2499 Kodiak	Kathy Cole
Alvo La Cruz	" 8253 "	Alvo La Cruz
Roland Warkoch	Box 313	Roland Warkoch
PAT McDEVITT	P.O. Box 23 Kodiak AK	Pat McDevitt
Henry Henry	P.O. Box 8053 Kodiak AK	Henry Henry
Michael Sweeney	Box 2891 Kodiak, AK	Michael Sweeney
Jeff LeDoux	Box 2105 Kodiak AK	Jeff LeDoux
Kathleen Tyhuis	Box 2392 Kodiak AK	Kathleen Tyhuis
Susan Korota	Box 3610 Kodiak	Susan Korota
GARY WARD	BOX 8306 KODIAK	Gary Ward
MARC HANSEN	BOX 1452 KODIAK	Marc Hansen
Nivianne Cleland	Box 2105 Kodiak AK 99605	Nivianne Cleland
QUENTIN LICKITER	P.O. Box 1757 Kodiak AK	Quentin Lickiter
JOHN SULLIVAN	P.O. Box 1757 Kodiak AK	John Sullivan
Dani LaCruze	P.O. Box 8253 Kodiak	Dani LaCruze
James Horck	P.O. Box 3032 Kodiak	James Horck
SIMON FERKINGRAD	P.O. Box 28 Old Harbor	Simon Ferkingrad
Sheila J. Block	Box 8339 Kodiak	Sheila J. Block
Wendy Wainwright	Box 514 Kodiak	Wendy Wainwright
Patrick D. Williams	102 Center St. 315 - 102 Kodiak	Patrick D. Williams
Genece Manner	P.O. Box 2241 Kodiak, AK	Genece Manner
Chester Clark	500 Lincoln St Sitka	Chester Clark
Lisa D. Montoya	P.O. Box 3495 Kodiak AK	Lisa D. Montoya
Tammie Dennis	Box 2238 Kodiak AK	Tammie Dennis

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

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MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery of these stocks has been closed during 1994 & 1995. The Bairdi Fishery has been closed East of 165 degree W longitude during 1994 & 1995 to protect King Crab Stocks. The Bairdi Bottom drag fleet, the most destructive and onerous harvesting component of the fishing industry, is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
PAUL SEASTRAND	1657 EAST BAY BLVD	
Odie L Ward	PO Box 3162 Kodiak	Odie L Ward
Nona M Heglin	Box 8294 Kodiak	Nona M Heglin
RICHARD W. HEGLIN	307 COPE ST, KODIAK	Richard W Heglin
PORTA KVADONILIN	619 LOWER MILL RD	Porta Kvasinik
Jane Burpee	PO 2200 Kodiak	Jane Burpee
Rick Shuraboff	Box 222 Kodiak	Rick Shuraboff
Pam Freeman	Box 824 Kodiak	PAM FREEMAN
LANCE & PARKER	PO Box 2071 Kodiak	Lance Parker
Frank Hennickson	P.O. Box 4141 Kodiak	Frank Hennickson
KRISTIN GUARDSON	P.O. Box 1121	Kristin Guardson
AVENUE CAMPALA	P.O. Box 1443 KODIAK	Avenue Campala
LES GRAY	P.O. BOX 2546 KODIAK	Les Gray
WANDA A. DRYANT	P.O. BOX 1906 KODIAK	Wanda Dyant
Jerry Everman	Box 2779 Kodiak AK	Jerry Everman
Mike Melone	P.O. Box 1339 Kodiak	Michael Melone
John L. Tofley	Box 3299 Kodiak	John L. Tofley
Kathy Schuster	Box 1534 Kodiak	Kathy Schuster
John W. Severson	Box 3784 Kodiak	John W. Severson
GUY DALGREN	Box 8368 Kodiak	Guy Dalgren
LeRoy Blomdin	Box 623 Kodiak	LeRoy Blomdin
Lynn F. Sauppe	Box 1194 Kodiak	Lynn F. Sauppe
Dan Novachuk	Box # 2924 Kodiak	Dan Novachuk
Scott Surabode	Box 1921 Kodiak	Scott Surabode
Tim Truwer	Box 2170 Kodiak	Tim Truwer
JAMES W. CONAWAY	P.O. Box 9208 Kodiak AK 99515	James W. Conaway
Dyan Conaway	P.O. Box 643 Kodiak	Dyan Conaway
MICHAEL R. HANSEN	BOX 822 KODIAK	Michael R. Hansen

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

19
MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bajrdl Fishery has been closed east of 163 degree W longitude during 1994 & 1995 to protect King Crab Stocks. The harbor bottom drag fleet - the most destructive and dirtiest harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore to you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
Ellen Graham	1122 Mission Rd	Ellen Graham
KIP THOMAS	BOX 3258 KODIAK	KIP THOMAS
SHERIE ARDINGER	Box 3277 Kodiak	Sherie Ardinger
Phil Mason	685 Mulukey Woodland, cor 95695	Phil Mason
Melvin Ra	10734 Chisak dr Kodiak 99615	Melvin Ra
Roger Tool	PO Box 3866 Kodiak 99615	Roger Tool
Tom Stice	PO Box 8972 Kodiak 99615	Tom Stice
Kim Phillips	Box 683 Kodiak	Kim Phillips
Rob Gardner	Box 3229 Kodiak	Rob Gardner
DAVID ARDINGER	Box 3277 Kodiak	David Ardinger
Renee Manning	816 B LK Louise Kodiak	Renee Manning
FRED SARGENT	3171 WOODWAY	Fred Sargent
John Nevin	Box 2125 Kodiak	John Nevin
Victoria A. Dillon	661 Anderson Kodiak	Victoria A. Dillon
Mike Mullan	Box 2152 Kodiak	Mike Mullan
CRAG JOHNSON	Box 207 "	Craig Johnson
MICHAEL J. NUTTALL	2327 1/2 50th BROADWAY - GRANITE Co. 99613	Michael J. Nuttall
Todd HINCK	Box 671 Kodiak	Todd H.
Norm Gotz	1223 PANTON Kodiak	Norm Gotz
DAVE BARBER	1912 SELIEF KODIAK	Dave Barber
Walter Sargent	1830 MISSION RD	Walter Sargent
Brian Perry	PO Box 4366	Brian Perry
HA WILSON	" " 4116 KODIAK	HA Wilson
FRANK LEE	BOX 4454 KODIAK	KAREN LEE
FENNI OLSON	PO. 4345	Fenni Olson
26 MARIO MONSON BENS	PO B1736 99615	Mario Monson
GENE LORENSEN	1014 THORSHEIM	Gene Lorenson

To North Pacific Fishery Management Council

Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Bristol Fishery has been closed East of 156 degree W longitude during 1994 & 1995 to protect King Crab Stocks. The hard-bottom drag fleet - the most destructive and highest harvesting segment of the fishing industry - is allowed to trawl (avoid) the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME ADDRESS SIGNATURE

Charles G. Johnson 1813 Reznor

Ray M. Silcott 619 Hume

Charles Hill 323 Eskimo

Bob Koryntz Box 5567 Kodiak

Chels Holzstuh 3265 Bay View Dr

Preparla R Hill 323 Eskimo

Jeff Hunt 1015 Rindler

Mick Clark 83009

John Clark Box 2009 Kodiak

Allison Houston 32A Aliff Road Avak

Katie Mann 310 Center Ave Kodiak

Broke Craig BX 8507 Kodiak

Sammy Samson 1118 Ismailov

Don Dolan 1118 Ismailov

John K. Hill 229 211 Kodiak

James Johnson 613 Upper Mill Pt Rd

Tracy Cophelin 1421 Kouskov

Tracy Eagle Box 4055 Kodiak

Mike Miller Box 87391 Kodiak

Sue Guit 601 2743 Kodiak

Jeffery Hill 323 Eskimo

John Kouskov 1421 Kouskov

John Kouskov Box 4055 Kodiak

John Kouskov Box 87391 Kodiak

John Kouskov 1421 Kouskov

John Kouskov Box 4055 Kodiak

John Kouskov Box 87391 Kodiak

John Kouskov 1421 Kouskov

John Kouskov Box 4055 Kodiak

John Kouskov Box 87391 Kodiak

John Kouskov 1421 Kouskov

John Kouskov Box 4055 Kodiak

John Kouskov Box 87391 Kodiak

John Kouskov 1421 Kouskov

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North Pacific Fishery Management Council
 Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed and the directed fishery in these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed east of 163 degree W longitude during 1994 & 1995 to protect King Crab Stocks. The fair-weather bottom drag fleet, the most destructive and dirtiest harvesting segment of the fishing industry, is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW.

We implore you to take immediate action!

PRINTED NAME	ADDRESS	SIGNATURE
TRICIA HALL	325 EXETER AVE	<i>Tricia Hall</i>
CRAIG LOWENBERG	1322 ROZANOFF	<i>Craig Lowenberg</i>
Peggy O'Leary	Box 3614 Kodiak	<i>Peggy O'Leary</i>
Cathy Spang	602 S E 74th Anchorage	<i>Cathy Spang</i>
Sylvia M. Nelson	1450 E 5th Merrill	<i>Sylvia M. Nelson</i>
Long Leaker	1114 Ch. FE side	<i>Long Leaker</i>
Wally Turner	Box 4342 Kodiak	<i>Wally Turner</i>
Carlton Turner	Box 4342 Kodiak	<i>Carlton Turner</i>
GARY MOXLEY	805 E POINT SHANNON	<i>Gary Moxley</i>
Bob Lee	1707 DE STANTON	<i>Bob Lee</i>
Helm Johnson	Box 303 Kodiak	<i>Helm Johnson</i>
Wayne Patterson	P.O. Box 2615 Kenai 99541	<i>Wayne Patterson</i>

To: North Pacific Fishery Management Council
Alaska Board of Fisheries

MAY 28, 1996

King Crab Stocks in Bristol Bay are depressed, and the directed fishery on these stocks has been closed during 1994 & 1995. The Baird Fishery has been closed East of 163 degree W Longitude during 1994 & 1995 to protect King Crab Stocks. The hard-on-bottom drag fleet - the most destructive and direct harvesting segment of the fishing industry - is allowed to wreak havoc in the King Crab Savings Area between 163 and 162 degree W longitude. THIS MUST BE STOPPED NOW
We implore you to take immediate action!

PRINTED NAME ADDRESS SIGNATURE

Byron L. Reed
P.O. Box 2486

By 