



BSA 41

UNITED STATES DEPARTMENT OF COMMERCE
Office of the Under Secretary for
Oceans and Atmosphere
Washington, D.C. 20230

MAR 10 1997

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action.

TITLE: Environmental Assessment of Amendment 41 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area

LOCATION: Bering Sea and Aleutian Islands Area (BSAI)

SUMMARY: This environmental assessment analyzes prohibited species catch limits to protect Tanner crab and changes to the prohibited species catch limits of Tanner crab

RESPONSIBLE OFFICIAL: Steven Pennoyer
Regional Administrator
National Marine Fisheries Service
709 W. 9th St.
Juneau, Alaska 99801
Phone: 907-586-7221

The environmental review process led us to conclude that this action will not have a significant impact on the environment. Therefore, an environmental impact statement was not prepared. A copy of the finding of no significant impact, including the environmental assessment, is enclosed for your information. Also, please send one copy of your comment to me in Room 5805, OP/SP, U.S. Department of Commerce, Washington, D.C. 20230.

Sincerely,

Donna Wieting
Acting Director, Office of
Ecology and Conservation

Enclosure



ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/
FINAL REGULATORY FLEXIBILITY ANALYSIS
FOR

AMENDMENT 41

**Management of Tanner Crab (*C. bairdi*) Bycatch Limits
in Bering Sea Groundfish Trawl Fisheries**

an Amendment to the Fishery Management Plan
for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area



Prepared by staff of the
North Pacific Fishery Management Council

February 19, 1997

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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. An EA/RIR, which examined impacts of management measures proposed under both Amendment 37 and Amendment 41, was released for public review on May 10, 1996 (NPFMC, 5/10/96). In June 1996, the Council took final action on Amendment 37, providing several measures to protect the red king crab stock from possible impacts due to groundfish fisheries. At its September 1996 meeting, the Council identified and adopted Alternative 3, Option C as its preferred alternative for bycatch limits of Tanner crab taken incidentally in trawl fisheries. This measure is proposed as Amendment 41 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea/Aleutian Islands (BSAI) area.

Bycatch limits for Tanner crab that were established for Bering Sea trawl fisheries may be too high given current status of the crab stock, and bycatch may impact crab rebuilding and future crab harvests by pot fisheries. Crab bycatch limits were established for trawl fisheries beginning in 1986. Bycatch limits (termed Prohibited Species Catch limits, or PSC) for crab are apportioned into limitation zones, and allocated among groundfish trawl fisheries. Status quo Tanner crab PSC limits are 1,000,000 crab in Zone 1 and 3,000,000 crab in Zone 2. Three main alternative PSC limits were examined, as well as additional options for stairstep PSC limits for Tanner crab. The alternatives to the status quo included a reduced bycatch limit for crab and a crab PSC limit that fluctuates with crab abundance. The alternatives and options were as follows:

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.

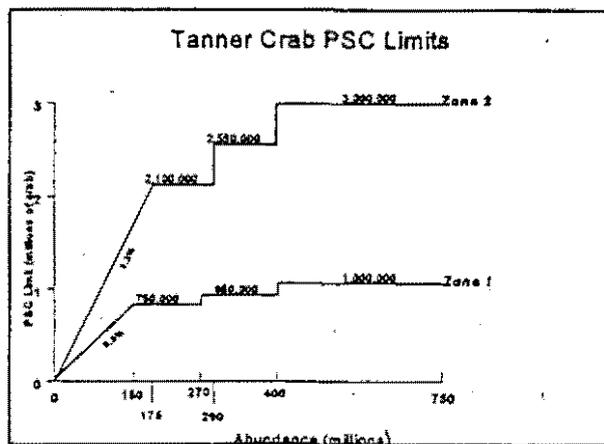
Alternative 3: Establish PSC limits for crab that fluctuate with crab abundance. Annual PSC limits would be set as a percentage of the total population indexed by the NMFS Bering Sea bottom trawl survey. Limits would be established based on a rate specified, within the range 0.10-2.0% of Tanner crab 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.

Option C (Preferred): Establish stairstep based PSC limits for Tanner crab, as negotiated by industry representatives. Under this alternative, PSC limits for *bairdi* in Zones 1 and 2 will be based on total abundance of *bairdi* crab as indicated by the NMFS trawl survey (see table and figure below). Based on 1996 abundance (185 million crabs), the PSC limit for *C. bairdi* in 1997 will be 750,000 crabs in Zone 1 and 2,100,000 crab in Zone 2. Crab bycatch accrued from January 1 until publication of the final rule (expected by April 1997) will be applied to revised bycatch limits established for specified fisheries.

| Amendment 41 PSC limits adopted for <i>bairdi</i> Tanner crab. | | |
|--|------------------------|-------------------|
| Zone | Abundance | PSC Limit |
| Zone 1 | 0-150 million crabs | 0.5% of abundance |
| | 150-270 million crabs | 750,000 |
| | 270-400 million crabs | 850,000 |
| | over 400 million crabs | 1,000,000 |
| Zone 2 | 0-175 million crabs | 1.2% of abundance |
| | 175-290 million crabs | 2,100,000 |
| | 290-400 million crabs | 2,550,000 |
| | over 400 million crabs | 3,000,000 |



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 from current levels. For example, PSC limits for Tanner crab proposed under Tanner crab Alternative 2 would increase female spawning stock by about 0.38%. At lower stock sizes, however, reduced PSC limits could result in conservation benefits.

The economic impacts of this management measure depend on the alternative chosen. 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. Simulation modeling indicated no net benefits or costs associated with setting caps at or near current bycatch levels. However, because PSC allocation becomes fixed for the year during the annual specification process, optimal allocation may be difficult 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. On average 1992-1995, groundfish fisheries bycaught crab at the following rates (bycatch as percentage of total crab survey abundance): Tanner crab (Zone 1, 0.39%; Zone 2, 0.79%). 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 stairsteps or 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.

1.0 INTRODUCTION

The groundfish fisheries in the Exclusive Economic Zone (EEZ) (3 to 200 miles offshore) off Alaska are managed under the Fishery Management Plan for the Groundfish Fisheries of the Gulf of Alaska and the Fishery Management Plan for the Groundfish Fisheries of the Bering Sea and Aleutian Islands Area. Both fishery management plans (FMP) were developed by the North Pacific Fishery Management Council (Council) under the Magnuson Fishery Conservation and Management Act (Magnuson Act). The Gulf of Alaska (GOA) FMP was approved by the Secretary of Commerce and become effective in 1978 and the Bering Sea and Aleutian Islands Area (BSAI) FMP become effective in 1982.

Actions taken to amend FMPs or implement other regulations governing the groundfish fisheries must meet the requirements of Federal laws and regulations. In addition to the Magnuson Act, the most important of these are the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), Executive Order (E.O.) 12866, and the Regulatory Flexibility Act (RFA).

NEPA, E.O. 12866 and the RFA require a description of the purpose and need for the proposed action as well as a description of alternative actions which may address the problem. This information is included in Section 1 of this document. Section 2 contains information on the biological and environmental impacts of the alternatives as required by NEPA. Impacts on endangered species and marine mammals are also addressed in this section. Section 3 contains a Regulatory Impact Review (RIR) which addresses the requirements of both E.O. 12866 and the RFA that economic impacts of the alternatives be considered. Section 4 contains the Final Regulatory Flexibility Analysis (FRFA) required by the RFA which specifically addresses the impacts of the proposed action on small businesses.

This Environmental Assessment/Regulatory Impact Review/Final Regulatory Flexibility Analysis (EA/RIR/FRFA) addresses proposals to reduce the impacts of trawling on Bering Sea Tanner crab and increase the probability of crab stock rebuilding.

1.1 Purpose of and Need for the Action

Bering Sea crab stocks are currently at relatively low levels based on recent National Marine Fisheries Service (NMFS) bottom trawl survey data. Recruitment and exploitable biomass of Bristol Bay red king crab (*Paralithodes camtschaticus*), and Bering Sea Tanner crab (*Chionoecetes bairdi*) stocks are near historically low levels. The 1995 Tanner crab season produced only 4.5 million pounds for the 196 vessels participating. This is the lowest catch since the fishery reopened in 1988. The stock is at historic low levels, and preliminary 1996 survey data indicates that the stock decline will continue (Bob Otto, NMFS, pers. comm), as shown in the adjacent table.

Abundance of Tanner (*bairdi*) crab in from NMFS surveys, in the Bering Sea 1988-1996.

| | MALES | | | FEMALES | | Grand Total |
|---------------|-------------------|-------------------|---------------|--------------|--------------|-------------|
| | Juveniles ≤110 | Prerec 110-134 | Large >135 | Small ≤85 | Large ≥85 | |
| 1988 | 287.3 | 59.7 | 17.4 | 184.8 | 81.0 | 630.2 |
| 1989 | 403.0 | 102.1 | 42.3 | 338.6 | 63.8 | 949.9 |
| 1990 | 286.1 | 78.8 | 53.7 | 266.5 | 97.4 | 782.5 |
| 1991 | 267.2 | 105.4 | 45.5 | 232.1 | 116.8 | 767.0 |
| 1992 | 121.0 | 101.9 | 52.8 | 98.9 | 63.9 | 438.5 |
| 1993 | 76.6 | 63.4 | 27.2 | 57.6 | 29.6 | 254.9 |
| 1994 | 47.9 | 38.6 | 20.0 | 57.9 | 27.5 | 192.0 |
| 1995 | 40.4 | 32.4 | 13.3 | 66.6 | 37.2 | 189.9 |
| 1996 (Prelim) | 52.6 | 23.5 | 12.5 | 59.3 | 27.7 | 184.8 |

1.2 Problem Statement

Bycatch limits for 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.

1.3 Alternatives Considered

Three main alternatives were examined. In addition to the status quo, Alternative 1, the impacts of a reduced fixed bycatch limit and floating caps were examined. These alternatives and options are shown graphically by Figures 1-3.

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.

Option C (Preferred): Establish stairstep based PSC limits for Tanner crab, as negotiated by industry representatives. Under this alternative, PSC limits for bairdi in Zones 1 and 2 will be based on total abundance of bairdi crab as indicated by the NMFS trawl survey (see table and figure below). Based on 1996 abundance (185 million crabs), the PSC limit for C. bairdi in 1997 will be 750,000 crabs in Zone 1 and 2,100,000 crab in Zone 2. Crab bycatch accrued from January 1 until publication of the final rule (expected by April 1997) will be applied to revised bycatch limits established for specified fisheries.

projected adult herring biomass (Amendment 16a). For the BSAI scallop fishery, the Council adopted floating crab PSC limits as part of the Amendment 1 package. Crab PSC limits for the scallop fishery will be set annually as a percentage of the NMFS survey abundance for Tanner crab (0.13542%) and snow crab (0.003176%), but a fixed limit for red king crab within the range of 500 to 3,000 crab.

Impacts of Alternative 3 to the trawl fishery depend on the percentage or rate chosen. A PSC limit established based on a higher percentage of crab abundance will cause the least negative impacts to trawl fisheries. Alternatively, a lower rate that equates to smaller PSC limits than set under the status quo may result in negative impacts to the trawl fleet (via increased costs, shorter seasons, less fish harvested, etc.).

Examination of recent bycatch as a percent of the total NMFS population index (all sizes of crab) provides some guidance on bycatch needs of the groundfish fisheries. Bycatch of Tanner crab, 1992 through 1995, as a percentage of the total index ranged from 0.26% to 0.49% in Zone 1 and 0.62% to 0.91% in Zone 2. Snow crab bycatch in Zone 2 has ranged from 0.05% to 0.15% of the survey index. Average bycatch rates, 1992-1995, based on survey percentages are shown in the adjacent table. If PSC limits were established at these rates, impacts would depend on the speed and magnitude of changes in crab stock abundance.

| Crab PSC rates based on average bycatch, 1992-1995, and annual crab abundance index of all sizes. | | |
|---|----------|----------|
| | (Zone 1) | (Zone 2) |
| Red king crab | 0.40% | - |
| Tanner crab | 0.39% | 0.79% |
| Snow crab | - | 0.10% |

The threshold limits proposed under Tanner crab Alternative 3, Option B were developed from historical bycatch data, and therefore may not substantially impact fisheries if PSC can be optimally allocated among trawl fisheries. The lower threshold "steps" were based on average levels of bycatch observed when Tanner crab abundance was at that level. For Step 1 (100-250 million crab), the proposed PSC limit (850,000 Tanner crab in Zone 1, and 1,500,000 in Zone 2) would be established at approximately the average bycatch observed for 1994 and 1995, which was 835,000 Tanner crab in Zone 1, and 1,515,000 in Zone 2. Average abundance in 1994/1995 was 191 million crab of all sizes. Abundance of Tanner crab was also in this range in 1986. For Step 2 (250-500 million crab), the proposed PSC limit (900,000 Tanner crab in Zone 1, and 2,300,000 in Zone 2) would be established at levels intermediate between Steps 1 and 3. These levels for Step 2 are slightly lower levels than the average bycatch observed for 1992 and 1993. Average abundance of Tanner crab in 1992/1993 was 347 million crabs of all sizes. Tanner crab abundance at this step was also observed in 1978, 1979, 1982, 1983, 1984, and 1987. For Step 3 (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. Tanner crab abundance at this step was occurred in 1976, 1977, 1980, 1981, 1988, 1989, 1990, and 1991. The current PSC limits were adopted by the Council in 1989 based on an estimated abundance of Tanner crabs in 1988. In 1988, it was estimated there were 176.1 million Tanner crabs in Zone 1 and 412.8 million Tanner crabs in Zone 2. Abundance has fallen below 100 million animals only once in the time-series (1985, 84.7 million).

The stairstep limits proposed under Tanner crab Alternative 3, Option C were also developed from historical bycatch data, and therefore may not substantially impact fisheries if PSC can be optimally allocated among trawl fisheries.

Based on past bycatch performance, and historic Tanner crab abundance, impacts on trawl fisheries under Option B and Option C may be only somewhat constraining to trawl fisheries as long as PSC limits can be efficiently allocated among various trawl fisheries. The potential benefit of threshold limits is that while it allows bycatch levels to fluctuate with crab abundance, it 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.

3.3 Bering Sea Fishery Simulation Model Results

This is essentially what is proposed by Alternative 2. Optimal allocation will be difficult to achieve because these apportionments are made pre-season. However, the Council will be considering an FMP amendment in the future that would allow individual vessel bycatch accountability, a tool that has potential to reduce bycatch and better allocate available PSC.

As with all PSC limits proposed under this alternative, trawl fisheries may be negatively impacted if PSC limits are not optimally allocated pre-season. In particular, the yellowfin sole fishery stands to be the most impacted fishery. Recent implementation of trawl closure areas in Bristol Bay (Amendment 37) and around the Pribilof Islands (Amendment 21a) have limited grounds available to this fishery.

The major assumption regarding assessment of impacts for Alternative 2 is that crab stock abundance will remain relatively stable, or that the trawl fishery will adapt to changes in crab abundance. As crab stocks increase, bycatch will further constrain trawl fisheries if fixed PSC limits are established. This may be expected for snow crab PSC limits, in particular, as abundance of large snow crab is projected to increase in the near future. On the other hand, if crab stocks continue to decline, bycatch will account for a higher proportion of the total annual mortality.

3.2.3 Alternative 3: Establish PSC limits for bairdi crab that fluctuate with crab abundance. Annual Tanner crab 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.

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.

Option C (Preferred): Establish stairstep based PSC limits for Tanner crab, as negotiated by industry representatives. Under this alternative, PSC limits for bairdi in Zones 1 and 2 will be based on total abundance of bairdi crab as indicated by the NMFS trawl survey (see table and figure below). Based on 1996 abundance (185 million crabs), the PSC limit for C. bairdi in 1997 will be 750,000 crabs in Zone 1 and 2,100,000 crab in Zone 2. Crab bycatch accrued from January 1 until publication of the final rule (expected by April 1997) will be applied to revised bycatch limits established for specified fisheries.

Alternative 3 specifies a PSC limit that varies with crab abundance. This is similar to the way PSC limits are set for Pacific herring in BSAI trawl fisheries and crab in BSAI scallop fisheries. The measures are frameworked such that they are established during the annual specification process. Herring PSC limits are set at 1% of the

million). In addition, the 1996 fisheries for Bristol Bay red king crab and Bering Sea Tanner crab may occur at very low levels, or may not even occur at all if stocks remain at low levels (K. Griffin, ADF&G, personal communication). As a consequence of low stock sizes and low prices, the crab fleet is expected to experience major changes in revenues in 1996.

3.2 Potential Impacts of Modifying Tanner Crab Bycatch Limits

3.2.1 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.

In general, crab PSC limits have not constrained most groundfish trawl fisheries. Rather, these fisheries close either upon reaching the total allowable catch quota (TAC) or attainment of halibut PSC limits. The one notable exception is the rock sole/other flatfish trawl fishery, which was limited in 1993 and 1994 despite relatively high levels of crab PSC apportioned to that fishery. For example, in 1994 Zone 1 was closed on February 28 due to attainment of red king crab PSC limit (110,000 crabs) and Zone 2 closed on May 7 due to the Tanner crab PSC limit (260,000 crabs). The yellowfin sole fishery was closed out of Zone 1 due to Tanner crab bycatch on April 14, 1995.

Even under status quo, halibut and crab PSC limits may become more constraining to groundfish trawl fisheries if pollock TAC's are reduced in the future. Total annual BSAI groundfish harvest is limited by an optimum yield (OY) cap of two million metric tons. Pollock accounts for about 1.1 to 1.3 million mt of the total OY cap. The rest is apportioned among other fisheries. This OY cap generally results in TAC allocations to higher valued species and fisheries with lower halibut bycatch (such as the pollock fishery) than to flatfish fisheries (Witherell 1994). For example, in 1996, pollock TAC was set at the ABC level, whereas TACs for flatfish were 665,000 mt below ABC. Hence, if pollock TAC is reduced in the future, fisheries will have higher TAC of flatfish to harvest. However, fisheries may be unable to harvest this additional flatfish TAC even under existing PSC limits. Reduced PSC limits would make achieving a two million mt OY even more challenging.

In evaluating the status quo, or proposed reductions, it is informative to know what crab bycatch in groundfish fisheries costs the directed crab fisheries. The answer to this question can be derived from the adult equivalent exercise made in the previous section. If groundfish fisheries caught no crab incidentally, the crab fishery may increase total ex-vessel revenues by about \$10.5 million. This represents an estimate of opportunity costs. Assuming there are about 275 crab vessels, these crab would equate to about \$38,000 per vessel in gross ex-vessel value. Potential costs of proposed alternative crab PSC limits for trawl fisheries can be measured against potential benefits to crab fisheries.

| | Adult male Equivalents | Adult weight | Average price/lb | Total value (\$) |
|---------------|---------------------------|-----------------|---------------------|---------------------|
| Red king crab | 33,231 | 6.5 | 3.80 | 820,800 |
| Tanner crab | 920,060 | 2.3 | 2.80 | 5,925,000 |
| Snow crab | 1,958,138 | 1.3 | 1.50 | 3,818,000 |
| Total | | | | \$10,563,800 |

3.2.2 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.

Recent data indicate that the current PSC limits for crab could be reduced from existing levels, yet not impact groundfish fisheries if the available PSC is optimally allocated among target fisheries and seasons. On average, bycatch taken each year has been less than the PSC limit. Bycatch of Tanner crab was 902,724 crabs in Zone 1 and 2,033,057 crabs in Zone 2 (average 1993-94, all gears). Hence, based on average bycatch needs, PSC limits could be reduced by about 20,000 red king crab and 1,000,000 Tanner crab (Zones 1 and 2 combined).

This section also addresses the requirements of both E.O. 12866 and the Regulatory Flexibility Act to provide adequate information to determine whether an action is "significant" under E.O. 12866 or will result in "significant" impacts on small entities under the RFA.

E. O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be "significant". A "significant regulatory action" is one that is likely to:

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

A regulatory program is "economically significant" if it is likely to result in the effects described above. The RIR is designed to provide information to determine whether the proposed regulation is likely to be "economically significant."

3.1 Background Economic Information on Bering Sea Crab and Groundfish Fisheries

The most recent description of the groundfish fishery is contained in the Economic Status of the Groundfish Fisheries Off Alaska, 1995 (Kinoshita et al. 1995). The report includes information on the catch and value of the fisheries, the numbers and sizes of fishing vessels and processing plants, and other economic variables that describe or affect the performance of the fisheries. Catch of groundfish in the Bering Sea has remained relatively stable over the past 10 years, averaging about 1.8 million metric tons, consisting primarily of pollock). About 2,000 vessels fish for groundfish in the BSAI and GOA each year. Preliminary data for 1995 indicate that in the BSAI area, 112 vessels fished with hook and line, 105 vessels fished with groundfish pot gear, and 156 vessels fished with trawls. Catch in the domestic groundfish fisheries off Alaska totaled over 2 million metric tons in 1994, worth \$439 million in ex-vessel value. The value of resulting products was over \$1.1 billion.

The economics of BSAI crab fisheries are summarized in ADF&G's Annual Area Management Reports. Total value of these crab fisheries in recent years is about \$180 million to \$260 million per year. Most vessels that participate in Tanner crab fisheries also participate in the Snow crab and Bristol Bay red king crab fisheries. Since 1982, the snow crab fishery has generated much higher values than the other crab fisheries. Although snow crab landings had dropped drastically since the peak in 1991 (325 million lbs.), price increased such that average gross ex-vessel value increased to over \$710,000 per vessel in the 1995 snow crab fishery. In the Tanner crab fishery, price did not keep up with reduced landings since 1992, and gross ex-vessel value was only \$60,000 per vessel in 1995. Assuming that all vessels in the snow crab fishery also fished for Tanner crab in 1995, vessels averaged about \$770,000 in ex-vessel value. The Bristol Bay red king crab fishery did not open in 1995. Ex-vessel values had averaged about \$175,000 per vessel per year in that fishery.

Gross revenues from crab fisheries are expected to be lower in 1996 than in previous years. The 1996 snow crab fishery produced only about 50.7 million pounds. At an exvessel price of \$1.25 per pound, this fishery generated a total of approximately \$63 million. This represents a 65% decline over the 1995 fishery gross revenues (\$180

None of the alternatives is expected to impact endangered or threatened species or critical habitat of listed whales.

2.4 Impacts on Marine Mammals

Marine mammals not listed under the Endangered Species Act that may be present in the GOA and BSAI include cetaceans, [minke whale (Balaenoptera acutorostrata), killer whale (Orcinus orca), Dall's porpoise (Phocoenoides dalli), harbor porpoise (Phocoena phocoena), Pacific white-sided dolphin (Lagenorhynchus obliquidens), and the beaked whales (e.g., Berardius bairdi and Mesoplodon spp.)] as well as pinnipeds [northern fur seals (Callorhinus ursinus), and Pacific harbor seals (Phoca vitulina)] and the sea otter (Enhydra lutris).

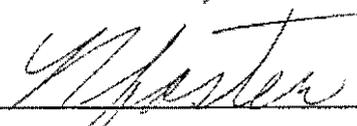
None of the alternatives is expected to impact marine mammals not listed under the Endangered Species Act.

2.5 Coastal Zone Management Act

Implementation of any of the alternatives would be conducted in a manner consistent, to the maximum extent practicable, with the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972 and its implementing regulations.

2.6 Conclusions or Finding of No Significant Impact

None of the alternatives is likely to significantly affect the quality of the human environment, and the preparation of an environmental impact statement for the proposed action is not required by Section 102(2)(C) of the National Environmental Policy Act or its implementing regulations.



DATE

MAR 3 1997

3.0 **REGULATORY IMPACT REVIEW: ECONOMIC AND SOCIOECONOMIC IMPACTS OF THE ALTERNATIVES**

This section provides information about the economic and socioeconomic impacts of the alternatives including identification of the individuals or groups that may be affected by the action, the nature of these impacts, quantification of the economic impacts if possible, and discussion of the trade offs between qualitative and quantitative benefits and costs.

The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following statement from the order:

In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environment, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

2.3 Impacts on Endangered or Threatened Species

Listed and candidate species under the Endangered Species Act (ESA) that may be present in the GOA and BSAI include:

Endangered

| | |
|----------------------------|-------------------------------|
| Northern right whale | <u>Balaena glacialis</u> |
| Sei whale | <u>Balaenoptera borealis</u> |
| Blue whale | <u>Balaenoptera musculus</u> |
| Fin whale | <u>Balaenoptera physalus</u> |
| Humpback whale | <u>Megaptera novaeangliae</u> |
| Sperm whale | <u>Physeter macrocephalus</u> |
| Snake River sockeye salmon | <u>Oncorhynchus nerka</u> |
| Short-tailed albatross | <u>Diomedea albatrus</u> |

Threatened

| | |
|---|---------------------------------|
| Steller sea lion | <u>Eumetopias jubatus</u> |
| Snake River spring and summer chinook salmon | <u>Oncorhynchus tshawytscha</u> |
| Snake R. fall chinook salmon | <u>Oncorhynchus tshawytscha</u> |
| Spectacled eider | <u>Somateria fischeri</u> |

The impact of BSAI and GOA groundfish fisheries on Steller sea lions was addressed in a formal consultation on April 19, 1991. NMFS concluded that the BSAI groundfish fisheries were not likely to adversely affect listed cetaceans or to jeopardize the continued existence or recovery of Steller sea lions or affect their respective critical habitats. NMFS determined that section 7 consultation should be reinitiated for Steller sea lions if any proposed change in the BSAI fishery was likely to adversely affect them, if new information regarding the effects of the fishery on Steller sea lions was obtained, or if there was a change in the status of sea lions. Since April 1991, NMFS has reinitiated section 7 consultation for several regulatory amendments and for the annual total allowable catch specifications.

Formal consultation conducted on effects of the GOA and BSAI groundfish fisheries concluded that the continued operation of these fisheries would not adversely affect listed species of salmon as long as current observer coverage levels continued and salmon bycatch was monitored on a weekly basis. Critical habitats of listed salmon species are not affected by this action. Consultation must be reinitiated if chinook salmon bycatch exceeds 40,000 fish in either the BSAI or GOA or sockeye salmon bycatch exceeds 200 fish in the BSAI or 100 fish in the GOA.

Endangered, threatened, and proposed species of seabirds that may be found within the regions of the GOA and BSAI where the groundfish fisheries operate, and potential impacts of the groundfish fisheries on these species are discussed in the EA prepared for the TAC specifications. The U.S. Fish and Wildlife Service (USFWS), in consultation on the 1995 specifications, concluded that groundfish operations will not jeopardize the continued existence of the short-tailed albatross (letter, Rappoport to Pennoyer, February 7, 1995). This action is not expected to affect threatened or endangered seabird species or their critical habitat in any manner or extent not already addressed under previous consultations.

Although concern has been raised about the unknown mortality of crabs caused by trawling, reducing PSC limits may exacerbate these unobservable impacts. In an attempt to catch less crabs (via reduced bycatch limits, VIP regulations, or proposed measures such as IBQ's, Harvest Priority, etc.), trawl fishermen may modify their gear. Modifications to footrope design, roller size, and mesh size can result in fewer crabs being retained and counted by observers. For trawl fisheries historically limited by bycatch limits, reduced bycatch rates of PSC species may result in increased effort (at least until limited by TAC of targets). In turn, increased trawl effort could result in increased unobservable impacts on crab resources. This possibility was also raised during the Council's 1993 deliberations over trawl codend mesh size, but the benefits of reduced bycatch were felt to outweigh the possible costs of unobserved mortality due to non-retention.

Another possible way to base PSC caps on abundance of the size of crab taken as bycatch in trawl fisheries, rather than based on the total survey index of all size groups. A shortcoming of Alternative 3 is due to the fact that minor changes in survey station or crab distribution can create major changes in the survey population estimate. This is because the population index is dominated by small animals (true for all 3 species) and survey estimates of small crab and their distribution are highly variable from year to year. With Alternative 3, annual PSC limits could be set disproportional to the abundance of the size of crab taken in trawl fisheries (which consists primarily of large crab). Of concern is the potential for a high PSC limit generated by large numbers of juveniles. A similar concern occurs at the opposite extreme where an artificially low PSC limit could needlessly constrain trawl fisheries. In reviewing the draft EA/RIR, the Council's Crab Rebuilding Committee concluded that Alternative 3 would have less problems if PSC limits were based on the survey abundance of large crab, but noted that there would still be annual variability. At its April 1996 meeting, the Council's Scientific and Statistical Committee recommended that this approach be considered, but as a separate amendment. The following is an excerpt from their minutes:

"In examining the alternatives for PSC limits that fluctuate with abundance, the SSC discussed the recommendation made by the Crab Rebuilding Committee that a different "currency" be used in establishing caps (e.g., the use of a cap in terms of "large" crab rather than total number of crab may be more stable over time than the total number of crab due to recruitment fluctuation). The SSC believes that a change to a new "currency" system should be done carefully with requisite analyses, because the effects of using different measures may be complicated (nonlinear, highly variable). If the Council wishes to move in this direction, the SSC suggests it be done as a separate amendment to avoid confusion."

Due to time limitations, a comprehensive analysis of PSC limits based on abundance of large crab was not undertaken for this amendment package. If the Council's preferred option is Alternative 3, then a follow up amendment analysis to modify the index may be prepared in the future to address these concerns. Such an analysis would examine the effects of using a different "currency" for establishing the PSC limits, rather than based on total population index.

A better measurement of impacts would take into account other factors such as the size and sex of crab taken. In January 1995, the Council's Scientific and Statistical committee recommended that the impacts of crab bycatch should be measured by adult equivalents. This also provides better estimates of impacts across fisheries.

The exercise of determining adult equivalents (detailed in NPFMC, 5/10/96) provided two major insights into the impact of trawl bycatch. First, a comparison of adult equivalent mortality across fisheries is instructive for developing a crab rebuilding policy. In

years when a GHF is established, the single largest source of human induced crab mortality is removals of legal males by directed crab fisheries. This is true for male crab of all three species. Crab fisheries accounted for about 98% of the male red king crab, 85% of male Tanner crab, and 98% of the male snow crab mortality. The crab fishery has a

Average adult equivalent crab removals by groundfish, scallop, and crab fisheries as a percentage of total crab abundance, 1993.

| Fishery | Bristol Bay Red king | | EBS Tanner | | EBS Snow | |
|---------|-------------------------|--------|---------------|--------|-------------|--------|
| | male | female | male | female | male | female |
| | Groundfish | 0.82 % | 0.98 % | 4.24 % | 1.73 % | 1.06 % |
| Scallop | 0.00 % | 0.00 % | 0.09 % | 0.19 % | 0.00 % | 0.00 % |
| Crab | 35.23 % | 2.04 % | 29.73 % | 1.79 % | 80.39 % | 0.01 % |

relatively smaller impact on females. For females, crab fisheries accounted for 68% of the female red king crab, 47% of the Tanner crab, and 6% of the snow crab mortality. Most of the remaining removals are due to the trawl and other groundfish fisheries. In all cases examined, the scallop fishery had relatively little impact on crab stocks as measured by observed bycatch. These data indicate that reductions in crab quotas for crab fisheries may have relatively more impact on rebuilding than reductions in crab bycatch in trawl or dredge fisheries.

The second insight provided by this exercise is a measurement of adult equivalent removals relative to population size. As indicated by the adjacent table, bycatch in groundfish fisheries has relatively small impacts on crab

populations. Of these crab species, groundfish fisheries impact Tanner crab the most, killing almost 5% of the adult male stock as bycatch. The impact on female Tanner crab was less, as fewer females are taken as bycatch. Smaller impacts on red king crab and snow crab were estimated. Additionally, impacts due to the 1995 groundfish fisheries on these crab species were generally lower than in previous years.

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

| Year | Bristol Bay Red king | | EBS Tanner | | EBS Snow | |
|---------|-------------------------|--------|---------------|--------|-------------|--------|
| | male | female | male | female | male | female |
| | 1993 | 0.82 % | 0.98 % | 4.24 % | 1.73 % | 1.06 % |
| 1994 | 0.88 % | 1.47 % | 4.25 % | 1.87 % | 2.27 % | 0.12 % |
| 1995 | 0.22 % | 0.24 % | 5.69 % | 0.91 % | 1.09 % | 0.03 % |
| Average | 0.64 % | 0.90 % | 4.73 % | 1.50 % | 1.47 % | 0.09 % |

From these data, one can also estimate what a reduction in trawl PSC limits means in terms of female spawning biomass. For example, the impacts of a 25% reduction in Tanner crab PSC limits proposed under Alternative 2 would result in about a 0.38% increase in female spawner abundance. In other words, Tanner crab female spawner may have increased from 37.2 million mature females to 37.3 million mature females in 1995.

This analysis indicates that reducing the PSC limits may not drastically improve or rebuild crab stocks. Because bycatch mortality caused by trawl fisheries is very small relative to other sources of removals due to natural and fishing mortality, reductions in bycatch limits may not result in measurable improvements to crab stock abundance. Potential "savings" of crab through PSC reductions proposed under Alternative 2 and 3 will increase crab available for harvest or spawning only slightly. This was also the conclusion of Witherell and Harrington (1995) and Stevens (1990) who stated that "Removals of this magnitude (0.5% of the population as trawl bycatch) are well below the ability of the NMFS crab survey to detect, and probably have no significant biological impact".

2.0 NEPA REQUIREMENTS: ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

An environmental assessment (EA) is required by the National Environmental Policy Act of 1969 (NEPA) to determine whether the action considered will result in significant impact on the human environment. The environmental analysis in the EA provides the basis for this determination and must analyze the intensity or severity of the impact of an action and the significance of an action with respect to society as a whole, the affected region and interests, and the locality. If the action is determined not to be significant based on an analysis of relevant considerations, the EA and resulting finding of no significant impact (FONSI) would be the final environmental documents required by NEPA. An environmental impact study (EIS) must be prepared for major Federal actions significantly affecting the human environment.

An EA must include a brief discussion of the need for the proposal, the alternatives considered, the environmental impacts of the proposed action and the alternatives, and a list of document preparers. The purpose and alternatives were discussed in Section 1, and the list of preparers is in Section 10. This section contains the discussion of the environmental impacts of the alternatives including impacts on threatened and endangered species and marine mammals.

The environmental impacts generally associated with fishery management actions are effects resulting from 1) harvest of fish stocks which may result in changes in food availability to predators, changes in the population structure of target fish stocks, and changes in community structure; 2) changes in the physical and biological structure of the benthic environment as a result of fishing practices, e.g., effects of gear use and fish processing discards; and 3) entanglement/entrapment of non-target organisms in active or inactive fishing gear. A summary of the effects of the 1995 groundfish total allowable catch amounts on the biological environment and associated impacts on marine mammals, seabirds, and other threatened or endangered species are discussed in the final environmental assessment for the 1995 groundfish total allowable catch specifications.

2.1 Potential Impacts of Modifying Crab Bycatch Limits on Groundfish Stocks

None of the alternatives considered in this document is likely to have significant impacts on groundfish stocks. Catch of all groundfish is counted against the TAC, regardless where or when it is caught. Closure of bycatch zones to groundfish trawling will likely be offset by increased effort outside the closure areas. No changes to groundfish stock status from the status quo are expected, as it is likely that fisheries will continue to remove about two million metric tons of groundfish per year from the BSAI region.

2.2 Potential Impacts of Modifying Crab Bycatch Limits on Crab Stocks

There are several ways to measure relative crab mortality caused by the trawl fishery. The simplest way is to compare current levels of bycatch as a percentage of total crab population. For example, current bycatch amounts to about 0.5% of the red king crab population, 1.2% of the Tanner crab population, and 0.14% of the snow crab population based on recent NMFS survey indices of abundance. It should be noted that the NMFS survey provides population estimates as an index only; small crab are not fully vulnerable to the trawl gear used, and consequently the "real" crab population size is likely much larger than the survey index. Therefore, bycatch accounts for a smaller percentage of the actual population than indicated by the survey index comparisons.

Crab bycatch in trawl fisheries as a percentage of total crab abundance as indexed by NMFS surveys.

| | Bristol Bay | EBS | EBS |
|---------|-----------------|---------------|-------------|
| | <u>Red king</u> | <u>Tanner</u> | <u>Snow</u> |
| 1992 | 0.49 % | 0.92 % | 0.22 % |
| 1993 | 0.52 % | 1.34 % | 0.13 % |
| 1994 | 0.82 % | 1.30 % | 0.13 % |
| 1995 | 0.13 % | 1.21 % | 0.06 % |
| AVERAGE | 0.49 % | 1.19 % | 0.14 % |

In harvesting groundfish, fisheries catch crab incidentally as bycatch. Among the objectives of the BSAI groundfish FMP is minimizing the impact of groundfish fisheries on crab and other prohibited species, while providing for rational and optimal use of the region's fishery resources. All gear types used to catch groundfish have some potential to catch crab incidentally, but the large majority of crab bycatch occurs in dredge and trawl fisheries.

Crab bycatch limits were established for trawl fisheries beginning in 1986. Bycatch limits (termed Prohibited Species Catch limits, or PSC) for crab are apportioned into limitation zones (Figure 4), and allocated among groundfish trawl fisheries. Current crab PSC limits are 1,000,000 Tanner crab in Zone 1 and 3,000,000 Tanner crab in Zone 2. To allocate total groundfish harvest under established PSC limits, PSC is apportioned among trawl fisheries during the annual specification process (e.g., Table 1). When a target fishery attains a PSC apportionment or seasonal allocation specified in regulations, the bycatch zone to which the allocation applies closes to that target fishery for the remainder of the season.

1.4.2 Bycatch of Tanner Crab in Groundfish Trawl Fisheries

Crab bycatch is estimated by the National Marine Fisheries Service through the groundfish Observer Program. A total of 2.3 million Tanner crab were taken as bycatch in the 1995 BSAI groundfish fisheries (Table 2). Bycatch of Tanner crab has been reduced in recent years, down significantly from 4.3 million in 1992. Most Tanner crab bycatch is taken in the trawl fisheries (about 98%) and to a lesser extent in the longline (1.5%) and groundfish pot fisheries (0.5%). Although Tanner crabs are bycaught in nearly every trawl fishery, the yellowfin sole fishery takes the largest share, followed by the rock sole/other flatfish fisheries. Bycatch is highest in NMFS statistical areas 509 and 513; and large numbers of Tanner crab area also consistently taken in areas 517 and 521. Data indicate that the recent level of Tanner crab bycatch in trawl fisheries (1992-1995 average of 3.06 million) is high relative to the 1978-1987 average of 2.06 million (Table 3).

| | Zone 1 | Zone 2 | Other areas | Total |
|-----------|----------------|------------------|---------------|------------------|
| 1992 | 1,144,671 | 2,699,256 | 448,106 | 4,292,033 |
| 1993 | 1,040,166 | 2,329,840 | 51,820 | 3,421,826 |
| 1994 | <u>765,283</u> | <u>1,736,273</u> | <u>43,426</u> | <u>2,544,982</u> |
| 92-94 Ave | 983,373 | 2,255,123 | 181,117 | 3,419,614 |
| 93-94 Ave | 902,724 | 2,033,057 | 47,623 | 2,983,404 |
| 1995 | 923,088 | 1,341,894 | 34,874 | 2,299,856 |

Examination of available crab bycatch carapace width frequency information suggests that most trawl bycatch is smaller than legal size (140 mm), but about the size of 50% maturity for females (90 mm). Bycatch data from the 1994 and 1995 fisheries, suggest a consistent take of larger crab (NPFMC 1996). A rough estimate on average width of Tanner crabs taken as bycatch, based on these data and total crab bycatch by regulatory area, is 125 mm for males in 1994 and 120 mm for males in 1995. Similarly, a rough estimate of average width for females is 85 mm in 1993 and 1995. These averages indicate that Tanner crabs taken as bycatch may be larger than in previous years.

Observer data indicate that a majority of Tanner crab taken as bycatch in trawl fisheries are males. On average, 1993-1995, 75% of the Tanner crab measured by observers were male. A high male sex ratio of observed bycatch appeared throughout the data for all statistical areas and years examined. This is not surprising due to size selection by trawl gear and location of groundfish trawling. Similar to this analysis, a 74:26 male:female sex ratio was reported for crab bycatch in 1991 trawl fisheries. As with BSAI trawl fisheries, pot and longline fisheries catch primarily males. Average carapace width for male Tanner crabs was about 110 mm in pot fisheries and 130 mm in longline fisheries. Average width of female Tanner crabs was about 85 mm (NPFMC 1996).

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 closed to reduce bycatch of herring, and also of halibut, which move into the nearshore area in June. In addition to establishing nearshore trawl closure areas, the Council also recommended that NMFS rescind regulations allowing trawling for Pacific cod in the area off Port Moller, as these regulations are out of date given the current status of red king crab and scientific knowledge of critical habitat.

The third management measure adopted by the Council was a reduction of PSC limits for red king crab taken in trawl fisheries. Specifically, the Council recommended adoption of a staircase-based PSC limit for red king crab in Zone 1. PSC limits would be based on abundance of Bristol Bay red king crab as shown in the adjacent table.

In years when red king crab in Bristol Bay are below threshold of 8.4 million mature crabs, 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 pounds of effective spawning biomass, a PSC limit of 100,000 red king crab would be established. The 100,000 crab PSC limit corresponds to a 50% reduction from the current PSC limit, the same percentage reduction as

| Amendment 37 PSC limits for Zone 1 red king crab. | |
|---|---------------|
| Abundance | PSC Limit |
| Below threshold or 14.5 million lbs of effective spawning biomass (ESB) | 35,000 crabs |
| Above threshold, but below 55 million lbs of ESB | 100,000 crabs |
| Above 55 million lbs of ESB | 200,000 crabs |

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 of 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 pounds of effective spawning biomass). Based on the 1996 abundance estimate (10.2 million mature females and 20.3 million lbs of effective spawning biomass), the PSC limit for 1997 will be 100,000 red king crab.

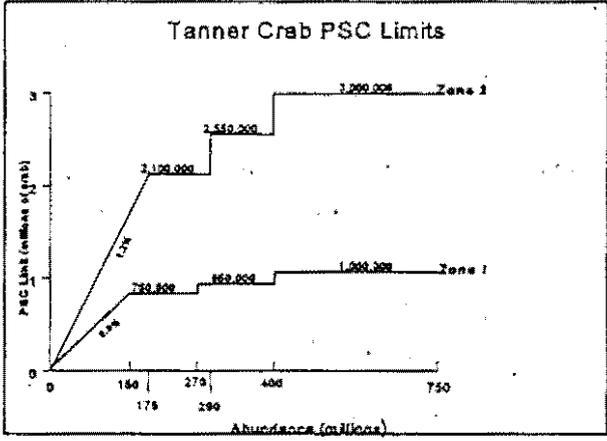
In June 1996, the Council did not make any recommendations regarding PSC limits for Tanner and snow crabs, although the analysis was completed (NPFMC, May 10, 1996). Rather, the Council formed an industry workgroup to review proposed PSC limits for these crab species. This work group consisted on three crab fishery representatives, three trawl fishery representatives, and one shoreside processing representative. The group met August 29-30 and came to a consensus on bycatch limits for bairdi crab. The agreement negotiated by affected industry groups resulting in Alternative 3, Option C. These staircase limits were basically developed from historical bycatch data.

At its September 1996 meeting, the Council took final action on Amendment 41. Based on its review of the draft EA/RIR and input from its advisory bodies and public testimony, the Council adopted Alternative 3, Option C for PSC limits for *C. bairdi* Tanner crab taken in BSAI trawl fisheries (Appendix 1). Under this Alternative, PSC limits for bairdi in Zones 1 and 2 will be based on total abundance of bairdi crab as indicated by the NMFS trawl survey. Based on 1996 abundance (185 million crabs), the PSC limit for *C. bairdi* in 1997 will be 750,000 crabs in Zone 1 and 2, 100,000 crab in Zone 2. The Council's intent was for crab bycatch accrued from January 1 until publication of the final rule (expected by April 1997) would be applied to revised bycatch limits established for specified fisheries.

1.4.1 Bycatch Management

Amendment 41 PSC limits adopted for bairdi Tanner crab.

| Zone | Abundance | PSC Limit |
|--------|------------------------|-------------------|
| Zone 1 | 0-150 million crabs | 0.5% of abundance |
| | 150-270 million crabs | 750,000 |
| | 270-400 million crabs | 850,000 |
| | over 400 million crabs | 1,000,000 |
| Zone 2 | 0-175 million crabs | 1.2% of abundance |
| | 175-290 million crabs | 2,100,000 |
| | 290-400 million crabs | 2,550,000 |
| | over 400 million crabs | 3,000,000 |



1.4 Background

In January 1995, the Council initiated several analyses to examine impacts of proposals to control crab bycatch in the groundfish fisheries. Among these proposals is a reduction of existing crab bycatch limits (with an option that the limits be based on crab abundance), and initiation of bycatch limits for snow crab. The Council suggested specific alternatives for PSC bycatch limits be examined, based on input from it's Advisory Panel and a proposal by the State of Alaska.

At its January 1996 meeting, the Council requested that staff examine the suite of management measures (modified Crab Savings Area, crab PSC bycatch limits, and northern Bristol Bay closure area) in one package, so that the impacts of these measures can be analyzed in a comprehensive manner. An additional option of establishing PSC limits for Tanner crab based on abundance thresholds, was proposed by the Alaska Crab Coalition in January 1996, and was added to the analysis at the request of the Council. One set of possible thresholds is analyzed as Alternative 3, Option B.

At its April 1996 meeting, the Council modified the alternatives to include reduced PSC limits for Tanner crab and snow crab. The range of PSC rates for red king crab and Tanner crab were also reduced, as data indicated that bycatch in 1995 was much lower than in previous years. The Council also requested the analysts also include some discussion regarding the Crab Rebuilding Committee's recommendation that PSC limits proposed under Alternative 3 be based on survey index of adult crab, rather than total population. The SSC noted that modification of PSC rates should occur as a separate, follow-up amendment.

In June 1996, the Council took final action on Amendment 37, which contained several measures to protect the red king crab stock from possible impacts due to groundfish fisheries. First, the Council recommended a year-round closure to non-pelagic trawling in the Red King Crab Savings Area (162° to 164° W, 56° to 57° N). An extended duration of the closure period provides for increased protection of adult red king crab and their habitat. To allow some access to productive rock sole fishing areas, 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. A separate bycatch limit for this area would be established at no more than 35% of the red king crab prohibited species catch (PSC) limits apportioned to the rock sole fishery.

To protect juvenile red king crab and critical rearing habitat, the Council recommended that all trawling be prohibited on a year-round basis in the nearshore waters of Bristol Bay. Specifically, the area east of 162° W (i.e., all of Bristol Bay) would be closed to trawling, with the exception of an area bounded by 159° to 160° W

The Bering Sea fishery simulation model (Ackley 1995) was employed to estimate the economic impacts of reducing crab caps in the Bering Sea. A general discussion of the model follows in the next section, and a detailed discussion can be found in Amendments 21a and 21b, as well as in the EA/RIR for Amendment 37 (NPFMC 5/10/96, pp.64-66 and Appendix 8). Detailed output from the model was not provided for this section in order to conserve space, and because the output is similar to other model runs in this amendment.

The Bering Sea fishery simulation model was modified to include the bycatch of *Chionoecetes opilio* crab and assign caps for this species. The value data for *C. bairdi*, *C. opilio* and red king crab were updated for this analysis as well. The model was run with the most constraining options in place to examine the greatest expected changes from Status Quo. Model runs using both the 1993 and 1994 data sets included the following options: (1) Status Quo which included a three month closure of the Red King Crab Savings Area; (2) a Zone 1 cap for bairdi crab of 850,000 and a Zone 2 bairdi crab cap of 1.5 million crab; (3) a Zone 1 cap of 35,000 red king crab; (4) a Zone 2 cap of 11 million opilio crab; (5) a run with all of the above caps in place (850,000 Zone 1 bairdi, 1.5 million Zone 2 bairdi, 11 million Zone 2 opilio, and 35,000 Zone 1 red king crab) as well as the closure of the Red King Crab Savings Area; (6) a run with all of the above caps, the Red King Crab Savings Area closure, and the Northern Bristol Bay closure (7) the caps and closures as above in (6) with the additional constraint of a 6 million opilio crab cap in Zone 2; and (8) The June 1996 Council action to close the Red King Crab Savings Area on an annual basis, close Northern Bristol Bay to trawling (the 2 block opening not included in this analysis), and based on population size, set the Zone 1 cap of red king crab at 100,000 crab. In addition (8) applies a Zone 1 cap on bairdi at 750,000 crab and the Zone 2 bairdi cap at 2.1 million crab.

The model runs which examined the impacts of various area alternatives for the Red King Crab Savings Area were presented in the EA/RIR for Amendment 37. The impacts of the Northern Bristol Bay Closure were estimated by model runs and presented in sections 4.0 and 6.0. The results of the cap analysis runs presented here can be compared with the previous runs with the caution that splitting Tanner crab into bairdi and opilio separately may have changed the bycatch rates of areas, and that the crab values have been updated. Details of the model and assumptions are available in the draft EA/RIR for Amendment 37.

The bycatch of the crab species in 1993 and 1994, largely because of existing caps, were not generally in excess of the most restrictive options used in the model runs, and often were below the more restrictive caps. For instance, under Status Quo in the 1993 data, 7.5 million opilio crab were estimated to be bycaught in Zone 2 in the absence of a cap, and in 1994 approximately 10 million opilio crab were estimated to be bycaught in Zone 2. The cap used for opilio crab was 11 million, so that only specific fisheries might be affected by the opilio cap, since the overall cap of 11 million exceeded the bycatch from all fisheries in each year. Thus the model does not capture the impacts of years in which the bycatch rates for any of the species might be higher. Similarly, the impacts of a cap might be less than the model predicts if crab were caught at a higher rate in 1993 or 1994 than would happen in future fisheries, as was the case in 1994. The bycatch of red king crab predicted by the model from 1994 data was approximately 90,000 red king crab with the 3 month Red King Crab Savings Area closure in place, while in 1995 the actual number bycaught was approximately at the most restrictive cap of 35,000 crab.

The constraints on the fishing fleet by the individual crab caps (Alternatives Bairdi (850,000 Zone 1, 1.5 million Zone 2); Red (35,000 Zone 1); and Opilio (11 million Zone 2) resulted in changes in net benefits to the Nation from Status Quo of less than approximately \$500,000 under the 1993 data set (attached Table). This is because the bycatch of each crab species available to the model was similar to the caps in that year. The model runs based on the 1994 data estimated decrements to the net benefits to the Nation of from approximately \$1 million to \$4.8 million. The reduction of the red king crab cap to 35,000 resulted in the greatest change from Status Quo under both the 1993 and 1994 data.

Model runs to estimate the impacts of all three management measures in place concurrently were also made using the 1993 and 1994 data. These runs simulated a closure of the Red King Crab Savings Area for the first three

months of the year, a closure of the Northern Bristol Bay area, and caps of 850,000 bairdi crab in Zone 1, 1.5 million bairdi crab in Zone 2, 11 million opilio crab in Zone 2, and 35,000 red king crab in Zone 1 (indicated as RKC, Caps, N.BB in [Table 4](#)). With these constraints in place, the estimated net benefits to the Nation decreased by approximately \$1.4 million using the 1993 data set and by approximately \$3.9 million using the 1994 data set.

Reducing the opilio cap to 6 million crab in addition to all of the proposed closures and caps above reduced the estimated net benefits to the action from status quo by approximately \$1.4 million using the 1993 data and by approximately \$11.1 million using the 1994 data (indicated as RKC, Cap, BB, 6 mil. Op in [Table 4](#)). The reason there was no change from all proposed closures and caps in place using the 1993 data and decreasing the opilio cap by 5 million crab was that the bairdi caps closed the Zone 2 fisheries which would have been impacted by the reduced caps. Using the 1994 data, it was the opilio cap rather than the bairdi cap which was more constraining. The overall bycatch of opilio crab was not greatly reduced in 1993 from status quo because the bairdi crab closure caused fishing to occur outside of Zone 2 where opilio crab bycatch is still substantial.

Additional runs to estimate the impacts of measures taken in June 1996 with the most recent (September 1996) suggested caps for bairdi crab in place were also made (indicated as RKC, current, BB in [Table 4](#)). Under these runs with the 1993 and 1994 data the following assumptions applied: (1) Annual closure of the Red King Crab Savings Area; (2) Annual closure of Northern Bristol Bay (due to programming difficulty and time available, the summer opening of two blocks for yellowfin sole fishing was not included as an option); (3) a 100,000 red king crab cap in Zone 1 based on current population estimates for 1996; (4) a Zone 1 cap of 750,000 bairdi crab and a Zone 2 cap of 2.1 million bairdi crab. The estimated net benefits to the nation decreased by approximately \$1.2 million using the 1993 data set and by approximately \$2.2 million using the 1994 data set. These decrements in net benefits to the Nation represent changes from Status Quo of 0.4% and 0.8% in the 1993 and 1994 data sets, respectively.

3.4 Potential Cumulative Impacts and Interactions with Other Management Measures

Implementation of Amendment 41, along with area closures implemented under Amendment 37, may have cumulative effects on groundfish trawl fisheries. As noted by the Scientific and Statistical Committee, time-area closures cause area shifts in groundfish fishery effort. With each additional bycatch restriction, options for the groundfish trawl fleets are reduced and these effort shift could increase the bycatch of other prohibited species. To some extent, this situation occurred in the rock sole trawl fishery as a result of implementing the Bristol Bay Red King Crab Savings Area by inseason action in 1995 and 1996. The 1996 directed rock sole fishery was apparently closed early due to increased halibut bycatch per metric ton of groundfish. Bycatch rates for Tanner crab also increased (note that about the same amount of Tanner crab bycatch was taken, and less rock sole was caught), but bycatch of red king crab was much reduced due to the closure.

| Year | Date Closed | Reason for closure | Harvest (mt) of rock sole | Zone 1 Tanner crab | Zone 1 red king crab | halibut mortality (mt) |
|------|-------------|--------------------|---------------------------|--------------------|----------------------|------------------------|
| 1993 | Feb 16 | RKC, Zone 1 | 38,000 | 420,000 | 181,000 | 667 |
| 1994 | Feb 28 | RKC, Zone 1 | 37,000 | 259,000 | 154,000 | 281 |
| 1995 | Feb 21 | Halibut | 32,000 | 320,000 | 19,000 | 428 |
| 1996 | Feb 26 | Halibut | 19,000 | 290,000 | 9,000 | 436 |

The impacts of trawl closure areas on the trawl fleet may be further exacerbated by reduced crab PSC limits. As discussed in the previous paragraph, implementation of the Red King Crab Savings Area may cause higher bycatch rates for Tanner crab in the rock sole fishery. Hence, to maintain the rock sole fishery in Zone 1 at current harvest levels, a relatively high proportion of Tanner crab PSC (requiring ~300,000 crab) could be allocated to the early season rock sole fishery.

The nearshore Bristol Bay trawl closure adopted under Amendment 37 may similarly shift effort of the yellowfin sole trawl fishery into Zones 1 and 2, which may have higher bycatch rates of Tanner crab and halibut. Hence, the yellowfin sole fishery may require increased allocation of Tanner crabs and halibut to maintain harvest levels. Allocations of crab PSC among trawl fisheries will become much more contentious, even at current halibut and crab PSC limits. With reduced crab 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° W. longitude), which typically has moderately high bycatch rates of halibut. Because attainment of the halibut cap shuts down fishing in the entire Bering Sea for the affected fishery, the combination of closure areas and reduced PSC limits may have significant negative effects on certain trawl fisheries, particularly those targeting flatfish.

3.5 Administrative, Enforcement and Information Costs

No additional costs for administration, enforcement, or information requirements are expected under any of the alternatives.

4.0 FINAL REGULATORY FLEXIBILITY ANALYSIS

The objective of the Regulatory Flexibility Act is to require consideration of the capacity of those affected by regulations to bear the direct and indirect costs of regulation. If an action will have a significant impact on a substantial number of small entities an Final Regulatory Flexibility Analysis (FRFA) must be prepared to identify the need for the action, alternatives, potential costs and benefits of the action, the distribution of these impacts, and a determination of net benefits.

NMFS has defined all fish-harvesting or hatchery businesses that are independently owned and operated, not dominant in their field of operation, with annual receipts not in excess of \$2,000,000 as small businesses. In addition, seafood processors with 500 employees or fewer, wholesale industry members with 100 employees or fewer, not-for-profit enterprises, and government jurisdictions with a population of 50,000 or less are considered small entities. A "substantial number" of small entities would generally be 20% of the total universe of small entities affected by the regulation. A regulation would have a "significant impact" on these small entities if it reduced annual gross revenues by more than 5 percent, increased total costs of production by more than 5 percent, or resulted in compliance costs for small entities that are at least 10 percent higher than compliance costs as a percent of sales for large entities.

If an action is determined to affect a substantial number of small entities, the analysis must include:

(1) a description and estimate of the number of small entities and total number of entities in a particular affected sector, and total number of small entities affected; and

(2) analysis of economic impact on small entities, including direct and indirect compliance costs, burden of completing paperwork or recordkeeping requirements, effect on the competitive position of small entities, effect on the small entity's cashflow and liquidity, and ability of small entities to remain in the market.

4.1 Economic Impact on Small Entities

Most trawl vessels and processor participating in the BSAI groundfish fishery would be affected by the management measures proposed under all alternatives to the Status quo for the three management measures under consideration.

-Most catcher vessels harvesting groundfish off Alaska meet the definition of a small entity under the RFA. In 1993, 132 trawl catcher vessels landed groundfish from the BSAI. Many of these vessels would be affected by PSC limits considered under alternatives to the status quo. The economic impact on small entities could result in a reduction in annual gross revenues by more than 5 percent and could, therefore, potentially have a significant economic impact on a substantial number of small entities.

In the final rule implementing Amendment 41, NMFS has taken steps to minimize economic impacts on small entities by structuring the annual specification process of the PSC C. bairdi limit to be responsive to the total C. bairdi abundance as estimated annually. Alternative 1--Status Quo was rejected as more burdensome on small entities because status quo bycatch limits for C. bairdi 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. Alternative 2 was rejected because the major assumption regarding assessment of impacts for Alternative 2 is that crab stock abundance will remain relatively stable, or that the trawl fishery will adapt to changes in crab abundance. If crab stocks continue to decline, bycatch will account for a higher proportion of the total annual mortality.

The proposed rule to implement Amendment 41 was published in the Federal Register on January 2, 1997 (62 FR 85) and comments were invited on the IRFA. No comments were received on the IRFA.

5.0 REFERENCES

- Ackley, D. 1995. Bering Sea Fishery Simulation Model. Alaska Fishery Research Bulletin 2(1):83-86.
- NPFMC (North Pacific Fishery Management Council). 1996. Additional analysis for Amendment 37 and an Environmental Assessment/Regulatory Impact Review/ Initial Regulatory Flexibility analysis for Amendment 41. May 10, 1996. 268 p.
- Stevens, B.G. 1990. Survival of king and Tanner crabs captured by commercial sole trawls. Fishery Bulletin 88:731-744.
- Witherell, D., and G. Harrington. 1995. Evaluation of Alternative Management Measures to Reduce the Impacts of Trawling and Dredging on Bering Sea Crab Stocks. Proceedings of the International Symposium on Biology, Management, and Economics of Crabs from High Latitude Habitats. Alaska Sea Grant Program Report (in press).

6.0 AGENCIES AND INDIVIDUALS CONSULTED

Ron Berg, Mary Furuness
National Marine Fisheries Service.
Fish Management Division
Alaska Region Office, Juneau

Martin Loefflad
National Marine Fisheries Service
Alaska Fisheries Science Center
Seattle, Washington

Sue Mello
National Marine Fisheries Service
Protected Species Management Division
Alaska Region Office, Juneau

Bob Otto
National Marine Fisheries Service
AFSC Kodiak Laboratory

NPFMC Scientific and Statistical Committee

NPFMC Advisory Panel

NPFMC Crab Rebuilding Committee

NPFMC Crab Negotiating Committee

NPFMC BSAI Crab Plan Team

7.0 LIST OF PREPARERS

David Witherell
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, Alaska 99501

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Figure 2. Alternative 3, Option B prohibited species catch limits for Eastern Bering Sea Tanner crab (*C. bairdi*) examined by this analysis.

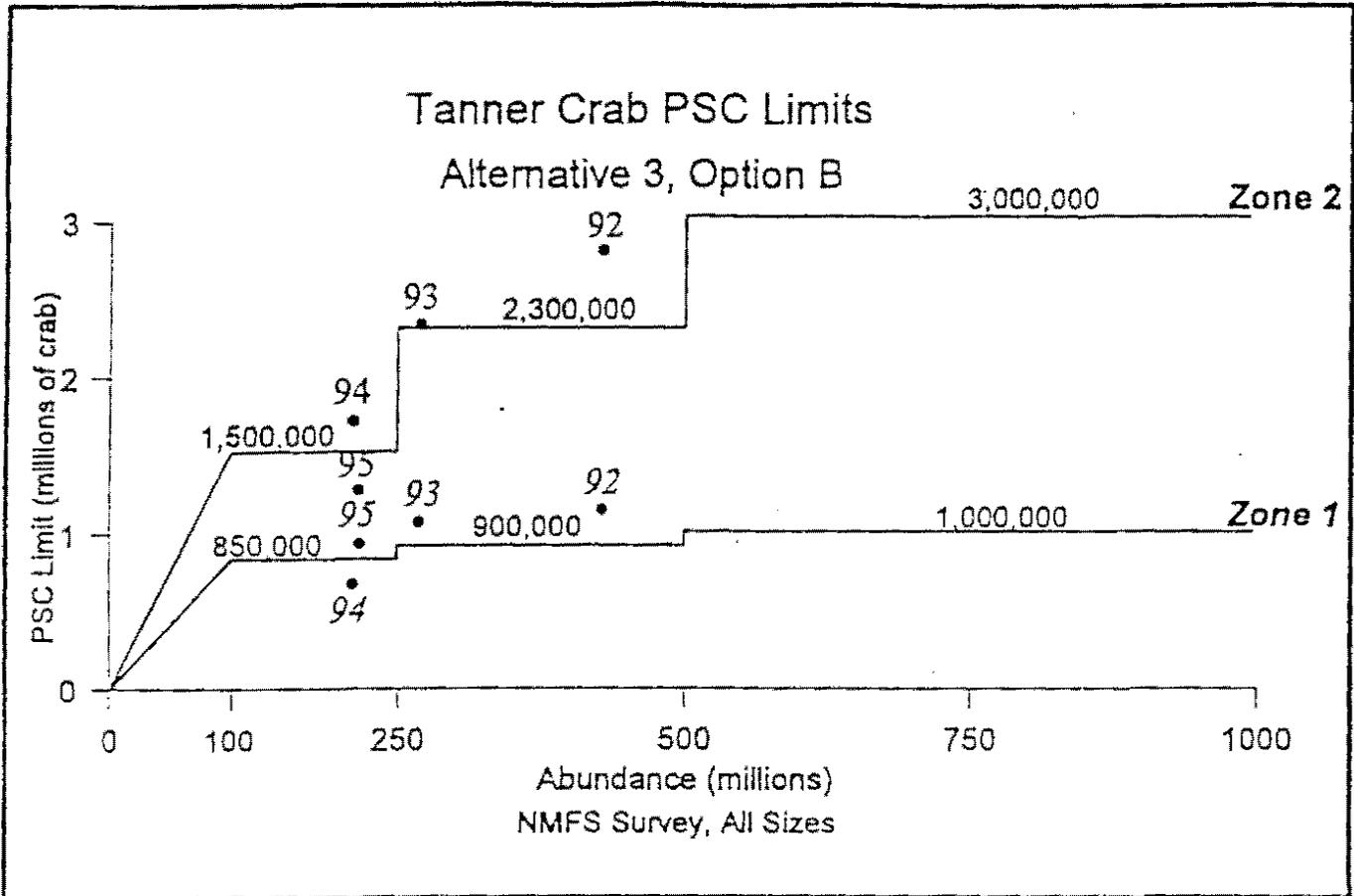


Figure 3.

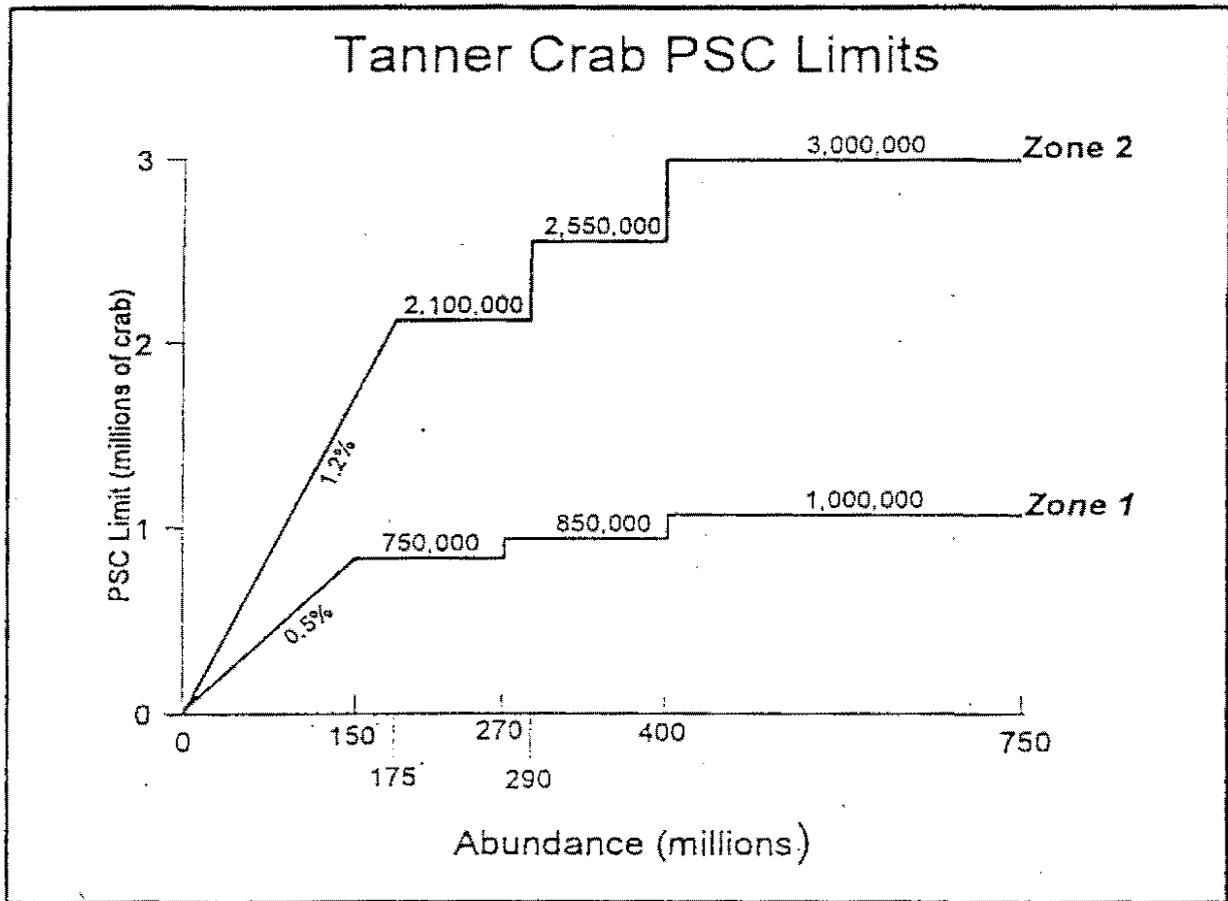
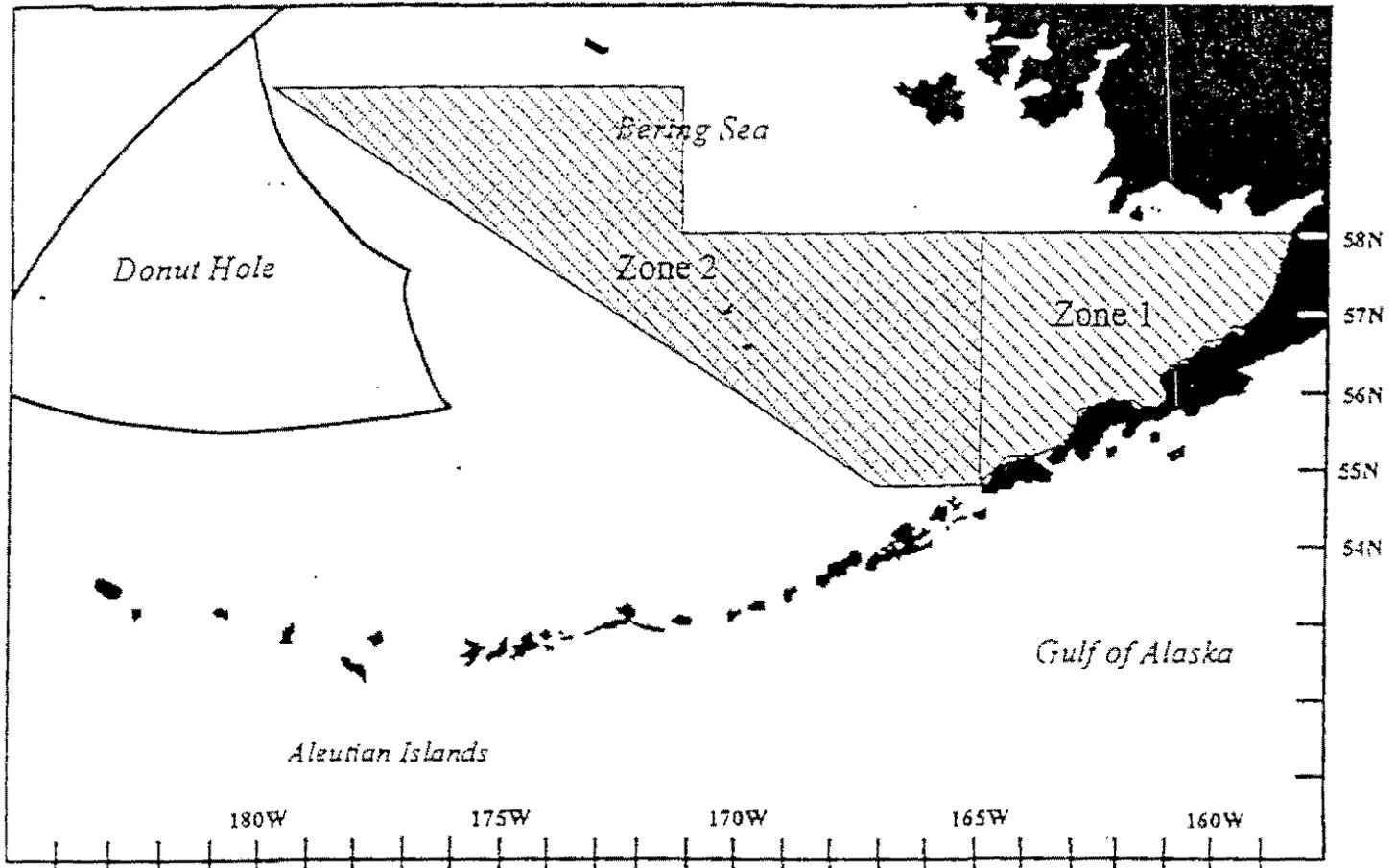


Figure 4. Prohibited species bycatch limitation zones in the Bering Sea.



Prohibited Species Bycatch Limitation Zones

Rationale for Closure: To allow for control of red king crab and *C. bairdi* Tanner crab bycatch.

Origin: Implemented under Amendment 10 on March 16, 1987.

Description of Area: Areas close to directed fishing when crab bycatch caps are attained in specified fisheries. Bycatch Limitation Zone 1 means that part of the Bering Sea Subarea that is south of 58° 00' N. latitude and east of 165° 00' W. longitude. Bycatch Limitation Zone 2 means that part of the Bering Sea Subarea bounded by straight lines connecting the following coordinates in the order listed:

| North latitude | West longitude |
|----------------|----------------|
| 54° 30' | 165° 00' |
| 58° 00' | 165° 00' |
| 58° 00' | 171° 00' |
| 60° 00' | 171° 00' |
| 60° 00' | 179° 20' |
| 59° 25' | 179° 20' |
| 54° 30' | 167° 00' |
| 54° 30' | 165° 00' |

Table 1. Prohibited species catch (PSC) apportionment for 1996 BSAI trawl fisheries.

Final 1996 BSAI Trawl Fisheries PSC
Apportionments and Seasonal Allowances

| Fishery Group | Hallbut Mortality Cap (mt) | Herring (mt) | Red King Crab (animals) Zone1 | C. bairdi Zone1 | C. bairdi Zone2 |
|---|----------------------------------|-----------------|-------------------------------------|--------------------|--------------------|
| Yellowfin sole | 820 | 287 | 50,000 | 250,000 | 1,530,000 |
| January 20 - March 31 | 160 | | 5,000 | 50,000 | |
| April 1 - May 10 | 150 | | 15,000 | 200,000 | |
| May 11 - August 14 | 100 | | 10,000 | | |
| August 15 - Dec 31 | 410 | | 20,000 | | |
| Rocksole/other flatfish | 730 | | 110,000 | 425,000 | 510,000 |
| January 20-March 29 | 453 | | | | |
| March 30 - June 28 | 139 | | | | |
| June 29-December 31 | 138 | | | | |
| Turbot/sablefish/ Arrowtooth | 0 | | | | 0 |
| Rockfish | 110 | 7 | | | 10,000 |
| Jan. 1 - Mar. 29 | 30 | | | | |
| Mar. 30 - June 28 | 50 | | | | |
| June 29 - Dec. 31 | 30 | | | | |
| Pacific cod | 1,685 | 22 | 10,000 | 250,000 | 250,000 |
| January 20-October 24 | 1,585 | | | | |
| Oct. 25-December 31 | 100 | | | | |
| Pollockmackerel/o.species | 430 | 154 | 30,000 | 75,000 | 690,000 |
| January 20-April 15 | 330 | | | | |
| April 15- December 31 | 100 | | | | |
| Pelagic Trawl Pollock | | 1,227 | | | |
| TOTAL | 3,775 | 1,697 | 200,000 | 1,000,000 | 3,000,000 |

Note: unused PSC allowances may be rolled into the following seasonal apportionment.

Table 2. Crab bycatch (numbers of crab, all sizes) from 1995 BSAI trawl fisheries, by gear, target, and area.
Source: Blend estimates supplied by Mary Furuness, NMFS, Alaska Region 2/14/96.

| 1995 crab bycatch data | | Red King | bairdi | o.Tanner |
|--------------------------------|--------------------------|---------------|------------------|------------------|
| by gear and target | | | | |
| Hook & Line | | | | |
| | P. cod | 202 | 24,582 | 75,303 |
| | sablefish | 28 | 21 | 562 |
| | other | 51 | 33 | 907 |
| | <u>Total all targets</u> | <u>281</u> | <u>24,636</u> | <u>76,772</u> |
| Groundfish Pot | | | | |
| | P. cod | 2,976 | 63,038 | 153,431 |
| | other | 0 | 0 | 30 |
| | <u>Total all targets</u> | <u>2,976</u> | <u>63,038</u> | <u>153,461</u> |
| Trawl | | | | |
| | bottom pollock | 2,631 | 107,706 | 146,715 |
| | P. cod | 4,883 | 244,088 | 45,922 |
| | flathead sole | 93 | 57,934 | 456,552 |
| | midwater pollock | 2,014 | 46,260 | 59,939 |
| | rock sole/o.flats | 22,839 | 403,047 | 1,204,128 |
| | yellowfin sole | 8,648 | 1,349,275 | 3,196,459 |
| | other | 3,826 | 3,871 | 55,840 |
| | <u>Total all targets</u> | <u>44,934</u> | <u>2,212,181</u> | <u>5,165,555</u> |
| <u>Total all gears/targets</u> | | <u>48,191</u> | <u>2,299,855</u> | <u>5,395,788</u> |

| 1995 crab bycatch data | | Red King | bairdi | o.Tanner |
|-----------------------------|-----|---------------|------------------|------------------|
| by area (all gears/targets) | | | | |
| Regulatory Area | | | | |
| | 508 | 160 | 324 | 39 |
| | 509 | 14,278 | 903,847 | 93,973 |
| | 512 | 1,985 | 281 | 25 |
| | 513 | 1,882 | 884,937 | 3,697,634 |
| | 514 | 2,187 | 13,105 | 747,528 |
| | 516 | 19,215 | 18,636 | 270 |
| | 517 | 4,410 | 431,358 | 435,333 |
| | 518 | 8 | 8,001 | 31,744 |
| | 519 | 345 | 8,319 | 19,990 |
| | 521 | 239 | 25,599 | 205,046 |
| | 523 | 0 | 328 | 3,065 |
| | 524 | 12 | 4,306 | 153,902 |
| | 541 | 3,134 | 800 | 4,315 |
| | 542 | 336 | 15 | 2,921 |
| | 543 | 1 | 0 | 6 |
| <u>Total all areas</u> | | <u>48,192</u> | <u>2,299,856</u> | <u>5,395,789</u> |

Table 3. Historical estimates of Tanner crab taken as bycatch in Bering Sea trawl fisheries, 1978-1995.
 Source: NPFMC 1989, Stevens et al. 1996.

| <u>Year</u> | <u>Crab Population (millions)</u> | <u>Bycatch (millions)</u> | <u>Bycatch as Percent of Population</u> |
|-------------|---|-------------------------------|---|
| 1978 | 440.40 | 4.10 | 0.93 |
| 1979 | 377.00 | 7.50 | 1.99 |
| 1980 | 983.00 | 3.70 | 0.38 |
| 1981 | 745.10 | 1.60 | 0.21 |
| 1982 | 355.80 | 0.40 | 0.11 |
| 1983 | 410.50 | 0.60 | 0.15 |
| 1984 | 252.50 | 0.70 | 0.28 |
| 1985 | 84.70 | 0.90 | 1.06 |
| 1986 | 208.30 | 0.60 | 0.29 |
| 1987 | 486.80 | 0.50 | 0.10 |
| 1988 | 630.20 | NA | NA |
| 1989 | 949.90 | NA | NA |
| 1990 | 782.50 | NA | NA |
| 1991 | 767.00 | 1.67 | 0.22 |
| 1992 | 438.50 | 4.04 | 0.92 |
| 1993 | 254.90 | 3.41 | 1.34 |
| 1994 | 192.00 | 2.50 | 1.30 |
| 1995 | 189.90 | 2.30 | 1.21 |

Table 4. Summary of total catch, bycatch, total gross and net values of catch and bycatch, and estimated total net benefits to the Nation under status quo and combinations of Bairdi, Opilio and red king crab caps - 1993 and 1994 data.

Model runs based on 1993 data

| Alternative | Total Catch | Total Retained Catch | Total Gross Value | Total Net Value | Tanner Crab | Opilio Crab | Red King Crab | Halibut | Chisook Salmon | Other Salmon | Herring | Gross Value Bycatch | Net Value Bycatch | Total Gross minus Bycatch Gross | Total Net minus Bycatch Net |
|---------------------|-------------|----------------------|-------------------|-----------------|-------------|-------------|---------------|---------|----------------|--------------|---------|---------------------|-------------------|---------------------------------|-----------------------------|
| Status Quo | 1,809,778 | 1,552,688 | \$847,189,115 | \$315,373,429 | 2,278,571 | 14,941,480 | 63,692 | 3,708 | 50,506 | 98,496 | 746 | \$46,719,080 | \$20,923,772 | \$800,470,032 | \$294,449,657 |
| Bairdi | 1,807,170 | 1,551,953 | \$846,410,232 | \$315,091,474 | 2,093,271 | 14,236,044 | 61,082 | 3,663 | 50,506 | 98,496 | 746 | \$46,692,729 | \$20,103,812 | \$801,727,503 | \$294,987,662 |
| Rud | 1,812,070 | 1,552,768 | \$846,815,608 | \$315,238,220 | 2,330,484 | 15,029,742 | 63,987 | 3,691 | 50,549 | 98,496 | 746 | \$47,071,607 | \$21,050,105 | \$799,744,001 | \$294,188,114 |
| Opilio | 1,809,264 | 1,552,380 | \$846,974,451 | \$315,295,721 | 2,268,976 | 14,873,835 | 63,692 | 3,708 | 50,506 | 98,496 | 746 | \$46,604,656 | \$20,879,578 | \$800,369,795 | \$294,416,142 |
| Bairdi/Rud/Opilio | 1,800,044 | 1,548,209 | \$843,358,594 | \$313,986,781 | 2,084,468 | 13,248,503 | 56,844 | 3,638 | 50,549 | 98,496 | 746 | \$43,609,935 | \$19,701,340 | \$799,659,559 | \$294,285,438 |
| RKC Caps N BB | 1,792,522 | 1,543,623 | \$839,924,271 | \$312,743,556 | 2,115,971 | 13,416,553 | 54,936 | 3,601 | 50,493 | 98,496 | 631 | \$43,686,418 | \$19,651,917 | \$796,237,853 | \$293,091,639 |
| RKC Cap BB & net Op | 1,792,522 | 1,543,623 | \$839,924,271 | \$312,743,556 | 2,115,971 | 13,416,553 | 54,936 | 3,601 | 50,493 | 98,496 | 631 | \$43,686,418 | \$19,651,917 | \$796,237,853 | \$293,091,639 |
| RKC current BB | 1,802,213 | 1,547,967 | \$843,711,202 | \$314,114,888 | 2,304,461 | 15,166,112 | 60,959 | 3,672 | 50,436 | 98,953 | 634 | \$46,898,720 | \$20,871,349 | \$797,012,482 | \$293,243,539 |

Model runs based on 1994 data

| Alternative | Total Catch | Total Retained Catch | Total Gross Value | Total Net Value | Tanner Crab | Opilio Crab | Red King Crab | Halibut | Chisook Salmon | Other Salmon | Herring | Gross Value Bycatch | Net Value Bycatch | Total Gross minus Bycatch Gross | Total Net minus Bycatch Net |
|---------------------|-------------|----------------------|-------------------|-----------------|-------------|-------------|---------------|---------|----------------|--------------|---------|---------------------|-------------------|---------------------------------|-----------------------------|
| Status Quo | 1,803,803 | 1,536,805 | \$827,694,400 | \$305,508,379 | 2,597,799 | 10,914,052 | 90,030 | 4,576 | 42,216 | 49,528 | 1,600 | \$51,226,167 | \$23,341,231 | \$776,468,322 | \$282,167,148 |
| Bairdi | 1,788,906 | 1,528,925 | \$824,268,868 | \$303,180,458 | 2,344,968 | 11,808,748 | 90,960 | 4,743 | 41,992 | 49,531 | 1,612 | \$50,915,043 | \$23,329,365 | \$779,353,025 | \$279,851,073 |
| Rud | 1,784,587 | 1,530,005 | \$809,049,182 | \$298,758,777 | 2,401,238 | 10,234,614 | 45,766 | 4,268 | 41,987 | 49,528 | 1,611 | \$46,965,008 | \$21,420,894 | \$762,084,174 | \$277,337,884 |
| Opilio | 1,803,653 | 1,536,668 | \$827,678,518 | \$305,285,397 | 2,500,570 | 11,349,426 | 89,894 | 4,870 | 42,216 | 49,528 | 1,600 | \$52,179,182 | \$23,896,895 | \$774,899,410 | \$281,388,502 |
| Bairdi/Rud/Opilio | 1,785,714 | 1,546,366 | \$818,242,868 | \$302,471,879 | 1,970,889 | 11,871,255 | 45,950 | 4,487 | 42,273 | 49,531 | 1,612 | \$46,282,502 | \$21,280,286 | \$772,040,366 | \$281,203,674 |
| RKC Caps N BB | 1,764,899 | 1,533,632 | \$809,685,495 | \$299,366,870 | 1,914,074 | 12,042,346 | 46,873 | 4,459 | 42,295 | 49,531 | 1,686 | \$45,807,519 | \$21,095,858 | \$763,857,976 | \$278,271,812 |
| RKC Cap BB & net Op | 1,694,281 | 1,501,448 | \$784,411,138 | \$290,224,793 | 1,883,508 | 9,607,004 | 46,473 | 4,416 | 42,295 | 49,531 | 1,600 | \$40,908,334 | \$19,174,679 | \$743,504,804 | \$271,050,114 |
| RKC current BB | 1,791,207 | 1,529,788 | \$822,715,050 | \$303,705,815 | 2,345,413 | 11,058,963 | 91,518 | 4,796 | 42,009 | 49,529 | 1,588 | \$51,985,200 | \$23,767,063 | \$770,749,853 | \$279,938,753 |

DIFFERENCE FROM STATUS QUO

Model runs based on 1993 data

| Alternative | Total Catch | Total Retained Catch | Total Gross Value | Total Net Value | Tanner Crab | Opilio Crab | Red King Crab | Halibut | Chisook Salmon | Other Salmon | Herring | Gross Value Bycatch | Net Value Bycatch | Total Gross minus Bycatch Gross | Total Net minus Bycatch Net |
|---------------------|-------------|----------------------|-------------------|-----------------|-------------|-------------|---------------|---------|----------------|--------------|---------|---------------------|-------------------|---------------------------------|-----------------------------|
| Status Quo | | | | | | | | | | | | | | | |
| Bairdi | -2,408 | -795 | -\$78,889 | -\$261,958 | -185,300 | -703,444 | -2,610 | -46 | 0 | 0 | 0 | -\$2,036,354 | -\$619,981 | \$1,267,471 | -\$58,005 |
| Rud | 2,292 | 80 | \$373,507 | -\$139,210 | 51,913 | 88,294 | 296 | -17 | 42 | 0 | 0 | \$352,524 | \$126,533 | -\$726,031 | -\$261,543 |
| Opilio | -514 | -308 | -\$214,664 | -\$77,708 | -9,595 | -67,653 | 0 | 0 | 0 | 0 | 0 | -\$114,427 | -\$44,183 | -\$100,237 | -\$33,515 |
| Bairdi/Rud/Opilio | -9,734 | -4,479 | -\$1,800,521 | -\$1,386,649 | -194,183 | -1,692,988 | -6,847 | -70 | 42 | 0 | 0 | -\$1,020,047 | -\$1,222,429 | -\$810,473 | -\$164,220 |
| RKC Caps N BB | -17,256 | -9,165 | -\$726,844 | -\$2,629,874 | -182,600 | -1,524,935 | -8,754 | -107 | -104 | 0 | -115 | -\$3,032,665 | -\$1,271,855 | -\$4,292,179 | -\$1,358,018 |
| RKC Cap BB & net Op | -17,256 | -9,165 | -\$726,844 | -\$2,629,874 | -182,600 | -1,524,935 | -8,754 | -107 | -104 | 0 | -115 | -\$3,032,665 | -\$1,271,855 | -\$4,292,179 | -\$1,358,018 |
| RKC current BB | -7,568 | -4,721 | -\$3,477,913 | -\$1,258,542 | 25,890 | 224,624 | -2,789 | -36 | -71 | 457 | -112 | -\$20,362 | -\$52,424 | -\$3,457,550 | -\$1,206,118 |

Model runs based on 1994 data

| Alternative | Total Catch | Total Retained Catch | Total Gross Value | Total Net Value | Tanner Crab | Opilio Crab | Red King Crab | Halibut | Chisook Salmon | Other Salmon | Herring | Gross Value Bycatch | Net Value Bycatch | Total Gross minus Bycatch Gross | Total Net minus Bycatch Net |
|---------------------|-------------|----------------------|-------------------|-----------------|-------------|-------------|---------------|---------|----------------|--------------|---------|---------------------|-------------------|---------------------------------|-----------------------------|
| Status Quo | | | | | | | | | | | | | | | |
| Bairdi | -16,897 | -7,881 | -\$8,428,422 | -\$2,327,921 | -252,631 | 894,688 | 870 | 168 | -224 | 2 | 12 | -\$310,124 | -\$11,846 | -\$8,118,298 | -\$2,318,075 |
| Rud | -19,216 | -6,740 | -\$18,645,308 | -\$8,749,601 | -196,561 | -679,438 | -44,265 | -310 | -228 | 0 | 13 | -\$4,260,160 | -\$1,920,337 | -\$14,385,148 | -\$4,829,204 |
| Opilio | -151 | -1,140 | -\$615,972 | -\$222,982 | -87,229 | 435,374 | -177 | 295 | 0 | 0 | 0 | \$953,935 | \$555,684 | -\$1,569,907 | -\$778,646 |
| Bairdi/Rud/Opilio | -18,089 | -9,661 | -\$19,451,821 | -\$13,038,500 | -676,911 | 957,203 | -44,080 | -88 | 58 | 2 | 12 | -\$5,022,665 | -\$2,073,028 | -\$14,428,956 | -\$1963,474 |
| RKC Caps N BB | -36,905 | -9,173 | -\$18,028,955 | -\$8,141,569 | -883,788 | 1,128,294 | -43,157 | -116 | 79 | 2 | -14 | -\$5,417,648 | -\$2,245,373 | -\$12,611,347 | -\$3,898,136 |
| RKC Cap BB & net Op | -36,905 | -9,173 | -\$18,028,955 | -\$8,141,569 | -883,788 | 1,128,294 | -43,157 | -116 | 79 | 2 | -14 | -\$5,417,648 | -\$2,245,373 | -\$12,611,347 | -\$3,898,136 |
| RKC current BB | -12,596 | -7,017 | -\$4,979,458 | -\$1,802,564 | -52,388 | 144,911 | 1,488 | 221 | -208 | 1 | -12 | \$740,033 | \$425,831 | -\$5,719,469 | -\$2,228,395 |

Bairdi = 850,000 Zone 1 cap, 1.5 million Zone 2 cap; Opilio = 11 million Zone 2 cap; Rud = 35,000 Zone 1 cap, 6 mil. Op = Zone 2 Opilio cap of 6 million crab.
Current = 100,000 RKC, annual RKC closure; 750,000 Zone 1 Bairdi; 2.1 million Zone 2 Bairdi.

10.0 APPENDIX Crab Bycatch Committee Agreement

On August 30, 1996, the following agreement was reached by the negotiating committee on PSC caps for C. bairdi in the Bering Sea trawl fisheries. This agreement reflects revisions/clarifications made after the meeting.

PSC caps for bairdi:

The PSC limit for Tanner crab taken in Bering Sea trawl fisheries will be based on total abundance of C. bairdi as indicated by the NMFS annual bottom trawl survey as follows:

| <u>Area</u> | <u>Abundance*</u> | <u>PSC Limit</u> |
|-------------|-------------------------|-------------------|
| Zone 1 | 0 - 150 million crabs | 0.5% of abundance |
| | 150 - 270 million crabs | 750,000 crabs |
| | 270 - 400 million crabs | 850,000 crabs |
| | over 400 million crabs | 1,000,000 crabs |
| Zone 2 | 0 - 175 million crabs | 1.2% of abundance |
| | 175 - 290 million crabs | 2,100,000 crabs |
| | 290 - 400 million crabs | 2,550,000 crabs |
| | over 400 million crabs | 3,000,000 crabs |

* Abundance is the total population index (sum of all size/sex groups) of the Eastern District (east of 175° W) from the NMFS trawl survey.

Caveats and Recommendations:

1. These PSC limits will be subject to a 3 year review.
2. In the interim, other approaches to PSC limits will be analyzed. These approaches include basing PSC limits on number of mature crabs, weight of crabs, and mortality of crabs taken in trawl fisheries.

Industry Support:

All parties here below signed will support this agreement at the North Pacific Fishery Management Council meeting through Secretarial review and approval. The Committee strongly recommends that the NPFMC approve this agreement without change. Any substantive change from this agreement releases the parties from supporting said agreement.

