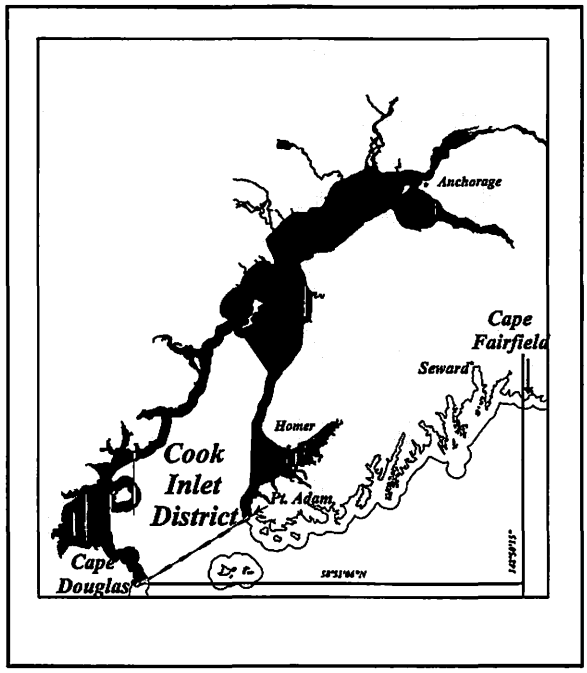
DRAFT FOR SECRETARIAL REVIEW

ENVIRONMENTAL ASSESSMENT/REGULATORY IMPACT REVIEW/ INITIAL REGULATORY FLEXIBILITY ANALYSIS FOR PLAN AMENDMENT 60 TO THE FISHERY MANAGEMENT PLAN FOR THE GROUNDFISH FISHERY OF THE GULF OF ALASKA TO **PROHIBIT NON-PELAGIC TRAWL GEAR IN COOK INLET**



Prepared by

Staff
Alaska Department of Fish and Game
North Pacific Fishery Management Council
National Marine Fisheries Service

February 14, 2002

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Magnuson-Stevens Fishery Conservation Act (MSA) emphasizes the importance of limiting the effects of bycatch to achieve sustainable fisheries. National Standard 9 mandates that conservation and management measures shall, to the extent practicable: minimize bycatch; and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. This analysis addresses the use of non-pelagic trawl gear in Federal waters of Cook Inlet in the Gulf of Alaska (GOA) north of a line from Cape Douglas to Point Adam. This area is currently managed as part of the Central Regulatory area in the GOA. Historically, Cook Inlet supported significant fisheries for king and Tanner crab and currently supports limited fisheries for Pacific cod. King and Tanner crab resources in the Cook Inlet portion of the GOA remain depressed. King crab fisheries have remained closed since 1984. Commercial Tanner crab fisheries have been closed since 1994. Due to the absence of Federal management of crab stocks in the GOA prior to August 1, 1996, the State of Alaska has been delegated jurisdiction for managing all crab stocks in the GOA Exclusive Economic Zone (EEZ).

To protect and promote rebuilding of king and Tanner crab resources, the Alaska Board of Fisheries (Board) prohibited the use of non-pelagic trawl in state waters of Cook Inlet in 1996. The Board took this action to protect crab resources and crab habitat in state waters from the possible adverse effects of bottom trawl gear. However, a significant portion of critical habitat for these crab resources occur in the Federal waters of Cook Inlet. In 1998, the Alaska Department of Fish and Game (ADF&G) submitted a proposal to the North Pacific Fishery Management Council to amend the GOA Groundfish FMP to close Federal waters in Cook Inlet to bottom (non-pelagic) trawl gear. Although little fishing effort has occurred with non-pelagic trawl gear in Cook Inlet, previous efforts to prohibit non-pelagic trawling in this habitat have largely been reactive. Greater long-term, proactive protection is needed for this habitat to promote the rebuilding of crab resources. This EA/RIR/IRFA for Plan Amendment 60 to the GOA Fishery Management Plan analyzes seven alternatives for gear specifications for the Cook Inlet portion of the GOA:

Alternative 1: No action.

Alternative 2: Prohibit the use of non-pelagic trawl in Federal waters of Cook Inlet. **(Preferred)**

Alternative 3: Defer management of groundfish in Federal waters of Cook Inlet to the State of Alaska.

Alternative 4: Remove waters of Cook Inlet from the Gulf of Alaska FMP.

Alternative 5: Require observer coverage for vessels fishing for groundfish in Federal waters of Cook Inlet.

Alternative 6: Implement time and area closures.

Alternative 7: Require an ADF&G Commissioner's Permit

The status quo alternative was not recommended by the State of Alaska as it would allow crab stocks to continue to be vulnerable to bycatch mortality by non-pelagic trawling in Federal waters of Cook Inlet.

Alternative 2, the preferred alternative, would prohibit the use of non-pelagic trawl gear in Federal waters of Cook Inlet and implement consistent gear restrictions with the Board in State waters of Cook Inlet to optimize protection and rebuilding of crab resources. The proposed gear ban in Federal waters would provide long-term protection to depressed king and Tanner crab resources in Cook Inlet and would provide concurrent management approaches with ADF&G. Because practically no fishing using non-pelagic trawl

gear has occurred in this area, there are no existing fisheries to affect. In September 2000, the Council selected Alternative 2 as its **preferred alternative**.

Alternative 3 would defer management of groundfish in Federal waters of Cook Inlet north of a line from Cape Douglas to Cape Elizabeth to the State of Alaska. It would expand upon the management authority proposed under Alternative 2, by authorizing ADF&G and the Board to manage all groundfish stocks within Federal waters of Cook Inlet, while retaining ultimate management authority under the National Marine Fisheries Service (NMFS), in consultation with the Council. State and Federal waters of Cook Inlet currently supports commercial Pacific cod fisheries, equally split between pot and jig gear. This fishery does not have an observer program.

Alternative 4 would withdraw Cook Inlet from the GOA FMP. The State of Alaska would assume management authority of groundfish in the absence of Federal management, as constrained by Section 306(a)(3) of the MSA. Pacific cod is the primary groundfish fishery in this area. The Board has prohibited the use of non-pelagic trawl gear in Cook Inlet state waters. Because minimal fishing with non-pelagic trawl gear has occurred in this area, there are no existing fisheries that would be affected. Alternative 4 would clarify fishing opportunities by establishing a single management agency for groundfish in Cook Inlet, while also optimizing protection and rebuilding of crab resources.

Alternatives 5 through 7 were suggested for analysis by the Advisory Panel in April 1999 and included in the analysis by the Council in October 1999. Alternative 5 would require observer coverage on all fishing vessels fishing for groundfish when operating within the proposed gear ban area. Because groundfish fishing in this area is managed by the Gulf of Alaska fishery management plan, crab bycatch in groundfish fisheries is monitored by the NMFS Observer Program. Observers are required on all vessels > 125 ft with 30% coverage of vessels 60-124 ft; observers are not required on vessels < 60 ft. Bycatch in scallop fisheries is monitored by the state observer program. In Cook Inlet, however, ADF&G biologists observe a portion of the scallop vessels fishing efforts. Thus, observer coverage requirements already exist for some commercial fisheries in this area.

Alternative 6 would establish time and area closures in the Federal waters of Cook Inlet. However, king and Tanner crab resources exhibit pronounced seasonal migrations in Cook Inlet and it would be difficult to establish time and area closures that would mesh with variability in the groundfish fishing seasons while effectively protecting king and Tanner crab resources.

Alternative 7 would place groundfish fisheries within Cook Inlet under restrictions of an ADF&G Commissioner's Permit. A Commissioner's Permit is currently required for commercial scallop vessels operating in this area. However, inseason management of the commercial scallop fisheries has been delegated to the State of Alaska. In contrast, groundfish fishing in Federal waters of Cook Inlet is regulated under the GOA FMP. Establishing management authority under a Commissioner's Permit would require a transfer of management authority similar to that considered for Alternatives 3 and 4.

1.0 INTRODUCTION

The groundfish fisheries in the Exclusive Economic Zone (EEZ) (3 to 200 miles offshore) in the Gulf of Alaska (GOA) are managed under the Fishery Management Plan (FMP) for the Groundfish Fisheries of the GOA. The FMP was developed by the North Pacific Fishery Management Council (Council) under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). It was approved by the Secretary of Commerce and became effective in 1978.

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-Stevens 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 preferred alternative as well as a description of alternative actions that may address the problem. This information is included in Section 1 of this document. Section 2 contains a section on the biology of king and Tanner crabs. Section 3 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 4 contains a draft 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 5 contains a finding of no significant impact by the preferred alternative on small businesses in accordance with the RFA.

1.1 Purpose of Document

This Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA) examines seven management alternatives, including the Council's preferred alternative to protect depressed king and Tanner crab resources in Federal waters of the Cook Inlet portion of the GOA. This action is considered to be subject to the requirements of NEPA to prepare an EA since it proposes to amend the existing FMP and create new regulations. If the EA portion of this document indicates that the preferred alternative has the potential to significantly impact the human environment, than an Enivironmental Impact Statement is required. If the EA finds that the preferred alternative will not significantly impact the human environment, then a Finding of No Significant Impact (FONSI) will be provided. The EA will evaluate the potential significance of the impact of the preferred alternative using the criteria described in NOAA Administrative Order (NA0) 216-6. These criteria are based on, and expand upon, the criteria developed by the Council on Environmental Quality (CEQ) guidelines.

The basis for this document comes from a proposal submitted by the Alaska Department of Fish and Game (ADF&G) to the Council during the Summer 1998 call for proposals (Appendix I). In December 1998, the Council approved development of an analysis of four proposed alternatives to prohibit the use of non-pelagic trawl in the Federal waters of Cook Inlet. The Council added three additional alternatives in October 1999 that are related to management authority over the Federal waters of Cook Inlet to the analysis during its initial review.

1.2 Need for Action

The Magnuson-Stevens Act emphasizes the importance of bycatch effects on achieving sustainable fisheries. National Standard 9 mandates that conservation and management measures shall, to the extent practicable: minimize bycatch; and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

King and Tanner crab stocks in Cook Inlet are in need of protection. The king crab population has not recovered from its dramatic decline in the 1980s; the last commercial fishery closed in 1984. The Tanner crab population has also declined and commercial crab fishing has not opened since 1991 in the western portion and 1994 in the eastern portion of the proposed closure area. ADF&G trawl surveys assess crabs in this area. A discussion of the current status of Cook Inlet crab resources is found in Section 2.0 of this analysis. Although non-pelagic trawl vessels have not regularly targeted this area since the 1980s, management efforts to protect the depleted crab resources have become reactive to anticipated non-pelagic trawl effort. This proposal would be proactive and conform to the Council's precautionary principle in providing protection in an area of important habitat for king and Tanner crab stocks.

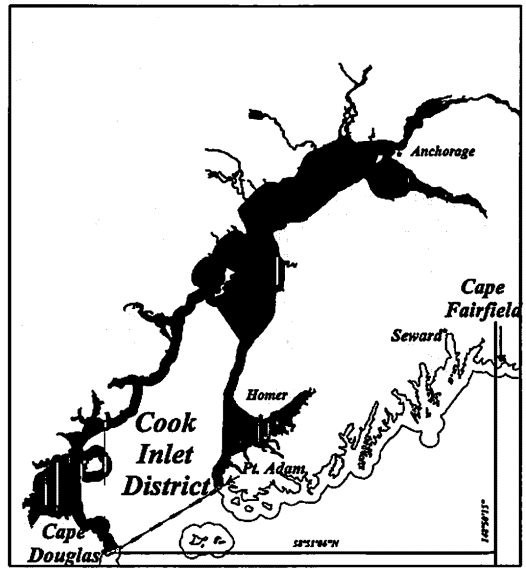


Figure 1. State (black) and Federal (north of red line) waters of Cook Inlet in Gulf of Alaska.

Although the State of Alaska has been delegated authority to manage crab resources in the GOA EEZ, the State lacks jurisdiction over the groundfish fisheries in the EEZ within Cook Inlet. Therefore, the State cannot extend a state water prohibition of non-pelagic trawling. Although non-pelagic trawling has not recently occurred in this area, interest continues to be expressed for trawling for flatfish species. Although the existing Federal regulatory structure does not provide for timely closure of non-pelagic trawling in this important crab habitat, in 1991 NMFS implemented a 90-day non-renewable closure to trawling in Cook Inlet.

Alternatives 2 through 4 would extend an existing state waters ban on non-pelagic trawling to include the Federal waters of Cook Inlet, thereby establishing consistent management and conservation measures throughout the Cook Inlet area. Alternatives 3 and 4 would further allow the State to assume deferred or full management authority of all groundfish in Federal waters of Cook Inlet.

Alternatives 2 through 4 would proactively protect depleted king and Tanner crab resources of Cook Inlet. The Council has taken measures to limit non-pelagic trawling in other fisheries to minimize the potential bycatch of crab species. Alternatives 2 through 4 may be seen as a continuation of these efforts. Action to prohibit the use of non-pelagic trawl gear for vessels targeting pollock in the Bering Sea/Aleutian Islands under BSAI Plan Amendment 57 was approved by the Council in June 1998 (NPFMC 1998) and became effective in Federal regulations on June 15, 2000. Only pelagic trawl gear as defined in Federal regulations is allowed in that fishery. This regulation requires the use of a performance standard to define non-pelagic trawling. Currently, the State of Alaska and the NMFS define non-pelagic trawling differently.

The Council requested that the Board take complementary action to redefine non-pelagic trawling in State waters. The Board reported that it would reschedule this action from its March 1999 meeting pending the outcome of the Council Enforcement Committee discussions on compatible definitions of non-pelagic or bottom gear held on April 21, 1999. The committee minutes on this issue follow:

> *"Both the State and Federal regulations define pelagic and non-pelagic trawl gear. The state definition for non-pelagic trawl gear does not allow for any contact of gear with the seabed. The federal definition of non-pelagic trawl gear is performance based, and allows incidental contact*

with the bottom with the allowance of 20 crab of any species ≤ 1.5 inches (38 mm) at the widest dimension. The BOF has proposed a third definition for "demersal" trawl that would equate to the federal definition of non-pelagic trawl. The federal definition of pelagic trawl definition would be redefined as equivalent to "mid-water" trawls. This third definition is proposed to eliminate regulatory confusion to fishermen in both state and federal waters.

The committee determined that no problem exists in terms of enforceability of the respective gear definitions. The state definition is enforceable in state waters; the federal definition is enforceable in federal waters.

The committee determined that the State and Federal pelagic trawl definitions are clear and not confusing within the separate governmental jurisdictions."

The committee concluded and the Council concurred that no additional action by the Council or Board was necessary at this time. Implementation of a ban on the use of non-pelagic trawl gear under Federal management (Alternative 2), however, would maintain the discrepancy in definitions that are described above. The committee members agreed that the different definitions addressed different management needs. If the preferred alternative (Alternative 2) were selected, there would be different definitions of non-pelagic gear for vessels operating in Cook Inlet. The definition used would depend on whether the vessel is fishing in state or Federal waters.

Another means for limiting the use of non-pelagic gear while maintaining consistent definitions of non-pelagic gear would be to delegate management authority in the Federal waters of Cook Inlet to the State of Alaska. Under Section 306(a)(3) of the Magnuson-Stevens Act of 1996, a State may regulate a fishing vessel outside the boundaries of the State in the following circumstances:

(A) The fishing vessel is registered under the law of that State, and (i) there is no fishery management plan or other applicable Federal fishing regulations for the fishery in which the vessel is operating; or (ii) the State's laws and regulations are consistent with the fishery management plan and applicable Federal fishing regulations for the fishery in which the vessel is operating.

(B) The fishery management plan for the fishery in which the fishing vessel is operating delegates management of the fishery to a State and the State's laws and regulations are consistent with such fishery management plan. If at any time the Secretary determines that a State law or regulation applicable to a fishing vessel under this circumstance is not consistent with the fishery management plan, the Secretary shall promptly notify the State and the appropriate Council of such determination and provide an opportunity for the State to correct any inconsistencies identified in the notification. If, after notice and opportunity for corrective action, the State does not correct the inconsistencies identified by the Secretary, the authority granted to the State under this subparagraph shall not apply until the Secretary and the appropriate Council find that the State has corrected the inconsistencies. For a fishery for which there was a fishery management plan in place on August 1, 1996 that did not delegate management of the fishery to a State as of that date, the authority provided by this subparagraph applies only if the Council approves the delegation of management of the fishery to the State by a three-quarters majority vote of the voting members of the Council.

(C) The fishing vessel is not registered under the law of the State of Alaska and is operating in a fishery in the exclusive economic zone off Alaska for which there was no fishery management plan in place on August 1, 1996, and the Secretary and the North Pacific Council find that there is a legitimate interest of the State of Alaska in the conservation and management of such fishery. The authority provided under this subparagraph shall terminate when a fishery management plan under this Act is approved and implemented for such fishery.

Alternatives 5 through 7 were proposed by the AP in April 1999 and included in the analysis by the Council in October 1999 during initial review of the analysis. Alternative 5 would require observer coverage when operating within the proposed gear ban area. Because groundfish fishing in this area is currently regulated under the GOA FMP, crab bycatch in groundfish fisheries is already monitored by the NMFS Observer Program. Observers are required on all vessels > 125 ft with 30% coverage of vessels 60-124 ft; observers are not required on vessels < 60 ft. However, because crab bycatch limits are established for the Central GOA, the existing NMFS management structure has a limited ability to respond to localized increases in crab bycatch.

Alternative 6 would establish time and area closures. However, king and Tanner crab resources exhibit pronounced seasonal migrations in this area and it would be difficult to establish time and area closures that would mesh with variability in the groundfish fishing seasons while effectively protecting king and Tanner crab resources.

Alternative 7 would place groundfish fisheries in the proposed gear ban area under restrictions of an ADF&G Commissioner's Permit. To establish management authority to occur under a Commissioner's Permit would require a transfer of management authority similar to Alternatives 3 and 4.

1.3 Alternatives Considered

The alternatives considered here were based on information received from the public through the Council process. The Council publishes a notice of its meetings in the Federal Register and public participation in selecting alternatives is made available throughout the development of these alternatives.

Alternative 1: No action.

Under the status quo, the use of non-pelagic trawl gear would not be restricted in Federal waters of Cook Inlet. Although non-pelagic trawling has not occurred recently in this area, interest continues to be expressed in trawling for flatfish in Cook Inlet. The existing Federal regulatory structure may not provide for timely closure of non-pelagic trawling in this important crab habitat to meet the stated goal of conservation of king and Tanner crab resources in the EEZ of Cook Inlet.

Alternative 2: Prohibit the use of non-pelagic trawl gear in Federal waters of Cook Inlet.

Alternative 2 would prohibit the use of non-pelagic trawl gear in Federal waters of Cook Inlet. This would effectively extend the area closed to non-pelagic trawling from State waters into the Federal EEZ. Establishment of gear exclusions for areas managed under a Federal FMP requires a plan amendment. Under Alternative 2, gear exclusions to protect crab stocks would be consistent in state and Federal waters of Cook Inlet and would meet the stated goal of conservation of king and Tanner crab resources in the EEZ of Cook Inlet. This action requires a plan amendment. The Council adopted this as its preferred alternative.

Alternative 3: Defer management of groundfish in Federal waters of Cook Inlet to the State of Alaska.

Currently, ADF&G regulates state waters of Cook Inlet in conformance with regulations of Federal fisheries unless the Alaska Board of Fisheries has adopted more conservative management plans or gear restrictions that do not conflict with Federal regulations and provide for greater resource protection in nearshore waters. Alternative 3 would redefine the management authority for this area and allow the State to assume management of all groundfish in all waters of Cook Inlet. This action requires a plan amendment. Under this alternative, the state would be granted responsibility for the management of all groundfish resources in the

Federal waters of Cook Inlet. This delegation of management authority is greater than is necessary to address the need for this action and would grant extensive new authority to the State of Alaska.

Alternative 4: Remove Cook Inlet from the Federal FMP.

Alternative 4 would redefine the management authority for this area by removing Cook Inlet from the GOA FMP (Figure 2). Under this alternative, management plans for the entire Cook Inlet area would be prepared by ADF&G staff and reviewed by the Alaska Board of Fisheries. It is the stated goal of ADF&G staff that traditional groundfish fisheries in Cook Inlet would continue, except that a non-pelagic trawl fishery would be prohibited. This alternative would clarify fishing opportunities by establishing a single management agency for groundfish in Cook Inlet. This action requires a plan amendment.

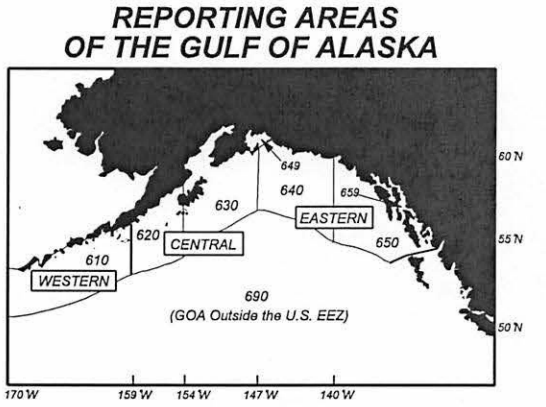


Figure 2. Reporting areas of the Gulf of Alaska.

Removal of Federal waters (EEZ) of Cook Inlet under Alternative 4 would result in the State of Alaska assuming management authority for groundfish fisheries in Federal waters of Cook Inlet. This alternative is a more extensive measure than may be needed to meet the stated management goal of taking a precautionary approach to conservation of king and Tanner crab resources in the EEZ of Cook Inlet. This action requires a plan amendment.

Alternatives 5: Require observer coverage when operating within the proposed gear ban area.

Alternative 5 would require observer coverage when vessels are fishing for groundfish within the proposed gear ban area. Because groundfish fishing is managed by the GOA FMP, crab bycatch in groundfish fisheries is monitored by the NMFS Observer Program. Observers are required on all vessels > 125 ft with 30% coverage of vessels 60-124 ft; observers are not required on vessels < 60 ft. Bycatch in scallop fisheries is monitored by the state observer program; 100% observer coverage is required on vessels in most areas. However, in Cook Inlet, ADF&G biologists observe a portion of scallop fishing efforts. Thus, observer coverage requirements already exist for some commercial fisheries in this area. In addition, this approach would result in fishery closures, through NMFS inseason management actions, only after crab had been caught and does not provide a proactive approach to crab protection. This action requires a regulatory amendment.

Alternative 6: Establish time and area closures.

Alternative 6 would establish time and area closures. This measure would likely allow some limited protection to king and Tanner crab resources. However, these crab stocks exhibit pronounced seasonal migrations in this area and it would be difficult to establish time and area closures that would mesh with variability in the groundfish fishing seasons while effectively protecting king and Tanner crab resources. This action requires a plan amendment. This alternative may be more difficult to establish and enforce than a ban on non-pelagic trawl gear and may fail to accomplish to goals of this action to protect crab resources.

Alternative 7: Place Federal waters of Cook Inlet under a Commissioner's Permit.

Alternative 7 would place groundfish fisheries in the proposed gear ban area under restrictions of an ADF&G Commissioner's Permit. A Commissioner's Permit is currently required for commercial scallop vessels operating in this area. However, inseason management of the commercial scallop fisheries has been

delegated to the State of Alaska. In contrast, groundfish fishing in Federal waters of Cook Inlet is regulated under the GOA FMP. To establish management authority to occur under a Commissioner's Permit would require a transfer of management authority similar to that considered for Alternatives 3 and 4. Analysis of these alternatives is provided elsewhere in this document. This action requires a plan amendment. This delegation of management authority is greater than is necessary to address the need for this action and would grant extensive new authority to the State of Alaska.

2.0 COOK INLET KING AND TANNER CRAB STOCKS

This section provides a description of the crab stocks in Cook Inlet. The Cook Inlet Management Area, Statistical Area H, includes all waters west of Cape Fairfield (148E 50' W long.) and north of Cape Douglas (58E 51' N lat.). This area supported commercial harvests of Tanner crab *Chionoecetes bairdi* since at least the 1960s and red king crab *Paralithodes camtschatica* since at least 1937 (Bechtol and Trowbridge 1999). ADF&G has management authority for these crab resources, and has divided the management area into six shellfish districts: Southern, Kamishak, Barren Islands, Outer, Eastern, and Central (Figure 3).

The Southern, Kamishak, and Barren Islands Districts have historically supported the largest commercial fisheries whereas the Outer, Eastern, and Central Districts have supported smaller fisheries. For king and Tanner crab management, the Kamishak and Barren Island Districts have typically been managed as a single unit and the Outer and Eastern Districts have similarly been managed as a single unit; that is, they have opened and closed concurrently.

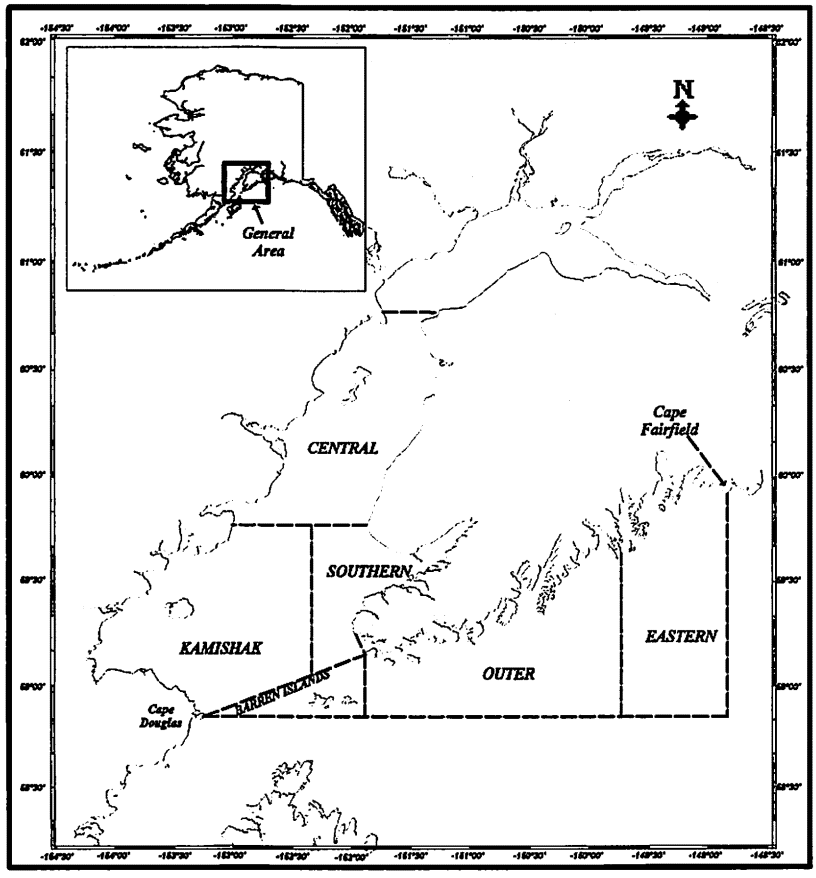


Figure 3. Commercial shellfish fishing districts of the Cook Inlet Management Area.

Most crab stocks in Alaska have experienced large fluctuations in population abundance (Kruse 1993), and harvests from these resources have been adjusted in relation to the level of population abundance. Tanner crab stocks in all surveyed districts of Cook Inlet have been at low abundance levels since the early-1990s and no commercial harvests

will be allowed until abundance increases. The Alaska Board of Fisheries adopted a management plan in 1998 to restrict the opening of any Tanner crab fisheries unless a minimum threshold of harvestable surplus of Tanner crab are available. Red king crab stocks have been at extremely low abundance levels in all surveyed districts of Cook Inlet since the mid-1980s, and no commercial, recreational or subsistence harvests will be allowed until stocks recover. Despite the absence of fisheries, ADF&G has maintained its program of annual surveys to monitor changes in abundance of king and Tanner crabs. Harvest data reported for the Cook Inlet Management area were compiled from historical annual management reports, previous reports to the Board, and data summaries from the ADF&G fish ticket harvest database. Survey data were compiled from historical survey reports and annual management reports.

2.1 Status of Stocks

2.1.1 Tanner Crab Assessment

Southern District

Annual pot and trawl surveys were used to develop an index of crab abundance and set the harvest level for subsequent commercial fisheries (Kimker 1991*a* and *b*; Bechtol and Trowbridge 1999; Bechtol 2001). The

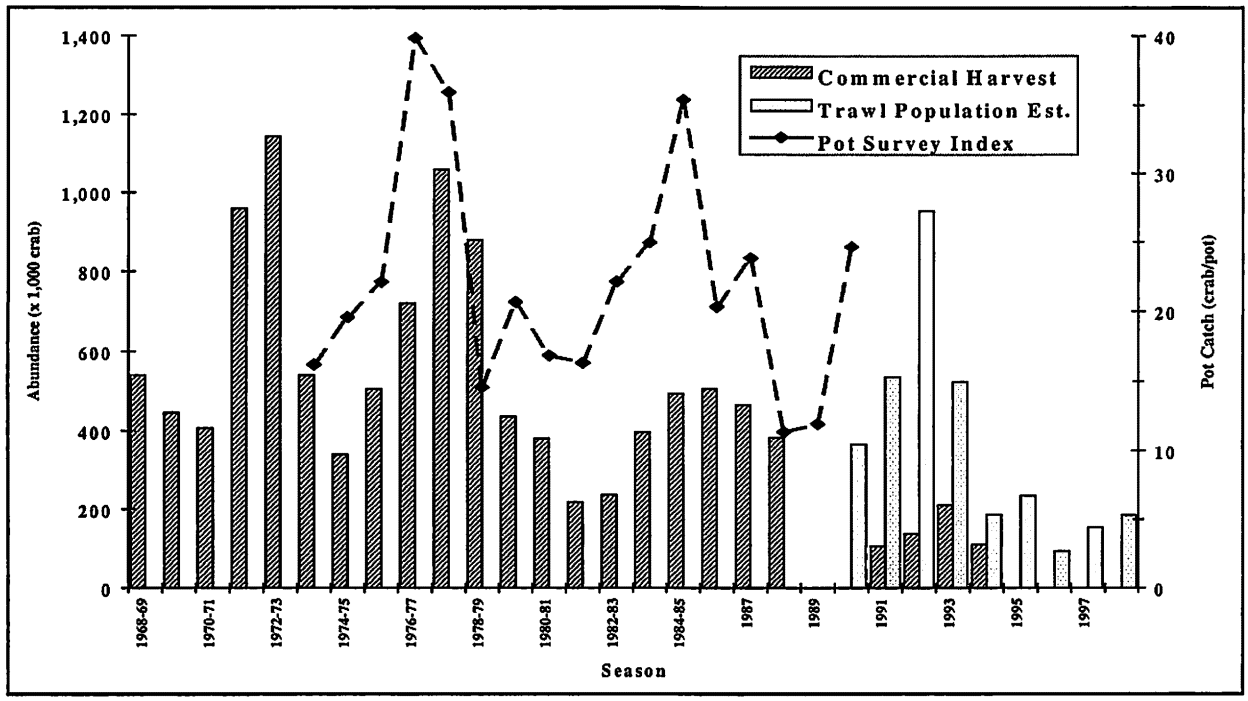


Figure 4. Harvest abundance and trawl survey and pot survey estimates of legal males Tanner crab in the Southern District, 1968-1999.

pot survey was begun in 1974 and discontinued after 1990 in the Southern District. Mean catch of legal male Tanner crab in Southern District pot surveys ranged from 39.8 crab per pot in 1977 to 11.4 crab per pot in 1988 (Figure 4). Catch rates of sublegal males ranged from 36.5 crab per pot in 1980 to 3.6 crab per pot in 1989.

Most individual trawl survey stations in the Southern District encompass 6.3 nm^2 (maximum of 8.9 nm^2), which is the area represented by a typical, single trawl tow (Bechtol 2001). From 18 to 23 stations have been

sampled annually since 1990, yielding a mean estimate of 1.7 million sublegal male crab, and 0.3 million legal male crab in the Southern District. The abundance estimates from ADF&G have ranged from roughly 950,000 legal crab to a record low of 74,000 legal male crab during the 2000 survey. Abundance of Tanner crab in the Southern District appears to be improving based on the 2001 trawl survey. Annual abundance of legal male crab has remained substantially below the historical mean since 1994. Legal male crab comprised from 2.6% to 34.6% of the male population, with a mean of 14.9%. Skip molt Tanner crab occur in the Southern District, as evidenced by the abundance of old shell male crab in the trawl survey, but annual incidence of skip molts has been highly variable. Although there has been a lack of post-recruit crab in recent years, incidence of pre-recruit skip molts in the trawl survey has generally decreased relative to the trawl survey history. Thus, it is unlikely that increases in skip molts account for the continued decline of Tanner crab in the Southern District. Abundance of female Tanner crab has ranged from 373,000 crab in 1997 to a record high estimate of 2.7 million crab in the 1999 survey (Bechtol and Trowbridge 1999; Bechtol 2001). Mature females have comprised from 15.7% to 66.9% of the estimates population.

Both the female and male trawl survey population estimates have indicated the presence of increased juvenile female crab and pre-recruit male crab in the past three years. The survey estimated over 1.1 million juvenile female crab in 1999, and nearly 2.3 million juvenile crab in 2001. Similarly, the male tanner crab abundance estimates for Pre-3 year old recruits was nearly 1.3 million in 1999. The Pre-4 year old estimate was nearly 1.9 million crab in 2001. Again, it is not clear from the survey data that these crabs are reaching legal recruitment age. The trawl surveys may not consistently sample Pre-recruit crabs in the smaller size classes and it is difficult to tell whether the pre-recruit estimates are representative of improving recruitment conditions. The survey gear has been modified slightly over the past few years and this gear may fish more efficiently than the previous survey gear. Based on preliminary reviews, this gear may be roughly 10% more efficient than the earlier survey gear in capturing larger crab[1].

Nevertheless, these year classes may represent an overall improvement in recruitment conditions and future surveys, particularly the 2002 survey, may show an increase in recruit and post-recruit males. Improved recruitment and population estimates for Tanner crab have been observed in other regions of the Gulf of Alaska, particularly, Kodiak, Prince William Sound, and the South Peninsula. The abundance estimates in Cook Inlet may reflect a general trend of improving recruitment and abundance in Gulf of Alaska.

Kamishak/Barren Islands

Annual pot surveys were begun in 1975 in the Kamishak and Barren Island Districts (Figure 4; Kimker 1991*b*). Mean catch of legal male Tanner crab in pot surveys ranged from 27.8 crab per pot in 1975 to 1.9 crab per pot in 1983 and 1987. Mean catch among all survey years was 8.0 legal male crab per pot, although annual catch rates exceeded this mean in only five survey years, all of which were prior to 1981. Catch rates of sublegal males ranged from 62.2 crab per pot in 1978 to 13.1 crab per pot in 1984. Pot surveys were discontinued after 1990 (Kimker 1991*a*).

Trawl surveys began in 1990 in the Kamishak and Barren Islands Districts (Kimker 1991*a*; Bechtol 1998; Bechtol and Trowbridge 1999). The annual sampling effort of 16 to 28 stations resulted in a mean abundance estimate of 3.0 million sublegal and 230,00 legal male Tanner crab among all survey years (1990-2001). Annual abundance of legal male Tanner crab has ranged from a record low of 15,000 in 2000 to 594,000 in 1990 (Figure 5). Few post-recruit crab have been captured by trawl surveys in these districts.

[1] William Bechtol, ADF&G Staff, Southcentral Region, Personal Communication 2001

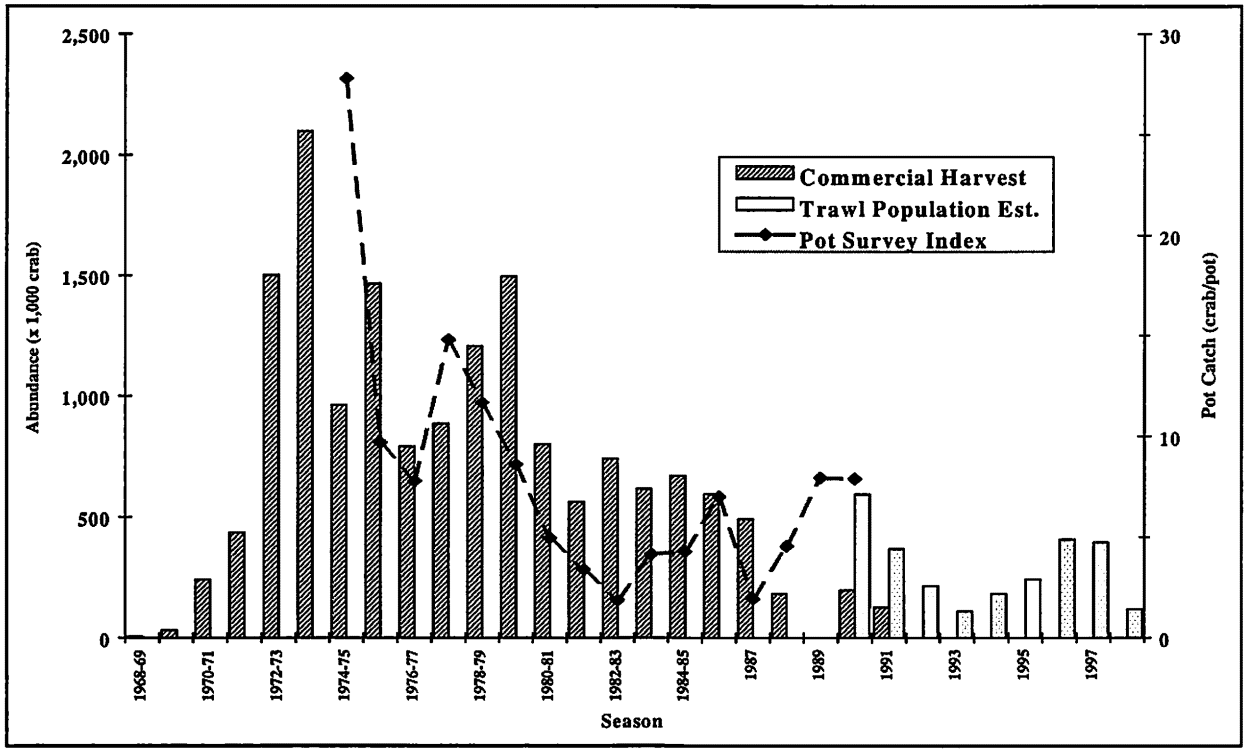


Figure 5. Harvest abundance and trawl survey and pot survey estimates of legal male Tanner crab in the Kamishak and Barren Islands Districts, 1968-1998.

Male skip molt crab, indicated by the old-shell component, are much more prevalent in the Kamishak and Barren Island Districts than in other portions of the Cook Inlet Management Area. Estimates of pre-recruit male crab have increased in recent years. In 1999, nearly 1.2 million Pre-2 year old recruits were estimated. Nearly 5.8 million Pre-4 year old recruits were observed in 2001. As mentioned in the previous section, some of these observations may be due to changes in the survey gear used, artifices of the trawl survey which occasionally encounter large numbers of pre-recruits out of proportion to their actual abundance. However, it is also possible that these recent trends in pre-recruits may be indicative of an overall improvement in the population abundance.

Estimated abundance of female Tanner crab in the Kamishak and Barren Islands Districts has ranged from 305,000 in 1998 to 5.0 million in 2001 (Bechtol and Trowbridge 1999; Bechtol 2001). Most of the increased abundance in the female Tanner crab population in 2001 comes from an extremely high estimate of juvenile crab. The estimated abundance of 7,900 mature female crab in 1998 represented a substantial decrease from historical levels. However, in the past three years, the abundance of mature female crab has increased from this low abundance. As with the male crab, the estimates of juvenile female crab may be due to a variety of factors including survey effects and the possibility that crab populations are improving.

Tagging studies with Tanner crab were conducted from 1974 to the mid-1980's in the Southern District and from 1975 to the mid-1980's in the Kamishak and Barren Islands Districts (Davis 1981; Kimker et al. 1985). Results indicated that legal male Tanner crab in the Kamishak and Barren Islands Districts comprised a single stock, but that legal male Tanner crab did not migrate between the Southern District and the Kamishak and Barren Islands Districts (Figure 3). Furthermore, legal males tagged in these two districts were recaptured in Kodiak's North Mainland Section, but only on a regular basis as far south as Douglas Reef immediately south of Cape Douglas. Due to the latter finding, survey results from the Kamishak and Barren

Islands Districts are often compared to results from surveys conducted immediately south of Cape Douglas by Kodiak ADF&G staff. Based on the tagging studies, it is likely that Tanner crab found north and south of Cape Douglas will exhibit similar changes in stock abundance.

2.1.2 King Crab Assessment

Catch rates of legal male king crab from Southern District pot surveys ranged from 0.4 crab per pot in 1982 to 3.4 crab per pot in 1978 (Table 1). A mean catch of 4.8 crab per pot in the 1990 survey is somewhat misleading. Most crab were caught at a single survey station and the 68-pot sampling effort, substantially less than previous surveys, focused on stations that historically exhibited the largest concentrations of king crab. Mean catch among all years was 7.7 sublegal and 1.8 legal king crab. Catches of female king crab also declined from 46.4 crab per pot in 1977 to 0.1 crab per pot in 1990. Mean catch among all years was 9.7 females per pot.

Table 1. Pot index survey catch and subsequent harvest abundance of king crab in the Southern District, 1974-1990.

		Number Females		Number Males			Males per Pot [a]		Subsequentn Harvest
Year	Pots Fished	Total	per Pot [a]	Sublegal	Legal	Total	Sublegal	Legal	(No. Males)
1974	240			494	275	769	2.1	1.1	242,202
1975	260	432	1.7	552	573	1,125	2.1	2.2	201,759
1976	227	981	4.3	977	225	1,202	4.3	1.0	126,258
1977	260	12,075	46.4	9,772	281	10,053	37.6	1.1	82,266
1978	237	2,944	12.4	5,501	807	6,308	23.2	3.4	100,665
1979	255	2,555	10.0	2,853	665	3,518	11.2	2.6	125,527
1980	367	14,855	40.5	10,041	1,941	11,982	27.4	5.3	74,804
1981	238	2,711	11.4	2,130	519	2,649	8.9	2.2	25,901
1982	222	1,889	8.5	608	95	703	2.7	0.4	Closed
1983	230	696	3.0	447	123	570	1.9	0.5	Closed
1984	234	2,100	9.0	777	418	1,195	3.3	1.8	Closed
1985	231	941	4.1	337	273	610	1.5	1.2	Closed
1986	237	480	2.0	365	210	575	1.5	0.9	Closed
1987	237	137	0.6	188	252	440	0.8	1.1	Closed
1988	228	294	1.3	336	184	520	1.5	0.8	Closed
1989	212	62	0.3	78	105	183	0.4	0.5	Closed
1990	68	10	0.1	19	329	348	0.3	4.8	Closed
Average			9.7				7.7	1.8	122,423

[a] Data not standardized for soak time.

Trawl surveys have been conducted annually in the Kamishak and Barren Islands Districts since 1990 (Kimker 1991*a*; Bechtol and Trowbridge 1999; Bechtol 2001). Red king crab are not abundant and have a patchy distribution in trawl survey catches (Table 2). Population abundance estimates are not calculated and the survey is treated as an index of king crab abundance. Catches of male crab have ranged from 3 in 1994 to 139 in 2001, with a mean catch among survey years of 26.8 crab. Most of the catch in recent years has been comprised of sublegal king crab, although more legal size crab were generally caught in the early 1990's. The king crab population in Cook Inlet remains severely depressed; all crab are needed to sustain the limited existing productivity. Because a stock recovery is not anticipated in the near term, the Alaska Board of Fisheries established a regulatory closure of all king crab fisheries in Cook Inlet, including the Kamishak Bay and Barren Islands Districts. The stock will continue to be monitored through ADF&G trawl surveys.

Table 2. King crab catches from Cook Inlet trawl surveys, 1990-1998.

Southern District

Year	Number Of Tows	Female Crab per Survey			Male Crab per Survey		
		Juvenile	Mature	Total	Sublegal	Legal	Total
1990	19	2	0	2	1	3	4
1991	20	0	8	8	1	104	105
1992	18	1	80	81	4	44	48
1993	19	3	18	21	7	8	15
1994	20	6	4	10	4	7	11
1995	20	0	1	1	0	3	3
1996	19	0	2	2	1	3	4
1997	23	0	39	39	1	8	9
1998	23	0	0	0	0	0	0
1999	20	0	0	0	0	2	2
2000	23	0	0	0	0	4	4
2001	22	0	0	0	0	4	4
Average	20.5	1.0	12.7	13.7	1.6	15.7	17.3

Kamishak and Barren Islands Districts

Year	Number Of Tows	Female Crab per Survey			Male Crab per Survey		
		Juvenile	Mature	Total	Sublegal	Legal	Total
1990	28	0	4	4	2	4	6
1991	20	0	0	0	0	7	7
1992	28	1	3	4	4	22	26
1993	16	0	0	0	1	1	2
1994	17	0	0	0	0	3	3
1995	27	4	0	4	3	3	6
1996	20	2	7	9	29	2	31
1997	20	60	7	67	33	13	46
1998	23	0	5	5	14	0	14
1999	19	0	0	0	0	2	2
2000	28	7	9	16	12	128	140
2001	25	1	52	53	0	43	43
Average	22.6	6.3	7.3	13.1	8.2	19.0	27.2

The annual pot surveys conducted in the Kamishak and Barren Islands Districts from 1975 until 1990 were used to develop an index of abundance of king crab to set the harvest level for subsequent commercial fisheries (Kimker 1991*b*). Catches of legal male king crab in the ranged from 0.3 crab per pot in 1986 to 27.0 crab per pot in 1975 (Table 3). The 1975 catch per pot was much greater than the catch obtained in any other survey year. Mean catch among years was 4.6 legal male crab per pot. Catch rates for female king crab also declined from 37.6 crab per pot in 1977 to 1.0 crab per pot in 1988. Mean catch among all years was 10.0 females per pot.

2.1.3 Commercial Crab Fisheries

The Tanner crab fisheries have been prosecuted in the GOA since 1967. Approximately 700 million pounds have been harvested since that time. The gear has evolved to include side loading mesh covered pots approximately 6 to 8 feet square and top loading pyramid or conical style gear. Fisheries have occurred in the South Peninsula, Chignik, Kodiak, Cook Inlet, Prince William Sound, Yakutat and Southeast Alaska Management Areas. The peak harvest of 54 million pounds was taken in 1978. Tanner crab populations and fisheries diminished after that time with no harvest from the South Peninsula and Chignik areas after 1989 until recently, when limited Tanner crab fisheries were opened in the South Peninsula and Kodiak regions in 2000 and 2001 and will be opened in the Kodiak region only in 2002. These Tanner crab fisheries are still

far below historic harvests, however, there is some indication that Tanner crab stocks in certain regions of the Gulf of Alaska may be improving. Prince William Sound has remained closed since 1988. Recent trawl survey estimates indicate that Tanner crab stocks in Prince William Sound may be improving. Kodiak and Cook Inlet had their most recent fisheries in 1994. Small fisheries continue to occur in Yakutat Bay and Southeast Alaska. The fishing season runs from February 15 through May 1.

The Southern District Tanner crab fishery primarily occurs in the relatively protected waters of Kachemak Bay, although the western portion of the district does include Federal waters (Figures 1 and 2). Homer and Seldovia, home ports to most of the fleet, are less than 3-hours travel from the geographic extremes of the district. Fishing depths range from 5 to 95 fathoms, but generally are between 30 and 65 fathoms. The commercial Tanner crab fishery began in the mid-1960s when this species was harvested incidentally to red king crab (Davis 1981). The first large harvest of Tanner crab was 1.4 million lb from the Southern District in the 1968-1969 season (Table 4 and Figure 3). Fishing effort quickly expanded to other Cook Inlet districts, and a peak harvest of 8.0 million lb from all districts in the management area was reached during the 1973-1974 season. Southern District catches cycled at approximately six-to-seven year intervals with large harvests of 2.9 million lb in 1972-1973, 2.8 million lb in 1977-1978, 1.2 million lb in 1984-1985, and 0.5 million lb in 1993 (Kimker 1996). Southern District mean harvest was 1.2 million lb during 1968 to 1994. Effort ranged from 35 vessels in 1976-1977 to 136 vessels in 1993. Commercial fishing for Tanner crab in the Southern District was closed in the 1989 and 1990 seasons, and has remained closed since 1995 due to depressed stock levels.

Most of Kamishak Bay and Barren Islands Districts are in Federal waters. These districts are managed as a single unit for Tanner crab because survey, fishery, and tag recovery information indicate these two districts contain a single stock of Tanner crabs (Davis 1981). Fishing occurred in a 15 to 90 fathom depth range. Historical catch following full development of the fishery and implementation of the legal minimum size has ranged from 0.4 to 3.3 million lb (Table 4; Figure 5). Tanner crab harvests in the Kamishak and Barren Islands Districts ranged from 12,398 lb in 1968-1969 to 4.7 million lb in 1973-1974. The fishery was closed in 1989, and 1992 through 2001 due to depressed stock conditions. Vessel effort ranged from 7 to 28 boats.

Red king crab fisheries have been prosecuted in the GOA since 1954. The gear has evolved to include side loading mesh covered pots approximately 6 to 8 feet square and top loading pyramid or conical style gear. Discrete populations are found in the Alaska Peninsula, Kodiak, Cook Inlet, Prince William Sound and Southeastern Management areas. Historically, the red king crab fishery has been Alaska's top shellfish fishery. Since the mid-1950s fishermen have harvested over 1 billion pounds of red king crab from GOA waters. The peak harvest came in 1965 when approximately 113 million pounds were landed from the five management areas. A near peak harvest occurred in the 1980/81 season, but three years later the fishery had crashed with the harvest down sixty-fold and all management areas in the Gulf closed completely for the first time.

A long period of few juvenile king crabs surviving to adult size was the reason for the crash. Biologists theorize that fish predation on king crabs and/or a warmer ocean environment were possibly responsible for the low numbers of red king crabs rather than overfishing (Kruse 1993). Their populations remain depressed and fisheries have not been open since 1983 with the exception of a small fishery in inside waters of Southeastern Alaska, that has occurred yearly since 1993.

Table 3. Pot index survey catch and subsequent harvest abundance of king crab in the Kamishak and Barren Islands, 1975-1990.

Year	Pots Fished	# of Females		# of Males			Males per Pot [a]		Subsequent Harvest
		Total	per Pot [a]	Sublegal	Legal	Total	Sublegal	Legal	(# of Males)
1975	96			1,529	2,593	4,122	15.9	27.0	201,759
1976	159			1,301	768	2,069	8.2	4.8	126,258
1977	199	7,488	37.6	4,326	698	5,024	21.7	3.5	82,266
1978	224	8,164	36.4	7,774	883	8,657	34.7	3.9	100,665
1979	261	6,123	23.5	7,553	1,109	8,662	28.9	4.2	125,527
1980	171	920	5.4	1,098	602	1,700	6.4	3.5	74,804
1981	173	1,337	7.7	1,191	1,202	2,393	6.9	6.9	25,901
1982	70	357	5.1	504	296	800	7.2	4.2	Closed
1983	192	407	2.1	250	150	400	1.3	0.8	Closed
1984	185	315	1.7	206	73	279	1.1	0.4	Closed
1985	182	247	1.4	100	314	414	0.5	1.7	Closed
1986	184	565	3.1	444	51	495	2.4	0.3	Closed
1987	108	1,169	10.8	1,374	429	1,803	12.7	4.0	Closed
1988	168	172	1.0	226	259	485	1.3	1.5	Closed
1989	126	436	3.5	330	487	817	2.6	3.9	Closed
1990	99	135	1.4	118	356	474	1.2	3.6	Closed
Average			10.0				9.2	4.6	105,311

[a] Data not standardized for soak time.

Table 4. Tanner crab commercial harvest by districts from the Cook Inlet Management Area, 1968-1998.

Season[a/]	Southern Harvest Vessels	Southern Harvest Biomass	Southern Harvest Abundance	Kamishak/Barren Islands Harvest Vessels	Kamishak/Barren Islands Harvest Biomass	Kamishak/Barren Islands Harvest Abundance	Central Harvest Vessels	Central Harvest Biomass	Central Harvest Abundance
1968-69		1,388,282	540,655		12,398	5,544			
1969-70		1,147,154	446,750		71,196	31,839			
1970-71		1,046,803	407,669		541,212	242,028			
1971-72		2,462,956	959,178		974,962	436,000			
1972-73		2,935,662	1,143,269		3,361,023	1,503,037			
1973-74		1,387,535	540,364		4,689,251	2,097,016			
1974-75		967,762	339,566		2,150,462	961,679			
1975-76		1,339,245	505,375	17	3,281,084	1,467,289			
1976-77	35	2,009,633	720,299	24	1,765,926	789,716			
1977-78	55	2,806,568	1,059,082	28	2,077,092	883,869			
1978-79	75	2,323,420	880,083	27	2,713,339	1,205,928			
1979-80	68	1,134,940	436,515	24	3,338,623	1,497,140			
1980-81	46	1,047,630	380,956	20	1,757,331	798,787			
1981-82	41	548,529	219,412	18	1,286,332	561,717			
1982-83	48	584,908	236,805	20	1,693,794	739,648			
1983-84	45	996,763	397,117	17	1,373,674	615,997			
1984-85	83	1,229,298	493,694	19	1,535,547	670,545			
1985-86	103	1,164,261	506,200	24	1,288,711	593,876			
1987	87	1,077,379	466,398	21	1,111,339	491,743	2	7,771	3,485
1988	127	944,763	384,050	24	417,182	182,176	3	8,396	3,923
1989		Closed			Closed			Closed	
1990		Closed		7	422,037	198,139		Closed	
1991	68	271,379	106,007	8	266,106	127,323		Closed	
1992	110	354,868	138,081		Closed			Closed	
1993	136	534,003	210,237		Closed			Closed	
1994	110	284,676	110,340		Closed			Closed	
1995		Closed			Closed			Closed	
1996-99		Closed			Closed			Closed	
Average	77	1,249,517	484,504	20	1,642,210	731,865	3	8,084	3,704

[a/] Fishing seasons overlapped two calendar years prior to 1987.

The earliest recorded commercial landings of king crab from Cook Inlet occurred in 1937 when crabs were canned at a Halibut Cove facility (Kimker 1996). The proximity to port and processors enabled daily fishing trips. Through the 1940s, commercial fishing for this species remained at relatively low levels and occurred primarily in the Southern District. By the mid-1950s, annual harvests increased to approximately 2.0 million lb. Harvests peaked at 2.8 million lb in the 1962-63 season and reached a low of 0.18 million lb during 1981-82, the last year of commercial harvest. The fishery has subsequently remained closed by emergency order due to low abundance (Table 5).

During the 1960s the king crab fishery expanded to the Kamishak and Barren Islands Districts. Harvests peaked at 5.5 million pounds in the 1962-1963 season (Table 5). However, catch dropped significantly the following year after processing facilities in the Seldovia area were severely damaged by the 1964 earthquake. Catches ranged from 1.4 to 3.0 million lb for the next decade before drastically declining in the early 1980s.

The commercial fishery has remained closed due to low stock abundance following a harvest of only 188,000 lb in the 1983-84 season.

Table 5. Commercial harvest (lb) of king crab by fishing season and district from the Cook Inlet Management Area, 1960-1999.

Year	Southern	District Kamishak Barren	Outer and Eastern	Total Catch
1960-61	2,699,680	986,551	118,067	3,804,298
1961-62	1,619,642	3,642,500	368,909	5,631,051
1962-63	2,769,343	5,509,708	343,505	8,622,556
1963-64	1,960,426	4,915,303	59,352	6,935,081
1964-65	1,892,479	1,850,572	963	3,744,014
1965-66	1,948,012	1,684,346	14,491	3,646,849
1966-67	1,347,904	1,386,008	89,510	2,823,422
1967-68	1,117,394	1,883,605	239,518	3,240,517
1968-69	750,906	1,711,296	87,302	2,549,504
1969-70	1,464,721	1,688,803	73,644	3,227,168
1970-71	1,540,018	2,115,991	9,468	3,665,477
1971-72	1,992,224	2,868,315	12,657	4,873,196
1972-73	1,391,024	2,756,023	1,966	4,149,013
1973-74	1,971,841	2,236,131	5,613	4,213,585
1974-75	1,816,512	2,965,310	2,035	4,783,857
1975-76	1,674,872	1,832,484	45,293	3,552,649
1976-77	1,035,316	3,103,895	16,384	4,155,595
1977-78	584,090	1,099,279	1,350	1,684,719
1978-79	664,388	480,261	1,753	1,146,402
1979-80	853,584	489,365	4,871	1,347,820
1980-81	508,670	1,635,922	8,022	2,152,614
1981-82	183,899	1,371,821	4,142	1,559,862
1982-83	Closed	807,079	15,280	822,359
1983-84	Closed	188,027	4,504	192,531
Average	1,444,861	2,050,358	63,692	3,438,506

2.2 Habitat Requirements for GOA Tanner crab *Chionoecetes bairdi*

Management Plan and Area(s) No Federal fishery management plan exists for the commercial king, Tanner and Dungeness crab fisheries in the GOA. Authority to manage these fisheries has been delegated to the State of Alaska.

2.2.1 General Distribution

Tanner crabs are distributed on the continental shelf of the North Pacific Ocean and Bering Sea from Kamchatka to Oregon. In Alaska, Tanner crabs are concentrated around the Pribilof Islands and immediately north of the Alaska Peninsula, and are found in lower abundance in the GOA and throughout the Alexander Archipelago. Crabs occur from the littoral zone to 473 m. Females reach a terminal size with their maturity molt. Large numbers of small-clawed males migrate into shallow waters (<18 m) of Southeast Alaska bays and inlets to molt en masse in March and April. Mature male Tanner crabs may skip a year or more of molting after they attain maturity. Adult male crabs have limited migratory movements. Female crabs also have limited annual migrations especially while brooding eggs. Eggs generally hatch from March through May in the GOA, and peak hatching occurs in early May in Southeast Alaska (Robert Stone, NMFS, Auke Bay Laboratory, personal observation).

Additional distribution data from the Alaska Department of Fish and Game are available from the following offices:

Southeast Alaska:	Petersburg, - Tim Koeneman, (907) 772-3801
Cook Inlet:	Homer – Charlie Trowbridge, (907) 235-8191
Kodiak, Alaska Peninsula, Western Alaska:	Kodiak - Daniel Urban, (907) 486-1840
Central Alaska:	Inst. Mar. Sci., Seward, AK- A.J. Paul, (907) 224-5261

2.2.2 Relevant Trophic Information

Tanner crab larvae are planktotrophic feeding on phytoplankton and small zooplankton (Table 6). Crabs of different size, sex and state of maturity consume similar prey species, but diet differs from one area to another depending on prey availability. Food of juvenile crabs includes other crabs, bivalves, polychaetes, ophiuroids, barnacles, and sediment. Cannibalism may be prevalent in juvenile crabs. Adults near Kodiak are opportunistic and feed mainly on arthropods (mainly juvenile *C. bairdi*), fish, mollusks and polychaetes. In Southeast Alaska, polychaetes constitute a large portion of the diet of adult crabs. Specific information on the feeding habits of Cook Inlet Tanner crab are not available.

Throughout their range *Chionoecetes* spp. are prey for at least seven species of invertebrates, twenty-six species of fishes, and four species of marine mammals. Pacific cod (*Gadus macrocephalus*) is the main predator on Tanner crabs in the Kodiak Island area; crabs up to 70 mm CW are consumed but most are between 7 and 23 mm CW. Sculpins (*Myoxocephalus* spp.) are also an important predator of crabs in the Kodiak area, including ovigerous females. Both adult and juvenile *C. bairdi* are cannibalistic. Other demersal fishes, including the yellow Irish Lord (*Hemilepidotus jordani*), are important predators. Larval predators include salmon, herring, jellyfish and chaetognaths. In the GOA juvenile coho salmon (*Oncorhynchus kisutch*) are important predators of Tanner crab zoeae (Mary Auburn-Cook, NMFS, Auke Bay Laboratory, personal communication).

Table 6. Typical distribution by life stage for Tanner crab, *Chionoecetes bairdi*, off Alaska.

Stage - EFH Level	Duration or Age	Diet/Prey	Season/ Time	Location	Water Column	Bottom Type	Ocean o-graphic Features	Other
Eggs 1	1 to 1.5 years	NA	All Year	ICS, MCS, OCS	D	Silt/Fine Sand		Carried by ovigerous female
Larvae 0	Unknown (12-14 d)	Diatoms Algae Zooplankton	April-September	MCS, ICS	P	NA	F	
Juveniles 1	1 to 5 years	Crustaceans polychaetes bivalves ophiuroids algae hydroids	All year	MCS, ICS, BAY,	D	Silt/Fine Sand		
Adults 1	5+ years	Polychaetes crustaceans mollusks hydroids	Spawning Late-December to June	MCS, ICS	D	Silt/Fine Sand		

2.2.3 Size at Maturity

One hundred percent of male *C. bairdi* 80 mm CW from the GOA are sexually mature as determined from the presence of spermatophores in the vas deferens and mating experiments. Estimates of the median size at maturity (SM_{50}) or mean size at maturity for Kodiak Island males are between 100 and 115 mm CW. The size of 50% maturity for females (50% have undergone the molt to maturity) was estimated at 83 mm CW. Since females do not continue to grow after maturity, measuring the mean size of a sample of multiparous females would reflect the mean size at maturity. Using this method, the mean size at maturity would be 97.3 mm CW for Kodiak Island females and 103.7 mm CW for Southeast Alaskan females. Specific studies on the sexual maturity of Cook Inlet Tanner crab are not available.

2.2.4 Life History

In May and June, age-1 crabs are abundant in Cook Inlet at 150 m depth in areas where small sponges, hydroids, and polychaete tubes dominated the benthic community. Ovigerous female crabs often bury in the sediment while brooding eggs.

Egg/Spawning See Adults

Larvae There are two zoeal stages, which inhabit the upper and middle zones of relatively shallow water in Cook Inlet. Larvae are strong swimmers and perform diel vertical migrations in the water column (down at night). They usually stay near the depth of the chlorophyll maximum during the day. The length of time larvae take to develop is unknown, although it has been estimated at only 12 to 14 days. The first benthic stage (megalops) settles on the bottom.

Juveniles In Southeast Alaskan bays young-of-year crab (8 to 15 mm CW) are locally abundant in early fall on silt/fine sand slopes between 4 and 10 m depth (Robert Stone, National Marine Fisheries Service, Auke Bay Laboratory, personal observation). Age 2 crab (34 to 48 mm CW) are locally abundant in similar habitat between 10 and 20 m depth during spring. Numerous crabs < 40 mm were observed from a submersible on silt substrate at 225 m depth along the Southeast Alaska coast. These observations indicate that juveniles are either widely distributed or make extensive seasonal migrations with respect to depth. Presumably, this pattern is similar in Cook Inlet juvenile crab.

Adults *C. bairdi* females have a terminal molt at maturity and breed for the first time in the soft-shelled state. In subsequent years multiparous crabs breed in the hard-shelled state and may use stored sperm to fertilize their eggs. Pubescent females molt and mate between January and May in nearshore waters (3-13 m) near Kodiak and between late-December and mid-June in the nearshore waters (4-19 m) of Southeast Alaska. Near Kodiak Island multiparous females are known to form high density mating aggregations consisting of hundreds of crabs per mound. These mounds may provide protection from predators and also attract males for mating. In Southeast Alaska, however, multiparous females have been observed mating in low-density aggregations in shallow water (including the intertidal zone) during May. Females have clutches of 50,000 to 400,000 eggs. Multiparous females annually produce an average of 170,000 eggs. Multiparous females carry and brood the embryos for one year after fertilization. Primiparous females may carry the fertilized eggs for as long as 1.5 years. Specific studies on the breeding behavior of Cook Inlet Tanner crab are not available.

2.3 Habitat Requirements for GOA Red King Crab *Paralithodes camtschaticus*

Management Plan and Area(s) No Federal fishery management plan exists for the commercial king, Tanner and Dungeness crab fisheries in the GOA This authority has been delegated to the State of Alaska.

2.3.1 General Distribution

Red king crab is widely distributed throughout the Bering Sea and Aleutian Islands, GOA, Sea of Okhotsk, and along the Kamchatka shelf. On the coast of North America it is found from Point Barrow, Alaska, to the Queen Charlotte Islands and waters adjacent to mainland northern British Columbia. Red king crab occupy depths from the intertidal region (young-of-the-year crabs) to 366 meters. Red king crab molt several times per year through age 3 after which molting is annual. At larger sizes, king crab may molt less frequently than annually as growth slows. Females grow more slowly and do not attain the size of males. In the northeastern GOA, fifty percent maturity is attained by females at 106 mm (about 6 yrs.). Natural mortality of adult red king crab males increases with size and has been estimated to reach about 25 percent per year (M=0.3) in crab greater than 135 mm carapace length, owing to old age, disease, and predation.

Additional distribution data may possibly be available from Alaska Department of Fish and Game staff:

Southeast:	Petersburg, Tim Koeneman, (907) 772-3801
Cook Inlet:	Homer, Charles Trowbridge, (907) 235-8191
Kodiak, Western Alaska, Aleutians:	Kodiak, Daniel Urban, (907) 486-1840
Central Alaska:	Seward, A.J. Paul, (907) 224-5261

2.3.2 Relevant Trophic Information

Subadult and adult red king crabs eat a variety of benthic invertebrates including clams, cockles, snails, barnacles, amphipods, crabs, polychaetes, hydroids, brittle stars, sand dollars, sea urchins and sea stars, and fishes such as Capelin (*Mallotus villosus*), Pacific Sand Lance (*Ammodytes hexapterus*), and Pacific Herring (*Clupea pallasi*). At least some of these fish are probably scavenged. A total of 98 different species were found in the stomachs of red king crabs from depths of 50 to 200 meters (164 to 656 feet) in late winter and late spring on the Kodiak Shelf. Red king crabs in the Okhotsk Sea have been found to prefer echinoderms and barnacles (*Balanus* sp.) just prior to and after molting. These species provide a good source of calcium carbonate which the crabs may need to replace that lost during ecdysis (molting).

The zoeae of the red king crab are planktivores, consuming both phytoplankton and zooplankton (Table 7). Stomach contents of the third and fourth zoeal stages collected in Cook Inlet, Alaska, included diatoms and the larvae of barnacles and the Helmet Crab (*Telmessus cheiragonus*). In the laboratory, the larvae will eat diatoms, crustacean nauplii, copepods, polychaete larvae and rotifers. In Auke Bay, Alaska, the larvae feed during the day at a depth of 5-10 meters (16-33 feet) and not at night. This feeding periodicity is consistent with the reverse diel vertical migration exhibited by red king crab larvae in Auke Bay.

Young-of-the-year red king crab eat diatoms, foraminiferans (protozoans with calcareous shells), sponge tissue, hydroids, bryozoans, polychaetes, bivalves, gastropods, ostracods, harpacticoid copepods, and sand dollars. In the laboratory postlarval, 1-year-old, and 2-year-old red king crabs are cannibalistic. The frequency of cannibalism in 1-year-old crabs depends on the quality of the diet fed to them, crab density and the complexity of the habitat. The frequency of cannibalism in 2-year-old crabs does not depend on crab density or the availability of cover in the laboratory.

A variety of predators consume the various life stages of the red king crab. The eggs are preyed upon by at least three species of nemertean worm: *Carcinonemertes regicides*, an undescribed small eyeless species, and *Alaxinus oclairi.* The first two species are the most widespread and abundant nemertean egg predators on red king crabs. The gammarid amphipod *Ischyrocerus* sp. also preys on red king crab eggs. Walleye pollock (*Theragra chalcogramma*) preys on larval king crab. Yellowfin Sole (*Limanda aspera*) eat large numbers of the glaucothoe stage. Juvenile and adult crabs are preyed upon by Pacific cod (*Gadus macrocephalus*), Pacific halibut (*Hippoglossus stenolepis*), sculpins (*Hemilepidotus* and *Myoxocephalus*), the Korean hair crab (*Erimacrus isenbeckii*), octopus (*Octopus* sp.) and the sea otter (*Enhydra lutris*).

2.3.3 Size at Maturity

The size of 50 percent maturity is 10 cm carapace length for female red king crabs from the northeastern GOA.

2.3.4 Life History

Egg/Spawning See Adults.

Larvae The larval stages consist of a pre-zoeal stage and four zoeal stages. The first post larval stage is the glaucothoe. The pre-zoeal stage lasts a few minutes, the zoeal stages each last 2-4 weeks, and the glaucothoe lasts 3-4 weeks. Metamorphosis to the first benthic stage occurs 3-4.5 months after hatching. Red king crab larvae occupy the upper 40-100 meters of the water column depending on the geographical area. The position of the larvae in the water column varies with the time of day. In Auke Bay, Alaska, red king crab larvae exhibit reverse diel vertical migration. The larvae are most abundant at 5 to 10 meters (16 to 33 feet) during the day and at 30 meters (98 feet) at night. A similar pattern of vertical migration has been observed at

Kodiak Island, Alaska. The first and second stage zoeae of red king crab females from Auke Bay tolerate temperature/salinity combinations for short periods that exceed the range to which they are exposed in nature. Stage I zoeae show high survival at temperatures from 0 to 12 C (32 to 54 F) and salinities of 20 to 30 ppt. Stage II zoeae show highest survival at temperatures from 0 to 6 C (32 to 41 F) and salinities of 20 to 30 ppt. Stage I and II zoeae studied in Japan showed similar temperature and salinity tolerances as those at Auke Bay. At Auke Bay, stage II zoeae preferred more saline conditions (29.4 ppt) than did stage I zoeae (27.5 ppt). Zoeae exposed to low salinity water passively sink until they reach higher salinity. Specific studies for Cook Inlet are not available. Patterns observed in Auke Bay are assumed to be similar in Cook Inlet.

Table 7. Typical distribution by life stage for red King crab, *Paralithodes camtschaticus*, off Alaska.

Stage – EFH Level	**Duration or Age**	**Diet/Prey**	**Season/Time**	**Location**	**Water Column**	**Bottom Type**	**Ocean-ographic**	**Other**
Eggs 1	11- 12 mo	NA	May-April	NA	NA	NA	NA	
Larvae 1	3-4.5 mo	Diatoms, Crustacean larvae	April-August	BAY, ICS	P	NA	F	
Juveniles 1	1 to 5-6 yrs	Diatoms Hydroids Polychaetes Mollusks, Harpacticoid copepods Bryozoans	All year	BCH, BAY ICS	D	SAV (epifauna)R, CB, G	NA	Found among biogenic assemblages (sea onions, tube worms,
Adults 1	10-15 yrs	Mollusks, echinoderms, polychaetes, decapod, crustaceans, Algae, urchins, hydroids, sea	Spawning Feb-June	ICS, BAY, BCH	D	S, M, CB, G	CL	

Juveniles Young-of-the-year crab occur at depths of 50 m or less. They are solitary and need high relief habitat or coarse substrate such as boulders, cobble, shell hash, and living substrates such as bryozoans and stalked ascidians. Between the ages of two and four years, there is a decreasing reliance on habitat and a tendency for the crab to form pods consisting of thousands of crabs. Podding generally continues until four years of age (about 6.5 cm), when the crab move to deeper water and join adults in the spring migration to shallow water for spawning. The remainder of the year crab are found in deep water. Juvenile crabs are somewhat more tolerant of reduced salinities than adults (see below).

Adults Adult and older juvenile red king crabs occur on a variety of substrata including rock or gravel (especially nearshore) and mud, sand, shell fragments or mixtures of these substratum types. Mating crabs often occur in areas with kelp (*Alaria, Costaria* and *Laminaria*). The kelp can provide cover for the courting pair when the female is soft and vulnerable to predation following molting. Red king crab do not osmoregulate and cannot tolerate low-salinity water. Adults show signs of stress when immersed in sea water

of less than about 18 ppt salinity. Red king crabs exhibit seasonal migration. Adult crabs occupy deeper offshore areas in summer. In late fall and early winter the crabs migrate onshore to shallow waters prior to larval hatching, molting of females, mating and egg extrusion which takes place from January through June depending on the geographical area. After this period of reproduction the crabs return to deep water. of reproduction. In southeastern Alaska, red king crab mate when they enter shallower waters (<50 m), generally beginning in January and continuing through June. Males grasp females just prior to female molting, after which the eggs are fertilized and extruded onto the pleopods of the female's abdomen. In the northeastern GOA fecundity ranges from 148,300 to 446,600 eggs for females ranging in carapace length from 128 to 145 mm (5 to 5.7 in). The female red king crab carries the eggs for 11-12 months before they hatch, generally in March through May. Hatching of king crab larvae is temporally synchronized with the spring phytoplankton bloom in southeastern Alaska.

2.4 Groundfish Fisheries in the Federal Waters of Cook Inlet

The primary groundfish fishery in Federal waters of Cook Inlet targets Pacific cod (Table 8). The Pacific cod fishery has largely developed with pot gear since 1990 but was prosecuted with longline, and to a lesser extent trawl prior to that time (Bechtol 1995). In recent years, roughly 95 percent of the harvests from the Federal waters of Cook Inlet are Pacific cod. This harvest has increased in recent years (Table 8). However, the vast majority of the Pacific cod harvest has come from vessels operating pot gear, and to a lesser extent longline gear. Since 1987, only two vessels have harvested groundfish in the Federal waters of Cook Inlet using non-pelagic trawl gear. Participation has been similarly limited and sporadic for pelagic trawl gear. Table 9 provides the number of vessels by gear type that have harvested groundfish in the federal waters of Cook Inlet. Due to State of Alaska confidentiality requirements, harvest data from less than four vessels cannot be reported. However, the majority of groundfish harvests in the Federal waters of Cook Inlet comes from pot and longline gear. Harvests from other gear types, including bottom trawl comprise a small proportion of the overall groundfish harvests. Participation by other gear types in the fishery has been sporadic and limited.

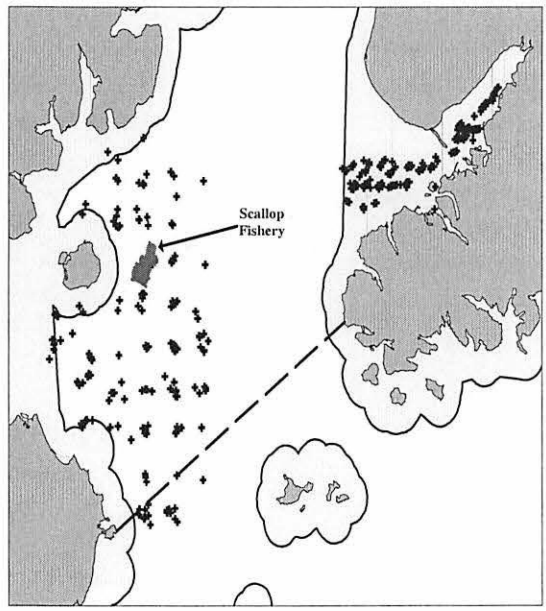


Figure 6. Illustration of proposed closed area in Cook Inlet, showing 1990-96 ADF&G trawl survey locations (+) and the commercial scallop tow locations (center polygon).

Since 1997, the state has operated a small State managed cod fishery in the adjacent state waters of Cook Inlet and a limited number of vessels have participated in that fishery. The State water Pacific cod fishery is limited to pot and jig gear and those vessels are not harvesting cod from Federal waters.

IFQ halibut fisheries occur throughout Cook Inlet. These fisheries occur in both state and Federal waters, however, the halibut IFQ fishery is managed by NMFS under the provisions of the North Pacific Halibut Act of 1982. A substantial infrastructure has also developed in this area supporting recreational

harvests of halibut and groundfish in both state and Federal waters of Cook Inlet (Meyer 1996; Vincent-Lang 1998). Additional information on the nature of halibut sportfish fisheries is available in the EA/RIR/IRFA prepared for the charter guideline harvest level analysis. This analysis is available through the North Pacific Fisheries Management Council.

The most recent indicators of groundfish composition in this area come from trawl surveys conducted annually by ADF&G since 1990 (Figure 6). These surveys focus on habitat and areas that historically produced the bulk of the crab fishery and survey catches (Bechtol and Trowbridge 1999). An example is provided by the 1998 trawl survey in which arrowtooth flounder and butter sole comprised over 57% of the 1998 survey catch biomass in Kamishak Bay (Table 10; Bechtol 2000). Although State of Alaska confidentiality requirements restrict NMFS from releasing precise species composition data on the two vessels using non-pelagic gear in the past 14 years, the species composition of harvests from these trawl vessels generally reflects ADF&G survey species composition. Species composition data are limited for Federal waters of Cook Inlet outside of the Kamishak Bay survey. However, this composition likely represents species composition in a wide variety of the habitat and depth available in Federal waters of the Cook Inlet area.

Table 8. Commercial groundfish harvests (mt) by species from Federal waters of Cook Inlet, 1987-2000.

Year	Pacific Cod	Pollock	Sablefish	Arrowtooth Flounder	Various Flatfish	Various Rockfish	Skates	Sharks	Other Groundfish	Total Groundfish
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	19.2	0.0	0.7	0.0	0.0	0.2	0.0	0.0	0.0	20
1989	**	**	**	**	**	**	**	**	**	**
1990	34.1	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	35
1991	287.6	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	288
1992	342.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	343
1993	581.4	0.0	0.0	0.1	0.0	1.7	0.0	0.0	0.5	589
1994	145.9	0.2	8.0	0.0	0.0	0.2	0.0	0.0	6.0	155
1995	5655.2	0.4	0.2	0.5	5.7	0.9	3.8	0.1	5.6	5672
1996	6211.7	0.3	0.5	0.0	0.0	1.5	11.2	0.2	3.4	6229
1997	3463.4	1.1	0.1	0.0	0.0	.3	3.1	0.0	6.2	3474
1998	2578.2	0.0	0.0	0.0	0.0	.6	0.4	0.0	2.1	2581
1999	3799.7	0.0	0.0	0.0	0.0	.3	0.0	0.0	.5	3801
2000	4712.2	1.3	0.0	0.0	0.0	.3	18.5	0.3	0.0	4714

** Due to State of Alaska Confidentiality Requirements, these landing data cannot be reported. Less than 4 vessels harvested groundish from Federal waters in 1989.

Table 9 Number of Vessels by Gear Type Harvesting Groundfish from the Federal Waters of Cook Inlet 1987-2000.

	Gear Type						
Year	Bottom Trawl	Pelagic Trawl	Jig/Handline /Troll	Other Gear	Pot	Longline	Total Vessels
1987							0
1988			2	1		19	22
1989						1	1
1990	1				2	8	11
1991			1		5	18	24
1992					10	15	25
1993					9	14	23
1994					3	14	17
1995	1		1		11	42	55
1996					12	20	32
1997			1		6	23	30
1998					6	21	27
1999					**8**	**28**	**36**
2000		**1**	**1**		**10**	**30**	**42**

Table 10. Aggregate catch composition in a bottom trawl survey (n=23 stations) of Kamishak Bay, 1998.

Species	(lb)	(mt)	Percent
Pacific Cod	34,555	15.7	5.8%
Arrowtooth Flounder	200,815	91.1	33.5%
Flathead Sole	19,087	8.7	3.2%
Rock Sole	2,773	1.3	0.5%
Dover Sole	9,161	4.2	1.5%
Rex Sole	2,431	1.1	0.4%
Butter Sole	143,375	65.0	23.9%
Yellowfin Sole	13,141	6.0	2.2%
English Sole	1,209	0.5	0.2%
Starry Flounder	6,481	2.9	1.1%
Alaska Plaice	3,996	1.8	0.7%
Rougheye Rockfish	209	0.1	<0.1%
Dusky Rockfish	26	0.0	<0.1%
Walleye Pollock	11,338	5.1	1.9%
Spiny Dogfish	20,302	9.2	3.4%
Skate	37,161	16.9	6.2%
Sablefish	829	0.4	0.1%
Sculpin	5,653	2.6	0.9%
Halibut	53,650	24.3	9.0%
Weathervane Scallop	5,395	2.4	0.9%
Snails	944	0.4	0.2%
Green Urchin	6,750	3.1	1.1%
Red King Crab	3,134	1.4	0.5%
Tanner Crab	5,737	2.6	1.0%
Shrimp	370	0.2	0.1%
Other Species	8,128	4	<0.1%
Debris	2,497	1.1	0.4%
Total	**599,148**	**271.8**	**100.0%**

2.5 Scallop Fishery in the Federal Waters of Cook Inlet

ADF&G has managed a dredge fishery for weathervane scallops (*Patinopecten caurinus*) in the Kamishak Bay District of the Cook Inlet area since 1983 (Figure 2). Harvests have ranged from 0.2 to 12.8 metric tons, although the fishery was closed in 1995 and no effort occurred from 1988 to 1992 (Table 10). The Kamishak Bay fishery is managed conservatively relative to other weathervane scallop fisheries in Alaska (Shirley and Kruse 1995; Griffin et al. 1997). Significant controlling factors for Kamishak Bay include gear restriction to a single 6-foot dredge, a relatively small harvest level, on-board observers when requested, and a bycatch cap of 0.5% of the estimated population of king and Tanner crab. This latter aspect largely controls where the fishery occurs within available scallop habitat.

Table 11. Annual catch and effort in the weathervane scallop fishery, Kamishak Bay 1983-98.

Year	Shucked meats (mt)	(kg/hr)	Vessels
1983	1.1	9.8	1
1984	2.9	11.5	3
1985	5.4	17.9	1
1986	7.0	16.4	3
1987	0.2	6.9	2
1988	No Effort		
1989	No Effort		
1990	No Effort		
1991	No Effort		
1992	No Effort		
1993	9.1	17.3	3
1994	9.3	20.2	4
1995	Closed		
1996	12.8	24.0	5
1997	9.2	23.1	3
1998	**	**	1
1999	9.2	N/A	3
2000	9.1	N/A	3

** Due to State of Alaska confidentiality requirements, these data cannot be released.

3.0 ENVIRONMENTAL IMPACTS OF THE ALTERNATIVES

The following chapter was adapted from the NEPA section prepared by NMFS for draft Environmental Assessment/ Regulatory Impact Review/ Initial Regulatory Flexibility Analysis for amending the process by which annual harvest specifications are established for Alaska groundfish fisheries (NMFS 2001), dated January 31, 2001.

The groundfish fisheries occur in the North Pacific Ocean and Bering Sea in the U.S. EEZ from 50° N to 65°N latitude. The SEIS which accompanied the 1999 groundfish TAC specifications provides a complete detailed description of the affected environment (NMFS 1998a). Substrate is described at section 3.1.1, water column at 3.1.3, temperature and nutrient regimes at 3.1.4, currents at 3.1.5, groundfish and their management at 3.3, marine mammals at 3.4, seabirds at 3.5, benthic infauna and epifauna at 3.6, prohibited species at 3.7, and the socioeconomic environment at 3.10. NMFS has also release an updated draft SEIS (NMFS 2001) for public review and comment.

An EA is prepared pursuant to NEPA to determine whether a proposed action will result in significant effects on the human environment. If the environmental effects of the action are determined not to be significant based on an analysis of relevant considerations, the EA and resulting finding of no significant impact are the final environmental documents required by NEPA. If it is concluded that the proposal is a major Federal action significantly affecting the human environment, an environmental impact statement must be prepared.

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 Sections 1.1 and 1.2, and the list of preparers is in Section 8. The first part of this section contains the discussion of the environmental impacts of the alternatives including impacts on threatened and endangered species and marine mammals. The RIR/IRFA contains a discussion of the economic impacts of the alternatives on small entities. This section concludes by providing a summary of the potential impacts of this action on the human environment.

3.1 Status of Groundfish Target Species in the GOA

Designated target species and species groups in the GOA are walleye pollock, Pacific cod, deep water flatfish, rex sole, shallow water flatfish, flathead sole, arrowtooth flounder, sablefish, other slope rockfish, northern rockfish, Pacific Ocean perch, shortraker and rougheye rockfish, pelagic shelf rockfish, demersal shelf rockfish, Atka mackerel, thornyhead rockfish, and other species. Year 2001 annual specifications for the GOA area are presented in the emergency interim rule for the implementation of Steller sea lion protection measures and 2001 specifications for the BSAI and GOA (66 FR 7276, January 22, 2001). For detailed life history, ecology, and fishery management information regarding groundfish stocks in the GOA see Section 3.3 of the SEIS (NMFS 1998a).

3.2 Status of Prohibited Species Stocks

Prohibited species taken incidentally in groundfish fisheries include: Pacific salmon (chinook, coho, sockeye, chum, and pink salmon), steelhead trout, Pacific halibut, Pacific herring, and Alaska king, Tanner and snow crabs. In order to control its bycatch of prohibited species in the groundfish fisheries, the Council annually specifies halibut limits for the GOA fishery and halibut and other PSC limits in BSAI. During haul sorting, these species or species groups are to be returned to the sea with a minimum of injury except when their retention is required by other applicable law. The status of the different prohibited species are summarized in NMFS (2001). The section on GOA crab stocks is incorporated in this section.

3.2.1 GOA Alaska King and Tanner Crab

GOA Alaska king and Tanner crab stocks in the GOA are assessed and managed by the State of Alaska exclusively because no federal FMP for crab has been developed in the GOA. Alaska king and Tanner crab are treated as prohibited species in the groundfish fisheries in the GOA.

Alaska king and Tanner crab stocks are severely depressed over much of the GOA. The last king crab fishery in the Kodiak, Chignik, and South Peninsula Districts occurred in 1982, and in Cook Inlet in 1983. The red and blue king crab fisheries will remain closed in all Districts of the GOA in 2001. The only 2000 Tanner crab fishery in the GOA occurred in the Southeast District. In that fishery, 771 mt of Tanner and 254 mt of golden king crab were harvested. The 2000 survey indicated that the number of legal sized males was sufficient to permit a 2001 Tanner crab fishery in portions of the GOA. The State of Alaska set guideline harvest levels (GHLs) of 227 mt within the Kodiak District and 170 mt within the South Peninsula District. The 2001 survey indicated that there is a sufficient biomass to allow a fishery in portions of the Kodiak region in 2002. The GHL for this fishery is 227 mt. These areas have been previously closed since 1994. There are no PSC bycatch limits in the groundfish fisheries in the GOA, rather to protect crab, large areas of historically important crab habitat have been closed to the use of non-pelagic trawl gear in the GOA.

In 1998, the Alaska Board of Fisheries extended closures in State waters to non-pelagic trawling to almost all areas of the GOA primarily to reduce potential crab bycatch. Several small regions in State waters were kept open to non-pelagic gear based on their historic importance to the Pacific cod non-pelagic trawl fleet and the absence of important crab habitat in these regions. These areas are located in the Kodiak and South Peninsula regions. These closures limit the use of non-pelagic gear to harvest groundfish from the Federal TAC if vessels are fishing within state waters. In most cases, the State of Alaska opens state waters during the Federal groundfish fishery under state gear restrictions. Through November 18, 2000, in the groundfish fisheries gulfwide, trawl gear had a bycatch of 46,918 Tanner and 38 red king crab; hook-and-line gear had a bycatch of 167 Tanner and 41 red king crab; and pot gear had a bycatch of 65,832 Tanner and 7 red king crab.

3.3 Forage Species

Forage fish species are abundant fishes that are preyed upon by marine mammals, seabirds and other commercially important groundfish species. The following forage species are included in the forage fish category established in 1998: Osmeridae (which includes capelin and eulachon), Myctophidae (lanternfishes), Bathylagidae (deep sea smelts), Ammodytidae (sand lances), Trichodontidae (sandfishes), Pholididae (gunnels), Stichaeidae (pricklebacks), Gonostomatidae (bristlemouths), and the Order Euphausiacea (krill). For further detailed discussion of forage fish species, see section 3.3.3.13 of the SEIS (NMFS 1998a) and the EA for Amendment 39 to the FMP (NMFS 1998b). Information on the current status for a number of forage species may be found in detail in Ecosystem Considerations for 2001 (NMFS 2000a).

Forage fish perform a critical role in the complex ecosystem functions of the Gulf of Alaska by providing the transfer of energy from the primary or secondary producers to higher trophic levels. For example, eulachon and capelin play a key role in the trophic interaction of species, transferring energy from primary production to high trophic level predators in the GOA (NMFS 2000a) and are seen in the diet of Steller sea lions (Pitcher 1981). Sand lance form large migrating schools in the late summer and early fall and move inshore to spawn in the winter, providing one of the few sources of food inshore in the winter while most other fish species migrate off shore at this time of the year (NMFS 2000a).

Because of their importance to so many ecosystem components, a management assemblage for forage fish was established in 1998 in Amendment 39 to the GOA FMP (63 FR 13009, March 17, 1998). Although ABC

and TAC amounts are not specified for species in the forage fish category, the amendment provides protection for forage fish by preventing the development of commercial fisheries for these species groups. Directed fishing for forage fish species is restricted year-round with a maximum retainable bycatch of 2%. This amendment also established mandatory reporting by categories for forage fish species groups beginning in 1998.

Forage fish bycatch in the commercial groundfish trawl fisheries are less then one percent of any directed fishery. Even though the amount of biomass is unknown for the individual forage fish groups, it is assumed that the amount of bycatch is not likely to affect the forage species' ability to reproduce. It is also assumed that the small amount of bycatch should not cause competition with predators of forage fish species (NMFS 1998a).

3.4 Environmental Impacts of the Alternatives

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 and scavengers, changes in the population structure of target fish stocks, and changes in the marine ecosystem community structure; (2) changes in the physical and biological structure of the marine 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. Because of the very limited extent of non-pelagic trawl harvests in the Federal waters in Cook Inlet, it is not expected that the effect of the use of this gear on the harvest of fish stocks or entanglement of non-target organisms is substantial. The principal effect of non-pelagic gear in Cook Inlet is likely to be on the physical and biological structure of the marine environment and also on the potential bycatch of crab stocks. These potential environmental impacts are discussed below.

3.4.1 Status of Marine Habitat

This EA/RIR/IRFA tiers off of the analysis in section 4.3.4.1 of the SEIS (NMFS 1998a) regarding effects of TAC on substrate and benthic habitat. All the marine waters and benthic substrates in the management areas comprise the habitat of the target species. Additionally the adjacent marine waters outside the EEZ, adjacent State waters inside the EEZ, shoreline, freshwater inflows, and atmosphere above the waters, constitutes habitat for prey species, other life stages, and species that move in and out of, or interact with, the target species in the management areas. Distinctive aspects of the habitat include water depth, substrate composition, substrate infauna, light penetration, water chemistry (salinity, temperature, nutrients, sediment load, color, etc.), currents, tidal action, phytoplankton and zooplankton production, associated species, natural disturbance regimes, and the seasonal variability of each aspect. Substrate types include bedrock, cobbles, sand, shale, mud, silt, and various combinations of organic material and invertebrates which may be termed biological substrate. Biological substrates present in these management areas include corals, tunicates, mussel beds, tube worms. Biological substrate has the aspect of ecological state (from pioneer to climax) in addition to the organic and inorganic components. Ecological state is heavily dependant on natural and anthropogenic disturbance regimes. The fishery management plans (NPFMC 1995, 1994) contain some descriptions of habitat preferences of the target species and projects are underway to systematically present biological requirements for each life history stage that are known (NMFS-Council in progress). Much remains to be learned about habitat requirements for most of the target species.

Fisheries could alter the composition of the BSAI and GOA ecosystems in a number of ways, including enhancement of a prey species by removal of a predator, enhancement of one competitor by removal of another, and suppression of a predator by removal of prey (NMFS 2000d). Indirect effects may also occur depending on the role of the species removed and the method of removal. For example, Estes et al. (1998) suggests that killer whale predation has shifted from a diet that did not include sea otters prior to the 1990s

to one that now includes sea otters which have experienced a rapid decline in population in recent years. This shift may be due to the decline in other prey species such as Steller sea lions and harbor seals.

Most of the work evaluating predator/prey relationships in the EBS/AI and GOA regions in recent years has been done in the eastern Bering Sea. Evidence from retrospective and modeling studies (Hollowed et al. 2000, Livingston and Jurado-Molina, 2000) and examination of trophic guild changes (Anderson and Piatt, 1999; Livingston et al., 1999) suggest that under the present groundfish fishery management regime, there has not been clear evidence of fishing as a cause of species fluctuations through food web effects. Trends in biomass for a number of target species, also do not seem to be affected by various fishing regimes, as seen in a number of biomass projection for groundfish species in the BSAI SAFE report (NPFMC 2000a).

The marine habitat may be further altered by changes in the amount and flow of energy with the removal of fish and the return of discard in fisheries. The recipients, locations and forms of discards may differ from those in an unfished system. For the eastern Bering Sea total catch biomass including non groundfish removals) as a percentage of total system biomass (excluding dead organic material known as detritus) was estimated to be 1% of the total system biomass (Hilborn and Walters 1992). From an ecosystem perspective, total fishing removals are a small proportion of the total system energy budget and are small relative to internal sources of interannual variability in production (NMFS 2000b). Energy flow paths do not seem to be redirected by discards and offal. Before improved retention requirements for P. cod and pollock were in place it was estimated that the total offal and discard production was 1% of the estimated unused detritus going to the ocean bottom (Queirolo et al. 1995). Combined evidence regarding the level of discards relative to natural sources of detritus and no evidence of changes in scavenger populations that are related to discard trends suggest that the present groundfish fishery management regime has insignificant ecosystem impacts through energy removal and redirection. (NMFS 2000b).

Auster and Langton (1999) reviewed the indirect effects of fishing on EFH. Studies that they reviewed showed immediate effects of fishing on species composition and diversity and a reduction of habitat complexity. Short-term effects were a good indicator of long term effects, and recovery was variable depending on habitat type, life histories of component species, and the natural disturbance regime. They also wrote that data are lacking on the spatial extent of fishing-induced disturbance, the effects of specific gear types along a gradient of fishing effort, and the linkages between habitat characteristics and the population dynamics of fishes. Trawling on sea floor habitat and benthic communities in the GOA generally disturb sea floor habitats by displacing boulders, removing epifauna, decreasing the density of sponges and anthozoans, and damaging echinoderms. However, the effect of this disturbance on fish and other living marine resources is not known.

Trawls and dredges can impact crab populations by direct mortality (bycatch), indirect mortality (unobserved), and habitat modification. Many regulations have been promulgated for North Pacific groundfish fisheries to address these concerns. A summary of studies on trawl impacts on Alaska crab resources is provided in this section.

3.4.2 Bycatch

Bycatch of crab occurs incidentally to groundfish trawl and scallop dredge fisheries if they occur in areas with crabs. Bycatch of crab in groundfish fisheries are monitored by the NMFS Observer Program. Observers are required on all vessels > 125 ft, on 30% of vessels 60-124 ft; observers are not required on vessels < 60 ft. Bycatch in scallop fisheries is monitored by the state observer program; 100% observer coverage is required on vessels in most areas. In Cook Inlet, ADF&G biologists observe scallop vessels intermittently. Description of crab bycatch in these fisheries is provided below.

3.4.2.1 Direct Bycatch Mortality

The effect of crab bycatch on crab stocks is somewhat tempered by survival of discarded crabs. There have been numerous studies conducted on crab bycatch mortality, with each study having different objectives, methodology, and results. A summary of these studies is provided below, but many questions remain unanswered. Stevens (1990) found that 21% of the king crabs and 22% of the Tanner crabs captured incidentally in BSAI trawl fisheries survived at least 2 days following capture. Blackburn and Schmidt (1988) made observations on instantaneous mortality of crab taken by domestic trawl fisheries in the Kodiak area. They found acute mortality for softshell red king crab averaged 21%, hard shelled red king crab 1.2%, and 12.6% for Tanner crab. Another trawl study indicated that trawl induced mortalities aboard ship were 12% for Tanner crab and 19% for red king crab (Owen 1988). Fukuhara and Worlund (1973) observed an overall Tanner crab mortality of 60-70% in the foreign Bering Sea trawl fisheries. They also noted that mortality was higher in the summer (95%) than in the spring (50%). Hayes (1973) found that mortality of Tanner crab captured by trawl gear was due to time out of water, with 50% mortality after 12 hours. Natural Resource Consultants (1988) reported that overall survival of red king crab and Tanner crab bycaught and held in circulation tanks for 24-48 hours was <22%. In other analyses, the estimated mortality rate of trawl bycaught red king crab and Tanner crab was 80% (NPFMC 1993, 1995).

Besides direct mortality from being caught and handled, there will be further mortality due to relocation into unsuitable habitat and predation while returning to the sea floor. This type of mortality will also depend on many conditions such as depth, type of species, age and size of species, predator concentration and oceanic conditions. Although there are few studies which have considered these sources of mortality, neither relocation nor predation will likely result in 100% mortality (Hill and Wassenberg, 1990).

3.4.2.2 Unobserved Mortality

Not all crab in the path of a trawl are captured. Some crab pass under the gear, or pass through the trawl meshes. Non-retained crab may be subject to mortality from contact with trawl doors, bridles, footrope, or trawl mesh, as well as exposure to silt clouds produced by trawl and dredge gear. Only a few studies have been conducted to estimate catchability of crabs by trawl gear, and these studies are summarized below.

In one experiment to measure non-observable mortality, 169 red king crab were tethered in the path of an Aleutian combination trawl (Donaldson 1990). The trawl was equipped with a footrope constructed of 14-inch bobbins spaced every 3 feet, separated by 6.5-inch discs. Thirty-six crabs (21.3%) were recovered onboard the vessel in the trawl. Divers recovered 46.2% of the crabs not captured by the trawl. Another 32.5% were not recovered but assumed to have interacted with the trawl. Of the 78 crab not retained in the trawl, but captured by divers, only 2.6% were injured. If all injured crabs die, the non-observable mortality rate for trawl gear on red king crab is estimated at 2.6% (Donaldson 1990). It should be noted that hardshell crabs were used in this experiment; higher impacts would be expected if softshell crabs were tested. Additionally, some areas have had higher intensity of bottom trawling than other areas, thus potentially exposing some crab to multiple interactions with trawl gear.

In 1995, NMFS used underwater video cameras to observe the interaction of trawl gear with king and Tanner crabs (Craig Rose, NMFS, unpublished data). The experiment was conducted in Bristol Bay in an area with large red king crabs and *C. bairdi* Tanner crabs. Three types of trawl footropes were examined and they are as follows: a footrope with 3-4 foot lengths of 6-inch discs separated by 10-inch discs (called disc gear), a footrope with 24-inch rollers (tire gear), and an experimental float/chain footrope with the groundgear suspended about 8-inch off the seafloor. For disc gear, preliminary analysis indicated that all red king crab encountered entered the trawl and about 76% of the Tanner crab were caught. Tire gear captured fewer king crab (42%) and Tanner crab (1%). The float/chain gear did not catch any of the crabs encountered. At the

December 1995 Council meeting, excerpts of the NMFS video were shown to the Council and public. Trawl industry representatives testified that groundgear used to harvest finfish in this area depended on target species and bottom type, with tire-gear footropes used in hard bottom areas, and disc-gear used on smooth bottom areas. Testimony also indicated that there was also variability in groundgear used among vessels, but that on average, most gear used in Bristol Bay trawl fisheries would be comprised of groundgear with discs or rollers larger than the disc gear tested and smaller than the tire gear tested.

The NMFS underwater video observations were further analysed to determine the proportion of red king crab that were injured by passage under bottom trawl footropes (Rose, 1999 unpublished manuscript). Injury rates of 5% to 10% were estimated for crabs that encountered, but were not captured, in the center section of the trawl.

3.4.3 Habitat Impacts

Some general conclusions drawn from studies of trawling worldwide can be applied to Alaska. Actions that affect one species adversely may benefit another species. In a review of 22 studies worldwide, Auster and Langton (1999) found that despite their wide geographic range, from tropical to boreal, all studies showed similar classes of impacts. They found that mobile fishing gear reduced habitat complexity in three ways: (1) the epifauna is removed or damaged; (2) sedimentary bedforms are smoothed and bottom roughness is reduced, and (3) taxa are removed which produce structure, including burrows and pits. These findings are consistent with the findings of the studies in the North Pacific detailed above. Also applicable to the Alaska situation is the idea that environmental variables, including the make-up of the bottom, depth of the water (1) sedentary megafauna (e.g., anemones, soft corals, sponges, whelk eggs, ascidians), neptunid whelks and empty shells were more abundant in the unfished (UF) area; (2) mixed responses were observed in motile groups (e.g., crabs, sea stars, whelks); and (3) overall diversity and niche breadth of sedentary organisms (e.g., sponges, anemones, soft corals, stalked tunicates) indicates that long-term exposure to bottom trawling, at least in the experimental area, reduces diversity and increases patchiness of this epibenthic community. Some of the physical effects of trawling, and their potential impacts on the North Pacific, are discussed in more detail below:

Trawling an area kicks up both inorganic and organic sediments, contributing significantly to the average suspended sediment load in the trawled area, especially at depths where bottom stress due to tidal and current action is weak (Churchill 1989). Compared to the GOA, the Bering Sea has relatively weak currents but relatively strong tidal action, accounting for up to 95% of all flow as deep as 200 m. Unlike the GOA, which has a greater variety of bottom types, the Bering Sea has a bottom mostly comprised of sand and mud.

Sediment resuspension can have a long-term effect on benthic communities. An increase of sediment reduces light levels on the seabed, can smother the benthos when it resettles, create anaerobic conditions near the seabed, and reintroduce toxins that may have settled out of the water column (Churchill 1989, Jones 1992, Messieh et al. 1991). Sediment resuspension may also have the beneficial effect of enhancing the food supply to the water column (Churchill 1989). Effects both beneficial and negative would probably be greater in the deep ocean where the bottom is relatively unaffected by natural disturbances, but minimal in areas with significant current or tidal transport, because organisms in such areas are adapted to such events (International Council for the Exploration of the Sea 1988, Jones 1992). The eastern Bering Sea with its winter storms, whose effects are in some ways similar to that of trawling, falls in the latter category, especially in the shallower areas.

The resuspension of sediments can lead to a recomposition of the ocean floor, in an effect called winnowing. In winnowing, small particles which are resuspended by a trawl pass may move with the currents to another area instead of resettling, so that the texture of the bottom coarsens. Again, areas subject to storm activity

may naturally experience this phenomenon, so that trawling would not make much difference, especially in shallower waters. But in waters at a depth exceeding storm-related effects, the resuspension caused by trawls could have a stronger impact on the composition of the bottom.

The extent to which the gear penetrates the substrate depends on the makeup of the bottom, the speed with which the gear is being towed, the strength of tides and currents, the gear configuration, and the component of the gear encountered. Otter trawl doors can penetrate the substrate as little as 1 cm, on sand and rock substrata, or as much as 30 cm in some mud strata (Jones 1992). Heavier doors create deeper troughs.

The length of time that the benthic troughs last is also variable. In sand or mud substrata with strong tidal action or currents, the troughs can be washed away within a few hours or days (Caddy 1973, Jones 1992). But in very deep seabeds (deeper than 100 m) with weak currents and a mud or sandy-mud substrate, the troughs can last for much longer, from a few months to over five years (Brylinsky et al. 1994, Jones 1992, Krost et al. 1990). The impacts can vary depending upon the scale of the fishery (Thrush et al. 1998).

While trawl doors cause the most intensive effects over relatively narrow paths (< 3 m wide), the sweeps and footropes may have a more profound effect on the environment, as they impact a much larger area, due to their greater width (Jones 1992, Kaiser and Spencer 1996b, Reise 1982). Different types of footropes cause different levels of disruption. Footropes designed to skim over the seafloor, which are typically used in the BSAI on soft bottoms, cause little physical alteration aside from smoothing of the substrate and minor compression. However, if the area is trawled repeatedly, by the same vessel or different vessels, the cumulative effect of these minor compressions can cause a "packing" of the substrate (Schwinghammer et al. 1996). This packing effect can be further exacerbated when the net fills up and the codend is dragged along the bottom.

The survival of benthic organisms in the path of trawl gear is also very variable. Factors include the species, age, and size of the organism, type of gear, component of gear encountered, size of the haul, substrate morphology, and ocean conditions. The sedentary organisms living in the upper 5 cm of the seabed are especially vulnerable (Rumohr and Krost 1991). Thin-shelled bivalves and starfish tend to sustain heavy damage from the trawl doors, while thick-shelled bivalves are less likely to be damaged. Diatoms, nematodes and polychaetes have been found to be affected by the passage of trawls (Brylinsky et al. 1994). Hard-shelled red king crab seem to fare better; in one experiment the crab were tethered in the path of an Aleutian combination trawl, and only 2.6% of the crabs that interacted with the trawl, but were not retained, were injured (Donaldson 1990). In another experiment, an estimate was made of the rate of injuries sustained by red king crabs passing under three types of bottom trawl footropes commonly used in the bottom trawl fisheries of the eastern Bering Sea. Injury rates of 5%, 7% and 10% were estimated for crab passing under the three types of commercial footropes (Rose in press).

Some studies have found that recolonization in disturbed habitat can occur over a relatively short period. Brylinsky et al. (1994) found that nematodes and polychaetes returned to their pre-trawled levels in less than seven weeks, and diatoms increased in abundance in trawl troughs within 80 days; in a study by Rumohr and Krost (1991), small epibenthic species recovered to pre-trawl densities in 24 hours.

Several studies have observed increases in scavenging in the wake of beamtrawls. These short-term changes in individual species distribution, however, are not likely to affect the ecosystem in any profound sense. The more important question is whether bottom trawl fishing causes long-term changes in the benthic community structure. Intensive fishing in an area can possibly result in such changes by promoting populations of opportunistic fish and crabs that migrate into fished areas in order to feed on animals that have been disturbed in the wake of a trawl tow (Caddy 1973, Kaiser and Spencer 1994, 1996a).

No studies have directly examined the impacts of trawling on crabs per se, so potential impacts cannot be quantified at this time. However, the available information do suggest that non-pelagic trawling gear results in crab bycatch, and bycatch mortality whether observed or unobserved. The relative impact from the use of non-pelagic gear compared to other gear types that capture crab, such as pot gear is unclear. These studies do suggest that depending on the particular conditions of the substrate non-pelagic trawling can have significant impacts on the benthic substrate and other sessile animals.

3.4.4 Cumulative effects of the alternatives

Cumulative impacts are those combined effects on the quality of the human environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what Federal or non-Federal agency or person undertakes such other actions (40 CFR 1508.7, 1508.25(a), and 1508.25(c)). Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The concept behind cumulative effects analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually.

To avoid the piecemeal assessment of environmental impacts, cumulative effects were included in the 1978 Council on Environmental Quality (CEQ) regulations, which led to the development of the CEQs cumulative effects handbook (CEQ 1997) and federal agency guidelines based on that handbook (e.g., EPA 1999). Although predictions of direct effects of individual proposed actions tend to be more certain, cumulative effects may have more important consequences over the long term. The possibility of these "hidden" consequences presents a risk to decision makers, because the ultimate ramifications of an individual decision might not be obvious. The goal of identifying potential cumulative effects is to provide for informed decisions that consider the total effects (direct, indirect, and cumulative) of alternative management actions.

The methodology for cumulative effects analysis used in this analysis is as follows:

- Describe the potential direct and indirect effects of each of the alternatives;
- Identify external factors such as other fisheries, other types of human activities, and natural phenomena that could have additive or synergistic effects; and
- Discuss the reasoning that led to the evaluation, referencing evidence from the peer-reviewed literature.

The advantages of this approach are that it (1) closely follows CEQ guidance, (2) employs an orderly and explicit procedure, and (3) provides the reader with the information necessary to make an informed and independent judgment concerning the validity of the conclusions.

The direct effects of the preferred alternative to prohibit bottom trawling in Cook Inlet is that crab stocks located there would be protected from the potential effects of bottom trawling. Those effects were described above in Sections 3.4.2 and 3.4.3. That discussion demonstrated that the gear is detrimental to recovery of GOA crab stocks. Therefore, the preferred alternative results in a benefit to the crab stocks.

Indirect effects include impacts on the habitat from bottom trawling and on fishery participants. Again, gear effects are described in Sections 3.4.2 and 3.4.3. An extensive discussion of the effects of bottom trawling on habitat may be found in Chapter 3.2 of the Draft Programmatic Supplemental Environmental Impact Statement (DPSEIS) (NMFS 2001). As stated there, little work has been done on the effects of trawling on seafloor habitat and biological communities in the northeastern Pacific Ocean, particularly in the GOA. The

greatest bottom trawl effort in the GOA has taken place in the Kodiak Island region (Figure 3.2-3), where directed fisheries have targeted Pacific ocean perch, Pacific cod, and flatfish. No trawling in the Cook Inlet area was identified from the observer database for 1990-98. The best available data from ADF&G, indicate that only two vessels have used bottom trawl gear during 1987-2000, and the total harvests from these vessels was limited. Practically, there has been negligible use of bottom trawl gear in the Federal and State waters of Cook Inlet in recent years.

The following is a summary of bottom trawl gear effects on substrates and benthic communities from Section 3.2.1.2 of the DPSEIS. Some general conclusions drawn from studies of trawling worldwide can be applied to Alaska. Mobile fishing gear reduced habitat complexity in three ways: (1) epifauna are removed or damaged; (2) sedimentary bedforms are smoothed and bottom roughness is reduced; and (3) taxa, which produce structure, including burrows and pits, are removed. Environmental variables will play a role in determining the effects and consequences; however, actions that adversely affect one species may benefit another. Resuspension of sediments, alteration of the seabed due to contact with trawl gear, alteration of species mix, cumulative and long-term effects from bottom trawl gear were addressed in detail.

GOA plan amendments 14 and 55 defined and established habitat protection policies for the future conservation of groundfish stocks. It is inferred that these actions will provide a conditionally beneficial effect to marine habitat. GOA plan amendments 3 and 20 increased apportionment of total groundfish quotas to the longline fleet, which equated to a decrease in bottom trawl quotas. GOA plan amendments 9, 15, 18, and 26 closed specific geographic areas to bottom trawling, primarily for the protection of crab. The reduction of bottom trawling due to these measures could provide conditionally beneficial effects to benthic habitat in localized areas.

As summarized in the DPSEIS, the Council and NMFS have rigorously and publicly weighed issues and promulgated changes to the groundfish fishery management process through a long series of FMP amendments in response to scientific, stakeholder, public interest, and other inputs. The decisionmaking process has been slow and cumbersome, but it has maintained a constant focus on the principal objectives of the 1976 Magnuson-Stevens Act, as reauthorized periodically during the past 25 years: to optimize harvest of North Pacific groundfish stocks for the maximum economic benefits to the nation. In the past decade, this focus has broadened to include minimizing environmental effect, maximizing Alaskan coastal village participation, and dealing with special problems as they arise. The future of this highly democratic, participatory, and public process is unclear as the process will be forced to address increasingly complex "mixtures" of issues that, synergistically, may not be understood at a level sufficient to allow resolution.

Cumulatively significant impacts from the preferred alternative have not been identified. Bottom trawling does not occur in the Federal portion of Cook Inlet now, and therefore no fishery participants are impacted through a loss of fishing income. The preferred alternative is expected to result in neutral effects on crab in the short term since the gear prohibition does not alter current fishing practice but is intended as a proactive measure to prevent future bottom trawling activity. It may result in benefits to the crab resource in the long term if the gear prohibition creates a favorable habitat conditions for the recovery of Gulf crab stocks. However, these benefits are uncertain. Given that there has been negligible use of bottom trawl gear in Cook Inlet since 1987, and no discernable or measurable effect of this lack of bottom trawl effort on the status of Cook Inlet crab populations, there is no information to suggest that prohibiting bottom trawling will directly result in improved crab populations. The effects of limiting bottom trawl gear may be beneficial on crab populations, but data are not available to test this hypothesis. For those stated reasons, there is expected to be no cumulative significant impact of the preferred alternative on the human environment.

3.5 Status of Marine Mammal Populations

Marine mammals not listed under the ESA 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 bairdii* and *Mesoplodon spp.*)] as well as pinnipeds [northern fur seals (*Callorhinus ursinus*), and Pacific harbor seals (*Phoca vitulina*)] and the sea otter (*Enhydra lutris*). For further information see Section 3.4 and 4.3.2 of the SEIS (NMFS, 1998a), and the following discussion. Due to the already limited use of non-pelagic gear in Cook Inlet, it is not expected that this action would have a substantial impact on the status of marine mammal populations.

3.5.1 Pinniped Species

Steller Sea Lions

The most recent detailed review of Steller sea lion population status in Alaska is contained in the Section 7 Biological Opinion and Incidental Take Statement (Comprehensive BiOp)(NMFS 2000b). Recent survey data used to monitor population status are contained in section 4.8.12 of the Comprehensive BiOp (NMFS 2000b). The opinion describes the continuing decline of the Steller sea lion population and concluded that the FMPs for the Groundfish fisheries in the BSAI and the GOA were likely to jeopardize the continued existence of the Steller sea lion population west of 144°W longitude. An overview of ESA Section 7 consultations for Steller sea lions and the groundfish fisheries is in section 3.7 of this EA/RIR/IRFA.

Northern fur seals

Northern fur seals were listed as depleted in 1988 under the Marine Mammal Protection Act. Much of the research effort for fur seals takes place on the Pribilof Islands (St. Paul and St. George). The National Marine Mammal Laboratory (NMML) conducts counts of adult males (bulls) annually, and counts of pups biennially. Analysis of the 1998 bull and pup counts indicate a continued slight decrease in fur seal numbers on both of the Pribilof Islands. From 1997 to 1998 the total number of adult males on the Pribilof Islands decreased by 1.6 percent. Because of the high variability in these counts, however, several more years of data are needed to determine if a trend exists. The estimate of the total number of pups born on St. Paul Island in 1998 was 179,149 (SE = 6,193); the standard error accounts for variance in the estimation of both live and dead pups. The total estimated number of pups born in 1998 was not significantly different ($P = 0.82$) from 1996, but was significantly less than the estimate in 1994 ($P < 0.01$). The total number of pups born on St. George Island and the approximate 95 percent confidence interval was 21,547 - 22,633. The 1998 estimate of pups born on St. George Island is significantly less ($P < 0.01$) than the number of pups born in 1996, but the estimate is not significantly different ($P = 0.22$) from the estimate of the number of pups born in 1994.

A conservation plan for the northern fur seal was written to delineate reasonable actions to protect the species (NMFS 1993). Following that, fishery regulations were implemented in 1994 (50 CFR 679.22(a)(6)) to create a Pribilof Islands Area Habitat Conservation Zone, in part to protect the northern fur seals. This trawl closure area reduces the risk of direct interaction between the northern fur seal and the trawl fisheries. The incidental take of northern fur seals has been primarily in the trawl fisheries and has been determined to not contribute significantly to the stocks potential biological removal (PBR) (Hill el al. 1996). Northern fur seal have a diet similar to Steller sea lions, preying on small pollock, and P. cod. The groundfish fisheries generally remove fish that are larger than the prey normally selected by northern fur seals and fishing takes place at a time that northern fur seal are usually not present. The current trend in the northern fur seal population has been generally stable and increasing over the past 10 years (Hill et al. 1996).

Harbor seals

Harbor seals are divided into 3 stocks, southeast, GOA and Bering Sea. Details on the each stock may be found in the 2000 Alaska Marine Mammal Stock Assessment (NMFS 2000c). This report is also available on the web at http://www.fakr.noaa.gov/protectedresources/mmsa_00.pdf.

For the Southeast Alaska stock, results from the Sitka, Ketchikan, and Glacier Bay trend analyses provide a strong indication that the number of harbor seals in Southeast Alaska has been increasing since at least 1983 (Small et al. 1997). The NMML conducted aerial assessment surveys for harbor seals in the southern portion of southeast Alaska, from Frederick Sound to the US/Canadian border in 1998. The northern portion of southeast Alaska was surveyed in 1997. Two observers worked out of Petersburg and five observers used Ketchikan as their base of operations. From 18 to 28 August 1998, the entire coastline was surveyed from small, single-engine aircraft equipped with floats, at an altitude of 200-250 m (700-800 ft.). Observers estimated the number of seals hauled out and took photographs of all seal haulouts. Results from the two surveys will be combined to produce an overall estimate for southeast Alaska.

For the Gulf of Alaska harbor seal stock, the only complete survey available is from 1994. From the information available, the stock assessment authors state that the general trend of the population is decreasing with large declines occurring in Prince William Sound after the 1989 oil spill and a steady decline along the Kodiak archipelago. Despite a few areas of increase, the overall population size for the Gulf of Alaska is small compared to populations in the 1980s and 1970s.

The number of harbor seals in the Bering Sea stock is thought to be declining (Alaska SRG, see DeMaster 1996); however, published data to support this conclusion are unavailable. Specifically, in 1974 there were 1,175 seals reported on Otter Island. The maximum count in 1995 (202 seals) represents an 83% decline (Withrow and Loughlin 1996). However, as noted by the Alaska SRG (DeMaster 1996), the reason(s) for this decline is(are) confounded by the recolonization of Otter Island by northern fur seals since 1974, which has caused a loss of available habitat for harbor seals. Further, counts of harbor seals on the north side of the Alaska Peninsula in 1995 were less than 42% of the 1975 counts, representing a decline of 3.5% per year. The number of harbor seals in northern Bristol Bay are also lower, but have remained stable since 1990 (Withrow and Loughlin 1996).

None of the harbor seal stocks are listed as "depleted" under the MMPA or listed as "threatened" or "endangered" under the Endangered Species Act. For commercial groundfish fisheries, the estimated incidental take is 36 to 87 animals per year (NMFS 2000c). At present, annual mortality levels less than 211 animals per year (i.e., 10% of PBR) can be considered insignificant and approaching zero mortality and serious injury rate. Although considered unlikely due to stable or increasing trends, it is unknown if the estimated annual level of total human-caused mortality and serious injury exceeds the PBR (2,114) for this stock.

3.5.2 Cetacea Species

Beluga whales

There are five stocks of Beluga whales that occur in the action area., the Beaufort, Eastern Chukchi, Eastern Bering, Bristol Bay and the Cook Inlet stocks. All of the stocks, except Cook Inlet, are stable and there is no record of groundfish fisheries incidental take. Because their diet consists mainly of salmonids and small schooling fishes, there is little groundfish fisheries interaction for this species.

The NMML flew aerial surveys of the isolated stock of beluga whales in Cook Inlet, Alaska, during June and July of 1993 through 2000. This included nearly 100% of the coastal areas each year, and with the addition of offshore transects, systematic searches encompassed 13 to 29 percent of the entire inlet. Beluga whales were concentrated in a few dense groups in shallow areas near river mouths in the northern portion of upper

Cook Inlet. Very few belugas occurred elsewhere. Over the past three decades, there have been decreases in sightings of beluga whales both in offshore areas and in lower Cook Inlet. Estimated abundance of beluga's has declined 50% from 1994 to 1998 leading to the stock being designated in 2000 as depleted under the Marine Mammal Protection Act (65 FR 34590). Since 1995, there have been no sightings in NMML surveys south of the upper inlet. More recent tagging studies and aerial observations for Cook Inlet beluga whales support these observations (Rugh et al., 2001). The distribution of beluga in both the winter and summer months indicate that these whales do not migrate to Lower Cook Inlet as had been previously thought.[2]

Harbor porpoise and Dall's porpoise

Harbor porpoise occur in three stocks in Alaskan waters: Southeast, Gulf of Alaska and Bering Sea. No reliable information is available on trends in abundance for these stocks of harbor porpoise and no records of incidental take by the groundfish fisheries of either the Southeast stock or the Gulf of Alaska stock exist. The Bering Sea stock has had a small amount of incidental take in the Bering Sea trawl fishery. When averaged with the incidental take in the gillnet fishery the annual average of incidental take for the Bering Sea stock is 2 animals, well below the PBR of 86 (NMFS 2000c).

Dall porpoise are managed as one stock throughout Alaskan waters. No reliable information is available on trends in abundance for this stock. Six different commercial fisheries operating within the range of the Alaska stock of Dall's porpoise were monitored for incidental take by NMFS observers during 1990-95: Bering Sea (and Aleutian Islands) groundfish trawl, longline, and pot fisheries, and Gulf of Alaska groundfish trawl, longline, and pot fisheries. No mortalities of Dall's porpoise were observed by NMFS observers in either pot fishery or the Gulf of Alaska longline fishery. The mean annual (total) mortality was 4.6 (CV=0.20) for the Bering Sea groundfish trawl fishery, 0.6 (CV=1.0) for the Gulf of Alaska groundfish trawl fishery, and 1.6 (CV=.61) for the Bering Sea groundfish longline fishery. Based on currently available data, the level of all human-caused mortality and serious injury (42) does not exceed the PBR (1,537).

Researchers from the NMML conducted line transect aerial surveys for harbor porpoise and Dall's porpoise from 27 May to 28 July 1998 in the Gulf of Alaska (offshore waters from Cape Suckling to Unimak Pass), Prince William Sound, and Shelikof Strait. The survey aircraft was a Twin Otter flown at an altitude of 500 ft and an airspeed of 100 knots. Sawtooth lines covered the offshore waters from Cape Suckling to Unimak Pass (offshore of Kodiak Island) from about 15 nm seaward to the 1,000 fathom line. A series of zigzag lines covered Shelikof Strait, between the Alaska Peninsula and Kodiak Island. Larger inlets and bays were also included in the survey. The survey in Prince William Sound consisted of two lines: one covering the central waters and one along the coast with extensions into selected inlets. Two primary observers surveyed from bubble windows on each side of the aircraft. A third observer, viewing directly beneath the aircraft from a belly window, recorded porpoises missed on the trackline by the primary observers.

Poor weather restricted the completion of the entire planned survey. Survey lines were completed in Prince William Sound and an adequate number of survey miles were completed offshore from Cape Suckling west along the Kenai Peninsula, offshore of Kodiak Island, west to Sutwik Island (Alaska Peninsula), and in Shelikof Strait. A total of 5,722 nm were flown, with sightings of 83 harbor porpoise, 69 Dall's porpoise, 13 killer whales, 47 humpback whales, 24 fin whales, 1 Cuvier's beaked whale, 1 northern right whale, 25 harbor seals, 20 Steller sea lions, and 1 northern fur seal. These data are used to estimate annual abundance of harbor porpoise and Dall's porpoise, one of the key pieces of information needed to manage marine mammal-fishery interactions. A report should be available in 2001.

---

[2]Personal Communications with Barbara Mahoney, National Marine Fisheries Service, Alaska Regional Office, Anchorage, AK 99513

3.5.3 Order Carnivora

Northern Sea Otter

The northern sea otter living in the Aleutian Islands area was listed as a candidate for listing under the ESA by the U. S. Fish and Wildlife Service. (65 FR 67343, November 9, 2000). The population has declined from 55,000 to 73,700 individuals in the 1980s (Calkins and Schneider 1985) to approximately 6,000 individuals in the late 1990s. (U. S. Fish and Wildlife Service, unpublished data). There are no anticipated direct or indirect impacts upon sea otters by the groundfish fisheries since sea otters occur primarily in nearshore waters and feed mostly on benthic invertebrates[3]. In the Adak area, sea otters have been observed eating fish, though they prefer to eat clams and mussels[4].

Sea otters are considered a keystone species because of their influence on the structure of the marine community (O'Clair 1998). With the reduction in sea otter population, the sea urchin population has increased leading to a reduction in kelp beds. The kelp beds are important for maintaining lower trophic levels of marine organisms which in turn support raptors, marine mammals, and marine birds. Kelp beds are known to support various species of juvenile fish and invertebrates and help provide the sedimentation necessary to support clams (USFWS 1983). The kelp beds occur in nearshore waters to 40 feet in depth. Walleye pollock and Pacific cod have been collected in nearshore waters by beach seining around Unalaska (USGS 1999). In Akutan, rock sole were commonly observed during shoreline transects to below 30 feet, in deeper waters where kelp beds occur (USFWS 1983). If groundfish depend upon kelp beds during any part of their life stages, the disappearance of the kelp beds with the reduction in sea otter populations may have an impact on groundfish survival by reducing available habitat.

3.6 Seabird Species Population Status

Seabirds spend the majority of their life at sea rather than on land. Alaska's extensive estuaries and offshore waters provide breeding, feeding, and migrating habitat for approximately 100 million seabirds. Thirty-four species breed in the Bering Sea/Aleutian Islands (BSAI) and Gulf of Alaska (GOA) regions and number 36 million and 12 million individuals, respectively. Another 6 species breed at other locations in Alaska. In addition, up to 50 million shearwaters and 3 albatross species feed in Alaskan waters during the summer months but breed farther south. The current world population of short-tailed albatross is approximately 1200 individuals. Detailed seabird information on species population status, life history, ecology, and bycatch is contained in section 3.5 of the SEIS (NMFS 1998a).

3.7 Status of Endangered or Threatened Species

The Endangered Species Act of 1973 as amended (16 U.S.C. 1531 *et seq*; ESA), provides for the conservation of endangered and threatened species of fish, wildlife, and plants. The program is administered jointly by the NMFS for most marine mammal species, marine and anadromous fish species, and marine plants species, and by the USFWS for bird species, and terrestrial and freshwater wildlife and plant species. There is currently very little use of non-pelagic trawl gear in the Federal waters of Cook Inlet. None of the alternatives would increase the use of non-pelagic gear in Cook Inlet.

---

[3]D. Burn, November 30, 2000. Personal Communication. U. S. Fish and Wildlife Service. Marine Mammals Management Office, 1011 Tudor Rd. Anchorage, AK 99503.

[4]Devries S. 1997. Personal communication U. S. Fish and Wildlife Service. Marine Mammals Management Office, 1011 Tudor Rd. Anchorage, AK 99503

The designation of an ESA listed species is based on the biological health of that species. The status determination is either threatened or endangered. Threatened species are those likely to become endangered in the foreseeable future [16 U.S.C. § 1532(20)]. Endangered species are those in danger of becoming extinct throughout all or a significant portion of their range [16 U.S.C. § 1532(20)]. Species can be listed as endangered without first being listed as threatened. The Secretary of Commerce, acting through NMFS, is authorized to list marine fish, plants, and mammals (except for walrus and sea otter) and anadromous fish species. The Secretary of the Interior, acting through the USFWS, is authorized to list walrus and sea otter, seabirds, terrestrial plants and wildlife, and freshwater fish and plant species.

In addition to listing species under the ESA, the critical habitat of a newly listed species is designated concurrent with its listing to the "maximum extent prudent and determinable" [16 U.S.C. § 1533(b)(1)(A)]. The ESA defines critical habitat as those specific areas that are essential to the conservation of a listed species and that may be in need of special consideration. Federal agencies are prohibited from undertaking actions that destroy or adversely modify designated critical habitat. Some species, primarily the cetaceans, which were listed in 1969 under the Endangered Species Conservation Act and carried forward as endangered under the ESA, have not received critical habitat designations.

Federal agencies have an affirmative mandate to conserve listed species. One assurance of this is Federal actions, activities or authorizations (hereafter referred to as Federal action) must be in compliance with the provisions of the ESA. Section 7 of the ESA provides a mechanism for consultation by the Federal action agency with the appropriate expert agency (NMFS or USFWS). Informal consultations, resulting in letters of concurrence, are conducted for Federal actions that may affect but are not expected to adversely affect listed species or critical habitat. Formal consultations, resulting in biological opinions, are conducted for Federal actions that may have an adverse affect on the listed species. Through the biological opinion, a determination is made as to whether the preferred alternative is likely to jeopardize the continued existence of a listed species (jeopardy) or destroy or adversely modify critical habitat (adverse modification). If the determination is that the action proposed (or ongoing) will cause jeopardy, reasonable and prudent alternatives may be suggested which, if implemented, would modify the action to avoid the likelihood of jeopardy to the species or destruction or adverse modification of designated critical habitat. A biological opinion with the conclusion of no jeopardy may contain conservation recommendations intended to further reduce the negative impacts to the listed species. These conservation recommendations are advisory to the action agency [50 CFR. 402.25(j)]. If a likelihood exists of any taking[5] occurring during promulgation of the action, an incidental take statement may be appended to a biological opinion to provide for the amount of take that is expected to occur from normal promulgation of the action.

Twenty-three species occurring in the GOA and/or BSAI groundfish management areas are currently listed as endangered or threatened under the ESA (Table 3.1). The group includes great whales, pinnipeds, Pacific salmon and steelhead, and seabirds.

Of the species listed under the ESA and present in the action area (Table 3.1), some may be negatively affected by groundfish fishing. NMFS is the expert agency for ESA listed marine mammals and anadromous fish species. The USFWS is the expert agency for ESA listed seabirds. The fisheries as a whole must be in compliance with the ESA.

Section 7 consultations with respect to actions of the federal groundfish fisheries have been done for all the species listed in Table 3.1, either individually or in groups. See section 3.8 of the SEIS (NMFS 1998a), for summaries of section 7 consultations done prior to December 1998. An FMP-level biological opinion was

[5] The term "take" under the ESA means "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct" [16 U.S.C. § 1538(a)(1)(B)].

prepared pursuant to Section 7 of the ESA on all NMFS listed species present in the fishery management areas for the entire groundfish fisheries program. The opinion was issued November 30, 2000 (NMFS 2000b). The Steller sea lion was the only species to be determined to be in jeopardy or risk of adverse modification of its habitat based upon the FMPs. Consultations prepared subsequent to the SEIS (NMFS 1998a) are summarized below.

Table 3.1. **ESA Listed Species. The following species are currently listed as endangered or threatened under the ESA and occur in the GOA and/or BSAI groundfish management areas.**

Common Name	Scientific Name	ESA Status
Northern Right Whale	*Balaena glacialis*	Endangered
Bowhead Whale [1]	*Balaena mysticetus*	Endangered
Sei Whale	*Balaenoptera borealis*	Endangered
Blue Whale	*Balaenoptera musculus*	Endangered
Fin Whale	*Balaenoptera physalus*	Endangered
Humpback Whale	*Megaptera novaeangliae*	Endangered
Sperm Whale	*Physeter macrocephalus*	Endangered
Snake River Sockeye Salmon	*Onchorynchus nerka*	Endangered
Short-tailed Albatross	*Phoebaotria albatrus*	Endangered
Steller Sea Lion	*Eumetopias jubatus*	Endangered and Threatened [2]
Snake River Fall Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Snake River Spring/Summer Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Puget Sound Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Lower Columbia River Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Upper Willamette River Chinook Salmon	*Onchorynchus tshawytscha*	Threatened
Upper Columbia River Spring Chinook Salmon	*Onchorynchus tshawytscha*	Endangered
Upper Columbia River Steelhead	*Onchorynchus mykiss*	Endangered
Snake River Basin Steelhead	*Onchorynchus mykiss*	Threatened
Lower Columbia River Steelhead	*Onchorynchus mykiss*	Threatened
Upper Willamette River Steelhead	*Onchorynchus mykiss*	Threatened
Middle Columbia River Steelhead	*Onchorynchus mykiss*	Threatened
Spectacled Eider	*Somateria fishcheri*	Threatened
Steller Eider	*Polysticta stelleri*	Threatened

[1] The bowhead whale is present in the Bering Sea area only.

[2] Steller sea lion are listed as endangered west of Cape Suckling and threatened east of Cape Suckling.

Steller sea lions and other ESA listed marine mammals.

The only marine mammal identified as a concern with the implementation of the FMPs for the BSAI and GOA groundfish fisheries was the Steller sea lion. In compliance with the ESA, NMFS developed a reasonable and prudent alternative (RPA) for the BSAI and GOA groundfish fisheries to avoid jeopardy to endangered Steller sea lions and adverse modification of their critical habitat. The RPA is based on the following three main principles: (1) temporal dispersion of fishing effort, (2) spatial dispersion of fishing effort, and (3) sufficient protection from fisheries competition for prey in waters adjacent to rookeries and important haulouts. The RPA focused on three fisheries that posed the most concern for competition with Steller sea lions for prey; the BSAI and GOA pollock and Pacific cod fisheries, and the BSAI Atka mackerel fishery. Neither the conclusions of the Comprehensive Biop (NMFS 2000b) nor the RPA was adopted by

the Council at its December 2000 meeting for numerous reasons, including lack of confidence in the scientific premises supporting the biological opinion, lack of public and Council input during its development, and general disagreement about the efficacy of the RPA measures. Subsequently, the Alaska congressional delegation sponsored a rider to the 2001 appropriations bill (Section 209 of Pub.L. 106-554) that provided direction for a one-year phase-in of the RPA and opportunity for the Council to assess and potentially modify the RPA prior to full implementation in 2002 based on independent scientific reviews or other new information.

The protection measures in the emergency rule (66 FR 7276, January 22, 2001) reflect the first year implementation phase of the RPA and provides for full implementation of the RPA by 2002. Some elements of the RPA, such as critical habitat harvest limits for GOA pollock and Pacific cod, will require new monitoring and management measures that NMFS has yet to develop and implement.

ESA Listed Pacific Salmon

When the first Section 7 consultations for ESA listed Pacific salmon taken by the groundfish fisheries were done in 1994 and 1995 only three evolutionary significant units (ESUs) of Pacific salmon were listed that ranged into the fishery management areas (NMFS 1994, 1995). Additional ESUs of Pacific salmon and steelhead were listed under the ESA in 1998 and 1999 (NMFS 1999b). Only the Snake River fall chinook salmon has designated critical habitat and none of that designated habitat is marine habitat. Under Section 7 regulations, consultation should be reinitiated in the event of additional listings. Using the year 2000 proposed TAC specifications, NMFS reinitiated consultations for ESA listed Pacific salmon for all twelve ESUs of Pacific salmon that are thought to range into Alaskan waters. The consultation for the Pacific salmon species was issued December 22, 1999, and contained a determination of not likely to jeopardize their continued existence. No critical habitat has been designated for these species within the action area, therefore, none will be affected by the proposed fisheries. The biological opinion reviewed the status of Snake river fall chinook, Snake River spring/summer chinook, Puget Sound chinook, Upper Columbia river spring chinook, Upper Willamette River chinook, Lower Columbia river chinook, Upper Columbia river steelhead, Upper Willamette River steelhead, Middle Columbia river steelhead, Lower Columbia river steelhead, and Snake river Basin steelhead, the environmental baseline for the action area, the effects of the proposed fishery and the cumulative effects. The opinion was accompanied by an Incidental Take Statement that states the catch of listed fish will be limited specifically by the measures proposed to limit the total bycatch of chinook salmon. Bycatch should be minimized to the extent possible and in any case should not exceed 55,00 chinook per year in the BSAI fisheries or 40,000 chinook salmon per year in the GOA fisheries.

Project-level consultation for ESA listed Pacific salmon was not reinitiated for the year 2001 TAC specifications because none of the triggers for reinitiation are thought to have occurred. Those four triggers include: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; (4) a new species is listed or critical habitat designated that may be affected by the identified action. In instances where the amount or extent of incidental take is exceeded, the action agency must immediately reinitiate formal consultation. The Comprehensive BiOp (NMFS 2000b) stated that ESA listed Pacific salmon are not in jeopardy or risk of adverse modification of their habitat by the groundfish fisheries in the BSAI or GOA.

Short-tailed Albatross

The only new information on seabirds since publication of the SEIS (NMFS 1998a) concerns the taking of short-tailed albatross and subsequent Section 7 consultations on that species. It is summarized below:

On 22 October 1998, NMFS reported the incidental take of 2 endangered short-tailed albatrosses in the hook-and-line groundfish fishery of the BSAI. The first bird was taken on 21 September 1998, at 57 30'N, 173 57'W. The bird had identifying leg bands from its natal breeding colony in Japan. It was 8 years old. In a separate incident, one short-tailed albatross was observed taken on 28 September 1998, at 58 27'N, 175 16'W, but the specimen was not retained for further analysis. Identification of the bird was confirmed by USFWS seabird experts. The confirmation was based upon the observer's description of key characteristics that matched that of a subadult short-tailed albatross to the exclusion of all other species. A second albatross was also taken on 28 September 1998, but the species could not be confirmed (3 species of albatross occur in the North Pacific). Both vessels were using seabird avoidance measures when the birds were hooked.

The USFWS listed the short-tailed albatross as an endangered species under the ESA throughout its United States range (65 FR 46644, July 31, 2000). Under terms of the 1999 biological opinion, incidental take statement, a take of up to 4 birds is allowed during the 2-year period of 1999 and 2000 for the BSAI and GOA hook-and-line groundfish fisheries (USFWS 1999). If the anticipated level of incidental take is exceeded, NMFS must reinitiate formal consultation with the USFWS to review the need for possible modification of the reasonable and prudent measures established to minimize the impacts of the incidental take.

NMFS Regional Office, NMFS Groundfish Observer Program, and the USFWS Offices of Ecological Services and Migratory Bird Management are actively coordinating efforts and communicating with each other in response to the 1998 take incidents and are complying to the fullest extent with ESA requirements to protect this species. Regulations at 50 CFR § 679.24(e) and 679.42(b)(2) contain specifics regarding seabird avoidance measures. In February 1999, NMFS presented an analysis on seabird mitigation measures to the Council that investigated possible revisions to the currently required seabird avoidance methods that could be employed by the long-line fleet to further reduce the take of seabirds.

The Council took final action at its April 1999 meeting to revise the existing requirements for seabird avoidance measures. The Council's preferred alternative would: 1) explicitly specify that weights must be added to the groundline (Currently, the requirement is that baited hooks must sink as soon as they enter the water. It is assumed that fishermen are weighting the groundlines to achieve this performance standard.); 2) the offal discharge regulation would be amended by requiring that prior to any offal discharge, embedded hooks must be removed; 3) streamer lines, towed buoy bags and float devices could both qualify as bird scaring lines (Specific instructions are provided for proper placement and deployment of bird scaring lines.); 4) towed boards and sticks would no longer qualify as seabird avoidance measures; 5) the use of bird scaring lines would be required in conjunction to using a lining tube; and 6) night-setting would continue to be an option and would not require the concurrent use of a bird scaring line.

These revised seabird avoidance measures are expected to be effective in 2001. The avoidance measures affect the method of harvest in the hook-and-line fisheries, but are not intended to affect the amount of harvest.

A Biological Opinion on the BSAI hook-and-line groundfish fishery and the BSAI trawl groundfish fishery for the ESA listed short-tailed albatross was issued March 19, 1999, by the USFWS for the years 1999 through 2000 (USFWS 1999). The conclusion continued a no jeopardy determination and the incidental take statement expressing the requirement to immediately reinitiate consultations if incidental takes exceed four short-tailed albatross over two years' time. Consultations on short-tailed albatross was not re-initiated for the year 2000 TAC specifications because the March 19, 1999, biological opinion covered through the end of calendar year 2000. In September 2000, NMFS requested re-initiation of consultation for all listed species under the jurisdiction of the USFWS, including the short-tailed albatross, spectacled eider and Steller's eider for the BSAI and GOA FMPs and 2001-2004 TAC specifications. Based upon NMFS' review of the fishery

action and the consultation material provided to USFWS, NMFS concluded that the BSAI and GOA groundfish fisheries are not likely to adversely affect either the spectacled eider or the Steller's eider or destroy or adversely modify the critical habitat that has been proposed for each of these species.

3.8 Ecosystem Considerations

Ecosystem considerations for the BSAI and GOA groundfish fisheries are explained in detail in *Ecosystem Considerations for 2001* (NMFS 2000a). This document provides updated information on biodiversity, essential fish habitats, consumptive and non-consumptive sustainable yields, and human considerations. This information is intended to be used in making ecosystem-based management decisions such as establishing ABC and TAC levels.

3.9 The Human Environment

The operation of the groundfish fishery in the Bering Sea/Aleutian Islands and the Gulf of Alaska is described by gear type in the SEIS (NMFS, 1998a) and in the draft SEIS (NMFS 2001). General background on the fisheries with regard to each species is given in the BSAI and GOA groundfish FMPs (NPFMC 1999a and 1999b).

3.9.1 Fishery Participants

For detailed information on the fishery participants including vessels and processors see sections 5.3 and 5.4 of this EA/RIR/IRFA. Section 5.0 outlines the economic impacts of each alternative on fishery participants. Additional information regarding fishery participants can be found in the 1999 Economic SAFE report (Hiatt and Terry, 2000). Section 5.0 concludes that the preferred alternative is not likely to have a significant economic impact on small entities. Again, in the past 14 years only two vessels have used non-pelagic gear in the Federal waters of Cook Inlet.

3.9.2 Economic Aspects of the Fishery

The most recent description of the economic aspects of the groundfish fishery is contained in the 1999 Economic SAFE report (Hiatt and Terry, 2000). This report, incorporated herein by reference, presents the economic status of groundfish fisheries off Alaska in terms of economic activity and outputs using estimates of catch, bycatch, ex-vessel prices and value, the size and level of activity of the groundfish fleet, the weight and value of processed products, wholesale prices, exports, and cold storage holdings. The catch, fleet size and activity data are for the fishing industry activities that are reflected in Weekly Production Reports, Observer Reports, fish tickets from processors who file Weekly Production Reports, and the annual survey of groundfish processors. External factors that, in part, determine the economic status of the fisheries are foreign exchange rates, the prices and price indices of products that compete with products from these fisheries, and fishery imports. Sections 5.0 and 6.0 of this document contain additional information regarding the economics of this fishery.

3.10 Coastal Zone Management Act

Implementation of each 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.

3.11 Conclusions or Finding of No Significant Impact

The alternatives in this analysis address a prohibition on trawling in Federal waters of Cook Inlet in the GOA that would be implemented under GOA Plan Amendment 60. NMFS has not yet made a finding of no significant impact under NEPA. Such a determination will be made if the proposed rule is approved by the Secretary and a final rule for the GOA Plan Amendment 60 is developed.

4.0 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 Regulatory Impact Review (RIR) 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.

An RIR is required by NMFS for all regulatory actions or for significant Department of Commerce or NOAA policy changes that are of significant public interest. The RIR: (1) provides a comprehensive review of the level and incidence of impacts associated with a proposed or final regulatory action; (2) provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problems; and (3) ensures that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost effective way.

Executive Order 12866, "Regulatory Planning and Review," was signed on September 30, 1993 and established guidelines for promulgating new regulations and reviewing existing regulations. While the order covers a variety of regulatory policy considerations, the benefits and costs of regulatory actions are a prominent concern. Section 1 of the order describes the regulatory philosophy and principles that are to guide agency development of regulations. The regulatory philosophy stresses that, in deciding whether and how to regulate, agencies should assess all costs and benefits of all regulatory alternatives. In choosing among regulatory approaches, the philosophy is to choose those approaches including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity) that maximize net benefit to the nation.

The regulatory principles in E.O. 12866 emphasize careful identification of the problem to be addressed. The agency is to identify and assess alternatives to direct regulation, including economic incentives, such as user fees or marketable permits, to encourage the desired behavior. When an agency determines that a regulation is the best available method of achieving the regulatory objective, it shall design its regulations in the most cost-effective manner to achieve the regulatory objective. Each agency shall assess both the costs and benefits of the intended regulation and, recognizing that some costs and benefits are difficult to quantify, propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Each agency shall base its decisions on the best reasonably obtainable scientific, technical, economic, and other information concerning the need for, and the consequences of, the intended regulation.

An RIR is required for all regulatory actions that either implement a new FMP or significantly amend an existing FMP. The RIR is part of the process of preparing and reviewing FMP's and provides a comprehensive review of the changes in net economic benefits to society associated with proposed regulatory actions. The analysis also provides a review of the problems and policy objectives prompting the regulatory proposals and an evaluation of the major alternatives that could be used to solve the problem. The purpose of the analysis is to ensure that the regulatory agency systematically and comprehensively considers all available alternatives so that the public welfare can be enhanced in the most efficient and cost-effective way. The RIR addresses many of the items in the regulatory philosophy and principles of E.O. 12866.

Executive Order 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 impacts 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.

4.1 Management Background

This analysis addresses the need to amend the GOA FMP to provide greater protection to depressed king and Tanner crab stocks by: (1) prohibiting the use of non-pelagic trawl gear in the Cook Inlet portion of the GOA EEZ (Alternative 2 (**preferred**)); (2) deferring management to the State (Alternative 3); (3) removing the Cook Inlet portion of the GOA EEZ from the GOA Groundfish FMP (Alternative 4); (4) establishing observer coverage (Alternative 5); (5) establishing time and area closures (Alternative 6); and (6) requiring a Commissioner's Permit (Alternative 7).

4.2 Analysis of alternatives

Alternative 1: Status Quo

Under the status quo, the use of non-pelagic trawl gear would not be restricted in Federal waters of Cook Inlet.

Although non-pelagic trawling has not occurred recently in this area, interest continues to be expressed in trawling for flatfish in the Federal waters of Cook Inlet. The existing Federal regulatory structure may not provide for sufficiently timely closure of non-pelagic trawling in this important crab habitat to meet the stated goal of conservation of king and Tanner crab resources in the EEZ of Cook Inlet.

Alternative 2: Prohibit the use of non-pelagic trawl gear in Federal waters of the Cook Inlet portion of the Gulf of Alaska. (**Preferred**)

This gear ban would provide long-term protection to depressed king and Tanner crab resources in Cook Inlet and would provide consistent management approaches with ADF&G. The Alaska Board of Fisheries has already adopted regulations closing state waters of Cook Inlet to non-pelagic trawl gear for groundfish. This closure would prohibit the use of non-pelagic trawl gear in approximately 2,400 nm^2 of Federal waters in Cook Inlet. There has historically been little non-pelagic trawl activity in the proposed gear ban area (Table 9 in Section 2.0 of the Environmental Assessment), and, thus, little basis upon which to evaluate the potential for foregone economic opportunities if the proposal is adopted.

The most recent non-pelagic trawl landings in the Federal waters of Cook Inlet were reported in 1990 and 1995 (Section 2.0 of the Environmental Assessment). Based on the past 14 years of State of Alaska landings

data, only two vessels have used non-pelagic gear in the Federal waters of Cook Inlet. Based on the relative amounts of groundfish harvested, it appears that these vessels were targeting Pacific cod. These data are obtained through the State of Alaska fishticket database which collects data on the landing of commercial harvests in the State. State of Alaska confidentiality requirements do not allow the release of specific harvest data if fewer than four vessels are participating in the fishery. However, the data do indicate that the overall value of Pacific cod and other groundfish harvested by these vessels is a small percentage of the overall value of groundfish fish harvested in the Federal waters of Cook Inlet in either 1990 or 1995. In 1990 and 1995, the ex-vessel value of groundfish harvest by non-pelagic trawl gear in each year was less than $10,000. Based on past performance, it appears unlikely that there will be further participation in the Cook Inlet Pacific cod or other groundfish fisheries with non-pelagic gear.

It is also difficult to evaluate how the development of a fishery with non-pelagic trawl gear would affect existing and potential fisheries with other gears. The greatest groundfish biomass vulnerable to trawl gear in this area is arrowtooth flounder, comprising over 1/3 of the total 1998 ADF&G trawl survey catch (Table 9 in Section 2.0 of the Environmental Assessment). Based on historical non-pelagic trawl fishery performance and the virtual absence of any recent or present activity in this fishery, combined with data on available groundfish resource composition in the proposed gear ban area, adoption of the preferred alternative is not anticipated to significantly impact the economic status of the non-pelagic trawl fleet in the Gulf of Alaska.

The benefits of precluding potentially substantial crab bycatch and thus, facilitating the recovery of the king andTanner crab resource, should a groundfish trawl fishery reemerge in Federally managed waters of Cook Inlet, are believed to be considerable. Historically, Tanner commercial crab fisheries in Cook Inlet produced landings valued in excess of $5,500,000 for the Tanner crab fishery (based on 1987 peak value), and $3,000,000 for the king crab fishery (based on 1982 peak value). Both king and Tanner crab commercial fisheries have been closed in recent years, due to severely depressed stock conditions. If resource recovery was accomplished and directed fisheries on king and/or Tanner crab stocks in Cook Inlet were resumed, the economic value of these fisheries (based on historic landings and price information) substantially outweigh possible costs to the groundfish trawl and processing industry attributable to restrictions on use of non-pelagic gear. Proactive action by the Council to assure avoidance of significant bycatch losses of king and Tanner crabs, should interest in a non-pelagic groundfish fishery reemerge in Cook Inlet, will directly benefit the crab rebuilding effort.

Should, under the protection of the proposed action, these stocks regain sufficient abundance to permit reopening of commercial crab fisheries in Cook Inlet, the benefits deriving from those fisheries would accrue, in part, from the adoption of the ban on non-pelagic trawls. Whether, or when, such abundance levels might be realized is uncertain, given the complex range of factors which are believed to have led to their decline. It is, therefore, not possible to provide a quantitative estimate of these benefits. However, the protection of the existing resource and reestablishment of healthy, abundant king and Tanner crab stocks in Cook Inlet is clearly the underlying objective (and expectation) of the non-pelagic trawl ban management action.

Because, as noted, no non-pelagic fishery currently exists in this area, any attributable cost of adopting the proposed action would be hypothetical. Nonetheless, for the sake of argument, one could imagine that, in the future, costs attributable to adoption of Alternative 2 could be incurred, most likely primarily by catcher/processor vessels, wishing to target flatfishes. In order to quantitatively estimate "potential" cost effects, information would be required on vessel numbers, size, configuration, as well as, operational strategies and cost structures, product forms, and markets, etc., for a non-pelagic trawl groundfish target fishery in Cook Inlet. Because no such data exist (indeed, no such fishery exists) it is not possible to be more precise about the "costs" of adopting a ban on non-pelagic trawls. Adoption of the proposed amendment is

not anticipated to affect fishing opportunities , costs, nor revenues, for groundfish operations utilizing longline, pot, jig, and non-pelagic trawl gears.

Alternative 3: Defer management of groundfish in Federal waters of Cook Inlet to the State of Alaska.

Presumably, the same long-term protection to depressed king and Tanner crab resources in Cook Inlet would occur under this alternative as would occur under Alternative 2. Currently, ADF&G manages State waters in Cook Inlet in accordance with NMFS when a Federal groundfish fishery is being conducted in adjacent Federal waters. ADF&G opens this "parallel" fishery in State waters to allow vessels participating in the Federal fishery the opportunity to harvest fish that may occur within State waters. During this "parallel" fishery, the State regulates the State waters of Cook Inlet in conformance with regulations of Federal fisheries unless the Alaska Board of Fisheries has adopted more conservative management plans or gear restrictions that do not conflict with Federal regulations while providing greater resource protection in nearshore waters. As an example, the State may impose vessel size restrictions on vessels that are fishing within State waters during the Federal fishery. During the "parallel" fishery, the total catch in State waters is debited against the Federal TAC set for that particular fishery.

Alternative 3 would redefine the management authority for the Federal waters of Cook Inlet and allow the State to assume management of all groundfish under deferred authority from the Council for Federal waters of Cook Inlet. That is, these waters would still ultimately be under the jurisdiction of the Council, NMFS, and Secretary of Commerce, but the State would be the primary in-season manager of these stocks. However, this alternative was a more extreme remedy to the problem than was deemed necessary by the Council. Because, if adopted, Alternative 3 would provide no additional "benefits" (over the preferred alternative), while it would impose a disproportionate change in the existing State/Federal management relationship in Cook Inlet and was rejected by the Council.

It is not clear that this alternative would have any additional costs or benefits on either NMFS or ADF&G. ADF&G would assume in-season management for all groundfish under this alternative. This could require additional costs in terms of increased data collection, monitoring, or enforcement. It is not clear whether this in-season management could be incorporated into the existing State management program for State waters within Cook Inlet or if additional management activities and costs would be incurred. To the extent that this alternative would transfer management authority, and costs to ADF&G, it could reduce overall management costs to NMFS for enforcement and monitoring. Again, the potential additional costs to ADF&G under this alternative, and the potential reduction in costs to NMFS under this alternative are unknown and the relative costs or benefit of this transfer in management authority is unknown. It should be noted that under this alternative, NMFS retains ultimate management authority for the Federal waters within Cook Inlet and some management costs for NMFS would continue under this alternative.

Alternative 3 would simply defer authority to the State, but it would not actually prohibit the use of non-pelagic trawl gear in the Federal waters of Cook Inlet. Presumably, the State would take action to prohibit non-pelagic trawl gear once management authority was transferred. This is a reasonable assumption given the fact that the State has already taken action to prohibit the use of non-pelagic gear in the State waters of Cook Inlet (See Section 2.0 of the Environmental Assessment). Nevertheless, under this alternative, it is not certain than the non-pelagic trawl gear ban action recommended by the Council would in fact be taken.

As stated above, under Alternative 2, costs to the industry that might have entered a non-pelagic trawl fishery at some undetermined time in the future, are not quantifiable. Further, under this alternative in which the in-season management authority for all groundfish management is deferred to the State of Alaska, additional regulatory measures may be imposed by the State of Alaska at some point in the future that are beyond the scope and unrelated to the restriction of non-pelagic trawl gear to restrict crab bycatch. The potential for

additional management measures could have additional costs for any groundfish fishery, using any gear type, currently occurring in the Federal waters of Cook Inlet but these potential costs are unknown.

If the State took the same management measures as those envisioned under Alternative 2 above, then the same potential, and hypothetical, costs and benefits would apply to Alternative 3. However, because this alternative does not specifically prohibit the use of non-pelagic trawl gear in the Federal waters of Cook Inlet, it may not have the same potential costs and benefits. This alternative would create an alternative management structure and could result in additional changes to the fishery such as those described above. Any potential additional costs or benefits of this transferrence of management beyond the non-pelagic trawl ban are highly uncertain, not foreseeable, and may not occur. This alternative could achieve the mangement objectives and the potential benefits of that action, however, it does not appear to be the least-burdensome alternative among those considered, specifically when compared to Alternative 2.

Alternative 4: Remove the Cook Inlet area from the Gulf of Alaska groundfish FMP.

The same long-term protection to depressed king and Tanner crab resources in Cook Inlet, as accrue for the preferred alternative, would be expected from the adoption of this alternative. As with Alternative 3, however, Alternative 4 would require changes in the management structure and relationship between State and Federal authorities which are substantially more extensive and intrusive than required to achieve the objectives of the Cook Inlet non-pelagic trawl prohibition in Federal waters.

Alternative 4 would remove a geographic area (Cook Inlet) from the GOA groundfish FMP. This would result in the State assuming *de facto* management of all groundfish in the excluded waters–that is, the Federal waters of Cook Inlet. As with Alternative 3, presumably the State would take action to prohibit non-pelagic trawl gear in the Federal waters of Cook Inlet over which it would now have management authority.

Hypothetical costs to the industry that might have entered a non-pelagic trawl fishery at some unspecified point in the future are not quantifiable. Further, under this alternative in which the management authority for all groundfish management is deferred to the State of Alaska by lack of its incorporation in the GOA FMP, additional regulatory measures may be imposed by the State of Alaska at some point in the future that are beyond the scope and unrelated to the restriction of non-pelagic trawl gear to restrict crab bycatch. The potential for additional management measures could have additional costs for any groundfish fishery, using any gear type, currently occurring in the Federal waters of Cook Inlet. If the State took the same management measures as those envisioned under Alternative 2 above, then the same potential, and hypothetical, costs and benefits would apply to Alternative 4. However, because this alternative does not specifically prohibit the use of non-pelagic trawl gear in the Federal waters of Cook Inlet, it may not have the same potential costs and benefits. This alternative would create an alternative management structure and could result in additional changes to the fishery such as those described above. Any potential additional costs or benefits of this transferrence of management beyond the non-pelagic trawl ban are highly uncertain, not foreseeable, and may not occur.

The potential shift in management costs from NMFS to ADF&G described under Alternative 3 would be expected under this alternative as well. However, since this alternative would remove NMFS' management authority, this alternative would transfer all management costs to ADF&G. This alternative could achieve the mangement objectives and the potential benefits of that action, however, it does not appear to be the least-burdensome alternative among those considered, specifically when compared to Alternative 2.

Alternative 5: Require observer coverage for vessels fishing for groundfish in Federal waters of Cook Inlet.

Because groundfish fishing in this area is managed by the GOA FMP, crab bycatch in groundfish fisheries is monitored by the NMFS Observer Program. Currently, observers are required on all vessels greater than 125 ft length overall (LOA) with 30% coverage of vessels between 60 and 124 ft LOA; observers are not required on vessels less than 60 ft LOA. As a note, the State is responsible for the in-season management of the Scallop fishery occurring in both State and Federal waters of Cook Inlet and crab bycatch in scallop fisheries is monitored by the state observer program; 100% observer coverage is required on vessels in most areas. However, in Cook Inlet, ADF&G biologists observe only a portion of the scallop vessels fishing efforts.

This alternative changes the existing vessel length standards for observer coverage and require 100% coverage. Observer coverage requirements already exist for some of the groundfish vessels fishing in the Federal waters of Cook Inlet. However, only those vessels greater than 125' LOA have observer coverage 100% of the time. Therefore, all vessels between 60 and 125' LOA would have to increase their observer coverage from 30% to 100% when fishing within the Federal waters of Cook Inlet. All vessels under 60' LOA would have to begin observer coverage since they are currently exempted under Federal regulations.

The daily cost of an observer is estimated at $330/day[6]. Using the 2000 fishing season as a representative example of fishing effort within the Federal waters of Cook Inlet, the additional observer costs to vessels under this alternative is estimated at $120,087.[7]

Moreover, it is likely that this cost underestimates the true costs. As noted, the cost estimates above may not include all logistics and transportation expenses incurred by the observers. These expenses would be billed, on top of the assumed $330/day observer costs, to the fishing vessel operators.

But, in addition, these fishing operations incur economic and operational impacts that are not directly reflected in the money they must spend on observer coverage. For example, fishing vessel operators may have to alter their travel plans and schedules to pick up or drop off observers; observers and their equipment may take up limited deck space while they observe gear setting and retrieval, and record and sample catch and bycatch; observers occupy "living space" aboard, which otherwise may have housed additional crew members. These operational impacts may be reflected in both increased operating expenses and reduced harvests and revenues. These impacts would be relatively more severe on a smaller vessel. It is not possible, with available information, to quantify these effects, but they may represent a substantial additional cost of operation for this class of vessels.

The discussion above was predicated on a set of costs that reflect experience in the current 100 percent and 30 percent observed fleets, however, most of the vessels that would be required to carry observers under this

---

[6] Personal Communication, Ben Muse, Economist, NMFS Alaska Region – Based on analysis of observer contract rates.

[7] The additional costs were estimated by determining the number of vessels fishing for groundfish multiplied by the number of days that these vessels fished for groundfish within the Federal waters of Cook Inlet, multiplied by the daily cost or observer coverage less the existing level of days of observer coverage for those vessels which are currently required to carry observers. The number of fishing days was estimated as follows. Alaska fish ticket records record the dates for the start and end of a fishing trip. This made it possible to estimate the length of each trip. It was thus possible to count up the number of days of fishing time. For purposes of this calculation, it is assumed that 30% of the days that vessels in 60 to 124' LOA class were fishing in Federal waters in Cook Inlet, they were observed. This is clearly a crude approach to this calculation, but it is sufficiently accurate to allow the analysis to address the significance threshold in E.O. 12866 ($100 million). A source of inaccuracy which might increase the number of trips and lead to an overestimate of costs involves the assumption that each trip was represented by only one fish ticket. It is likely that an unknown number of trips generated more than one fish ticket.

alternative are under 60 feet and have not been required to carry observers before. It is likely that the costs of supplying certified observers to these small vessels will be higher, on average, than the costs of supplying observers to the larger vessel fleet. There are several reasons for this: (a) working conditions may be more difficult on smaller vessels and observers may require higher wages for working on them, (b) smaller vessels may take shorter but more frequent trips making it necessary for observers to transfer between operations more frequently and increasing logistical and transportation costs, (c) higher costs for moving observers between vessels may make it harder for observer companies to meet the needs of fishermen for observers in a timely manner, (d) increased demands for observers associated with the program may make it harder for observer companies to supply them.

Additional observer coverage by itself, in the absence of other management restrictions, is unlikely to provide greater protection to king and Tanner crab stocks. This alternative would indicate the presence and level of crab bycatch in the Federal waters of Cook Inlet with greater certainty, but would not in fact reduce the level of that bycatch which is the purpose of this management action. This alternative would impose a significant cost on groundfish vessels, could jeopardize the safety of observers on-board smaller vessels, and does not address the management objectives identified at the outset of this action. This alternative would appear to yield signficant costs and significant additional burdens compared to either the status quo or the preferred alternative.

Alternative 6: Establish time and area closures.

This alternative would establish time and area closures to protect king and Tanner crab resources from non-pelagic trawl gear. As noted in Section 2.0 of the Environmental Assessment, king and Tanner crab exhibit pronounced seasonal migrations within Cook Inlet. Therefore, the presence of crab stocks would need to be monitored in "real time" in order to assess what areas may have crab stocks that could be subject to bycatch by non-pelagic trawls. This alternative would require monitoring bycatch of crab in non-pelagic trawl gear and closing those areas, or prohibiting fishing during those time periods when crab bycatch is present. Given the fact that there is no non-pelagic trawl activity within the Federal waters of Cook Inlet, this alternative would require some form of observer coverage in order to assess relative levels of bycatch. As noted, in Alternative 5, observer costs are estimated at $330/day, however, this alternative would not increase observer coverage beyond the status quo.

Once the presence of king and Tanner crab bycatch in non-pelagic trawl gear is noted, then NMFS would need to close those areas where the bycatch occurs. Given the existing requirements for Federal rulemaking under the Administrative Procedures Act (APA) for closing specific areas to non-pelagic trawling, it is not clear whether these closures would be enacted within the short time frame required to effectively restrict non-pelagic trawl bycatch. In addition, fishing effort can be highly variable depending upon seasonal closures and market conditions. It would be difficult to establish time and area closures that would mesh with variability in the groundfish fishing seasons while effectively protecting king and Tanner crab resources.

It is not clear that this alternative would have additional costs or benefits beyond the status quo. If the time and area closures limited any future, though currently non-existent, non-pelagic trawl fisheries, then it would be expected to have a cost to those vessels relative to the status quo. Because such a fishery does not currently exist, any potential costs relative to the status quo are unknown. Additionally, any potential benefits from this alternative due to reduced bycatch of crab stocks that may aid in the improved recruitment and growth of those species is also highly speculative and unknown.

Alternative 7: Require a Commissioner's Permit.

When the regulatory authority has been established by the Alaska Board of Fisheries, a fishery managed under restrictions of an ADF&G Commissioner's Permit allows specific operating conditions to be established. For example, a Commissioner's Permit is currently required for commercial scallop vessels operating in this area. However, authority to require a Commissioner's Permit must rest with the State and the Alaska Board of Fisheries. In contrast, groundfish fishing in Federal waters of Cook Inlet is regulated under the GOA FMP. To establish management authority to occur under a Commissioner's Permit would require a transfer of management authority similar to that considered for Alternatives 3 and 4, with similar costs and management implications. Analysis of these alternatives is addressed elsewhere under Alternatives 3 and 4.

4.3 Economic Impacts

The Cook Inlet area historically supported limited non-pelagic trawl fisheries for Pacific cod and, in 1983 only, for yellowfin sole. In 1990, due to concerns over depressed king and Tanner crab resources, the Alaska Board of Fisheries (Board) adopted regulations to prohibit the use of non-pelagic trawl gear in state waters that were thought to encompass primary crab habitat–in other words, areas with relatively high crab abundance. In 1996, the Board extended the prohibition on non-pelagic trawl gear to all State waters within Cook Inlet. The Board took this action based on concerns expressed by some fishermen that non-pelagic trawl gear could be affecting crab stocks in Cook Inlet through relatively high bycatch and altering the habitat in wasy that were unfavorable to crab productivity.

Federal waters of Cook Inlet do not currently support non-pelagic trawl fisheries. By volume, and value, the Pacific cod is the groundfish most harvested by vessels in the Federal waters of Cook Inlet (See section 2.0 of the Environmental Assessment). Pot and longline gear harvest of Pacific cod–the most commonly used gear in Cook Inlet–has far exceeded historical harvests of this species by trawl gear. A regulatory gear ban of Federal waters in Cook Inlet to non-pelagic trawl gear would preclude potential, future participation by the non-pelagic trawl gear component of the fishing fleet. However, this is unlikely to have a significant economic impact to the non-pelagic trawl fleet based on: 1) the lack of current participation by the non-pelagic trawl fleet; 2) the utilization of the Pacific cod resource by other gear types; and 3) the ability of the non-pelagic trawl fleet to harvest Federal quotas of GOA groundfish outside Cook Inlet in other areas of the GOA open to non-pelagic trawling.

Most importantly, a permanent gear ban on the use of non-pelagic trawl gear in the Federal waters of Cook Inlet, as proposed under Alternative 2, the preferred alternative, will promote rebuilding of the king and Tanner crab resources to the extent allowable by existing environmental conditions. As previously stated, should, under the protection of the proposed action, these stocks again regain sufficient abundance to permit reopening of commercial crab fisheries in Cook Inlet, the economic and socioeconomic benefits deriving from those fisheries would accrue, in part, from the adoption of the ban on non-pelagic trawls.

When, or whether, such king and/or Tanner crab abundance levels might be realized is uncertain. The reasons for their decline are complex and not well understood. It is, therefore, not possible to provide a quantitative estimate of these economic benefits. However, the protection of the existing resource, and the successful reestablishment of healthy, abundant king and Tanner crab stocks in Cook Inlet, is clearly the underlying objective (and expectation) of the non-pelagic trawl ban management action.

Several of the proposed alternatives would accomplish, or attempt to accomplish, the objectives of the action by significantly altering the management authority and relationship between Federal and State fisheries agencies. As noted, under the discussion of Alternatives 3, 4, and 7, this new management structure does not directly address the management objective of preventing the bycatch of crab by non-pelagic trawl gear. These alternatives could alter the relative costs of administering the management of groundfish fisheries

within the Federal waters of Cook Inlet between the State and NMFS, although it is not clear that this would result in additional costs. These alternative do not appear to create additional costs for the industry relative to the preferred alternative. It is not clear that these alternatives would result in any economic benefits beyond the status quo due to the fact that they do not, by themselves, limit non-pelagic trawl bycatch which may have adverse impacts on crab stocks in Cook Inlet resulting in a potentially lower economic return than might be realized without non-pelagic trawl bycatch. At the least, these alternatives would alter management of groundfish without directly achieving the management objective.

Alternative 5 would establish an observer program for vessel fishing for groundfish in the Federal waters of Cook Inlet. This program would be costly to industry and would not, in itself, reduce the bycatch of crab by non-pelagic trawl gear, merely monitor the level of that bycatch more precisely. The additional costs to the industry relative to the status quo are described under the discussion of Alternative 5. It is not clear that this alternative would result in any economic benefits beyond the status quo due to the fact that this alternative does not, in itself, limit non-pelagic trawl bycatch which may have adverse impacts on crab stocks in Cook Inlet resulting in a potentially lower economic return than might be realized without non-pelagic trawl bycatch.

Alternative 6 would initiate time and area closures for non-pelagic trawl gear to minimize crab bycatch. This alternative would not address the management objective as completely as a complete trawl ban due to the fact that this alternative would allow non-pelagic trawling until bycatch is observed and then closures would be implemented. Given the time required to implement area and time closures, this alternative may not result in limiting bycatch beyond that possible under the status quo alternative. It is not clear that this alternative would have additional costs above those under the status quo. It is also not clear that this alternative would result in any economic benefits beyond the status quo due to the delay in implementing this alternative and the possible impacts non-pelagic trawl bycatch may have on the economic return from rebuilt crab stocks.

4.4 Administrative, Enforcement and Information Costs

Only minimal additional costs due to implementation of the preferred alternative are expected. Some cost could be incurred for prosecuting cases for violations of the regulations.

However, as noted in Section 4.3, several of the alternatives could significantly shift the relative costs of management and enforcement between NMFS and the State. Alternatives 3, 4, and 7 could increase the relative enforcement and management costs for the State (ADF&G, and the Board) compared to either the preferred alternative or the status quo since the State would assume, either directly or indirectly, management authority for Cook Inlet groundfish. Presumably, this would result in a transfer of costs from NMFS to the State in equal proportion although this is not clear. It is not clear that these measures would result in additional costs, but it would be a reallocation of administrative and enforcement costs.

Alternative 5 would impose additional costs on NMFS relative to both the status quo and the preferred alternative to provide support to analyze the observer data. Although the industry does pay for the direct costs of placing an observer onboard a vessel, indirect costs such as those accrued to analyze the observer data are not covered by the fee observer contractors assess on the vessel. Additional observers above those currently employed would be expected to increase NMFS observer administration costs. These costs cannot be determined at this time and would be dependent on the number of additional observers deployed relative to the status quo and the costs of additional NMFS staffing required to analyze the data provided by those observers.

Alternative 6 would impose additional costs on NMFS by requiring NMFS to take in-season management measures above those currently being taken under the status quo, or those necessary under the preferred

alternative. These costs cannot be determined at this time and would be dependent on the degree of in-season actions (e.g., closing and opening areas) and the costs of additional NMFS staffing required to analyze the data and implement those closures.

4.5 Summary of the significance criteria

NMFS has not identified any factors under any of the alternatives that would (a) "Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency"; (b) "Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof"; or (c) "Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the executive order." Additionally, none of the alternatives under consideration would have an annual impact 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, of State, local, or tribal governments or communities.

5.0 INITIAL REGULATORY FLEXIBILITY ANALYSIS

5.1 Introduction

This Initial Regulatory Flexibility Analysis (IRFA) evaluates alternative regulatory actions that would improve our information on demersal shelf rockfish (DSR) bycatch mortality in the targeted halibut and groundfish fisheries in Federal waters in the Gulf of Alaska off of Southeast Alaska.

5.2 The purpose of an IRFA

The Regulatory Flexibility Act (RFA), first enacted in 1980, was designed to place the burden on the government to review all regulations to ensure that, while accomplishing their intended purposes, they do not unduly inhibit the ability of small entities to compete. The RFA recognizes that the size of a business, unit of government, or nonprofit organization frequently has a bearing on its ability to comply with a Federal regulation. Major goals of the RFA are: (1) to increase agency awareness and understanding of the impact of their regulations on small business, (2) to require that agencies communicate and explain their findings to the public, and (3) to encourage agencies to use flexibility and to provide regulatory relief to small entities. The RFA emphasizes predicting impacts on small entities as a group distinct from other entities and on the consideration of alternatives that may minimize the impacts while still achieving the stated objective of the action.

On March 29, 1996, President Clinton signed the Small Business Regulatory Enforcement Fairness Act. Among other things, the new law amended the RFA to allow judicial review of an agency's compliance with the RFA. The 1996 amendments also updated the requirements for a final regulatory flexibility analysis, including a description of the steps an agency must take to minimize the significant economic impact on small entities. Finally, the 1996 amendments expanded the authority of the Chief Counsel for Advocacy of the Small Business Administration (SBA) to file *amicus* briefs in court proceedings involving an agency's violation of the RFA.

In determining the scope, or 'universe', of the entities to be considered in an IRFA, NMFS generally includes only those entities that can reasonably be expected to be directly regulated by the proposed action. If the effects of the rule fall primarily on a distinct segment, or portion thereof, of the industry (e.g., user group, gear type, geographic area), that segment would be considered the universe for the purpose of this analysis. NMFS interprets the intent of the RFA to address negative economic impacts, not beneficial impacts, and thus such a focus exists in analyses that are designed to address RFA compliance.

Data on cost structure, affiliation, and operational procedures and strategies in the fishing sectors subject to the proposed regulatory action are insufficient, at present, to permit preparation of a "factual basis" upon which to certify that the preferred alternative does not have the potential to result in "significant adverse impacts on a substantial number of small entities" (as those terms are defined under RFA). Because, based on all available information, it is not possible to 'certify' this outcome, should the proposed action be adopted, a formal IRFA has been prepared and is included in this package for Secretarial review.

5.3 What is required in an IRFA?

Under 5 U.S.C., Section 603(b) of the RFA, each IRFA is required to contain:

- A description of the reasons why action by the agency is being considered;
- A succinct statement of the objectives of, and the legal basis for, the proposed rule;

- A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply (including a profile of the industry divided into industry segments, if appropriate);
- A description of the projected reporting, record keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
- An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap or conflict with the proposed rule;
- A description of any significant alternatives to the proposed rule that accomplish the stated objectives of the proposed action, consistent with applicable statutes, and that would minimize any significant economic impact of the proposed rule on small entities. Consistent with the stated objectives of applicable statutes, the analysis shall discuss significant alternatives, such as:

    1. The establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities;

    2. The clarification, consolidation, or simplification of compliance and reporting requirements under the rule for such small entities;

    3. The use of performance rather than design standards;

    4. An exemption from coverage of the rule, or any part thereof, for such small entities.

5.4 What is a small entity?

The RFA recognizes and defines three kinds of small entities: (1) small businesses, (2) small non-profit organizations, and (3) and small government jurisdictions.

Small businesses. Section 601(3) of the RFA defines a 'small business' as having the same meaning as 'small business concern' which is defined under Section 3 of the Small Business Act. 'Small business' or 'small business concern' includes any firm that is independently owned and operated and not dominant in its field of operation. The SBA has further defined a "small business concern" as one "organized for profit, with a place of business located in the United States, and which operates primarily within the United States or which makes a significant contribution to the U.S. economy through payment of taxes or use of American products, materials or labor...A small business concern may be in the legal form of an individual proprietorship, partnership, limited liability company, corporation, joint venture, association, trust or cooperative, except that where the firm is a joint venture there can be no more than 49 percent participation by foreign business entities in the joint venture."

The SBA has established size criteria for all major industry sectors in the US including fish harvesting and fish processing businesses. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $3.5 million for all its affiliated operations worldwide. A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $3.5 million criterion for fish harvesting operations. Finally a wholesale business servicing the fishing industry is a small businesses if it employs 100 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide.

The SBA has established "principles of affiliation" to determine whether a business concern is "independently owned and operated." In general, business concerns are affiliates of each other when one concern controls or has the power to control the other, or a third party controls or has the power to control both. The SBA considers factors such as ownership, management, previous relationships with or ties to another concern, and contractual relationships, in determining whether affiliation exists. Individuals or firms that have identical or substantially identical business or economic interests, such as family members, persons with common investments, or firms that are economically dependent through contractual or other relationships, are treated as one party with such interests aggregated when measuring the size of the concern in question. The SBA counts the receipts or employees of the concern whose size is at issue and those of all its domestic and foreign affiliates, regardless of whether the affiliates are organized for profit, in determining the concern's size. However, business concerns owned and controlled by Indian Tribes, Alaska Regional or Village Corporations organized pursuant to the Alaska Native Claims Settlement Act (43 U.S.C. 1601), Native Hawaiian Organizations, or Community Development Corporations authorized by 42 U.S.C. 9805 are not considered affiliates of such entities, or with other concerns owned by these entities solely because of their common ownership.

Affiliation may be based on stock ownership when (1) A person is an affiliate of a concern if the person owns or controls, or has the power to control 50 percent or more of its voting stock, or a block of stock which affords control because it is large compared to other outstanding blocks of stock, or (2) If two or more persons each owns, controls or has the power to control less than 50 percent of the voting stock of a concern, with minority holdings that are equal or approximately equal in size, but the aggregate of these minority holdings is large as compared with any other stock holding, each such person is presumed to be an affiliate of the concern.

Affiliation may be based on common management or joint venture arrangements. Affiliation arises where one or more officers, directors or general partners controls the board of directors and/or the management of another concern. Parties to a joint venture also may be affiliates. A contractor and subcontractor are treated as joint venturers if the ostensible subcontractor will perform primary and vital requirements of a contract or if the prime contractor is unusually reliant upon the ostensible subcontractor. All requirements of the contract are considered in reviewing such relationship, including contract management, technical responsibilities, and the percentage of subcontracted work.

Small organizations The RFA defines "small organizations" as any not-for-profit enterprise that is independently owned and operated and is not dominant in its field.

Small governmental jurisdictions The RFA defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with populations of less than 50,000.

5.5 Purpose and reason for considering the proposed action

The analysis addresses the need to amend the GOA FMP to provide greater protection to king and Tanner crab populations in the GOA. The Alaska Board of Fisheries prohibited the use of non-pelagic trawl gear in State waters of Cook Inlet to protect and promote the rebuilding of king and Tanner crab resources. However, a portion of crab resources have historically been harvested in the Federal waters of Cook Inlet. Although little fishing effort has occurred with non-pelagic trawl gear, previous efforts to prohibit non-pelagic trawling in this habitat have largely been "reactive" measures. Greater long-term proactive protection of crab from bycatch could promote rebuilding of these resources. This EA/RIR/IRFA for Plan Amendment 60 to the GOA Fishery Management Plan analyzes seven alternatives for limiting the use of non-pelagic

trawl gear in the Federal waters of Cook Inlet. The preferred alternative would prohibit the use of non-pelagic trawl gear in the Federal portion of Cook Inlet to protect crab stocks.

5.6 Objectives of, and legal basis for, the proposed action

While there is no FMP for crabs in the GOA, the legal basis for this action is to minimize impacts on essential fish habitat and promote the recovery of king and Tanner crabs in the GOA under the provisions of theMSA. The problem statement and objectives for this action were presented in Section 1.1. In general, the objective is to protect critical habitat for crab resources occurs in Federal waters of Cook Inlet, in order to facilitate the recovery of these potentially economically important fishery resources, and to avoid wasteful and destructive bycatch loss, to the maximum extent practicable.

5.7 Number and description of small entities affected by the proposed action

For purposes of the IRFA, all pollock, Pacific cod, crab, and scallop vessels operating in the Cook Inlet management area of the GOA can be considered small businesses, with annual receipts of less than $3.5 million. Under the preferred alternative, non-pelagic trawling would be prohibited in the Federal waters of Cook Inlet. However, since no non-pelagic trawling activity is ongoing in those waters, and has not since 1995 the adverse impacts on small entities would be negligible. For a detailed treatment of the fishing sector in this management area, refer to Section 3.9 of the EA, or Sections 4.2 and 4.3 of the RIR.

Section 2.1.3 provides baseline information on the commercial king and Tanner crab fisheries. Table 4 lists Tanner crab commercial harvests for Cook Inlet for 1968-98. Table 5 lists the king crab commercial harvests for Cook Inlet for 1960-84. These fisheries have been closed since then. A description of groundfish fisheries in Cook Inlet are described in Section 2.4. crab fisheries from 1968 to when they were closed. fixed gear P. cod fishery from 1992-1999. Specifically, Table 8 shows the amount of catch harvested by target species and gear type. Table 9 lists the aggregate catch composition in a Kamishak Bay bottom trawl survey. Section 2.5 describes the weathervane scallop fishery in Cook Inlet. Table 10 lists the annual catch and effort in the fishery during 1983-98.

5.8 Adverse economic impacts on regulated small entities

The preferred alternative represents the "least burdensome" alternative available to the Council, which simultaneously achieves the stated objectives of the action. Each of the other alternative to the status quo option, would impose more costly and/or administratively "extreme" solutions, to achieve the desired management outcome. They, therefore, have the potential to impose greater, not lesser, burdens on small entities operating in the Cook Inlet fisheries.

If adopted, the preferred alternative would "theoretically" eliminate fishing opportunities for some vessels. However, at present, no operators are participating in non-pelagic trawl fishing, in Cook Inlet. It is not certain that any would seek to do so, in the future. Nonetheless, adoption of any of the alternatives to the Status Quo (including the preferred alternative) would effectively preclude future use of this gear type, in the Cook Inlet (unless the Council subsequently took action to revoke the ban, which remains within their purview).

Adoption of the proposed action is perceived to be a "proactive" management action, designed to preempt use of destructive non-pelagic gear, so as to enhance the recovery of depleted crab stocks. This action, in effect, represents a trade-off between those "potentially"excluded from future use of non-pelagic trawls to harvest groundfish in Cook Inlet, and those who would "potentially" benefit in the future from recovered crab stocks and reopening of closed fisheries. The preferred alternative represents the least potentially

burdensome option, from the point of view of small entities, which simultaneously achieves the Council's management objectives for this action.

The perferred alternative does not impose a disproportionate burden on regulated small entities. All non-pelagic trawl vessels whether a small entity or not would be equally affected by this preferred alternative.

5.9 Recordkeeping and reporting requirements

The IRFA should include "a description of the projected reporting, record keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record..."

This regulation does not impose new recordkeeping or reporting requirements on the regulated small entities.

5.10 Federal rules that may duplicate, overlap, or conflict with proposed action

An IRFA should include "An identification, to the extent practicable, of all relevant Federal rules that may duplicate, overlap or conflict with the proposed rule..."

This analysis did not reveal any Federal rules that duplicate, overlap or conflict with the proposed action.

5.11 Description of significant alternatives

An IRFA should include "A description of any significant alternatives to the proposed rule that accomplish the stated objectives of the Magnuson-Stevens Act and any other applicable statutes and that would minimize any significant economic impact of the proposed rule on small entities."

There are no known small entities participating in any non-pelagic trawl fishery, in the Cook Inlet management area, that would be adversely impacted by adoption of the preferred alternative. The potential exists, under the status quo, that some fishing enterprise could, at some point in the future, decide it wished to fish with non-pelagic trawl gear in Cook Inlet. If the proposed action is taken, this "potential" fishing opportunity would be foreclosed. It is impossible to predict when, or even if, such a decision might be taken in the future, and by whom. Therefore, considerations of ownership, affiliation, and contractual characteristics of "potential" vessels wishing to enter this fishery, cannot be analyzed to determine if they meet the "small entities" criteria.

Under these circumstances, NMFS cannot quantify the number of small entities that "potentially" may be affected by this action, nor quantify the magnitude of those potential effects. NMFS cannot ,therefore, make a definitive finding of non-significance under the RFA. In the absence of such a finding, the foregoing IRFA has been prepared.

As noted in Section 4.3 of the RIR, alternatives that do not prohibit non-pelagic trawling could impede the rebuilding of king and Tanner crab stocks which could result in small entities foregoing economically valuable fisheries in the future. There are no known alternatives that would prohibit the bycatch of king and Tanner crab by non-pelagic trawl gear other than the preferred alternative. The preferred alternative accomplishes the goals of the MSA and other applicable law. Specifically, the preferred alternative directly addresses National Standard 9, "[c]onservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch." Those alternatives that would allow non-pelagic trawling in the Federal waters of Cook Inlet would not directly address the goals of the proposed action, and it is not clear that allowing non-pelagic trawling would result in beneficial economic impacts on small entities. Given the fact that no small entities are currently participating in the non-pelagic trawl fishery in the Federal waters of Cook Inlet, the preferred alternative best addresses the goals of the proposed action, the MSA, and minimizes adverse economic impacts on small entities by increasing the likelihood of rebuilding crab populations by eliminating non-pelagic trawl bycatch.

6.0 SUMMARY AND CONCLUSIONS

This analysis addresses the use of non-pelagic trawl gear in Federal waters of Cook Inlet in the GOA north of a line from Cape Douglas to Point Adam. This area is currently managed as part of the Central Regulatory area in the GOA. Historically, Cook Inlet supported significant fisheries for king and Tanner crab and currently supports limited fisheries for Pacific cod. King and Tanner crab resources in the Cook Inlet portion of the GOA remain depressed. King crab fisheries have remained closed since 1984. Commercial Tanner crab fisheries have remained closed since 1994. In the absence of Federal management of crab stocks in the GOA prior to August 1, 1996, the State has jurisdiction for managing all crab stocks in the GOA EEZ.

To protect and promote rebuilding of king and Tanner crab resources, the Alaska Board of Fisheries prohibited the use of non-pelagic trawl in state waters of Cook Inlet. However, a significant portion of critical habitat for these crab resources occurs in Federal waters of Cook Inlet. Although little fishing effort has occurred with non-pelagic trawl gear, previous efforts to prohibit non-pelagic trawling in this habitat have largely been reactive. Greater long-term, proactive protection is needed for this habitat to promote rebuilding of these resources.

The status quo alternative was not recommended by the State of Alaska as it would allow crab stocks to continue to be vulnerable to bycatch mortality by non-pelagic trawling in Federal waters of Cook Inlet.

Alternative 2, the preferred alternative, would prohibit the use of non-pelagic trawl gear in Federal waters of Cook Inlet. The Alaska Board of Fisheries has prohibited the use of non-pelagic trawl gear in state waters of Cook Inlet. The proposed gear ban in Federal waters would provide long-term protection to depressed king and Tanner crab resources in Cook Inlet and would provide concurrent management approaches with ADF&G. Because little fishing with non-pelagic trawl gear has occurred in this area, this will not significantly impact existing fisheries. Adoption of Alternative 2 would implement consistent gear restrictions in this area to optimize protection and rebuilding of crab resources.

Alternative 3 would defer management of groundfish in Federal waters of Cook Inlet north of a line from Cape Douglas to Cape Elizabeth to the State of Alaska. It would expand upon the management authority proposed under Alternative 2, by authorizing ADF&G and Board of Fisheries to manage all groundfish stocks within Federal waters of Cook Inlet. This area currently supports fisheries for Pacific cod.

Alternative 4 would withdraw Cook Inlet from the GOA FMP. The State of Alaska would assume management authority of groundfish in the absence of Federal management, as constrained by Section 306(a)(3) of the Magnuson-Stevens Act. The primary groundfish fishery in this area is currently Pacific cod. The Alaska Board of Fisheries has prohibited the use of non-pelagic trawl gear in Cook Inlet state waters. Because little fishing with non-pelagic trawl gear has occurred in this area, this alternative will not significantly impact existing fisheries. Alternative 4 would clarify fishing opportunities by establishing a single management agency for groundfish in Cook Inlet, while also optimizing protection and rebuilding of crab resources.

Alternative 5 would require observer coverage for vessels fishing for groundfish when operating within the proposed gear ban area. Because groundfish fishing in this area is managed by the GOA FMP, crab bycatch in groundfish fisheries is monitored by the NMFS Observer Program. Observers are required on all vessels > 125 ft with 30% coverage of vessels 60-124 ft; observers are not required on vessels < 60 ft. Bycatch in scallop fisheries is monitored by the state observer program; 100% observer coverage is required on vessels in most areas. However, in Cook Inlet, ADF&G biologists observe a portion of the scallop vessels fishing efforts. T hus, observer coverage requirements already exist for groundfish fishing in this area and adoption

of this alternative would have negligible effect toward affording greater protection to king and Tanner crab stocks.

Alternative 6 would establish time and area closures. However, king and Tanner crab resources exhibit pronounced seasonal migrations in this area and it would be difficult to establish time and area closures that would mesh with variability in the groundfish fishing seasons while effectively protecting king and Tanner crab resources.

Alternative 7 would place groundfish fisheries in the proposed gear ban area under restrictions of an ADF&G Commissioner's Permit. A Commissioner's Permit is currently required for commercial scallop vessels operating in this area. However, inseason management of the commercial scallop fisheries has been delegated to the State of Alaska. In contrast, groundfish fishing in Federal waters of Cook Inlet is regulated under the GOA FMP. To establish management authority to occur under a Commissioner's Permit would require a transfer of management authority similar to that considered for Alternatives 3 and 4.

7.0 LITERATURE CITED

Anderson, P.J. and J.F. Piatt. 1999. Community reorganization in the Gulf of Alaska following ocean climate regime shift. Marine Ecology Progress Series 189: 117-123.

Anderson, P.J., J.E. Blackburn, and B.A. Johnson. 1997*a*. Declines of forage species in the Gulf of Alaska, 1972-1995, as an indicator of a regime shift. Pp: 531-544, In: Forage Fishes in Marine Ecosystems. Alaska Sea Grant College Program Report 97-01. University of Alaska, Fairbanks.

Anderson, P.J., J.E. Blackburn, W.R. Bechtol, and J.F. Piatt. 1997b. Synthesis and analysis of Gulf of Alaska small-mesh trawl data, 1953 to 1996, and Gulf of Alaska forage fish icthyoplankton analysis, 1972 to 1996. Appendix L in: Duffy [ed], Exxon Valdex oil spill restoration project annual report, APEX Project Alaska Predator Ecosystem Experiment in Prince William Sound and the Gulf of Alaska; Restoration project 96163L A-P, annual report.

Armstrong, D.A., T.C. Wainwright, G.C. Jensen, P.A. Dinnel, and H.B. Anderson. 1993. TaKing refuge from bycatch issues: red king crab (Paralithodes camtschaticus) and trawl fisheries in the eastern Bering Sea. Canadian Journal of Fisheries and Aquatic Science 50:1993-2000.

Auster, P.J. and R.W. Langton. 1999. The effects of fishing on fish habitat. P150-187 *in* L.R. Benaka, ed. Fish habitat: essential fish habitat and rehabilitation. Ma. Fish. Soc. Symp. 22, Bethesda, MD.Auster, P. J. and R. W. Langton. 1999. The effects of fishing on fish habitat. In: L. Benaka (ed), Fish habitat: Essential Fish Habitat and Rehabilitation. American Fisheries Society. Bethesda, MD.

Auster, P.J., R.J. Malatesta, R.W. Langton, L.Watling, P.C. Valentine, C.L.S. Donaldson, E.W. Langton, A.N. Shepard, and I.G. Barr. 1996. The impacts of mobile fishing gear on sea-floor habitats in the Gulf of Maine (Northwest Atlantic): Implications for conservation of fish populations. Reviews in Fisheries Science 4(2): 185-202.

Bechtol, W.R. 2001. A bottom survey for crabs and groundfish in Southern, Kamishak Bay, and Barren Islands Districts of the Cook Inlet Management Area, 19-23 July and 16-23 August 1999. Alaska Department of Fish and Game, Comm. Fish. Mgt. and Development, Regional Information Report 2A01-05, Anchorage, AK.

_____. 1998. A bottom trawl survey for crabs in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area, 20-23 June and 17-20 August 1996. Alaska Department of Fish and Game, Comm. Fish. Mgt. and Development, Regional Information Report 2A98-04, Anchorage, AK.

_____. 1997. Changes in forage fish populations in Kachemak Bay, Alaska, 1976-1995. pp: 441-455, In: Forage Fishes in Marine Ecosystems. Alaska Sea Grant College Program Report 97-01. University of Alaska, Fairbanks.

_____.1995. The Pacific cod fishery in Cook Inlet: report to the Alaska Board of Fisheries. ADF&G, Comm. Fish. Mgt. and Development, Regional Information Report 2A95-35. 20 p. ADF&G, 333 Raspberry Rd., Anchorage, AK 99518.

_____. *under review*. Assessment of weathervane scallops at Kamishak Bay, Alaska, 1996. Alaska Department of Fish and Game, Comm. Fish. Div, Regional Information Report, Anchorage, AK.

_____ and C.E. Trowbridge 1999. Tanner and king crabs in the Cook Inlet Management Area: stock status and harvest strategies. Alaska Department of Fish and Game, Comm. Fish. Div., Regional Information Report 2A99-15, Anchorage, AK.

Bergman, M.J.N. and M. Hup. 1992. Direct effects of beam-trawling on macrofauna in a sandy sediment in the southern North Sea. ICES Journal of Marine Science 49:5-11.

Blackburn J., and D. Schmidt. 1988. Injury and apparent mortality rates from incidental trawl catches of halibut, king crab, and Tanner crab in the Kodiak area, 1977-81. Alaska Department of Fish and Game, Comm. Fish. Mgt. and Development, Regional Information Report 4K88-21, Kodiak, AK.

Brylinsky, M., J. Gibson, and D.C. Gordon Jr. 1994. Impacts of flounder trawls on the intertidal habitat and community of the Minas Basin, Bay of Fundy. Canadian Journal of Fisheries and Aquatic Sciences 51: 650-661.

Caddy, J.F. 1973. Underwater observations on tracks of dredges and trawls and some effects of dredging on a scallop ground. Journal of the Fisheries Research Board of Canada 30: 173-180.

Churchill, J.H. 1989. The effect of commercial trawling on sediment resuspension and transport over the Middle Atlantic Bight continental shelf. Continental Shelf Research, 9(9): 841-864.

Davis, Allen S. 1981. King and Tanner crab studies – Cook Inlet. Commercial Fisheries Research and Development Act, Project No. 5-44-R-1, Technical Report for period July 1, 1979 to June 30, 1980. Alaska Department of Fish and Game, Juneau, AK.

de Groot, S.J. 1984. The impact of trawling on benthic fauna of the North Sea. Ocean Manage. 9:177-190.

Donaldson, W.E. 1990. Determination of experimentally induced non-observable mortality on red king crab. Alaska Department of Fish and Game Regional Information Report 4K90-13.

Drew, S. C., and R.E. Larsen. 1994. Worldwide Trawl and Dredge Study. Marine Data Systems, Plymouth, MA, USA.

Eleftheriou, A., and M.R. Robertson. 1992. The effects of experimental scallop dredging on the fauna and physical environment of a shallow sandy community. Netherlands Journal of Sea Research 30: 289-299.

Estes, J. A., M. T. Tinker, T. M. Williams, and D. F. Doa. 1998. Killer whale predation on sea otters linking oceanic and nearshore ecosystems. Sci. 282: 473-476.

Fukuhara, F.M., and D. Worlund. 1973. Incidence of halibut and Tanner crab in catches by the eastern Bering Sea mothership trawl fishery and independent trawlers. NOAA/NMFS Report to the International North Pacific Fisheries Commission.

Gibbs, P.J., A.J. Collins, and L.C. Collett. 1980. Effect of otter prawn trawling on the macrobenthos of a sandy substratum in a New South Wales estuary. Aust. J. Freshwater Res., 31, 1-6.

Graham, M. 1955. Effect of trawling on animals of the sea bed. Pap. Mar. Biolg. Oceanogr. Deep Sea Res. Suppl. 3:1-6.

Griffin, K., G. Kruse, K. Lind, and L.-L. Low, and D. Witherell. 1997. Stock Assessment and Fishery Evaluation Report for the scallop fisheries off Alaska. NPFMC, 605 W. Fourth Avenue, Suite 306, Anchorage, AK 99501.

Hampton, M.A., P.R. Carlson, H.J. Lee and R.A. Feely. 1986. Geomorphology, sediment, and sedimentary processes. In. D.W. Hood and S.T. Zimmerman (eds), The Gulf of Alaska: Physical Environment and Biological Resources. United States Department of Commerce, NOAA and Department of the Interior, MMS, 93-143.

Hayes, M.L. 1973. Survival of Tanner crab (Chionoecetes bairdi) after capture in trawls and subsequent handling and storage aboard fishing boats. NOAA/NMFS report to the International North Pacific Fisheries Commission.

Hilborn, R. and C. J. Walters. 1992. Quantitative fisheries stock assessment: choice, dynamics and uncertainty. Chapman and Hall, New York, NY. 570 pp.

Hill, B.J. and T.J. Wassenberg. 1990. Fate of discards from prawn trawlers in Torres Strait. Australian Journal of Marine and Freshwater Research 41: 53-64.

Hollowed, A. B., N. Bax, R. J. Beamish, J. Collie, M. Fogarty, P. A. Livingston, J. Pope, and J. C. Rice. 2000. Are multispecies models an improvement on single-species models for measuring fishing impacts on marine ecosystems. ICES J. Mar. Sci. 57: in press.

Hutchings, P. 1990. Review of the effects of trawling on macrobenthic epifaunal communities. Australian Journal of Marine and Freshwater Research 41: 111-120.

International Council for the Exploration of the Sea. 1988. Report of the Study Group on the Effects of Bottom Trawling. In CM 1988/B International Council for the Exploration of the Sea.

Jennings, S. and M. J. Kaiser. 1998. The effects of fishing on Marine Ecosystems. Advances in Marine Biology 34:201-352.

Jones, J.B. 1992. Environmental impact of trawling on the seabed: a review. New Zealand Journal of Marine and Freshwater Research. 26: 59-67.

Kaiser, M.J. and B.E. Spencer. 1996a. Fish scavenging behavioral response of scavengers to beam-trawl disturbance. In. S.P.R. Greenstreet and M.L. Tasker, Aquatic Predators and their Prey, Blackwell Scientific Publications, Oxford.

_____. 1996b. The effects of beam-trawl disturbance on infaunal communities in different habitats. Journal of Animal Ecology. 65: 348-358.

_____. 1994. Fish scavenging behavior in recently trawled areas. Marine Ecology Progress Series, 112:41-49.

Kenchington, E.L. and M.J. Lundy. 1991. Bay of Fundy stock assessment. CAFSAC Research Document 91/26, 28 p.

Ketchen, K.S. 1947. An investigation into the destruction of ground by otter trawling gear. Prog. Rept. Fish. Res. Bd. Can. 73:55-56.

Kimker, A. 1996. Cook Inlet Area: annual shellfish management report, 1995-96. ADF&G, Comm. Fish. Mgt. and Development, Regional Information Report 2A96-30. Alaska Department of Fish and Game, Anchorage, AK.

_____. 1991*a*. A bottom trawl survey of crabs and groundfish in the Southern, Kamishak, and Barren Islands Districts of the Cook Inlet Management Area, July 6-17, 1990. Alaska Department of Fish and Game, Comm. Fish. Div., Regional Information Report 2H90-13, Anchorage, AK.

_____. 1991*b*. Cook Inlet king and Tanner crab index of abundance survey, June 11-29, 1990. Alaska Department of Fish and Game, Comm. Fish. Div., Regional Information Report 2H90-17, Anchorage, AK.

_____, L. Hammarstrom, and R. Gustafson. 1985. Cook Inlet Area, annual shellfish management report, 1984-1985. Alaska Department of Fish and Game, Comm. Fish. Div., Regional Information Report, Anchorage, AK.

Krost, P., M. Bernhard, F. Werner, and W. Hukriede. 1990. Otter trawl tracks in Kiel Bay (Western Baltic) mapped by side-scan sonar. Meereforschung 32: 344-353.

Kruse, G.H. 1993. Biological perspectives on crab management in Alaska. pp: 355-384 in: G. Kruse, D.M. Eggers, R.J. Marasco, C. Pautzke, and T.J. Quinn [eds]. Proceedings of the International Symposium on Management Strategies for Exploited Fish Populations. Alaska Sea Grant College, Report No. 93-02, University of Alaska, Fairbanks.

Livingston, P. A. and J. Jurado-Molina. 2000. A multispecies virtual population analysis of the eastern Bering Sea. ICES J. Mar. Sci. 57:264-269.

Livingston, P. A., L-L Low, and R. J. Murasco. 1999. Eastern Bering Sea ecosystem trends. Pp140-162. In Sherman, K. and Q. Targe (Eds.), Large marine ecosystems of the Pacific rim: assessment, sustainability and management. Blackwell Science, Malden, Mass. 465 pp.

MacIntosh, R.A., B.G. Stevens, and J.A. Haaga. 1995. Effects of handling and discarding on mortality of Tanner crabs, Chionoecetes bairdi. Proceedings of the International Symposium on Biology, Management, and Economics of Crabs from High Latitude Habitats. Alaska Sea Grant College Program Report.

Mayer, L.M., D.F. Schick, R.H. Findlay, and D.L. Rice. 1991. Effects of commercial dragging on sedimentary organic matter. Marine Environmental Research 31:249-261.

McAllister, D. 1991. Questions about the impact of trawling. Sea Wind 5(2):28-33.

McLoughlin, R.J., P.C. Young, R.B. Martin, and J. Parslow. 1991. The Australian scallop dredge: estimates of catching efficiency and associated indirect fishing mortality. Fisheries Research 11: 1-24.

McConnaughey, R. A., K. L. Mier and C. B. Dew. 1999. An examination of chronic trawling effects on soft-bottom benthos of the eastern Bering Sea. ICES J. Mar. Sci. (in press).

Messieh, S.N., T.W. Rowell, D.L. Peer, and P.J. Cranford. 1991. The effects of trawling, dredging and ocean dumping on the eastern Canadian continental shelf seabed. Continental Shelf Research, 11:1237-1263.

Meyer, S.C. 1996. Recreational halibut fishery statistics for southcentral Alaska (Area 3A), 1994: a report to the International Pacific Halibut Commission. Alaska Department of Fish and Game, Sport Fish Special Pub. 96-1, Anchorage, AK.

Naidu, A.S. 1988. Marine surficial sediments. Section 1.4 in C.N. Ehler, D.J. Basta, T.F. LaPointe, and G.C. Ray (editors). Bering, Chukchi, and Beaufort Seas coastal and ocean zones strategic assessment: Data atlas. U.S. Dep. Commer., NOAA, Nat'l Ocean Ser., Off. Oceanog. And Mar. Assess., Ocean Assess. Div., Str. Assess. Br. Silver Spring, MD.

NMFS (National Marine Fisheries Service). 2001. Draft Programmatic Supplemental Environmental Impact Statement For Alaska Groundfish Fisheries Implemented Under the Authority of The Fishery Management Plans for the Groundfish Fishery of the Gulf of Alaska and the Groundfish of the Bering Sea and Aleutian Islands Area. January 2001. National Marine Fisheries Service, P.O. Box 21668, Juneau, Alaska 99802.

_____. 2000a. Ecosystem Considerations for 2001. Pat Livingston. (Ed.). November 2000. Alaska Fisheries Science Center, 7600 Sand Point Way NE, Seattle WA, 98115.

_____. 2000b. ESA Section 7 Consultation Biological Opinion and Incidental Take Statement. Activities Considered: Authorization of Bering Sea/Aleutian Islands groundfish fisheries based on the Fishery Management Plan for the Bering Sea/Aleutian Islands Groundfish and Authorization of the Gulf of Alaska groundfish fisheries based on the Fishery Management Plan for Groundfish of the Gulf of Alaska. November 30, 2000. NMFS Alaska Region, P. O. Box 21668, Juneau, Alaska 99802. Also available at http://www.nmfs.noaa.gov/steller/fmp_sec07-NOV30_2000_FINAL.pdf.

_____. 2000d. Draft Environmental Assessment: Interactions Between the Pacific Cod Fisheries in the Bering Sea, Aleutian Islands, and the Gulf of Alaska and Steller Sea Lions. August 23, 2000. NMFS Alaska Region, P. O. Box 21668, Juneau, Alaska 99802.

_____. 1998a. Final Supplemental Environmental Impact Statement: Groundfish Total Allowable Catch Specifications and Prohibited Species Catch Limits Under the Authority of the Fishery Management Plans for the Groundfish Fishery of the Bering Sea and Aleutian Islands Area and Groundfish of the Gulf of Alaska. December 1998. National Marine Fisheries Service, P.O. Box 21668, Juneau, Alaska 99802. 692 pp + Appendices and Comments.

_____. 1998b. Environmental Assessment and Regulatory Impact Review for Amendment 36 to the Fishery Management Plan for the Groundfish Fishery of the Bering Sea and Aleutian Islands area and Amendment 39 to the Fishery Management Plan for Groundfish of the Gulf of Alaska to Create and Manage a Forage Fish Species Category. January 1998. National Marine Fisheries Service, Alaska Region, P.O. Box 21668, Juneau, AK 99802.

National Research Council. 1996. The Bering Sea Ecosystem. National Academy Press, Washington, D.C.

Natural Resources Consultants. 1988. Minimization of king and Tanner crab bycatch in trawl fisheries directed at demersal groundfish in the Bering Sea.

NPFMC (North Pacific Fishery Management Council). 1995. Fishery Management Plan for the Bering Sea/Aleutian Islands Groundfish. North Pacific Fishery Management Council, 605 W 4th Avenue, Suite 306, Anchorage, AK 99501.

_____. 1994. Fishery Management Plan for the Gulf of Alaska Groundfish Fishery. North Pacific Fishery Management Council, 605 W 4th Avenue, Suite 306, Anchorage, AK 99501 National Research Council. 1996. *The Bering Sea Ecosystem.* (National Academy Press, Washington, DC) 307 p.

_____. 1993. Environmental Assessment and Regulatory Impact of Amendment 37 to the Fishery Management Plans for the Groundfish Fishery of the Bering Sea and Aleutian Islands. NPFMC, 605 W. 4th Av., Suite 306, Anchorage, AK 99501.

_____. 1992. Final Supplemental Environmental Impact Statement and Regulatory Impact Review/Initial Regulatory Flexibility Analysis of Proposed Inshore/Offshore Allocation Alternatives (Amendment 18/23) to the Fishery Management Plans for the Groundfish Fishery of the Bering Sea and Aleutian Islands and the Gulf of Alaska. NPFMC, 605 W. 4th Av., Suite 306, Anchorage, AK 99501.

_____.1998. EA/RIR/FRA for Amendment 57 to the BSAI FMP to ban trawling with bottom gear in directed pollock fisheries of the BSAI and reduce PSC bycatch. NPFMC, 605 W. 4th Av., Suite 306, Anchorage, AK 99501.

Orensanz, J.M. 1986. Size, environment, and density: the regulation of a scallop stock and its management implications. Pages 195-227 *in* G.S. Jamieson and N. Bourne, editors. North Pacific workshop on stock assessment and management of invertebrates. Canadian Special Publication of Fisheries and Aquatic Sciences 92.

Owen, D. 1988. A bottom trawl survey on the west side of Kodiak Island: Viekoda Bay, Spiridon Bay, and Kupreanof Strait. Alaska Department of Fish and Game Regional Information Report 4K88-28, Kodiak.

Pitcher, K. W. 1981. Food of the Steller sea lion, Eumetopias jubatus, in the Gulf of Alaska. Fish Bull. 79:467-472.

Queirolo, L., L. W. Fritz, P. A. Livingston, M.R. Loefflad, D. Colpo, and Y. L. DeReynier. 1995. "Bycatch utilization and discards in the commercial groundfish fisheries of the Gulf of Alaska, eastern Bering Sea, and Aleutian Islands." in *NOAA Technical Memorandum NMFS-AFSC-58.* U. S. Department of Commerce, NOAA. 148 pp.

Reise, K. 1982. Long-term changes in the macrobenthic invertebrate fauna of the Wadden Sea: are polychaetes about to take over? Netherlands Journal of Sea Research 16:29-36.

Riemann, B. and Hoffmann E. 1991. Ecological consequences of dredging and bottom trawling in the Limfjord, Denmark. Marine Ecology Progress Series 69(1-2): 171-178.

Rose, C. S. 1999. Injury rates of red king crab, Paralithodes camtschaticu, passaging under bottom trawl footropes. Marine Fisheries Review 61(2):72-76.

Rugh, D.J., Shelden, K.E.W., Mahoney, B.A., Litzky, L.K. 2001. Aerial Surveys of Beluga in Cook Inlet Alaska, June 2000. National Marine Fisheries Service. Unpublished Memorandum.

Rumohr, H., and P. Krost. 1991. Experimental evidence of damage to benthos by bottom trawling with special reference to *Arctica islandica.* Meeresforschung 33: 340-345.

Russell, D. 1997. As trawling goes into high gear, undersea coastal habitat is being razed to the ground. Amicus Journal. Winter:21-25.

Schwinghamer, P., J.Y. Guigne, and W.C. Siu. 1996. Quantifying the impact of trawling on benthic habitat structure using high resolution acoustics and chaos theory. Canadian Journal of Fisheries and Aquatic Sciences 53: 288-296.

Shepard, A.N. and P.J. Auster. 1991. Incidental (non-capture) damage to scallops caused by dragging on rock and sand substrates. In: Shumway, S.E. and Sandifer (eds.) An International Compendium of Scallop Biology and Culture. World Aquaculture Workshops, #1, The World Aquaculture Society, Louisiana State University, Baton Rouge. pp. 219-230.

Shirley, S.M., and G.H. Kruse. 1995. Development of the fishery for weathervane scallops, *Patinopecten caurinus* (Gould, 1850) in Alaska. Journal of Shellfish Research 14:71-78.

Somerton, D.A. and R.S. Otto. 1999. Net efficiency of a survey trawl for snow crab, *Chionoecets opilio*, and Tanner crab, *C. bairid.* Fish. Bull. 97:617-625.

Stevens, B.G. 1990. Survival of king and Tanner crabs captured by commercial sole trawls. Fishery Bulletin 88:731-744.

_____, J.A. Haaga, R.A. MacIntosh, R.S. Otto, and L.Rugolo. 2000. Report to Industry on the 2000 Eastern Bering Sea crab survey. NOAA/NMFS-AFSC Processed Report 2000-07.

Thrush, S. F., J. E. Hewitt, V. J. Cummings, P. K. Dayton, M. Cryer, S. J. Turner, G. A. Funnell, R. G. Budd, C. J. Milburn, and M. R. Wilkinson. 1998. Disturbance of the marine benthic habitat by commercial fishing: impacts at the scale of the fishery. Ecological Applications, 8(3), pp. 866-879.

van Dolah, R.F., P.H. Wendt and N. Nicholson. 1987. Effects of a research trawl on a hard bottom assemblage of sponges and corals. Fisheries Research 5: 39-54.

Vincent-Lang, D. 1998. Area management report for North Gulf of Alaska recreational groundfish fisheries, 1997. Alaska Department of Fish and Game, Sport Fish Div., Fishery Management Rep. 98-2. 58 p. Anchorage, AK.

8.0 LIST OF INDIVIDUALS CONSULTED

Gulf of Alaska Groundfish Plan Team
605 W. Fourth Avenue, Suite 306
Anchorage, Alaska 99501

Darrell Brannan
NPFMC
Anchorage, Alaska

9.0 LIST OF PREPARERS

William Bechtol
Alaska Dept. of Fish and Game
Homer, Alaska

Linda Brannian
Alaska Dept. of Fish and Game
Anchorage, Alaska

Jane DiCosimo
North Pacific Fishery Management Council
605 W. Fourth Avenue, Suite 306
Anchorage, Alaska 99501

Glenn Merrill
National Marine Fisheries Service
Juneau, Alaska

Contributions by:

Kaja Brix
Andy Smoker
David Ackley
NMFS Fisheries Management
Juneau, Alaska

David Witherell
North Pacific Fishery Management Council
605 W. Fourth Avenue, Suite 306
Anchorage, Alaska 99501

APPENDIX I

ADF&G PROPOSAL

FISHERY MANAGEMENT PLAN AMENDMENT PROPOSAL
North Pacific Fishery Management Council

Please check applicable box(es):
IFQ Program
Bycatch Reduction X
BSAI Groundfish FMP
GOA Groundfish FMP X
BSAI Crab FMP
Scallop FMP

Name of Proposer: Alaska Department of Fish and Game
Date: 6/30/98

Address: 333 Raspberry Rd
Anchorage, AK 99518

Telephone: (907) 267-2118

Fishery Management Plan: GOA Groundfish

Brief Statement of Proposal:

To protect depressed stocks of king and Tanner crab in Cook Inlet by minimizing bycatch, this proposal would extend an existing state waters ban on non-pelagic trawling to include the Federal waters of Cook Inlet. For fishery management purposes, the state of Alaska has defined the Cook Inlet District as waters within Cook Inlet north of a line from Cape Douglas to Pt. Adam. The Cook Inlet District encompasses an area of Federal groundfish management (EEZ), defined as waters located more than three nautical miles from shore. Cook Inlet king and Tanner crab use and seasonally move between state and Federal waters in Cook Inlet.

Objectives of Proposal: (What is the problem?)

King and Tanner crab stocks in Cook Inlet are in need of protection. The king crab population has not recovered from its dramatic decline in the 1980s; the last commercial fishery closed in 1984. The Tanner crab population has also declined and commercial crab fishing has not opened since 1991 in the proposed gear ban area. ADF&G trawl surveys assess crabs in this area. Although non-pelagic trawl vessels have not regularly targeted this area since the 1980s, management efforts to protect the depleted crab resources have become reactive to anticipated non-pelagic trawl effort. This proposal would be proactive in providing protection and prohibiting use of this gear type in an area of critical habitat for king and Tanner crab stocks.

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

The State of Alaska lacks jurisdiction over the groundfish fisheries in the EEZ within Cook Inlet and therefore cannot extend a state water prohibition of non-pelagic trawling throughout the inlet. In 1991 NMFS did implement a 90-day non-renewable closure to trawling in Cook Inlet. Although trawling does not presently occur in this area, interest continues to be expressed in flatfish species. The existing Federal regulatory structure does not provide for timely closure of non-pelagic trawling in this important crab habitat. The proposed Council action is needed as a proactive approach to protect depleted king and Tanner crab resources of Cook Inlet.

Foreseeable Impacts of Proposal: (Who wins, who loses?)

Fishers speculating on a potential use of non-pelagic trawl gear in Cook Inlet will be precluded from that fishing opportunity. King and Tanner crab harvesters will benefit from both the rebuilding of crab populations in Federal waters of Cook Inlet and the consistent management of all Cook Inlet waters.

Are there Alternative Solutions? If so, what are they and why do you consider your proposal the best way of solving the problem?

1. Do nothing and crab stocks would continue to be vulnerable to bycatch mortality by non-pelagic trawling in Federal waters of Cook Inlet. This alternative was found not to be acceptable.

2. Delegate management of groundfish fisheries in Federal waters (EEZ) of Cook Inlet to the State of Alaska such that state regulations would be in effect for all of Cook Inlet. ADF&G manages state waters of Cook Inlet concurrent with Federal fisheries unless the Alaska Board of Fisheries has adopted conservative management plans or gear restrictions to provide for greater resource protection in nearshore waters. Therefore, traditional groundfish fisheries in Cook Inlet will continue but a flatfish trawl fishery will not develop. This alternative would clarify fishing opportunities by establishing a single management agency for groundfish in Cook Inlet. This alternative was not selected because it is more complex and might not be resolved in a timely fashion, a criteria necessary to a proactive approach to conservation of king and Tanner crab resources in the EEZ of Cook Inlet.

Supportive Data & Other Information: What data are available and where can they be found?

The following supportive data and other information are available:
1. The state of Alaska historical fish ticket database can be queried to obtain the recorded catch by non-pelagic trawl gear in Federal waters of Cook Inlet.
2. The NMFS observer database can be queried to obtain information on the crab bycatch in ongoing Federal fisheries in Cook Inlet.
3. ADF&G survey and tagging data document the historic distribution and migration of king and Tanner crab in Cook Inlet.
4. Historic ADF&G and NMFS management actions as well as regulations adopted by the Alaska Board of Fisheries can identify management of non-pelagic trawl gear in Cook Inlet.

Signature: