Endangered Species Act
Section 7 Consultation - Biological Assessment

Agency:	National Marine Fisheries Service
Activities Considered:	Crab fisheries authorized under the Fishery Management Plan for Bering Sea/ Aleutian Islands King and Tanner Crabs
Date:	March 29, 2002
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1.0 Purpose and Consultation History

This biological assessment evaluates the potential effects of the Fishery Management Plan for Bering Sea/Aleutian Islands (BSAI) King and Tanner Crabs (FMP) and its effects on endangered and threatened seabird species and their critical habitat. Since the conclusion of the prior consultation in 1998, the U.S. Fish and Wildlife Service (FWS) designated critical habitat for two listed species of seabirds. This assessment is based on the best information available to NMFS.

Section 7(a)(2) of the Endangered Species Act, 16 U.S.C. § 1531 et seq., requires that each Federal agency shall insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may adversely affect a listed species, that agency (i.e., the "action" agency) is required to consult with either the National Marine Fisheries Service (NMFS) or the FWS, depending upon the listed species that may be affected. For the actions described in this document, the action agency is NMFS's Sustainable Fisheries Division. Due to the listed species involved, the consulting agency is the FWS.

The purpose of this assessment is to determine if crab fisheries, as conducted under the FMP, adversely affect listed species or their critical habitat. Section 7 regulations allow a consultation to encompass a number of similar actions within a given geographic area or a segment of a comprehensive plan (50 CFR 402.14). Consistent with this regulatory provision and for purposes of efficiency, all actions under the FMP are being summarized in a single biological assessment. This assessment will be used for determining whether formal consultation or a conference is necessary.

Commercial harvest for the following species is regulated under the FMP: red king crab (*Paralithodes camtschatica*), blue king crab (*P. platypus*), golden king crab (*Lithodes aequispina*), scarlet king crab (*L. couesi*), Tanner crab (*Chionoecetes bairdi*), snow crab (*C. opilio*), grooved Tanner crab (*C. tanneri*), and triangle Tanner crab (*C. angulatus*). The management area is defined as those waters of the U.S. EEZ that lie south of Point Hope, east of the U.S.-U.S.S.R. convention line of 1867, and extend south of the Aleutian Islands for 200 miles between the convention line and Scotch Cap Light. Crabs are taken in pots and catch is processed both onshore and at sea. Crab fishing seasons occur in the fall, winter, and early spring, depending on the fishery.

The following listed species of seabirds occur in the BSAI: the endangered short-tailed albatross (*Phoebastria albatrus*), and the threatened spectacled eider (*Somateria fischeri*) and Steller's eider (*Polysticta stelleri*). Critical habitat has been designated for the Steller's eider and the spectacled eider.

In 1994, NMFS prepared a Biological Assessment for the FMP, which analyzed the potential takes of listed seabirds in these fisheries and conducted an informal Section 7 consultation with FWS (NMFS 1994a). According to that Biological Assessment, the crab fisheries are not known to result in any significant impact to the short-tailed albatross, Steller's eider, or spectacled eider. Nor do the fisheries compete for any crab species commonly preyed upon by marine birds. With one exception, NMFS determined that the BSAI crab fisheries would have no adverse impact on any listed seabird nor would they delay in any way the recovery

of those species. NMFS determined the Bering Sea snow crab fishery may adversely impact the spectacled eider.

The snow crab fishery was the only crab fishery under the FMP that NMFS and FWS determined through informal consultation had the potential to impact spectacled eiders due to vessel strikes. As a result of this finding, formal section 7 consultations were conducted to determine the effects of the snow crab fishery on the spectacled eider. FWS issued a biological opinion for the FMP in October, 1994 (FWS 1994b).

Between 1994 and 1998, NMFS consulted with the FWS annually on the FMP, which includes the winter snow crab fishery, pursuant to section 7 of the ESA (FWS 1996a, 1996b). These section 7 consultations on this fishery were formal because it was perceived that the snow crab fishery was likely to adversely affect spectacled eiders. This perception of a likelihood of an adverse effect resulted from: (1) a lack of knowledge concerning the at-sea range of spectacled eiders and; (2) a lack of knowledge of the species of eiders that have struck, or were likely to strike crab vessels.

Beginning in 1995, observers aboard crab vessels received training in bird identification and reporting. Observers were instructed to report all sightings of spectacled eiders (and all listed seabirds) to the FWS either directly or through the Alaska Department of Fish and Game (ADF&G). To date, no take of spectacled eiders (or any other listed seabird) associated with this fishery has been reported. Crab fishery observers continue to be placed aboard the catcher-processor vessels and catcher vessels participating in this fishery, and crab fishery observers continue to receive training and refresher training in seabird identification and seabird reporting procedures.

Since the initial determination in 1994 that this fishery was likely to adversely affect spectacled eiders, the FWS has learned much about the at-sea distribution of spectacled eiders. Satellite telemetry data and 3 years of late winter aerial surveys indicate that spectacled eiders spend the winter in exposed waters between St. Matthew and St. Lawrence Islands, or in open leads slightly west of the inter-island area. Snow crab fishing has been largely concentrated around the Bering Sea continental shelf, which in the Bering Sea, runs from Unimak Island to the northwest, passing well south and west of St. Matthew Island. Crab fishing occurs along the shelf because this is where the greatest snow crab concentrations occur, and not because of fishing ground access restrictions imposed by sea-ice conditions between January and March. Thus, even if sea ice conditions were to make it possible for crab vessels to venture into the waters used by wintering spectacled eiders, they would not likely do so, due both to the time and expense of vessels traveling that far and the relatively fewer number of harvestable snow crabs present there.

Therefore, in 1998, FWS concurred with NMFS's determination that the snow crab fishery is not likely to adversely affect threatened or endangered species under the jurisdiction of the FWS, including the threatened spectacled eider (FWS 1998).

NMFS and FWS also conducted an informal consultation on the Norton Sound summer king crab fishery. NMFS determined that the Norton Sound summer king crab fishery will not likely adversely affect the spectacled eider, other listed species or candidate species (NMFS 1994b). The FWS concurred with this finding (FWS 1994a).

In February 2001, FWS designated critical habitat for Steller's eider and spectacled eider, thus requiring reinitiating the section 7 consultation under 50 CFR §402.16. The FWS published the final determination of critical habitat for the spectacled eider and Alaska-breeding population of the Steller's eider in the Federal Register (66 FR 9146, 66 FR 8850).

2.0 The Crab Fisheries: Description of Actions

The purpose of this section is to describe the actions that are the subject of this assessment and thereby provide the background information needed to analyze their potential effects on listed species. The action to be analyzed is the management and prosecution of the crab fisheries authorized under the FMP. The FMP authorizes fisheries for 22 stocks of crab. Fisheries are not conducted for all of these stocks due to low abundance estimates and scientific uncertainty. A total of 395 vessels are licensed to fish for crab, although this number greatly exceeds the number of vessels that actually participate in any given crab fishery. Crab is harvested using pot gear. Crab fisheries occur during established seasons in the Fall, Winter, and Spring, depending on the fishery.

This section provides summary descriptive information on the major target species of the fisheries under the FMP, including important life history traits, trophic interactions, fisheries, stock assessments, and recommended catch levels. This section also identifies the conservative management measures ADF&G and NMFS have enacted since the conclusion of the previous section 7 consultation in 1998. These species and the respective fisheries are described in greater detail in the annual Crab Stock Assessment and Fishery Evaluation (SAFE) reports compiled by the North Pacific Fishery Management Council's (Council) Crab Plan Team, and reviewed at various levels throughout the Council process. By reference, those SAFE reports are incorporated in this document in their entirety (NPFMC 2001). All fishery information contained in this section can be found in the 2001 SAFE report, unless otherwise noted.

2.1 Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs

The crab stocks in the Bering Sea are managed by the State of Alaska (State) through the Federal FMP. Under the FMP, management measures fall into three categories: (1) those that are fixed in the FMP under Council control, (2) those that are frameworked so that the State can change management measures following criteria outlined in the FMP, and (3) those measures under discretion of the State. Significant State actions and actions to ensure the FMP complies with the Magnuson-Stevens Act are either reviewed by or developed in conjunction with the Council's Crab Plan Team.

Management measures implemented for the BSAI king and Tanner crab fisheries, as defined by the federal crab FMP, by category.

Category 1 (Fixed in FMP)	Category 2 (Frameworked in FMP)	Category 3 (Discretion of State)
* Legal Gear	* Minimum Size Limits	* Reporting Requirements
* Permit Requirements	* Guideline Harvest Levels	* Gear Placement and Removal
* Federal Observer Requirements	* Inseason Adjustments	* Gear Storage
* Limited Access	* Districts, Subdistricts and Sections	* Gear Modifications
* Norton Sound Superexclusive Registration Area	* Fishing Seasons	* Vessel Tank Inspections
	* Sex Restrictions	* State Observer Requirements
	* Closed Waters	* Bycatch Limits (in crab fisheries)
	* Pot Limits	* Other
	* Registration Areas	

The Council approved the FMP in 1989. The Council revised and updated the FMP in 1998 (NPFMC 1998). The revised version of the FMP incorporates: 6 FMP amendments; catch data and other scientific information from the past 10 years; and changes due to amendments to the Magnuson-Stevens Act and other laws, a Russian/US boundary agreement, and a Federal/State Action Plan. The revised FMP included Amendment 7 to specify criteria for identifying overfishing and when a crab stock is overfished.

Since the FMP was revised, NMFS has approved Amendment 8 to establish Essential Fish Habitat, Amendment 9 to extend the moratorium program, Amendment 10 to establish recency criteria for the crab license limitation program, Amendment 11 to implement a rebuilding plan for Tanner crab, Amendment 14 to implement a rebuilding plan for snow crab, and Amendment 15 to implement a rebuilding plan for St. Matthew blue king crab. Amendment 13, to implement American Fisheries Act sideboards, is currently under review by the Secretary of Commerce. The Council is developing Amendment 12 to establish habitat areas of particular concern. NMFS is developing implementing regulations for a capacity reduction program for the BSAI king and Tanner crab fisheries in response to a Congressional mandate.

2.1.1 Fishery Management

This section discusses crab management in general, fisheries for each species are discussed separately in following sections.

The status of each species is assessed annually based on the best scientific information available. The abundance of the major crab stocks is estimated annually from data collected during the NMFS annual Eastern Bering Sea trawl survey and published in the NMFS Annual Report to Industry (NMFS 2001). The crab stocks annually surveyed are: Bristol Bay red king crab, Pribilof Islands red king crab, Pribilof Islands blue king crab, St. Matthew blue king crab, eastern Bering Sea Tanner crab, and eastern Bering Sea snow crab. ADF&G derives the guideline harvest levels (GHL) from these annual abundance estimates following harvest strategies developed for each species. Once the fishery reaches its GHL, ADF&G closes the fishery by emergency order. For crab species not surveyed, ADF&G estimates abundance using pot surveys and fishery information.

The crab fisheries target only large male crabs. Each fishery has a minimum size limit for male crab. All crab fisheries use pot gear. In addition to minimum size and sex restrictions, the State has instituted numerous other regulations for the BSAI crab fisheries. The State requires vessels to register with the state by obtaining licenses and permits, and register for each fishery and each area. The State has established pot limits for most fisheries to limit effort in the crab fisheries.

State regulations also prescribe pot gear modifications to inhibit the bycatch of small crab, female crab, and other species of crab. Gear modifications include escape rings, tunnel size, and a requirement that crab pots be fitted with a degradable escape mechanism. Like other fisheries, pot fisheries incur some bycatch of incidental fish and crab. Bycatch in crab pot fisheries includes crabs, octopus, Pacific cod, halibut, and other flatfish (Tracy 1994). However, the vast majority of bycatch in the crab fisheries is females of target species, sublegal males of target species, and non-target crabs. All bycatch of non-legal crabs is discarded at sea. Since pot gear selectively harvests primarily legal sized crab, the crab fisheries do not remove significant amounts of other species from the ecosystem.

The State establishes fishing seasons following criteria in the FMP. The adjacent table outlines the BSAI crab fishing season start dates. Fishing seasons are established to achieve the biological conservation, economic and social, vessel safety, and gear conflict objectives of the FMP. Season opening dates are set to maximize meat yield, minimize handling of softshell crabs, and meet market demands. Seasons are closed once the fishery achieves the GHL.

Bering Sea Aleutian Islands King and Tanner crab fishing seasons	
Snow crab	January 15
Golden king crab	August 15
St. Matthew/Pribilof Islands king crab	September 15
Bristol Bay red king crab	October 15
Tanner crab	October 15 / January 15
Norton Sound king crab	July 1

Community Development Quota Program

The Magnuson-Stevens Act mandated that the Council and NMFS establish a Community Development Quota (CDQ) program under which a percentage of the total allowable catch of Bering Sea and Aleutian Island crab fisheries is allocated to the program (§305.104-297(1)(A)). The crab CDQ groups receive 7.5% of the GHL for the following Bering Sea fisheries: Bristol Bay red king crab, Pribilof red and blue king crab, Norton Sound red king crab, snow crab, and Tanner crab. Crab CDQ fisheries began in 1998. The Council and NMFS defer management authority of the BSAI king and Tanner crab CDQ fisheries to the State, with federal oversight. The FMP provides the State with the authority to establish CDQ fishing seasons, to allocate the crab CDQ reserve among CDQ groups, and to manage crab harvesting activity of the CDQ groups (§8.1.4.2 of the BS/AI crab FMP). ADF&G divides the 7.5% reserve among the six CDQ groups. The State sets the CDQ seasons after the regular commercial fishery. Sixty-five communities along the Bering Sea are eligible for the CDQ program. These villages aligned into six CDQ groups. A maximum of 23 vessels participate in any given CDQ crab fishery.

License Limitation Program

Fishing under the crab license limitation programs (LLP) began in January 2000. The goal of the LLP is to limit access to the crab fisheries to the historic participants or to people who purchase licenses from historic participants. Owners of vessels must have a valid LLP license in order to participate in the BSAI crab fisheries. The license specifies which crab fisheries a vessel may participate in and the maximum length overall allowed for the vessel. NMFS issued licenses based on fishing history during a general qualifying period, with area/species endorsements based on additional qualifying periods for each species by area. Licenses also limit the size of the vessel deployed under the license. Interim licenses were also issued to any applicant that had a valid moratorium qualification for crab in 1999. Interim licenses are temporary and the total numbers of licenses will decrease as interim licenses either are denied or licenses granted. Interim licenses are issued if any part of a person's claim is contested. Also, the number of licenses may change as a result of a small number of new licenses issued from late filed claims.

Crab Licenses Limitation Program: number of licenses issued as of January 2002

Number of crab licenses: 395 (113 of which are interim licenses)

Number of crab licenses with specific endorsements, by crab fishery:

Endorsement	Licenses	Interim	Total
Aleutian Is. golden king	23	18	41
Aleutian Is. red king	22	21	43
EBS Tanner	213	106	319
Bristol Bay red king	207	101	308
Norton Sound king	58	5	63
Pribilof Is. king	95	48	143
St. Matthew Is. blue king	135	67	202

Notes: A crab license may contain more than one endorsement. EBS Tanner endorsements included both snow crab (*C. opilio*) and Tanner crab (*C. bairdi*).

The LLP was recently modified by Amendment 10, which change the basic eligibility criteria for crab. Amendment 10 requires recent participation in the BSAI king and Tanner crab fisheries in order to qualify for a license under the crab LLP. The recent participation requirement applies to the general licenses only; if a vessel satisfies the recent participation criteria, the owner would receive the original license and all of the species/area endorsements for which it qualified under the original criteria. No new species/area endorsements could be earned during the recent qualification. The Secretary approved Amendment 10 and issued implementing regulations that resulted in a decrease in the total number of crab licenses.

American Fisheries Act Crab Sideboards

In 1998, Congress passed the American Fisheries Act (AFA) to establish a new allocation scheme for the BSAI pollock fishery. The AFA required harvest restrictions (commonly known as "sideboards") on the pollock fishermen who received exclusive harvesting privileges under the AFA to protect the interests of fishermen who are not directly benefitted by the AFA. Fourty-one AFA vessels are endorsed to fish in the BSAI crab fisheries, but these vessels are restricted to participation in the specific fishery for which they are endorsed. The sideboards for the AFA vessels to participate in the crab fisheries are as follows.

Under regulations implementing the AFA, an AFA vessel is ineligible to participate in any BSAI crab fishery unless that specific vessel participated in a specific crab fishery during certain qualifying years. AFA vessel permits could be endorsed for the Bristol Bay red king crab, snow crab, *C. bairdi* Tanner crab, St. Matthew blue king crab, Pribilof Islands king crab, Aleutian Islands red king crab, and Aleutian Islands golden king crab fisheries. To participate in a BSAI crab fishery, the operator of an AFA vessel would have to have a valid License Limitation Program (LLP) license for that crab fishery as well as an AFA vessel permit containing an endorsement for that crab fishery.

In addition to the historic participation requirements, there is a cap on the amount of Bristol Bay red king crab and *C. bairdi* Tanner crab that the AFA vessels can harvest. The Bristol Bay red king crab harvest cap is based on the aggregate 5-year (1991-1997, excluding 1994-1995) weighted average share. Under this cap, AFA vessels may harvest up to 10.81% of the regular commercial GHL, which equals 834,937 pounds for the 2000 fishery. In 2000, 26 AFA vessels participated in the Bristol Bay red king crab fishery. The amount of the harvest cap may change if the number of AFA vessels with Bristol Bay red king crab endorsements

changes. An aggregate harvest cap will be established for *C. bairdi* Tanner crab once the stock rebuilds. This harvest cap will be based on the aggregate historic catch of the endorsed *C. bairdi* Tanner crab vessels for 1995-1996. Management and implementation of these crab harvest cap sideboards is deferred to the State of Alaska.

Capacity Reduction Program

NMFS has developed a proposed rule to implement a capacity reduction program for the BSAI crab fisheries, excluding Norton Sound, pursuant to Section 144(d) of Public Law 106-554 (section 144). Section 144 mandates a specific capacity reduction program. The objective of the program is to permanently remove harvesting capacity from the BSAI crab fisheries by permanently reducing the number of license limitation program licenses issued pursuant to the FMP. The action is necessary because the BSAI crab fisheries are over capitalized. The program will: 1) prevent certain crab vessels from fishing again anywhere in the world; 2) revoke the crab LLP licenses NMFS issues based on the vessels' fishing history; 3) revoke any NMFS issued non-crab licenses that the vessels' owners still hold; and 4) revoke the vessels' fishing histories upon which NMFS based the licenses to be revoked. NMFS identified 247 vessels who will be eligible for the buyback based on criteria in section 144. The actual number of vessels that will be removed from the BSAI crab fisheries remains unknown. However, NMFS anticipates that this number would be between 30 and 90 vessels.

2.1.2 Observer Program

Observers are required on all vessels processing BSAI crab, which includes floater processors and catcher/processors, on 100% of the catcher vessels in specific crab fisheries, and on 10% of the catcher vessels in the remaining crab fisheries. ADF&G began the observer program for processing vessels in 1988 for BSAI king and Tanner crab fisheries. ADF&G expanded this program to include observer coverage for the processing vessels in the snow crab fishery in 1991. In 1994, ADF&G expanded the observer program to include requiring observers aboard all vessels (catcher vessels and processors) in permit fisheries targeting *C. tanneri*, *C. angulatus*, *L. couesi*, Bering Sea golden king crab, and Paralomis ssp. In 1995, ADF&G required observers aboard all vessels targeting red and golden king crabs in the Aleutian Islands. In 1998, ADF&G required 100% observer coverage on catcher vessels operating in the CDQ fisheries targeting red and blue king crab, snow crab, and Tanner crab (Pappas 1999). In 2000, the State expanded observer coverage to include 10% observer coverage of catcher vessels operating in the Bering Sea fisheries for snow crab, St. Matthew and Pribilof Islands king crab, Tanner crab, and Bristol Bay red king crab fisheries. In addition, ADF&G requires the AFA vessels have10% observer coverage in the Bristol Bay red king crab fishery and the Tanner crab fishery.

ADF&G does not place observers on catcher vessels in Norton Sound. In years when a floating processor operates in Norton Sound, it has 100% observer coverage. Norton Sound vessels are exempt from observer requirements because the vessels are small (all vessels are under 60 feet and the majority are less than or equal to 32 feet, and many do not have a wheel house).

Observers are responsible for collecting biological data and monitoring vessel compliance with regulations. Observers document and communicate their information with the observer program in three ways; 1)

observers complete radio report forms, which the observer files at sea daily or weekly, depending on the length of the fishery; 2) observers keep a logbook to record information while at sea; and 3) after the observer returns to port, the observer is debriefed. Observers report seabird interactions in all three ways. At the debriefings, observers are asked to report any strikes or sightings of listed seabirds. Further, observers are instructed to freeze and bring back any dead birds found on the boat (Larry Boyle, ADF&G, personal communication). If listed seabird encounters are reported in any of these ways, the observer is instructed to fill out the appropriate forms, which ADF&G submits to FWS (Schwenzfeier 2001, Morrison 2001). If no listed seabirds are encountered, no reports are filed with FWS.

Observers started receiving training in seabird identification and reporting in 1994, under a joint project between NMFS, FWS, and ADF&G. The focus of the project was on gathering information to determine the extent of spectacled eider strikes in the snow crab fishery, however, crab observers for all crab fisheries received the training. In the initial phase of the project, NMFS and FWS prepared a Seabird Observation Manual for the Bering Sea/Aleutian Islands Crab Fisheries (ADF&G, NMFS, FWS 1994/95). This manual details species identification, methods for recording data, and protocol for dealing with banded, injured, and dead birds. This information is still used by ADF&G, however, NMFS and FWS no longer produce the manual. Also, in 1995, FWS sent staff to Dutch Harbor to train observers in seabird identification techniques. FWS stopped this portion of the program when it determined it was unnecessary. NMFS and FWS stopped the joint project when the agencies determined that the snow crab fishery did not result in strikes of spectacled eiders, and thus the program was no longer necessary or required. (Larry Boyle, Rance Morrison, Mary Schwenzfeier, ADF&G, Andrew Grossman, NMFS, personal communication). Regardless, ADF&G remains committed to assure that observers report bird strikes and that all observed strikes of listed seabirds are reported to FWS (Schwenzfeier 2001, Morrison 2001, Larry Boyle, ADF&G, personal communication).

The ADF&G shellfish observers are trained at the North Pacific Fisheries Observer Training Center (OTC), which also trains the observers used by NMFS for the groundfish fisheries. At the OTC, observers are trained in seabird identification techniques by FWS staff. This is the same seabird training received by the observers used in the Federally managed groundfish fisheries. FWS staff that have administered this training include Vivian Mendenhall, Greg Balogh, and currently, Kathy Kuletz. Observers are instructed to document all seabird encounters, sightings, and strikes in their daily logbook in the seabird notes section. Observers are also instructed to keep dead birds to turn in to ADF&G, which would forward them on to FWS. The OTC also instructs observers to report seabird encounters during the debriefing with ADF&G shellfish observer program staff (Kyle Hogrefe, Paula Cullenberg, OTC, personal communication). The main difference between the training received by the groundfish observers and the shellfish observers is that the groundfish observers are supplied with a "species of interest encounter form" produced by NMFS, and the shellfish observers are not.

In conclusion, although the cooperative project between NMFS, FWS, and ADF&G was only implemented in 1994/5, NMFS believes that the observer training in seabird identification and reporting requirements through the OTC and ADF&G are sufficient to ensure that observed encounters are correctly identified and reported, first to ADF&G and then FWS. We believe that observers on crab vessels report, as instructed, seabird encounters to ADF&G and that the ADF&G shellfish observer program carries out its responsibilities to report observed strikes of listed seabirds to FWS. We do recommend two improvements to the current reporting system, 1) NMFS and FWS create a species of interest encounter form for the crab observers, and

2) FWS provide ADF&G with a report form to be faxed to FWS after each fishery summarizing the observer encounters or reporting that no encounters were observed during the fishery.

2.1.3 Overfishing Parameters

The FMP identifies the following overfishing definitions to provide objective and measurable criteria for identifying when the BSAI crab fisheries are overfished or overfishing is occurring, as required by the Magnuson-Stevens Act. The table above provides the minimum stock size threshold (MSST), maximum sustainable yield (MSY), optimum yield (OY), and MSY control rule estimates for the BSAI king and Tanner crab stocks. The Crab Plan Team will reevaluate these estimates every five years or when environmental conditions indicate a regime shift.

MSST, MSY, OY, and the MSY control rule estimates for BSAI king and Tanner crab stocks. Estimated values are in millions of pounds. (NA indicates that insufficient data exists at this time to estimate the value)

Stock	MSST	MSY	OY range	MSY control rule
Adak red king	NA	1.5	0 - 1.5	0.2
Bristol Bay red king	44.8	17.9	0 - 17.9	0.2
Dutch Harbor red king	NA	NA	NA	0.2
Pribilof Islands red king	3.3	1.3	0 - 1.3	0.2
Norton Sound red king	NA	0.5	0 - 0.5	0.2
Pribilof Islands blue king	6.6	2.6	0 - 2.6	0.2
St Matthew blue king	11.0	4.4	0 - 4.4	0.2
St Lawrence blue king	NA	0.1	0 - 0.1	0.2
Aleutian Is. golden king	NA	15.0	0 - 15.0	0.2
Pribilof Is. golden king	NA	0.3	0 - 0.3	0.2
St. Matthew golden king	NA	0.3	0 - 0.3	0.2
Aleutian Is. scarlet king	NA	NA	NA	0.2
EBS scarlet king	NA	NA	NA	0.2
TOTAL king crab		**43.9**	**0 - 43.9**	
E. Aleutian Is. Tanner	NA	0.7	0 - 0.7	0.3
EBS Tanner	94.8	56.9	0 - 56.9	0.3
W. Aleutian Is. Tanner	NA	0.4	0 - 0.4	0.3
TOTAL Tanner crab		**58.0**	**0 - 58.0**	
EBS snow	460.8	276.5	0 - 276.5	0.3
E. Aleutian Is. angulatus	NA	1.0	0 - 1.0	0.3
EBS angulatus	NA	0.3	0 - 0.3	0.3
E. Aleutian Is. tanneri	NA	1.8	0 - 1.8	0.3
EBS tanneri	NA	1.5	0 - 1.5	0.3
W. Aleutian Is. Tanneri	NA	0.2	0 - 0.2	0.3
TOTAL other Tanners		**4.8**	**0 - 4.8**	

Maximum sustainable yield (MSY) is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological and environmental conditions. MSY is estimated from

the best information available. Proxy stocks are used for BSAI crab stocks where insufficient scientific data exists to estimate biological reference points and stock dynamics are inadequately understood. MSY for crab species is computed on the basis of the estimated biomass of the mature portion of the male and female population or total mature biomass (MB) of a stock. A fraction of the *MB* is considered sustained yield (*SY*) for a given year and the average of the *SY*s over a suitable period of time is considered the MSY.

Overfishing and Overfished: The terms "overfishing" and "overfished" mean a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce MSY on a continuing basis. Overfishing is defined for king and Tanner crab stocks in the BSAI management area as any rate of fishing mortality in excess of the maximum fishing mortality threshold, F_{msy}, for a period of 1 year or more. Should the actual size of the stock in a given year fall below the minimum stock size threshold, the stock is considered overfished. If a stock or stock complex is considered overfished or if overfishing is occurring, the Secretary will notify the Council to take action to rebuild the stock or stock complex.

MSY control rule means a harvest strategy which, if implemented, would be expected to result in a long-term average catch approximating MSY. The MSY control rule for king and Tanner crabs is the mature biomass of a stock under prevailing environmental conditions, or proxy thereof, exploited at a fishing mortality rate equal to a conservative estimate of natural mortality. SY in a given year is the MSY rule applied to the current spawning biomass. Overfishing occurs if the SY is exceeded for more that one year.

MSY stock size is the average size of the stock, measured in terms of mature biomass of a stock under prevailing environmental conditions, or a proxy thereof. It is the stock size that would be achieved under the MSY control rule. It is also the minimum standard for a rebuilding target when remedial management action is required. For king and Tanner crab, the MSY stock size is the average mature biomass observed over the past 15 years, from 1983 to 1997.

Maximum fishing mortality threshold (MFMT) is defined by the MSY control rule, and is expressed as the fishing mortality rate. The MSY fishing mortality rate $F_{msy} = M$, is a conservative natural mortality value set equal to 0.20 for all species of king crab, and 0.30 for all *Chionoecetes* species. If the harvest rate is greater than the MFMT, then overfishing is occurring.

Minimum stock size threshold (MSST) is one half the MSY stock size, or 50% of the B_{msy}. The minimum stock size threshold is expressed in terms of mature biomass of a stock under prevailing environmental conditions, or a proxy thereof. When the mature biomass falls below this level, the stock is considered overfished.

2.2 Tanner Crab

The FMP covers the Bering Sea and Aleutian Islands stocks of Tanner crab (*C. bairdi*). On March 3, 1999, NMFS declared the Bering Sea stock of Tanner crab overfished because the stock size is below the minimum stock size threshold of 94.8 million pounds. The criteria for identifying when the fishery is overfished is explained in the Environmental Assessment for Amendment 7 (NPFMC 1999). As required by the Magnuson-Stevens Act, the Council developed and submitted a rebuilding plan to NMFS within one year from March 3, 1999. Amendment 11 is a rebuilding plan for the Bering Sea Tanner crab. NMFS published

in the *Federal Register* a notice of approval for Amendment 11 on June 20, 2000 (65 FR 38216). Fishing for both the Bering Sea and Aleutian Islands stocks of Tanner crab is closed.

Abundance

In 2001, the estimated abundance of mature biomass was 67.7 million pounds, an increase from the 2000 estimate of 59.1 million pounds. The estimated abundance of Bering Sea Tanner crab was 64.2 million pounds of mature biomass in 1997, 36.9 million pounds in 1998, 70.1 million pounds in 1999. The stock will be surveyed again in the summer of 2002.

Distribution and life history of Stock

Tanner crab are distributed on the continental shelf of the North Pacific Ocean and Bering Sea from Kamchatka to Oregon. Off Alaska, Tanner crab are concentrated around the Pribilof Islands and in Bristol Bay, and are found in lower abundance in the Gulf of Alaska. The Tanner crab stock of the Aleutian Islands is very small, and populations are found in only a few large bays and inlets

Tanner crab females are known to form high-density mating aggregations, or pods, consisting of hundreds of crabs per mound. These mounds may provide protection from predators and also attract males for mating. Mating need not occur every year, as some female Tanner crabs can retain viable sperm in spermathecae up to 2 years or more. Females have clutches of 50,000 to 400,000 eggs. Little information is known about the biology of two other closely related species of Tanner crab found in the Bering Sea and Aleutian Islands area.

In 1999, legal male Bering Sea Tanner crab were sparsely distributed in Bristol Bay and the Pribilof Islands, with the regions of highest abundance in central and southeast Bristol Bay. Distribution of the stock by year is detailed in the NMFS Reports to Industry on the Eastern Bering Sea Crab Surveys. Over the past 10 years, the regions of highest abundance have shifted around Bristol Bay, concentrating in years of low abundance in central, southeast, outer Bristol Bay. In years of high abundance, large males were widely distributed in Bristol Bay and continental slope areas with regions of relatively high abundance in mid-Bristol Bay or outer Bristol Bay and the Pribilof Islands.

Size at 50% maturity, as measured by carapace width, is 110 mm for males and 90 mm for females in the Bering Sea. The corresponding age of maturity for male Tanner crab is about 6 years. Growth during the next molt increases the size of males to about 120-140 mm. Mature male Tanner crabs may skip a year of molting as they attain maturity. Natural mortality of adult Tanner crab is estimated at about 25% per year (M=0.3).

Fishery

Approximately 319 vessels are qualified to fish EBS Tanner crab under the Federal crab license limitation program. The actual number of vessels that participate in the fishery in any give year is much less that the number of licenses issued. In the five years before the fishery closed in 1996, an average of 233 vessels participated in the fishery each year, ranging between 296 and 183 vessels. State regulations limit the number of pots a vessel can use - 250 pots for vessels >125 feet and 200 pots for vessels <125 feet.

The fishery targets male crabs larger than 5.5 inches (138 mm) carapace width. Bycatch in the Tanner crab fishery is sub-legal males, females, and other species of crab. ADF&G developed gear modification requirements to reduce the bycatch. In the Bering Sea, a 3" maximum tunnel height opening for Tanner crab pots is required to inhibit the bycatch of red king crab. Escape rings were adopted by the Board in 1996 to reduce capture and handling mortality of non-target crab, including sub-legal and female Tanner crab. Other gear restrictions include a requirement that crab pots be fitted with a degradable escape mechanism to prevent ghost fishing if the pot is lost.

Aleutian Islands Tanner Crab: Annual harvests in the Aleutian Islands area were 200,000 to 800,000 pounds through 1985. Thereafter, stocks declined, and landings were reduced. ADF&G trawl surveys indicated a dramatic decline from 1991 to 1994. The fishery has been closed since 1995 due to declining stock size estimated from surveys and poor fishery performance.

Catch and Harvest Rate

The GHL is derived from the annual abundance estimates pre-season. ADF&G closed the fishery in 1997 due to low female abundance and it has remained closed because of low stock levels. Stock abundance has fluctuated dramatically since 1980. The estimated spawning biomass of this stock is low and the stock is considered "overfished" under the Magnuson-Stevens Act. Over the past few decades, this stock appears to have experienced a 10-14 year recruitment cycle. The NMFS survey revealed high abundance of juvenile Tanner crabs in 1999, suggesting that an apparent strong recruitment event may soon promote stock rebuilding (NMFS 2000). Once the stock exceeds the fishery threshold for two consecutive years, fishing will be resumed, perhaps as soon as January 2003.

The rebuilding plan implements a conservative harvest strategy. ADF&G developed the stairstep harvest strategy for Tanner crabs, which was adopted by the Board in March 1999 and detailed in the ADF&G regional information report "Overview of Population Dynamics and Recommended Harvest Strategy for Tanner Crabs in the Eastern Bering Sea" (Zheng and Kruse 1999a). The new harvest strategy follows the precautionary approach to fishery management by incorporating a fishery threshold and stair-step harvest rates (Restripo et al. 1998). According to Zheng and Kruse (1999b), "These features reduce mature harvest rates to protect reproductive potential during periods of low abundance when risks of overfishing or falling below the overfished level reference points are high because of uncertainties in abundance estimates and population dynamics (i.e., depensation vs. compensation)."

The harvest strategy contains five components:

- Threshold: 21.0 million pounds of females biomass >79 mm CW. The fishery will be closed when the stock is below threshold.
- Mature Harvest Rates: 20% of molting mature males when biomass of females >79 mm CW is ≥45.0 million pounds and 10% of molting mature males when the biomass of females >79 mm CW is ≥21.0 million pounds and <45.0 million pounds. Molting mature males are 100% of newshell and 15% of oldshell males >112 mm CW.
- Legal Harvest Rate Cap: a 50% cap of exploitable legal males, which are 100% of newshell and 32% of oldshell legal males.

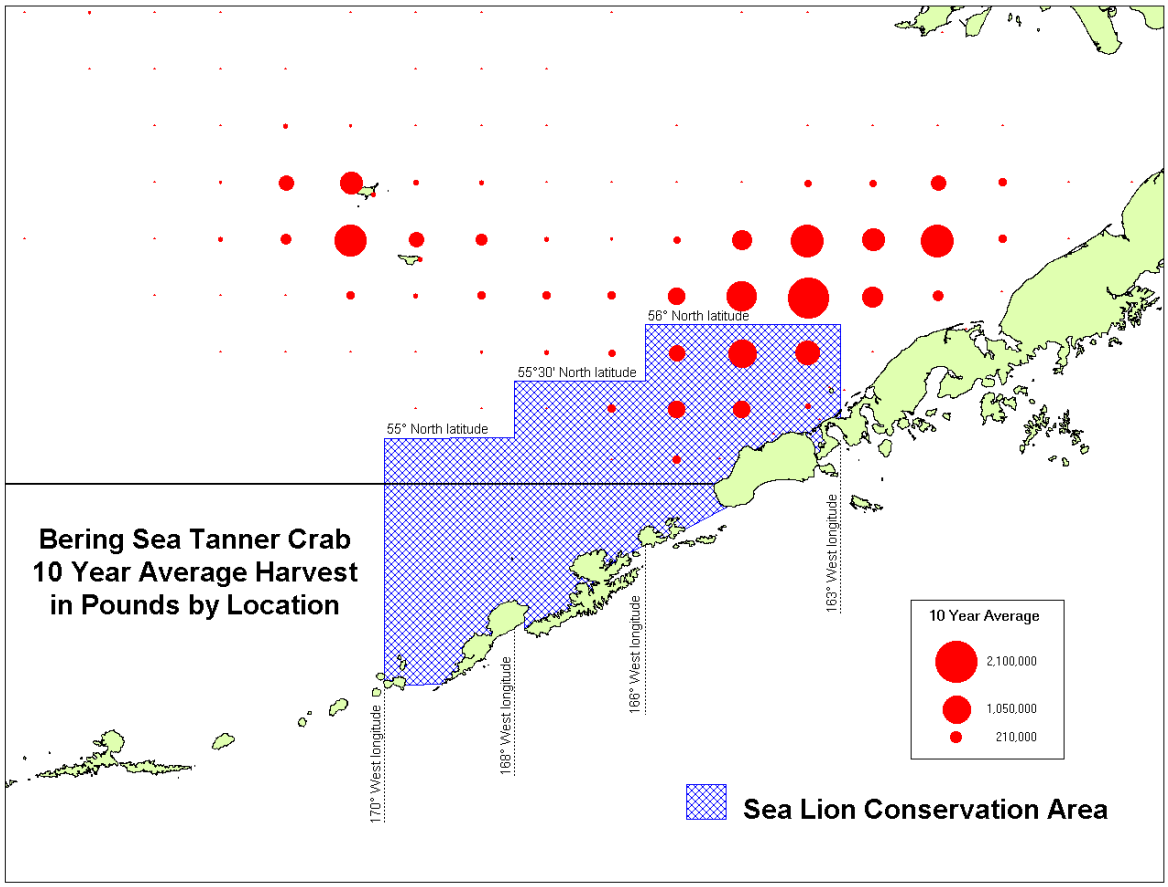
- GHLs for Bristol Bay and Pribilof Islands: GHLs are determined separately for crabs east of 168°W (Bristol Bay) and west of 168°W (Pribilof Islands) in the Eastern Subdistrict of the Bering Sea.
- A Precautionary Measure: when the stock is reopened to fishing after having been closed to all commercial fishing in the preceding season due to the depressed stock condition, the GHL in the season will be reduced to one-half of the value as computed in the above GHL determination.

Spatial and Temporal Distribution of Fishery

Map 1 shows the Tanner crab 10 year average harvest by State statistical area. This harvest area represents the distribution of large male crabs.

In March 2000, the Board adopted a seasonal management strategy for Bering Sea Tanner crab to create concurrent fisheries, reduce bycatch, and eliminate the possibility that the stock is hit twice. This strategy applies in years when the Tanner crab fishery is open (see harvest strategy above). East of 163°W long, Tanner crab is retained in the directed Bristol Bay red king crab (BBRKC) fishery until the fishery is closed or the Bristol Bay Tanner crab GHL is reached. Ten days after the closure of the BBRKC fishery, the area from 166°W long to 163°W long will be open to directed Tanner crab fishing gear until the Bristol Bay Tanner crab GHL is obtained or March 31. West of 166°W long, Tanner crab is retained in the directed snow crab fishery until the Pribilof Tanner crab GHL is obtained, the snow crab fishery closes, or March 31. In years when no GHL is established for the BBRKC stock or the snow crab stock, the Tanner crab fishery is restricted to the area west of 166° W long.

The Tanner crab season used to open November 1 and last until the GHL is harvested. Now, with the concurrent fisheries, in years when the fishery is open, Tanner crab will be harvested at three different times. East of 163°W long, the BBRKC and Tanner crab fishery will open October 15. Ten days after the closed of the BBRKC fishery, the area from 166°W long to 163°W long will be open to directed Tanner crab fishing gear until the Bristol Bay Tanner crab GHL is obtained or March 31. West of 166°W long, the snow crab and Tanner crab fishery will open January 15.



Map 1: Bering Sea Tanner Crab 10 Year Average Harvest in Pounds by Location (courtesy of ADF&G).

2.3 Snow crab

The FMP covers the fishery for the Bering Sea stock of snow crab (*C. opilio*). On September 24, 1999, NMFS declared the Bering Sea stock of snow crab crab overfished because the stock size is below the minimum stock size threshold of 460.8 million pounds. The Magnuson-Stevens Act requires the fishery management council to develop a rebuilding plan within one year from September 24, 1999. The criteria for identifying when the fishery is overfished is explained in the Environmental Assessment for Amendment 7 (NPFMC 1999). Amendment 14 is a rebuilding plan for Bering Sea snow crab. NMFS published in the *Federal Register* a notice of approval for Amendment 14 on January 4, 2001 (66 FR 742).

Abundance

The 2001 estimated abundance of snow crab is 571 million pounds, which is above the MSST. The estimated abundance of snow crab spawning biomass was 720.9 million pounds of mature biomass in 1998, 283.5 million pounds in 1999, and 472.7 million pounds in 2000. The stock will be surveyed again in the summer of 2002. Snow crab abundance is cyclical. Insufficient evidence exists to determine the cause of the current snow crab decline. However, the evidence highly suggests the causes are natural. The crab fisheries only harvest the large male crabs, however, the 1999 NMFS trawl survey showed dramatic declines in all segments of population of these crabs. Furthermore, it was suggested that the reproductive capacity of these populations is related to the abundance or biomass of mature females, which are not affected to any great extent by the crab and groundfish fisheries. Recruitment for crab species appears to be linked to environmental factors rather than biomass, so trends in recruitment are difficult to predict.

A period of low recruitment is thought to be the reason for the decline in snow crab. These events are quite possibly triggered by corresponding events in the physical environment, such as the regime shift and warm Bering Sea conditions in 1997 and 1998. Temperature is likely to be important to snow crab population dynamics. Warmer temperatures hasten growth, but they likely have a negative effect on reproduction as faster growing males have fewer mating opportunities prior to attaining harvestable size. On the other hand, crab larvae feed primarily on copepod nauplii, which we think are favored by warmer water in the Bering Sea. Crab megalopa settle out of the water column at very specific temperatures and depths. Therefore, survival may be favored by cooler, warmer or intermediate temperatures depending on what life stage one considers. In 1997 and 1998, water temperatures were at record high levels, triggering unusual plankton blooms and contributing to salmon run failures. Beyond temperature, we suspect advection of larvae by ocean currents to the nursery areas and cannibalism within the limited nursery areas from older crab cohorts are contributors to recruitment success or failures.

Distribution and life history of Stock

Snow crab are distributed on the continental shelf of the Bering Sea, Chukchi Sea, and in the western Atlantic as far south as Maine. Snow crab are not present in the Gulf of Alaska. In the Bering Sea, snow crab are common at depths between 50 and 200 meters. The eastern Bering Sea population within U.S. waters is managed as a single stock, however, the distribution of the population extends into Russian waters to an unknown degree. Off Alaska, snow crab are distributed in the survey area from 55°N to 62°N deeper than

50 meters. Evidence exists that an unknown portion of female and juvenile snow crab are distributed north and west of the survey area.

In 1999, large male Bering Sea snow crab were highly concentrated north and east of the Pribilof Islands and south and west of St. Matthew Island. Distribution of the stock by year is detailed in the NMFS Reports to Industry on the Eastern Bering Sea Crab Surveys. In years of high abundance, large males also concentrate northwest of St. Matthew Island and between St. Matthew Island and the Pribilof Islands.

While 50% of the females are mature at 50 mm, the mean size of mature females varies from year to year over a range of 63 mm to 72 mm carapace width. Females cease growing with a terminal molt upon reaching maturity, and rarely exceed 80 mm carapace width. Males similarly cease growing upon reaching a terminal molt when they acquire the large claw characteristic of maturity. The median size of maturity for males is 65 mm carapace width (approximately 4 years old). Males larger than 60 mm grow at about 20 mm per molt, but individuals vary widely in this regard. Female snow crabs are able to store spermatophores in seminal vesicles and fertilize subsequent egg clutches without mating. At least two clutches can be fertilized from stored spermatophores, but the frequency of this occurring in nature is not known. Snow crab feed on an extensive variety of benthic organisms including bivalves, brittle stars, crustaceans (including other snow crabs), polychaetes and other worms, gastropods, and fish. In turn, they are consumed by a wide variety of predators including bearded seals, Pacific cod, halibut and other flatfish, eel pouts, sculpins, and skates.

Fishery

The fishery targets male crabs larger than 4 inches carapace width, although the legal size is 3.1 inches (78 mm). State regulations limit the number of pots a vessel can use - 250 pots for vessels >125 feet and 200 pots for vessels <125 feet. Approximately 319 vessels are qualified to fish EBS Tanner crabs (which includes *C. opilio*) under the crab license limitation program. The number of licenses issued is greater than the number of vessels that actually participate in the fishery in any given year. From 1997 to 2001, an average of 227 vessels participated each year, ranging between 207 to 241 vessels.

In the Bering Sea, a 3" maximum tunnel height opening for Tanner crab pots is required to inhibit the bycatch of red king crab. Escape rings were adopted by the Board in 1996 to reduce capture and handling mortality of non-target crab. Other gear restrictions include a requirement that crab pots be fitted with a degradable escape mechanism. In March 2000, the Board adopted gear requirements to reduce bycatch of sublegal males and females in the directed snow crab fishery.

Catch and Harvest Rate

The GHL is derived from the annual abundance estimates pre-season. Prior to 1999, the status quo harvest rate was 58% of male crabs over 4 inches carapace width. Collapse of the Bering Sea snow crab stocks, as evidenced by severe lack of recruitment into the population, precipitated a reduction in the harvest rate to 22% for the 2000 snow crab fishery. Owing to the low spawning biomass (SB) of snow crab, NMFS classified the snow crab stock as “overfished” in 1999 and a rebuilding plan was developed. The prospects for a 2003 fishery are uncertain. The rebuilding plan implements a conservative harvest strategy. ADF&G

developed the stairstep rebuilding harvest strategy for snow crabs, which was adopted by the Board in March 2002.

The harvest strategy contains five components:

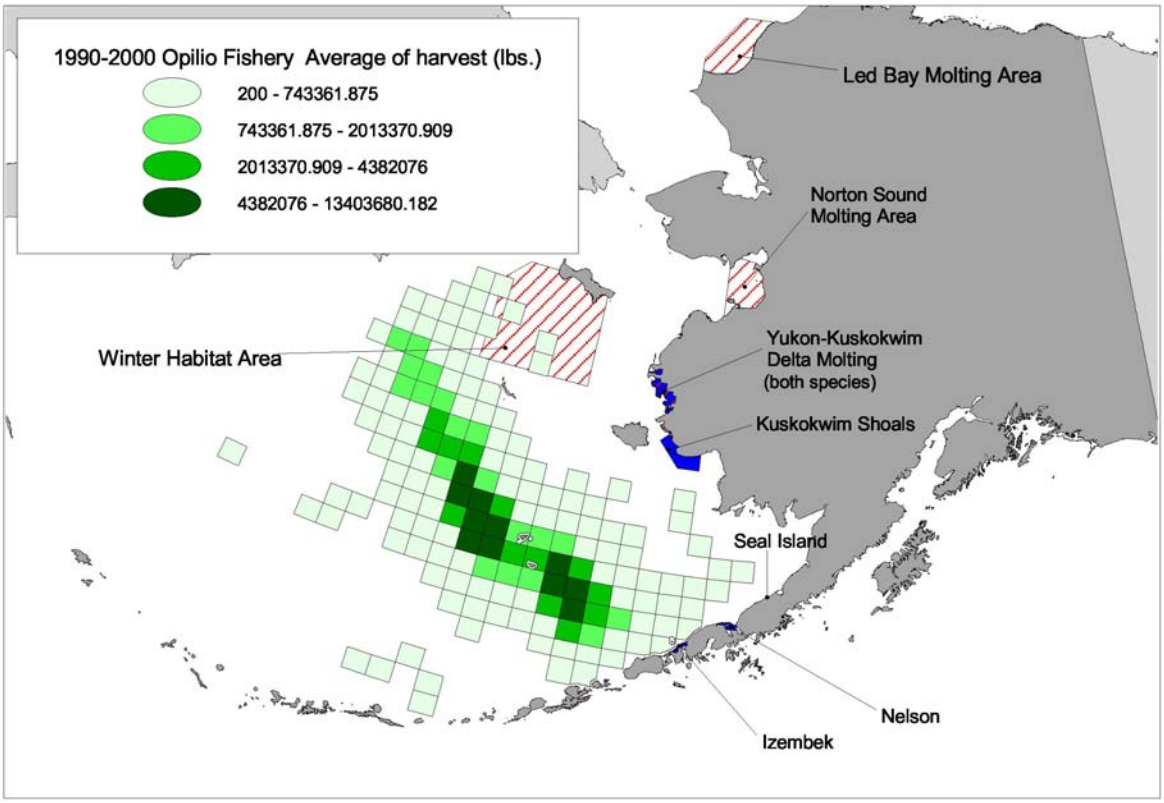
- Exploitation rate applied to estimated biomass of mature males.
- Threshold: the fishery will be closed when biomass is 25% of Bmsy
- Mature Harvest Rate: 58% of exploitable legal males - defined as 100% on new-shell males plus a percentage of old-shell males > 4 inches
- Legal Harvest Rate Cap: a linear function from one third of Fmay when total mature biomass is 25% of Bmsy to 75% of Fmsy when mature biomass is at Bmsy
- Minimum GHL 15 million pounds

Temporal and Spatial Distribution of Fishery

The snow crab fishery occurs in State Statistical area J, which includes all waters of the Bering Sea north of the latitude of Cape Sarichef at 54°36'N. lat. and east of the U.S. Russian Convention line of 1867. The snow crab fisheries occur in the Bering Sea in the U.S. EEZ from 56˚ N to 65˚N, concentrating south and southwest St. Matthew Island, between the 100 and 200 meter contour lines. Map 2 shows the 10 year average harvest of snow crab by location.

The fishing season opens January 15 and lasts until the GHL is harvested. In the past, the season has lasted through the middle of March. Due to the new conservative harvest strategy and low stock abundance, snow crab seasons are currently approximately one to two weeks long and will remain this long in the foreseeable future. The 2000 snow crab fishery opened for one week on April 1. ADF&G delayed the season due to extensive sea ice covering a portion of the fishing grounds. The 2001 snow crab fishery officially opened on January 15 but the catcher vessels in the fleet were on strike for 17 days, protesting the ex-vessel price offerings. The vessels remained docked until February 3, 2001, when they accepted an offer of $1.55 per pound for their catch. The fishery was closed on February 14, 2001, when the quota was reached.

The CDQ fishery, which harvests 7.5% of the GHL, lasts longer that the regular commercial fishery because each group is allocated a set amount of harvest. Since 1998, the snow crab CDQ fishery lasted approximately two months, April and May. Between 13 and 23 vessels participated in these fisheries.



Map 2: 1990-2000 Snow Crab (*C. opilio*) Fishery Average Harvest in Pounds and Steller's Eider and Spectacled Eider Critical Habitat (courtesy of NPFMC). Red stripes indicate spectacled eider critical habitat and blue indicates Steller's eider critical habitat.

2.4 Blue King Crab

The FMP covers two stocks of blue king crab (*Paralithodes platypus*), the St. Matthew stock and the Pribilof Island stock.

On September 24, 1999, NMFS declared the St. Matthew blue king crab overfished because the stock size is below the minimum stock size threshold of 11 million pounds. The Magnuson-Stevens Act requires the fishery management council to develop a rebuilding plan within one year from September 24, 1999. The criteria for identifying when the fishery is overfished is explained in the Environmental Assessment for Amendment 7 (NPFMC 1999). Amendment 15 is a rebuilding plan for St. Matthew blue king crab. NMFS published in the *Federal Register* a notice of approval for Amendment 15 on December 6, 2000 (65 FR 76175).

ADF&G closed the St. Matthews blue king crab fishery in 1999. It will remain closed until the stock size is above 2.9 million pounds of mature males. ADF&G also closed the fishery for the Pribilof Islands blue king crab in 1999, due to low and declining legal male abundance and poor fishery performance, although the stock is not classified as overfished.

Abundance

The 2001 estimated abundance of St. Matthew blue king crab was 9 million pounds, an increase from the 2000 estimate of 5.2 million pounds. The estimated spawning biomass of St. Matthew blue king crab was 24.1 million pounds in 1998, 4.8 million pounds in 1999. The estimated spawning biomass of Pribilof Islands blue king crab was 10.7 million pounds in 1998, 9.2 million pounds in 1999, 7.4 million pounds in 2000, and 7 million pounds in 2001. Survey estimates for St. Matthew Island blue king crabs indicated dramatic declines of both male and female crabs in all size categories in 1999 and 2000. Estimates of juvenile and female biomass are usually very imprecise due to the preference of such crab for rocky habitat which is not sampled well by trawls. Recruitment to the St. Matthew and Pribilof Islands blue king crab stocks has been declining for several years, but the sharp decline in all sizes suggest large survey measurement errors, a large increase in natural mortality, or some combination of both. The causes of the decline in recruitment into these blue king crab stocks in unknown, however, its presumed to be environmental. The stocks will be surveyed again in the summer of 2002.

Distribution and life history of Stocks

Blue king crab has a discontinuous distribution throughout their range (Hokkaido, Japan to Southeast Alaska). In the Bering Sea, discrete populations exist around St. Matthew Island, the Pribilof Islands, and St. Lawrence Island. Smaller populations have been found around Nunivak and King Island. Female and juvenile blue king crab are found in shallow water rocky habitat. Male blue king crab are found in waters around 70 meters. Juvenile blue king crab require cobble habitat with shell hash. These habitat areas have been found at 40-60 m around the Pribilof Islands. Unlike red king crab, juvenile blue king crab do not form pods, instead relying on cryptic coloration for protection from predators. Adult male blue king crab occur at an average depth of 70 m and an average temperature of 0.6oC.

Large male blue king crab were concentrated southeast of St. Matthew Island and northwest of the Pribilof Islands. Distribution of the stock by year is detailed in the annual NMFS Reports to Industry on the Eastern Bering Sea Crab Surveys.

Blue king crab molt multiple times as juveniles. Skip molting occurs with increasing probability for those males larger than 100 mm carapace length. Average molt increment for adult males is 14 mm. In the Pribilof area, 50% maturity of females is attained at 96 mm (about 3.8 inches) carapace length, which occurs at about 5 years of age. Blue king crab in the St. Matthew area mature at smaller sizes (50% maturity at 81 mm CL for females) and do not get as large overall. Blue king crab have a biennial ovarian cycle and a 14 month embryonic period.

Fishery

Minimum legal size for the Pribilof blue king crab is 6.5" carapace width. State regulations limit the number of pots a vessel can use - 50 pots for vessels >125 feet and 40 pots for vessels <125 feet. Approximately 143 vessels are qualified to fish in the Pribilof Island red and blue king crab concurrent fishery under the crab license limitation program. In the five years before the fishery closed in 1999, an average of 81 vessels participated in each year, ranging between 53 and 127 vessels.

Minimum legal size for St. Matthew Island blue king crab is 5.5" carapace width. State regulations limit the number of pots a vessel can use - 75 pots for vessels >125 feet and 60 pots for vessels <125 feet. Approximately 202 vessels are qualified to fish in the St. Matthew Islands red and blue king crab concurrent fishery under the crab license limitation program. In the five years before the fishery closed in 1999, an average of 109 vessels participated in each year, ranging between 87 and 131 vessels.

Other gear restrictions include a requirement that crab pots be fitted with a degradable escape mechanism. For the Pribilof district, king crab pots must have mesh webbing to reduce bycatch of small crab. For the St. Matthew district, to reduce bycatch of sub-legal and female crab, crab pots are required to have four 5.8 inch rings within one mesh of the bottom of the pot on each of 2 sides of the pot or one half of one side panel fit with 8 inch stretch mesh.

Catch and Harvest Rate

The GHL is derived from the annual abundance estimates and catch-survey analysis. The State generally sets pre-season GHLs for blue king crab based on a mature male harvest rate of 20%.

The rebuilding plan implements a more conservative harvest strategy for St. Matthew blue king crab. ADF&G developed the stairstep harvest strategy for St. Matthew blue king crab, which was adopted by the Board in March 2000. Discussion and analysis of the harvest strategy, including the catch-survey analysis are in the ADF&G report “Overview of Stock Assessment and Recommended Harvest Strategy for St. Matthew Island Blue King Crabs” (Zheng and Kruse 2000).

The harvest strategy contains four components:

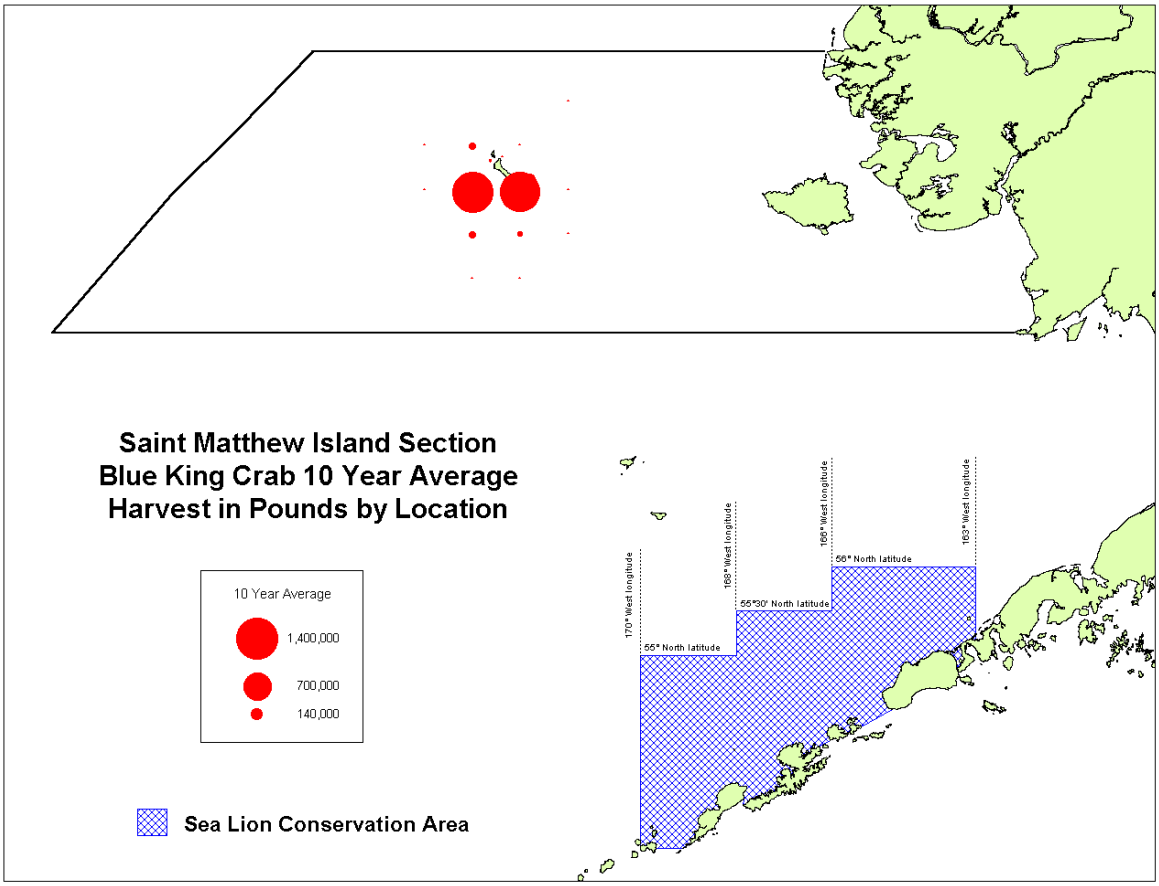
- Stock threshold: 2.9 million lbs of mature male (105 mm carapace length) biomass. This is 25% of the equivalent biomass at maximum sustainable yield (*Bmsy*=11.6 million lbs).
- Minimum GHL: 2.5 million lbs.
- Directed mature harvest rates: 0.0 when mature male biomass (*B*) is <2.9 million lbs, equal to (B-2.9)/(8.7)*0.1+0.1 when $11.6 > B \geq 2.9$ million lbs, and 0.2 when $B \geq 11.6$ million lbs, respectively.
- Cap of legal harvest rate: 0.4

Temporal and Spatial Distribution of Fishery

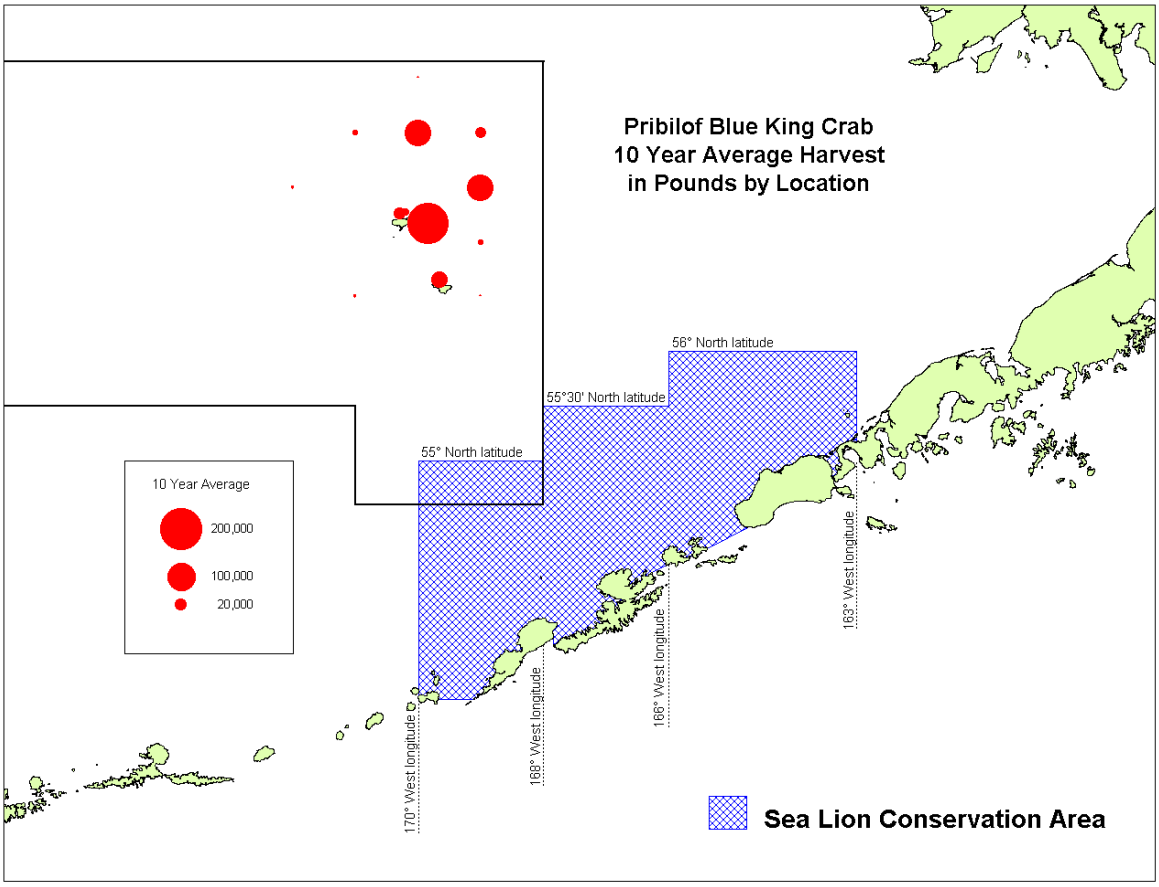
The blue king crab fishery occurs in the area of highest large male abundance, southwest of St. Matthew Island and north east of the Pribilof Islands (see Map 3 and Map 4).

Crab fishing is prohibited in the State waters (3 miles) around St. Matthew Islands and the nearby Pinnacle and Hall Islands to protect the egg-baring female and juvenile crab that congregate in the shallow waters and their habitat.

The St. Matthew and Pribilof Islands blue king crab fishing season opens September 15 and lasts until the GHL is harvested, which is usually about a week.



Map 3: Saint Matthew Islands Blue King Crab 10 Year Average Harvest in Pounds by Location (courtesy of ADF&G).



Map 4: Pribilof Blue King Crab 10 Year Average Harvest in Pounds by Location (courtesy of ADF&G).

2.5 Red King Crab

The FMP covers three stocks of red king crab (*P. camtschatica*), the Bristol Bay stock, the Norton Sound stock, and the Pribilof Island stock.

In the past, Bristol Bay red king crab (BBRKC) fishery was closed due to low female abundance, the threshold established by ADF&G. Currently, however, the stock is healthy and supports a fishery.

The Norton Sound red king crab fishery is managed as a super-exclusive registration area separately from the rest of the BSAI crab fisheries. Vessels that fish for Norton Sound red king crab cannot fish in other crab fisheries (Lean and Brennan 2000). Likewise, vessels that fish in other crab fisheries cannot fish in Norton Sound. This protects the local small boat fleet from competition from the larger vessels that fish in the other BSAI crab fisheries.

The Pribilof Island red king crab stock is managed concurrently with the blue king crab stock. The Pribilof Islands red king crab fishery is described in section 2.4 Blue King Crab. ADF&G closed the fishery for the Pribilof Islands blue and red king crab in 1999, due to low and declining legal male abundance and poor fishery performance, although the stock is not classified as overfished.

Abundance

The 2001 estimated spawning biomass of Bristol Bay red king crab was 88 million pounds, a decrease from the 2000 estimate of 89.7 million pounds. The estimated spawning biomass of Bristol Bay red king crab was 163.6 million pounds in 1998, 117.7 million pounds in 1999.

Then 2001 mature biomass estimate of Pribilof Islands red king crab was 25.5 million pounds, a substantial increase from the 2000 estimate of 10.2 million pounds. The 1999 estimate was 12.8 million pounds and the 1998 mature biomass estimate of 7.4 million pounds. Despite an increase in 2001, survey and fishery data indicate a long-term decline in this stock. These two stocks will be surveyed again in the summer of 2002.

The Norton Sound red king crab legal male abundance is estimated from the triennial trawl survey. The abundance estimate of legal male crabs in 1991 was 3.4 million pounds and in 1996 it was 1.6 million pounds. The survey conducted during August 1999 found a significant increase in the legal male population of red king crab to 4.3 million pounds.

Distribution of Stocks and Life History

Red king crab is widely distributed throughout the Bering Sea and Aleutian Islands, Gulf of Alaska, Sea of Okhotsk, and along the Kamchatka shelf. In Bristol Bay, red king crab mate when they enter shallower waters (<50 m), generally beginning in January and continuing through June. The female red king crab carries the eggs for 11 months before they hatch, generally in April. Red king crab spend 2-3 months in larval stages before settling to the benthic life stage. 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 65 mm), when the crab move to deeper water and join adults in the spring migration to shallow water for spawning and deep water for the remainder of the year.

King crab molt annually to shed their old shell an grow a new and bigger shell. After they shed their old shell, the new shell is soft. During this phase, the crab fisheries are closed to protect the soft-shelled crab and because soft-shelled king crabs have not market value. The known molting periods are specified in the FMP. The molting period for Bristol Bay red king crab is January through June. The molting period for Norton Sound is from mid-September through October.

King crab molt multiple times per year through age 3 after which molting is annual. At larger sizes, king crab may skip molt as growth slows. Females grow slower and do not get as large as males. In Bristol Bay, fifty percent maturity is attained by males at 120 mm CL and 90 mm CL by females (about 7 years). Mean age at recruitment is 8-9 years. Red king crab in the Norton Sound area mature at smaller sizes and do not attain maximum sizes found in other areas.

Fishery

Minimum legal size for red king crab is 6.5" carapace width. State regulations limit the number of pots a vessel can use - 250 pots for vessels >125 feet and 200 pots for vessels <125 feet. Approximately 308 vessels are qualified to fish in the BBRKC fishery under the crab license limitation program. From 1996 to 2000, an average of 245 vessels participated in the fishery per year, ranging between 196 and 274 vessels. Other gear restrictions include a requirement that crab pots be fitted with a degradable escape mechanism.

Norton Sound: The legal size limit is ≥4.75 inches carapace width. The pot limits in Norton Sound are 40 pots for vessels <125 feet and 50 pots for vessels >125 feet. Approximately 63 vessels are permitted to fish in the summer king crab fishery under the LLP. From 1996 to 2000, an average of 17 vessels participated in the Norton Sound summer fishery per year, ranging from 8 to 41 vessels. Since 1977, the maximum number of vessels that have participated in this fishery is 48 vessels in 1995.

The Norton Sound fishing fleet is unique from the other fisheries managed under the FMP. Due to the small pot limits and the super-exclusive registration area, almost all of the vessels that participate in the Norton Sound fishery are under 32 feet and are from the villages surrounding Norton Sound. In 1996, eight vessels between 35 and 52 feet participated in the fishery. From 1997 through 1999, only one vessel over 32 feet participated each year, the largest of which was 44 feet. In 2000, no vessels over 32 feet participated in the fishery (Betsy Brennen, ADF&G, personal communication). The majority of the fleet are converted herring sein boats, many of which are skiffs that do not have wheel houses or many lights. Even though they fish throughout the day and night, since it is a summer fishery occurring near the North Pole, most fishing occurs in daylight. Lights are only used towards the end of the season in August. Because these are small vessels, they usually return to port in rough weather (Betsy Brennen, ADF&G, personal communication).

The Norton Sound winter fishery uses snow machines to harvest crab. Approximately 10 snow machines are permitted to harvest king crab commercially. A substantial subsistence fishery in the winter also exists for Norton Sound red king crab (Lean and Brennan 2000).

Catch and Harvest Rate

The GHL is derived from the annual abundance estimates and catch-survey analysis. The State generally sets pre-season GHLs for Bristol Bay red king crab based on the following harvest strategy. ADF&G developed the stairstep harvest strategy for Bristol Bay red king crab. Analysis of the harvest strategy and the analytical tools used in developing and implementing the strategy are detailed in the ADF&G report: "Overview of population estimation methods and recommended harvest strategy for red king crabs in Bristol Bay" (Zheng et al. 1996).

The harvest strategy contains three components:

- the threshold level of abundance is 8.4 million mature female red king crab and 14.5 million pounds of effective spawning biomass[1]; the season will not open if preseason survey data indicates that the population is at or below either of these two indices of stock reproductive potential;
- if the effective spawning biomass is less than 55 million pounds, the harvest rate is 10% of mature male abundance or no more than 50% of the legal-sized male red king crab abundance, whichever is less;
- if the effective spawning biomass is 55 million pounds or more, the harvest rate is 15% of mature male abundance or no more than 50% of the legal-sized male abundance, whichever is less.

Pribilof Islands red king crab are harvested concurrently with the Pribilof Islands blue king crab fishery. The State generally sets pre-season GHLs for blue king crab based on a mature male harvest rate of 20%.

The Norton Sound GHL is set according to the following harvest strategy:

- when the abundance is below 1.5 million legal males crabs the fishery is closed;
- when the abundance is between 1.5 and 2.5 legal male crabs, the exploitation rate is 5% of legal male crabs; and
- when the abundance is above 2.5 million legal male crabs, the exploitation rate is 10% of legal male crabs.

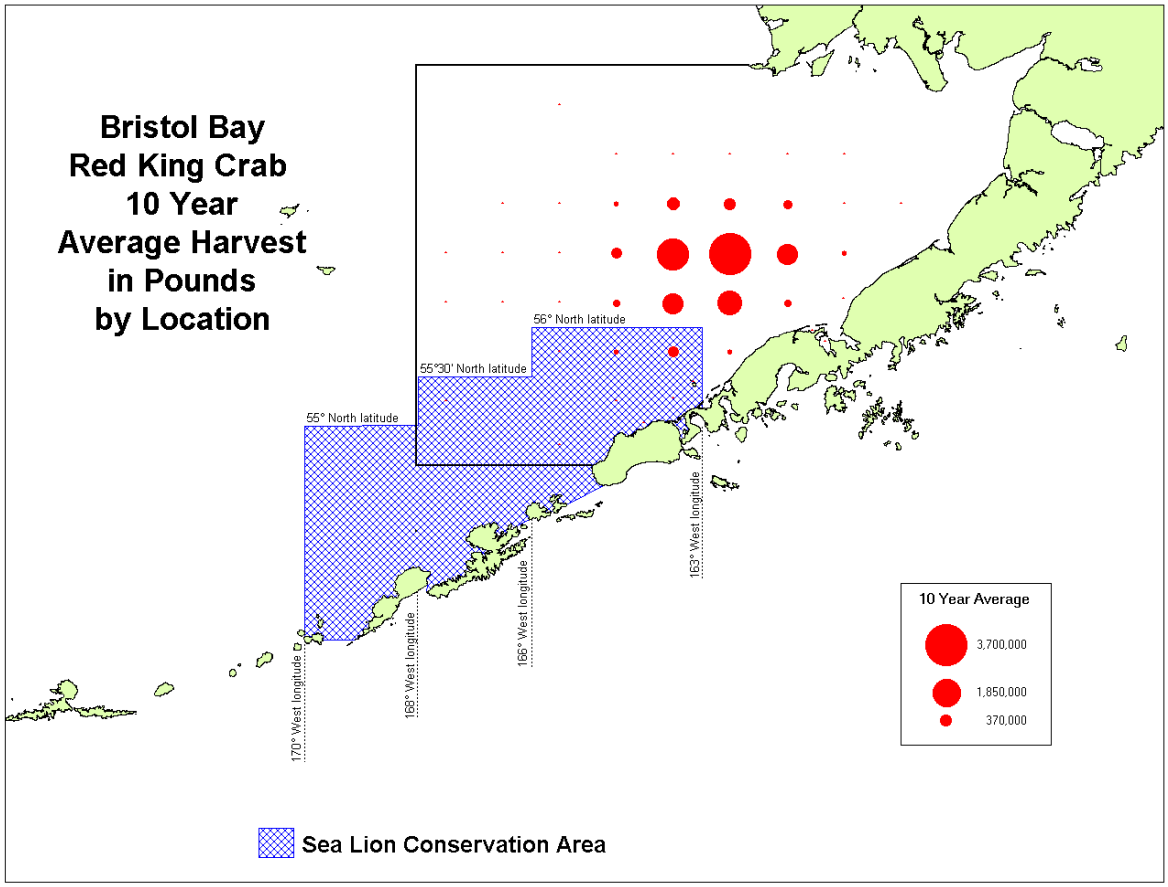
Temporal and Spatial Distribution of Fishery

The Bristol Bay red king crab fishery occurs in State registration area T, between 56°N and 57°N and between 165°W and 161°W. Season for the Bristol Bay red king crab fisheries opens October 15 and lasts until the GHL is harvested, which is usually about a week. Prior to 1999, the fishery opened on November 1. Map 5 shows the Bristol Bay red king crab 10 year average harvest by location.

[1] "Effective spawning biomass" means the estimated biomass of mature female red king crab that the population of mature male red king crab could successfully mate in a given year.

The Pribilof Islands red king crab fishery occurs in the area of highest large male abundance north east of the Pribilof Islands. The Pribilof Islands fishery opens September 15. Map 7 shows the Pribilof red king crab 10 year average harvest by location.

The Norton Sound fishery occurs in Norton Sound, concentrating near coastal villages. In 1981, the near shore waters were closed to commercial crab fishing (see map 6). The Norton Sound fishery has 2 seasons, a winter season and a summer season. The winter season opens November 15 to May 15, however, fishing is only allowed when the ice cover is solid. The summer season is from July 1 to early September. The distribution of the fleet depends on where the crab are located and where the processor is located. In the past couple of years, a floated processor was located in Golovin Bay. In years when there is no processor in Norton Sound, vessels fly their crab out of Nome to be processed in Anchorage. The CDQ group plans on building a processor in Nome, which would eliminate the need for a floating processor and would shift fishing effort near Nome (Betsy Brennen, ADF&G, personal communication).



Map 5: Bristol Bay Red King Crab 10 Year Average Harvest in Pounds by Location (courtesy of ADF&G).

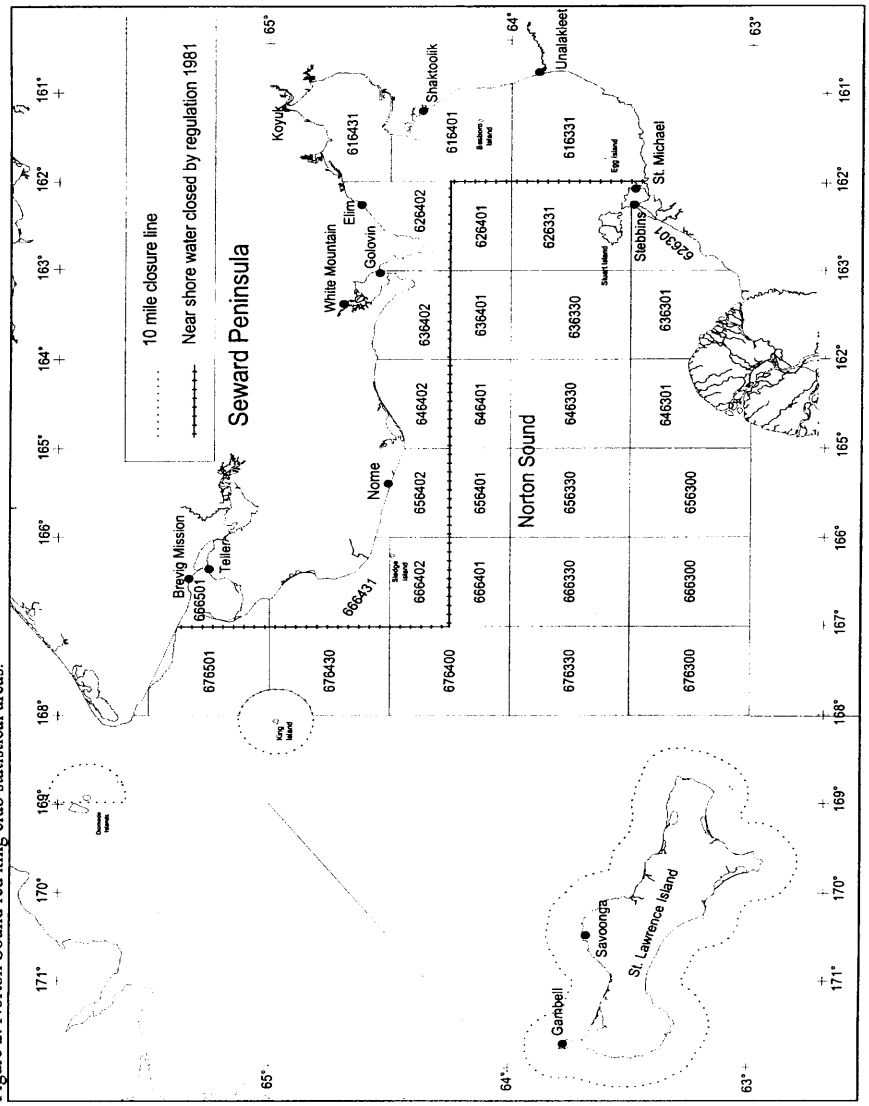
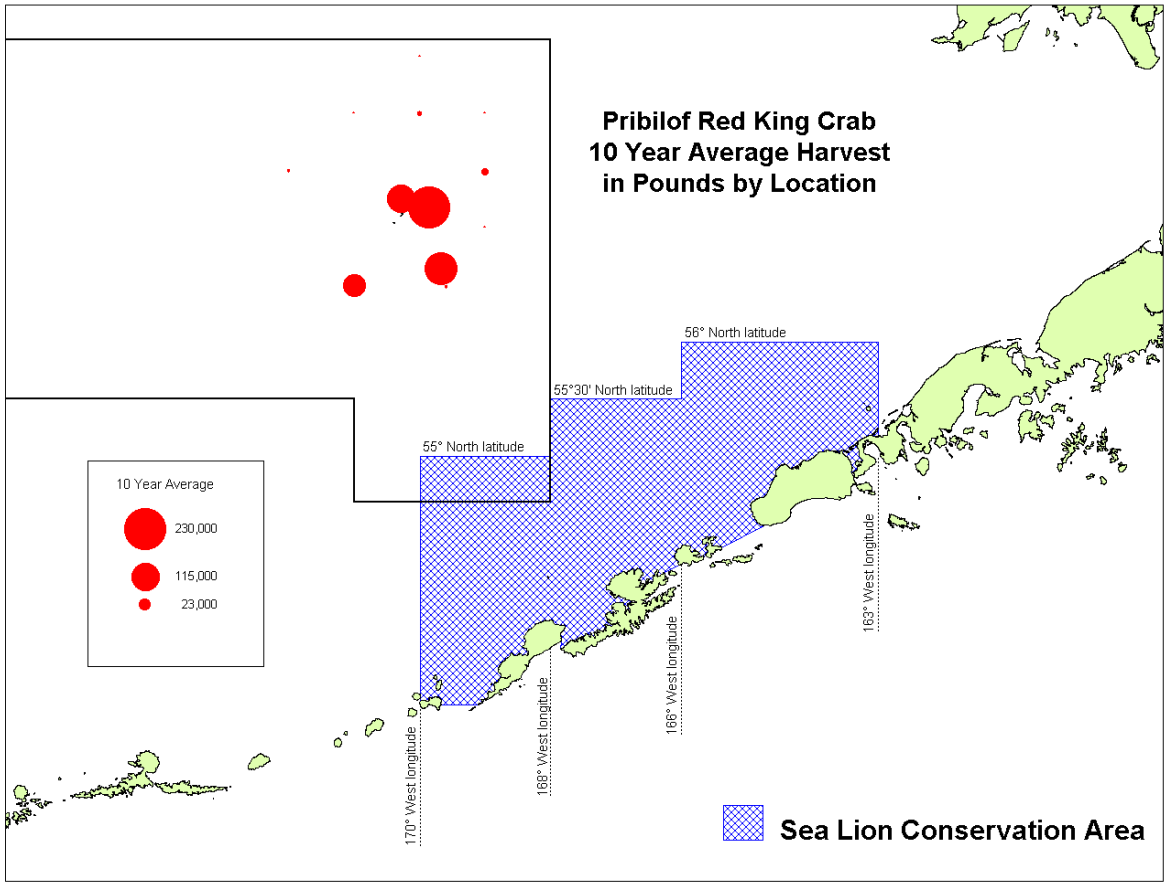


Figure 2. Norton Sound red king crab statistical areas.

Map 6: Norton Sound red king crab statistical areas and closed areas. Map provided by ADF&G.



Map 7: Pribilof Red King Crab 10 Year Average Harvest in Pounds by Location (courtesy of ADF&G).

2.6 Golden King Crab

The FMP covers three fisheries for golden (a.k.a. brown) king crab (*Lithodes aequispina*), one in the Aleutian Islands, and two in the Bering Sea.

Abundance

A portion of the eastern Aleutian Islands area was last surveyed with pots in 1997. The Aleutian Islands golden king crab stocks appear to be stable, based on the survey and fishery performance. A standardized triennial pot survey for golden king crab in a portion of the eastern Aleutian Islands (in the vicinity of Amukta, Chagulak, and Yunaska Islands) was initiated in 1997. Preliminary results from the recently completed 2000 survey of that area indicate that catch per unit effort (CPUE) of legal male crabs has dropped by roughly one-third from the 1997 CPUE, whereas female and pre-recruit male CPUEs remained roughly stable at their 1997 levels. Analysis of 1996-2000 golden king crab fishery performance and observer data from the entire area east of 174° W longitude, on the other hand, indicate that the golden king crab stock has remained stable in that larger area. The 2001/2002 GHL for the Aleutian Islands has again been set at 5.7 million pounds, with 2.7 million pounds for the area west of 174°W, and 3.0 million pounds for the area east of 174°W.

The golden king crab population in the Bering Sea is not currently surveyed and no estimate of abundance has been made. Population size is believed to be limited by the amount of available habitat in the Bering Sea.

Distribution and life history of Stocks

Golden king crab range from Japan to British Columbia. In the BSAI, golden king crab are found at depths from 200 m to 1,000 m, generally in high relief habitat such as inter-island passes. The golden king crab is found in only a few deep canyons in the Bering Sea District. In the Aleutian Islands, golden king crab inhabit the depths and steep bottom topography in the inter-island passes. Based on historic landing data, two golden crab stocks have been identified and are managed as the Sequam and Adak stocks separated at 174o W longitude.

Size at sexual maturity depends on latitude, with crabs in the northern areas maturing at smaller sizes. In the St. Matthew area, golden king crab are 50% mature at 92 mm carapace length (males) and 98 mm carapace length (females). In the Pribilof and western Aleutian Islands area, 50% maturity of males is attained at 107 mm (about 3.5 inches) carapace length and 100 mm (about 3.3 inches) carapace length for females. Further south, in the eastern Aleutian Islands, fifty percent maturity is attained at 130 mm carapace length (males) and 111 mm carapace length (females).

Fishery

Current minimum legal size for golden king crab is 6.0 inches in carapace width for Area O; elsewhere in the Bering Sea minimum size is 5.5" cw. As with other king crab, only males are harvested. Maximum allowable fishing mortality for the mature male golden king crab stock, as established by the FMP, is FOFL = FMSY = M.

By regulation, pots used in the Aleutian Islands golden king crab fishery must be longlined to reduce gear loss. A minimum of 10 pots must be linked together. No pot limits exist for the Aleutian Islands golden king crab fishery. Escape rings were adopted by the Board in 1996 to reduce capture and handling mortality of non-target crab; a minimum of four 5.5" rings are required on pots used in golden king crab fisheries. Other gear restrictions include a requirement that crab pots be fitted with a degradable escape mechanism consisting of #30 cotton thread (max. diameter) or a 30-day galvanic timed release mechanism.

NMFS has issued 41 licenses for the Aleutian Islands golden king crab fishery, which is more that the number of vessels that actually participate in the fishery in any given year. In the past five seasons, through the 2000/2001 season, an average of 17 vessels participated per year in this fishery, ranging between 15 and 18 vessels. Observers are required on all vessels fishing for golden king crab in the Aleutian Islands.

For Bering Sea golden king crabs, a commissioners permit is also required. During the last 15 years, the Pribilof district golden king crab fishery has been prosecuted by an average of three vessels. In the 1999 fishery three vessels participated, harvesting 200,000 pounds in a 6 month fishery. A fishery for golden king crab in the St. Matthew Islands section of the Northern District has been sporadic. There has not been a golden king crab fishery in the St. Matthew Islands since 1997. In years when there has been a fishery, less than three vessels have participated. In 1993 the Board imposed pot limits on the Bering Sea golden king crab fisheries. Current pot limits in the Pribilof District are 40 pots for vessels less than or equal to 125 feet, and 50 pots for vessels greater that 125 feet. In the Northern District, pot limits are 60 pots for vessels less than or equal to 125 feet, and 75 pots for vessels greater that 125 feet.

Catch and Harvest Rate

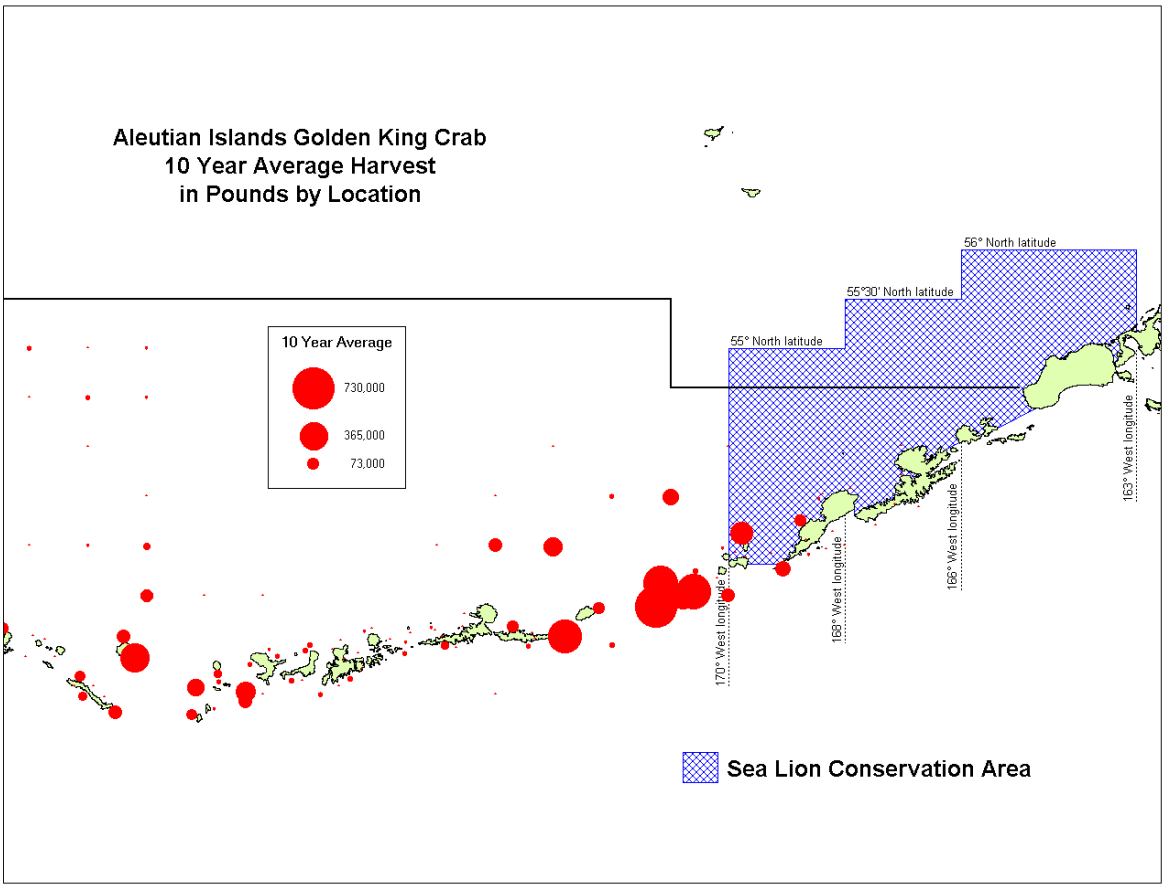
In the Aleutian Islands, the GHL is split between east and west of 174°W. The 1999/2000 GHL of 5.7 million pounds is divided into 2.7 million pounds west of 174°W, and 3.0 million pounds east of 174°W. The season opens August 15 and lasts until the GHL is harvested, usually about 9 months.

In the Bering Sea, ADF&G establishes harvest levels using historic catch data and inseason fishery data, based on provisions in the FMP.

Temporal and Spatial Distribution of Fishery

Map 8 shows the 10 year average harvest in pounds by location in the Aleutian Islands golden king crab fishery.

The Bering Sea golden king crab fishery occurs in the Pribilof district and most effort occurs in the area immediately to the south of the Pribilof Islands. The fishery typically occurs in the spring, after the closure of the Bering Sea snow crab fishery and in the fall, prior to the Bristol Bay red king crab fishery. A limited fishery occurs near St. Matthew Island in some years.



Map 8: Aleutian Islands Golden King Crab 10 Year Average Harvest in Pounds by Location (courtesy of ADF&G).

2.7 Other king and Tanner crabs

1999/2000 Guideline harvest levels (GHL) and status of the fishery for BSAI king and Tanner crab stocks not annually surveyed. Estimated values are in millions of pounds. (NA indicates that insufficient data exists at this time to estimate the value)

Stock	GHL	Fishery/Season
Adak red king	0	closed
Dutch Harbor red king	0	closed
Norton Sound red king	??	7/1-9/3:11/15-5/15
St Lawrence blue king	NA	permit
Aleutian Is. golden king	5.7	9/1
Pribilof Is. golden king	0.15	permit
St. Matthew golden king	0.015	permit
Aleutian Is. scarlet king	NA	permit
EBS scarlet king	NA	permit
E. Aleutian Is. Tanner	0	closed
W. Aleutian Is. Tanner	0	closed
E. Aleutian Is. angulatus	NA	permit
EBS angulatus	NA	permit
E. Aleutian Is. tanneri	0.2	permit
EBS tanneri	0.2	permit
W. Aleutian Is. Tanneri	0.1	permit

The FMP covers other species of king and Tanner crabs in the BSAI, however, these species either do not support commercial fisheries or they support very small fisheries. These stocks are not annually surveyed by NMFS. Stock status for the following stocks is unknown due to no survey biomass estimates: Pribilof Islands golden king crab (*Lithodes aequispinus*); Saint Lawrence Island blue king crab; Northern District golden king crab; *C. bairdi* Tanner crab (Western Aleutian); Aleutian Islands Scarlet king crab (*L. couesi*); Bering Sea triangle Tanner crab (*C. angulatus*); Eastern Aleutian Islands triangle Tanner crab; Eastern Aleutian Islands grooved Tanner crabs (*C. tanneri*); Western Aleutian Islands grooved Tanner crabs; Bering Sea grooved Tanner crabs.

The permit fisheries for the species identified in adjacent table are by ADF&G commissioner's permit only with 100% observer requirements. Most of these species are generally taken as bycatch in other crab fisheries. The ADF&G Gulf of Alaska Marine Resource Assessment Survey is a triennial trawl survey east of 170°W that provides some information on Dutch Harbor red king crab, Aleutian Islands golden king crab, Aleutian Islands scarlet king crab, E. Aleutian Islands Tanner crab, and E. Aleutian Islands grooved crab. The 1999 survey results are not available yet.

Aleutian Islands red king crab (Dutch harbor and Adak red king crab stocks): The Adak stock has not been surveyed since 1977 and the eastern portion of the Dutch Harbor stock was surveyed in 1999 by ADF&G. Few red king crab were caught in either the 1995 or 1999 survey of the eastern Aleutians. The eastern portion has been closed since 1982. The western fishery was closed for the 1996/97 and 1997/98 seasons due to poor fishery performance in the 1995/96 season; portions were reopened to limited exploratory fishing for the 1998/99 season. The 1999/2000 season is closed. The GHL for the eastern portion is set based on the triennial-quadrennial trawl survey. GHLs for the western portion are based on recent fishery performance.

Eastern Aleutian Islands *C. bairdi* Tanner crab: The fishery has been closed since 1995 due to declining stock size estimated from surveys and poor fishery performance. The 1995 ADF&G survey estimates of the number of crabs were 29,000 legal males and 135,000 females. The 1999 ADF&G survey estimate of crab abundance is not available at this time. However, preliminary survey results from 1999 indicate an increase in adult females and legal males from 1995 levels. Note that this increase is evident only within a very limited area.

Deepwater Tanner Crab: The grooved Tanner crab (*Chionoecetes tanneri*) and triangle Tanner crab (*Chionoecetes angulatus*) occur in deep water (> 400 fathoms) and have been commercially harvested only in the past few years. A directed fishery for grooved Tanner crab began in 1993, and about 200,000 pounds were landed in 1995. These crab weighed an average of 1.9 pounds, and sold for $1.50 per pound exvessel. Less than 3 vessels reported landings of C. angulatus in 1995 and 1996, and consequently, catches are confidential. There have been no landings of C. angulatus since 1996.

Scarlet king crab: (*Lithodes couesi*), Little information is known about the biology of scarlet king crab, found in the Bering Sea and Aleutian Islands area. This species occurs in deep water and have been harvested incidental to golden king crab and *Chionoecetes tanneri* fisheries. A total of 13,871 pounds of scarlet king crab were harvested in 1995. In 1997, 7,170 pounds of scarlet king crab were landed. Minimum size for *L. couesi* is 5.5 inches.

2.8 Action Areas for the Crab Fisheries

The action area for BSAI crab fisheries effectively covers all of the Bering Sea under U.S. jurisdiction, extending southward to include the waters south of the Aleutian Islands west of 170°W. to the border of the U.S. Exclusive Economic Zone. These regions encompass those areas directly affected by fishing, and those that are likely affected indirectly by the removal of crab at nearby sites. The lack of important information on distribution and stock structure of target species confounds a clear and precise definition of the action area, but a review of areas fished by the crab fisheries suggests that virtually the entire Bering Sea, excluding the nearshore region (less than 50 meters in depth), is utilized by one fishery or another. Maps showing the location of harvest for each of the major crab fisheries, over a 10 year period, is included in this document.

2.9 Conservation measures associated with the crab fisheries

Crab fisheries are managed by ADF&G, NMFS and the Council in a manner intended to protect and conserve the integrity of these ecosystems. Fishery management tools include permits and limited entry, catch quotas (GHLs), seasons, in-season adjustments, gear restrictions, closed waters, bycatch limits, allocations, regulatory areas, record keeping and reporting requirements, and observer monitoring. Specific management efforts are detailed above.

3.0 Status of Listed Species

The endangered short-tailed albatross (*P. albatrus*), threatened spectacled eider (*S. fisheri*), and threatened Steller's eider (*P. stelleri*) occur in the action areas for the three proposed actions; these species are under the jurisdiction of the FWS. In the action areas, critical habitat has been designated for the spectacled eider and Steller's eider (50 CFR 17.95(b)).

3.1 Short-tailed Albatross

Current Population Status

The short -tailed albatross is a large pelagic bird whose current range includes the Bering Sea and the Gulf of Alaska; it once ranged throughout most of the North Pacific Ocean. Originally numbering in the millions, the worldwide population of breeding age birds is currently approximately 600+ individuals and the worldwide total population is approximately 1,500 individuals (Dr. Hiroshi Hasegawa, Toho University, Japan, pers. comm.; the population was estimated at 400 in 1988, 700 in 1994). The population is increasing at an approximate annual rate of 7 to 8 percent, based on egg counts from 1980 to 1998 (Jean Cochrane, pers. comm.). At the beginning of the twentieth century, the species declined to near extinction, primarily as a result of hunting at the breeding colonies in Japan. Albatross were killed for their feathers and various body parts, and eggs were collected for food (FWS 1998b).

Endangered Species Act Listing

The short-tailed albatross was originally designated as endangered under the Endangered Species Conservation Act of 1969 on the list of foreign-listed species. In 1973, when the ESA replaced the 1969 Act, the short-tailed albatross was included as a foreign species but not as a native species, thus the listing noted it as endangered, except in the United States. The FWS corrected this administrative error by extending the species endangered status to include its range within the United States. The proposed and final rules contain detailed information on the species life history, demographics, and population status (FWS 1998c, 2000a). Despite the listing oversight, the short-tailed albatross has been protected in the EEZ since its 1970 listing. Therefore, ESA Section 7 consultations between NMFS and FWS are appropriate and required.

In its final rule extending the short-tailed albatrosses endangered status, FWS identified the following factors as potential threats to its conservation and recovery:

- Small population size
- Damage or injury related to oil contamination
- Consumption of plastics
- Incidental mortality in longline fisheries in the North Pacific and Bering Sea
- Entanglement in derelict fishing gear
- Collisions with airplanes at Midway Atoll

In this same rule, FWS identified activities that are not expected to result in any take of short-tailed albatrosses:

- Fishing activities in Alaska and Hawaii, other than longline fishing

- Lawfully conducted vessel operations such as transport, tankering, and barging
- Harbor operations or improvements

Designation of Critical Habitat, Development of a Recovery Plan and Delisting

At the time a species is proposed for listing under the ESA, critical habitat can also be proposed. Habitats outside of the United States are not eligible for critical habitat designation. The FWS determined that designation of critical habitat was not prudent for the short-tailed albatross and that such a designation would not be beneficial to the species (FWS 1998c, 2000a). FWS noted that the short-tailed albatross population is growing at a rate that is probably near its maximum biological capacity for growth, inferring that nothing about the bird's marine habitat is limiting population growth. Because the North Pacific Ocean and Bering Sea once supported millions of short-tailed albatrosses, agency scientists believe that this species is nowhere near its habitat carrying capacity, and that it would be some time before any feature of its marine habitat becomes a critical limiting factor to population growth. Thus, FWS concluded that no need exists for special management or protection of any marine habitat feature with regards to the short-tailed albatross. Further, because the species' precarious situation derives entirely from historical harvest of the birds themselves, not from actions that caused habitat degradation, and because marine habitat loss does not appear to be a factor limiting current population growth rate, the agency does not believe that areas exist within the United States that contain features essential to the conservation of the species that require special management or protection (FWS 2000a).

As a result of the extension of the endangered status for the short-tailed albatross to include the species' range within the United States, the FWS is expected to begin development and implementation of a recovery plan, the principal goal being to return the short-tailed albatross to a point at which ESA protection is no longer required. Delisting a species on the basis of recovery would occur at such time when the best scientific and commercial data available indicate that it is no longer endangered or threatened. To the maximum extent practicable, the recovery plan is to include objective, measurable criteria which, when met, would result in a determination that the species be removed from the list.

Occurrence of and Reported Fishery Takes in Waters off Alaska

Past observations indicate that as with other albatrosses, older short-tailed albatrosses are present in Alaska primarily during the summer and fall months along the shelf break from the Alaska Peninsula to the GOA, although 1- and 2-year-old juveniles may be present at other times of the year. Consequently, these albatrosses generally would be exposed to fishery interactions most often during the summer and fall. Albatrosses are surface feeders, which feed on principally small fish (e.g., larval and juvenile walleye pollock and sablefish), squid, and zooplankton, much of which is presumed to be of little commercial interest. The importance of commercial fish species in the diet of the short-tailed albatross, and the effects of the commercial fishery on this species, are not well known, but direct competition for food supplies is probably not a substantial problem (FWS 1998c).

Short-tailed albatross sightings in the BSAI and/or GOA have occurred in all months of the year (G. Balogh, pers. comm.) No short-tailed albatross takes were reported in Alaska crab fisheries from 1983 to 2001.

3.2 Spectacled Eider

Current Population Status

Spectacled eiders are large diving sea ducks that spend most of the year in marine waters, where they primarily feed on bottom-dwelling mollusks and crustaceans. Besides breeding and molting in some Alaska coastal areas, spectacled eiders congregate during the winter in exceedingly large and dense flocks in openings in the pack ice in the central Bering Sea between Saint Lawrence and Saint Matthew islands. Spectacled eiders from all three known breeding areas (in Alaska and Russia) use this wintering area. While at sea, spectacled eiders appear to be primarily bottom feeders, eating mollusks and crustaceans at depths of up to 70 m in the wintering area (FWS 1999a). Because nearly all individuals of this species may spend each winter occupying an area of ocean less than 31 mi (50 km) in diameter, they may be particularly vulnerable to chance events during this time (FWS 2000b). Between the 1970s and 1990s, spectacled eiders on the Yukon-Kuskokwim delta (an Alaska breeding area) declined by 96 percent, f rom 48,000 pairs to fewer than 2,500 pairs in 1992. Based on surveys conducted during the past few years, the Yukon-Kuskowkim delta breeding population is estimated to be about 4,000 pairs (FWS 2000b). Biologists estimate that about 9,000 pairs currently nest on Alaska's arctic coastal plain, and at least 40,000 pairs nest in arctic Russia. The current worldwide population estimate is 360,000 birds, which is derived from winter surveys in the Bering Sea and includes nonbreeding birds (FWS 1999b). Causes of the decline of spectacled eiders are not well understood. Besides known and plausible land-based causes (lead poisoning from spent lead shot; predation by foxes, gulls, and ravens on breeding grounds; and hunting), marine-based causes are even less clear. Complex changes in fish and invertebrate populations in the Bering Sea may be affecting food availability for spectacled eiders during the eight-to-ten-month nonbreeding season (FWS 1999b). Disturbance of marine benthic feeding areas by commercial bottom-trawl fisheries, environmental contaminants at sea , and competition for food with bottom-feeding walruses and gray whales may also affect spectacled eider populations (FWS 1999b).

Endangered Species Act Listing

The spectacled eider was listed as a threatened species throughout its range in Alaska and Russia in 1993 (FWS 1993). The action was taken because the species had declined by as much as 94 to 98 percent on its principal breeding range in Alaska, and breeding birds in Alaska continued to decline by about 14 percent per year. Critical habitat was not designated at the time. At the time of the listing, FWS noted that the marine habitat requirements of spectacled eiders were poorly understood, and that past and present threats to suspected marine habitats could include (1) toxic contaminants transported from Russian or North American sites, (2) indirect impacts of shifting populations of species with overlapping food habits, and (3) secondary effects of commercial fish and invertebrate harvests in the Bering Sea (FWS 1993). FWS had not found evidence that these generalized threats had actually occurred, although minimal information was available on long-term changes in the Bering Sea ecosystem.

At the time of the listing, very little was known about the spectacled eider's marine range. Recent satellite telemetry data and three years of late winter aerial surveys indicate that spectacled eiders spend the winter in exposed waters between Saint Matthew and Saint Lawrence islands, or in open leads slightly west of the

inter-island area (FWS 1998a). Other sightings in U.S. waters occur in August through September, when they molt in Ledyard Bay and northeast Norton Sound, and in migration near Saint Lawrence Island.

Regarding the protection of spectacled eiders at sea, the FWS has suggested the following measures to avoid harm to eiders in their molting and wintering areas (FWS 1999b):

- Comply with ESA Section 7 regulations.
- Prevent oil spills.
- Always use absorbent booms when transferring fuel to shore-based facilities.
- Store adequate oil and fuel cleanup equipment onsite at fuel transfer locations.
- Do not discharge oily bilge water near molting areas during summer or fall.
- Avoid disturbing or harvesting benthic communities in eider molting and wintering areas during any time of year.

Critical Habitat for the Spectacled Eider

The FWS designated critical habitat for the spectacled eider in 2001 (FWS 2001). Critical habitat for the spectacled eider includes areas on the Yukon-Kuskokwim Delta (Y–K Delta), in Norton Sound, Ledyard Bay, and the Bering Sea between St. Lawrence and St. Matthew Islands (see map 2). These areas total approximately 10,098,827 hectares (100,988.3 square kilometers; 38,991.6 square miles; 24,954,638 acres). The FWS believes all of these areas meet the definition of critical habitat in that they contain physical or biological elements essential for the conservation of the species and may require special management considerations or protection. The designated critical habitat constitutes FWS' best assessment of areas needed for the conservation of spectacled eiders and is based on the best scientific and commercial information available. A complete discussion of spectacled eider critical habitat is in the FWS' final determination published in the *Federal Register* (FWS 2001b, 66 FR 9146).

In the United States, spectacled eiders historically had a discontinuous nesting distribution from the Nushagak Peninsula in southwestern Alaska north to Barrow and east nearly to the Canadian border. Today two breeding populations remain in Alaska. The remainder of the species breeds in Arctic Russia. On the Y–K Delta, spectacled eiders breed mostly within 15 km (9.3 statute mi) of the coast from Kigigak Island north to Kokechik Bay, with smaller numbers nesting south of Kigigak Island to Kwigillingok and north of Kokechik Bay to the mouth of Uwik Slough. The coastal fringe of the Y–K Delta is the only subarctic breeding habitat where spectacled eiders occur at high density. Nesting on the Y–K Delta is restricted to the vegetated intertidal zone (areas dominated by low wet-sedge and grass marshes with numerous small shallow water bodies). Nests are rarely more than 190 m (680 ft) from water and are usually within a few meters of a pond or lake.

On Alaska's North Slope, nearly all spectacled eiders breed north of 70° latitude between Icy Cape and the Shaviovik River. Within this region, most spectacled eiders occur between Cape Simpson and the Sagavanirktok River. Spectacled eiders on the North Slope occur at low densities within about 80 km (43.2 nm) of the coast. During pre-nesting and early nesting, they occur most commonly on large shallow productive thaw lakes usually with convoluted shorelines or small islands. Such shallow water bodies with emergent vegetation and low islands or ridges appear to be important as eider nesting and brood-rearing habitat on the North Slope.

Within the United States, spectacled eiders molt in Norton Sound and Ledyard Bay, where they congregate in large, dense flocks that may be particularly susceptible to disturbance and environmental perturbations. During their time on the molting grounds (early July through October), each bird is flightless for a few weeks. However, there is no time in which all birds are simultaneously flightless. Norton Sound is located along the western coast of Alaska between the Y– K Delta and the Seward Peninsula. It is the principal molting and staging area for females nesting, and for juveniles raised, on the Y–K Delta, the most imperiled of the three breeding populations. Some Y–K Delta male spectacled eiders, presumably subadult males, also molt in Norton Sound. Breeding adult males from the Y–K Delta have not been observed to molt in Norton Sound, but they are known to molt in Ledyard Bay and in at least two locations in Russian waters. As many as 4,030 spectacled eiders have been observed in Norton Sound at one time. Spectacled eiders molted in the same portion of eastern Norton Sound each year from 1993 to 1997. Large flocks were reported in this same area in August and September from 1982 to 1990, suggesting that this area has a history of consistent use by molting spectacled eiders. Spectacled eiders arrive in eastern Norton Sound at the end of July and depart in mid-October. Although overall benthic biomass (quantity of organisms living on the sea floor) in this area is thought to be lower than in other parts of Norton Sound, the abundance of large gastropods (e.g., snails, which are presumably a spectacled eider food item) is higher in this area than elsewhere.

Ledyard Bay is one of the primary molting grounds for female spectacled eiders breeding on the North Slope, and most female birds molting here are from the North Slope. Satellite telemetry data suggest that male spectacled eiders from the North Slope appear to molt and stage in equal numbers in Ledyard Bay and the two primary molting areas in Russia, Mechigmenskiy Bay and off the coast of the Indigirka and Kolyma River Deltas. Aerial surveys in September 1995 found 33,192 spectacled eiders using Ledyard Bay. Most were concentrated in a 37-km (23- mi) diameter circle with their distribution centered about 67 km (36.2 nm) southwest of Point Lay and 41 km (22.1 nm) offshore.

During winter, spectacled eiders congregate in exceedingly large and dense flocks in pack ice openings between St. Lawrence and St. Matthew Islands in the central Bering Sea. Spectacled eiders from all three known breeding populations use this wintering area; no other wintering areas are currently known. A conservatively estimate of the entire wintering population, and perhaps the worldwide population, of spectacled eiders at 374,792 birds.

Although we are unaware of large numbers of spectacled eiders wintering elsewhere, it has been hypothesized that the known wintering location may not be the only location used by this species. Spectacled eiders may be overwintering south of St. Matthew and Nunivak Islands in Alaska, and south of the Chukotka Peninsula in Russia. No spectacled eiders were observed on one limited reconnaissance flight south of St. Matthew Island in 1995. FWS has not surveyed south of Nunivak Island during winter. To date, all satellite transmitter data gathered during winter has originated from the known wintering area.

3.3 Steller's Eider

Current Population Status

Steller's eiders are sea ducks that spend the majority of the year in shallow, nearshore marine waters where they feed by diving and dabbling for mollusks and crustaceans. Primary foods in marine areas include

bivalves, crustaceans, polychaete worms, and mollusks (FWS 1997). Three breeding populations of Steller's eiders are recognized, two in Arctic Russia and one in Alaska. Actual numbers nesting in Alaska and Russia are unknown but the majority of Steller's eiders nest in arctic Russia. After the nesting season, Steller's eiders return to marine habitats, where they molt. Concentrations of molting Steller's eiders have been noted in Russia, near Saint Lawrence Island in the Bering Sea, and along the northern shore of the Alaska Peninsula. Whereas the Russian Atlantic populations winter in the Barents and Baltic Seas, the Russian Pacific populations winter in the southern Bering Sea and North Pacific Ocean, where it presumably intermixes with the Alaska breeding population. During winter, most of the world's Steller's eiders concentrate along the Alaska Peninsula, from the eastern Aleutian Islands to southern Cook Inlet, in shallow, nearshore marine waters. In spring, large numbers concentrate in Bristol Bay before migration. Along open coastline, Steller's eiders usually remain within about 400 m of shore, normally in water less than 10 m deep, but can be found well offshore in shallow bays and lagoons or near reefs (FWS 1997). The Russian Atlantic population is believed to contain 30, 000–50,000 individuals, and the Russian Pacific population likely numbers 100,000–150,000; the threatened Alaska breeding population, however, is thought to number only in the low hundreds or low thousands on the Arctic coastal plain, and possibly only tens or hundreds on the Yukon-Kuskokwim delta. Overall numbers have likely declined from historical population sizes.

Endangered Species Act Listing

The Alaska breeding population of the Steller's eider was listed as a threatened species in 1997 (FWS 1997). This determination was based on a substantial decrease in the species' nesting range in Alaska, a reduction in the number of Steller's eiders nesting in Alaska, and the resulting increased vulnerability of the remaining breeding population t o extirpation (FWS 1997). Critical habitat was not designated at the time of the listing. Steller's eiders occupy a vast expanse of marine habitat during the non-nesting season. Within the marine distribution of the Steller's eider the environment has likely been affected by any number of human activities, including marine transport, commercial fishing, and environmental pollutants. Another possible threat is changes in the Bering Sea ecosystem affecting food availability. However, no evidence exists that modifications of the marine environment have caused the decline of the Alaska breeding population of Steller's eiders (FWS 1997).

Critical Habitat for the Steller's Eider

FWS designated critical habitat for the Alaska-breeding population of the Steller's eider. Critical habitat for the Alaska-breeding population of the Steller's eider includes breeding habitat on the Yukon-Kuskokwim Delta (Y–K Delta) and 4 units in the marine waters of southwest Alaska, including the Kuskokwim Shoals in northern Kuskokwim Bay, and Seal Islands, Nelson Lagoon, and Izembek Lagoon on the north side of the Alaska Peninsula (see map 2). These areas total approximately 7,333 square kilometers (approximately 2,830 square mi); and 1,363 km (852 mi) of shoreline. The FWS believes all of these areas meet the definition of critical habitat in that they contain physical or biological elements essential for the conservation of the species and may require special management considerations or protection. The designated critical habitat constitutes FWS' best assessment of areas needed for the conservation of spectacled eiders and is based on the best scientific and commercial information available. A complete discussion of spectacled eider critical habitat is in the FWS' final rule published in the *Federal Register* (FWS 2001a, 66 FR 8850).

Kuskokwim Shoals

The Kuskokwim Shoals is known to be of importance to Steller's eiders during molt and for staging during spring migration. A series of surveys has shown that large numbers of Steller's eiders stage near the Kuskokwim Shoals during spring migration, apparently foraging along the edge of the extensive shorefast ice that lingers into late April in this region.

Seal Islands

The Seal Islands Unit consists of several disjunct bays, lagoons, and nearshore areas. Steller's eiders concentrate in the Seal Islands lagoon in both spring and fall. Although the area has been inadequately surveyed for Steller's eiders, thousand are believed to molt in this lagoon. Steller's eider spring migration surveys, further indicating the area's importance to a large number of Steller's eiders. Finally, Steller's eiders that bred near Barrow also molt in the Seal Islands lagoon.

Nelson Lagoon

The Nelson Lagoon complex includes Nelson Lagoon, Herendeen Bay, and Port Moller. Use of the Nelson Lagoon complex by huge numbers of Steller's eiders during autumn molt is well documented. Dense aggregations also winter in the Nelson Lagoon complex, although ice cover may force them elsewhere during variable portions of colder winters. Large numbers can remain (or possibly rebuild) in late spring during migration as well. In addition to the very large numbers using this lagoon complex annually, banding data have demonstrated that Steller's eiders molting in Nelson Lagoon include members of the Alaska-breeding population. Observations show that Steller's eiders occur in dense clusters throughout most of Nelson Lagoon, including the area surrounding the community of Nelson Lagoon.

Izembek Lagoon

Izembek Lagoon is used by dense aggregations of Steller's eiders during molt, winter, and spring. Tens of thousands molt there each year. Tens of thousands also remain through winter in most years, although distribution and numbers are affected by ice cover and vary from year to year. Numbers may build again during spring. In addition to dense aggregations of Steller's eiders regularly occurring at Izembek, band recoveries show that the birds molting there include members of the Alaska-breeding population.

4.0 Effects of the Actions

This biological assessment analyzes the potential effects of actions under the Federal crab FMP on the short-tailed albatross, spectacled eider, Steller's eider, and the designated critical habitat. The crab FMP defers management of the BSAI crab fisheries to the State of Alaska. State crab management is constrained by the framework established in the FMP and the Magnuson-Stevens Act and other applicable Federal law. Based on this effects analysis and an analysis of cumulative effects, NMFS separately determines whether the actions under the FMP are likely to adversely effect the continued existence of a listed species or destroy or adversely modify designated critical habitat.

In February 2001, FWS designated critical habitat for spectacled eider and Steller's eider. As will become evident in the following discussion, the key questions in evaluating the potential effects of the actions under the FMP on populations of listed seabirds are whether the fisheries conducted under these actions impact listed species through trophic interactions, and whether the fishing methods and gear deployed take listed seabirds or adversely modify critical habitat. Due to the fact that some of the crab fisheries operate in critical habitat, an analysis of these actions on critical habitat is also necessary. In the action areas, critical habitat has not been designated for short-tailed albatross.

FWS identified commercial fisheries as an activity that may have the potential to destroy or adversely modify critical habitat for spectacled eiders and Steller's eiders (66 FR 9146, 66 FR 8850). However, for spectacled eiders, the FWS believes "that direct interactions with the commercial fisheries does not seem to be a problem for this species." (66 FR 9146)

FWS identified the following possible ways in which eiders or their habitat may be affected by commercial fisheries: (1) large numbers of small fuel and oil spills, including the practice of discharging oily bilge water; (2) fundamental changes in the marine ecosystem brought about by harvest or overharvest of fish and shellfish; (3) vessel strikes in which eiders collide with fishing vessels that are using bright lights during inclement weather; and (4) the alteration of the benthic environment by trawling gear (66 FR 9146). This Biological Assessment assesses the effects of these possible interactions between listed species and the crab fisheries as implemented under the crab FMP.

The first step in determining the effects of the crab fisheries on spectacled eider and Steller's eider critical habitat is to identify the regions of critical habitat where the crab fisheries occur.

Steller's eider critical habitat

No crab fisheries occur in or near the following areas of Steller's eider critical habitat: the Yukon-Kuskokwim Delta nesting unit, the Kuskokwim Shoals unit, the Seal Islands unit, and the Izembek Lagoon unit. This is shown in the maps of the distribution of the crab fisheries over the past 10 years.

The Nelson Lagoon unit is encompassed in the State statistical areas 615601 and 615602. A small amount of Bristol Bay red king crab is harvested in these statistical areas in some years, however no harvests are made inside the lagoon (see map 5). For example, in 1998, seven landings of red king crab were made from these State statistical areas, harvesting 69,823 pounds out of a total of 14.2 million pounds of red king crab harvested in 284 landings. In the past, these harvests occurred in November, however, with the red king crab

season change, future harvests will occur in the last two weeks of October. According to the FWS, Steller's eiders are present in Nelson Lagoon during the autumn molt, winter, and spring migration staging periods (FWS 2001a).

Spectacled eider critical habitat

Similarly, overlaying maps of crab fishery distribution with spectacled eider critical habitat indicates that no crab fishing occurs in the Yukon-Kuskokwin Delta unit and the Ledyard Bay unit.

In Norton Sound, a large portion of critical habitat has been closed to commercial crab fishing since 1981 (Lean and Brennan 2000, see map 6). However, crab fishing is allowed in the portion of critical habitat encompassed by State statistical areas 626401, 626331, and 626301. Catch has been recorded in these areas since 1977, however, harvests have only been made in these areas in 10 years from 1977 to 2000. During this time period, a total of 172,190 pounds have harvested in these statistical areas. This equals less than 2 percent of the total harvest from Norton Sound. In 2000, 1.6 percent of the harvest occurred in statistical area 626401, and no harvest occurred in areas 626331 and 626301 (Brennan 2000). The Norton Sound king crab fishery occurs in the summer, starting on July 1, and closing when the GHL is harvested, which is usually mid-August to September 3. FWS identified July to September as the months when spectacled eider are particularly susceptible to disturbance and environmental perturbations (FWS 2001b).

In the past, commercial crab fishing occurred near St. Lawrence Island (Lean and Brennan 2000). Commercial catches of red and/or blue king crab were made in 1983, 1989, 1992, and 1995. Since 1983, all waters within 10 miles of all inhabited islands in this region are closed to commercial crab fishing, to protect subsistence fishing. It is not likely that ADF&G will open a St. Lawrence commercial king crab fishery in the near future because of the apparent small stock size of both red and blue king crab. The St. Matthew blue king crab fishery occurs south of St. Matthew Island because that is where the abundance of large male crab congregate (see map 3).

Between 1990-2000, vessels targeting snow crab have fished the winter habitat area (see map 2). Due to State confidentiality laws, we can not disclose which years fishing occurred because less than four vessels fished in each of the five statistical areas over the 10 year time period. Note that two of the five statistical areas are only partially in critical habitat, so that the fishing could have occurred outside critical habitat.

4.1 Vessel Pollution

FWS identified the occurrence of a large numbers of small fuel and oil spills, including the practice of discharging oily bilge water, as possible ways in which spectacled eiders and Steller's eiders or their habitat may be adversely affected by commercial fisheries. FWS identified damage or injury to short-tailed albatross related to oil contamination as a potential threat to its conservation and recovery. Available information on the effects of oil spills caused by fishing vessels in the BSAI is summarized in the draft programmatic SEIS (NMFS 2001).

No information is available to determine if the BSAI crab fleet causes a large number of small fuel and oil spills in the action area. Fishing vessels report fuel and oil spills to the US Coast Guard (LT Joe Higgins, Marine Safety Office, US Coast Guard, personal communication). Observers are also tasked with reporting

oil spills to the Coast Guard. The Coast Guard does not categorize vessels by which fishery they participate in, instead it categorizes them by vessel size. So, we cannot determine oil spills caused specifically by crab vessels.

Three factors are important in analyzing the effects of fuel spills; what type of fuel/oil is spilled, how much, and where it spilled. The key questions are whether the potential exists for a large number of fuel and oil spills in or near designated critical habitat. And, whether the potential exists for the BSAI crab vessels to cause oil contamination of short-tailed albatross.

Steller's eider critical habitat
It is not probable that the small amount of effort (2% of vessel landings in 1998, 0.5% of pounds harvested of red king crab) near the Nelson Lagoon unit would pose a threat for a large amount of fuel and oil spills. In addition, the Bristol Bay red king crab fishery, which is the only crab fishery near Nelson Lagoon, occurs in the last two weeks of October, when the majority of Steller's eiders have migrated out of Nelson Lagoon.

Spectacled eider critical habitat
It is not probable that the small amount of red king crab fishery effort (less than 2% of total harvest from 1977-1999) near critical habitat in Norton Sound would pose a threat for a large amount of fuel and oil spills. The near shore area, which is the majority of critical habitat, is closed to fishing and a limited amount of fishing occurs in the adjacent statistical areas, a portion of which are critical habitat. However, fishing does occur from July to September, the months that FWS identified when spectacled eider are particularly susceptible to disturbance and environmental perturbations.

It is not probable that the small amount of snow crab fishery effort in the winter habitat area would pose a threat for a large amount of fuel and oil spills. In the period between 1990-2000, less than four vessels fished in each of the five statistical areas in critical habitat.

Short-tailed albatross
It is not probable that the lawful operation of BSAI crab fisheries cause oil contamination to short-tailed albatross.

4.2 Ecosystem Changes

FWS identified fundamental changes in the marine ecosystem brought about by harvest or overharvest of fish and shellfish as a potential threat to listed seabirds and their critical habitat. Plausible biological interactions include competition for prey and changes in the composition and structure of the ecosystem. Information on biological effect comes from directed research, such as prey studies of seabirds and studies of the trophic interactions of crab. The existing information suggests that the BSAI crab fisheries do not have a significant effect on the populations of any listed species of seabirds. No evidence indicates that the crab fisheries fundamentally change the ecosystem.

Harvest of crab by the fisheries would have a direct effect on listed seabirds or critical habitat if seabirds competed with the fisheries for prey. Information on spectacled eider feeding habits indicates that they spend most of the year in marine waters where they primarily feed on bottom-dwelling molluscs and crustaceans

at depth up to 70 m. Steller's eiders inhabit nearshore marine waters, where they feed by diving and dabbling for mollusks and crustaceans. Albatrosses are surface feeders, which feed on principally small fish (e.g., larval and juvenile walleye pollock and sablefish), squid, and zooplankton, much of which is presumed to be of little commercial interest. Crab, at the size and location targeted by the fishery, are not a prey item of these seabirds, and the crab fisheries do not remove significant amounts of any other species as bycatch from the ecosystem. Most crab consumers eat larval crab, small crab, and molting females, none of which the fishery targets. Therefore, the removal of crab by the fishery is not likely to alter the prey availability for listed seabirds. Thus, no available evidence to date indicates that crab fisheries compete with these seabirds or that the seabirds are limited by availability of prey.

Harvest of crab by the fisheries would have indirect effects on listed seabirds or critical habitat if the fisheries change the composition of structure of the ecosystem. The crab fishery harvests may have contributed to changes in the composition or structure of the ecosystem, but the nature of such hypothetical effects is not clear, if they occur. Under the FMP, overharvest is prevented by the overfishing parameters which close crab fisheries at low abundance levels and rebuild the stocks. Removal of crabs by the fisheries is not expected to cause trophic-level interactions impacting the prey consumed by listed seabirds.

From the available information, it is impossible to determine whether indirect take of short-tailed albatrosses resulted from ecosystem perturbations caused by this action. In the section 7 consultation for the Pacific halibut fisheries, FWS stated that "because the population on Torishima Island appears to be increasing at near maximum biological potential, it seems that this species is not limited be food quantity or quality. Therefore, the [FWS] concludes that indirect take resulting from changes in the marine trophic system that may have been caused by this fishery is negligible and discountable" (FWS 1998c). We apply this same reasoning to the fisheries under the crab FMP and conclude that indirect take resulting from changes in the marine trophic system that may have been caused by this fishery is negligible and discountable.

Some basic knowledge exists on the trophic interactions of the major crab species. These are summarized below.

Pacific cod is the main predator on Tanner crabs in terms of biomass. Predators consume primarily age 0 and 1 juvenile Tanner crab less than 7 cm carapace width. Flathead sole, rock sole, and yellowfin sole are important predators in terms of numbers of small crab. Larval predators include salmon, herring, and jellyfish. There is a high rate of cannibalism among juvenile crabs. Annual consumption of Tanner crabs by groundfish ranged from 10 billion to 153 billion crabs, consisting primarily of Age 0 and Age 1 crabs (Livingston et al. 1994). Yellowfin sole and flathead sole were found to be the primary consumers of small Tanner crabs, whereas Pacific cod preyed on the larger juveniles.

Snow crab feed on an extensive variety of benthic organisms including bivalves, brittle stars, crustaceans (including other snow crab), polychaetes and other worms, gastropods, and fish. In turn, they are consumed by a wide variety of predators including bearded seals, Pacific cod, halibut and other flat fish, eel pouts, sculpins, and skates. Predators consume primarily age 0 and 1 juvenile snow crab less than 7 cm carapace width. Flathead sole, rock sole, and yellowfin sole are important predators in terms of numbers of small crab. Larval predators include salmon, herring, and jellyfish. There is a high rate of cannibalism among juvenile crabs.

Predation of crabs by groundfish removes large numbers of young snow crab. For snow crabs, estimates of annual consumption by groundfish from May through September ranged from 9 billion to 31 billion crabs (Livingston et al. 1993). Snow crabs consumed were primarily age 1, and to a lesser extent age 2 and 3 crabs. Pacific cod is a primary predator of snow crab, particularly softshell female and juvenile crab (Livingston 1987). Flathead sole, yellowfin sole, and rock sole also prey on young snow crabs (Livingston et al. 1993).

A number of fish species are known to feed on larval red king crab, including Pollock, Pacific herring, sockeye salmon, and yellowfin sole. Once the crab settle on the sea floor, they are prey to a number of commercial and non-commercial fish species such as most flatfish species, halibut, sablefish, skates, sculpins, and other benthic invertebrates, such as sea stars. A high rate of cannibalism by juvenile red king crab on younger crab also exists. Studies have documented that Pacific cod consume soft-shelled female adult red king crab. Minimal research has been conducted on the trophic interactions of blue king crab. We can assume that blue king crab have similar trophic interactions as red king crab, however, blue king crab are predominantly distributed around the Pribilof and St. Matthew Islands.

Although yellowfin sole and Pacific cod are known predators of juvenile and molting red king crab (Livingston 1987), data suggest that mortality caused by groundfish predators on adult red king crab may be low during summer months. It has been estimated that Pacific cod consumed about 1.4% to 3.8% of the female red king crab stock during the early 1980's, which suggested to Livingston (1987), that these rates were not the major factor behind the Bristol Bay red king crab stock crash. In the late 1980's, consumption by Pacific cod was estimated at 3.8% to 14.3 % of the female red king crab stock (Livingston et al. 1994). Although it has been hypothesized that juvenile sockeye salmon may impact recruitment of red king crab in Bristol Bay, subsequent analysis has failed to support this theory (Tyler and Kruse 1996).

Crab predators and competitors have been at relatively high levels through the 1980's and 1990's. Biomass of crab competitors (inshore benthic infauna consumers such as starfish and flatfish) increased about 40% from 1979-1993 (Livingston et al. 1994). Most of this increase is attributable to a growing rock sole biomass, and to a lesser extent starfish and flathead sole biomass. Of the crab species, only snow crab comprises a substantial portion of the infauna consumer guild (species that eat clams, polycheates, etc.). Yellowfin sole had dramatically increased in abundance in the early 1980's to become the largest component of this guild until the early 1990's when rock sole became co-dominant. Mean size at age has declined for yellowfin sole and rock sole, indicating stress caused by competition, and to a lesser extent a decrease in average bottom temperature (Livingston et al. 1994).

Popular opinion has been that predation by groundfish has been a major source of natural mortality for juvenile and molting crabs in the Bering Sea, particularly in years of high abundance of predators. Competition with groundfish may also lead to slower growth, as well as reduced resistance to disease and predation. A recent analysis concluded that changes in Bering Sea crab and groundfish populations were not related (Kruse and Zheng 1999). That is, it does not appear from statistical analysis that groundfish predation caused declines in crab populations. To better illustrate this for snow crabs, Kruse and Zheng (1999) noted that although snow crabs are heavily preyed upon by Pacific cod, strong year classes of snow crabs co-occurred with high cod biomass resulting in positive correlations.

4.3 Vessel Strikes

Vessel strikes can be assessed because fishery observer programs have generated substantial information on operational interactions between seabirds and fisheries. In addition, from known migration and distribution patterns of listed seabirds, we can determine if a potential for vessel strikes exists. Direct interactions between seabirds and crab fishing vessels are reported by observers. Since 1995, observers on crab vessels have received annual training in bird identification and reporting, and have reported all observations to the FWS through the ADF&G office in Dutch Harbor. The general public, through voluntary reporting program, also reports seabird interactions to FWS. NMFS does not expect the fishing patterns to change in the foreseeable future and, therefore, does not expect an to increase the frequency of vessel strikes by seabirds. If the fishing patters do change as a result of future management action, such as a program to allocate harvest to fishermen, NMFS is required to reinitiate consultation.

Currently, crab vessels length overall ranges from 22 feet to 212 feet, with over two-thirds of the vessels under 125 feet. The major crab fisheries operate 24 hours a day during the season, using high powered lights to work on deck.

The section 7 consultation between NMFS and FWS from 1994 to 1998 focused on the potential for vessel strikes by spectacled eiders in the snow crab fishery. The snow crab fishery was the only crab fishery under the FMP that NMFS and FWS determined through informal consultation had the potential to impact listed seabirds. As a result of this finding, formal section 7 consultations were made to determine the effects of the snow crab fishery on the spectacled eider. This perception of a likelihood of an adverse effect resulted from: (1) a lack of knowledge concerning the at-sea range of spectacled eiders and; (2) a lack of knowledge of the species of eiders that have struck, or were likely to strike crab vessels (FWS 1998a).

The 1994 Biological Opinion explains that spectacled eiders may strike snow crab fishing vessels because the birds are disoriented by the bright lights (FWS 1994). The 1994 Biological Opinion references anecdotal information citing eiders (species not determined) striking lighted crab fishing vessels. FWS prepared an incidental take statement estimating that no more than 10 spectacled eiders can be incidentally taken (as reported by observers or volunteers). The statement prescribes NMFS to insure that ADF&G implement the observer and reporting requirements described in the Biological Opinion as reasonable and prudent measures. The observer and reporting requirements include that incidental bird take reports from trained fishery observers shall be forwarded to FWS. In January 1998, FWS concluded the formal consultation because no take of spectacled eiders associated with the snow crab fishery had been reported between 1994 and 1998.

Beginning in 1995, observers aboard crab vessels received training in bird identification and reporting. Observers were instructed to report all sightings of listed seabirds to the FWS either directly or through ADF&G. To date, no take of spectacled eiders associated with this fishery has been reported. ADF&G continues to place crab fishery observers aboard the catcher-processor vessels, and is now placing observers on a portion of catcher vessels participating in this fishery, and these observers continue to receive training and refresher training in seabird identification and seabird reporting procedures.

Since the initial determination that this fishery was likely to adversely affect spectacled eiders, the FWS has learned much about the at-sea distribution of spectacled eiders. Satellite telemetry data and 3 years of late

winter aerial surveys indicate that spectacled eiders spend the winter in exposed waters between St. Matthew and St. Lawrence Islands, or in open leads slightly west of the inter-island area. Snow crab fishing has been largely concentrated around the Bering Sea continental shelf, which in the Bering Sea, runs from Unimak Island to the northwest, passing well south and west of St. Matthew Island. Crab fishing occurs along the shelf because this is where the greatest snow crab concentrations occur, and not because of fishing ground access restrictions imposed by sea-ice conditions between January and March. Thus, even if sea ice conditions were to make it possible for crab vessels to venture into the waters used by wintering spectacled eiders, they would not likely do so, due both to the time and expense of vessels traveling that far and the relatively fewer number of harvestable snow crabs present there. Therefore, in 1998, FWS concurred with NMFS's determination that the snow crab fishery is not likely to adversely affect threatened or endangered species under the jurisdiction of the FWS, including the threatened spectacled eider (FWS 1998a).

In 2001, FWS discovered new anecdotal information that, in December of 1980 or 1981, one morning "at least 150" dead eiders (species unknown) were found on deck of the M/V Northern Endeavor, which was anchored on the Bering Sea side of False Pass (Charla Sterne, FWS, personal communication). According to the Commercial Fisheries Entry Commission database, in 1980-81, the M/V Northern Endeavor was a 173 ft. tender/packer, also known as a floater processor. Since this strike was reported to have occurred in December, and near False Pass, the vessel may have been processing Tanner crab, red king crab (in 1981, the Bristol Bay red king crab fishery lasted from 9/10/81 to 12/15/81), or groundfish.

It is unlikely that the eider species in this encounter were spectacled eiders because False Pass is much further south than the known winter distribution for spectacled eiders. Most likely, they were either Steller's eiders or king eiders. King eiders are not listed. According to a FWS report, "The reports we receive of king eider strikes are consistent with our prediction that king may be the predominant "eider" species fishermen have observed in past "bird storms" or collisions with lighted crab vessels in the Bering Sea" (FWS 1995). False Pass is not in critical habitat, however, it is relatively near the Izembek Lagoon unit of Steller's eiders critical habitat. According to FWS, Steller's eiders occupy Izembek lagoon during the fall, winter, and spring (66 FR 8850).

In determining the significance of the M/V Northern Endeavor incident, we need to first determine if a similar incident could occur today, over 20 years later, with floater processors, catcher/processors, or catcher vessels. Crab fisheries and their management has changed drastically since the early 1980's. Changes include observer coverage, reduced harvest levels, shorter fishing seasons, and tighter regulations on all aspects of the fisheries (which are detailed in section 2.0).

Fishing seasons are shorter today than 20 years ago, therefore vessels are on the grounds for a shorter amount of time. The 1981 Bristol Bay red king crab season was unusually long because of high crab abundance and a high harvest rate. Since 1984, ADF&G has reduced the red king crab harvest rate drastically and abundance has yet to reach the high levels experienced in the late 1970's and early 1980's. Between 1990 and 1998, the season opened November 1 and lasted for between 4 to 12 days. In 1999, the Board moved the season date to October 15, and the season lasted 5 days in 1999 and 4 ½ days in 2000. The Tanner crab fishery has been closed since 1997. In the future, when abundance increases enough to allow a fishery, the Tanner crab fishery will be concurrent with the Bristol Bay red king crab fishery, which means vessels will fish for both king and Tanner crabs at the same time. Any remaining harvest of Tanner crab will be available 10 days after the close

of the king crab season, between 166°W and 163°W, and for harvest concurrently with the snow crab fishery in January. The majority of catcher vessels and catcher/processors that operate in these fisheries operate far from shore.

In the past five years, a maximum of 12 floater processors have operated in any given crab fishery, and one or two of them do anchor near False Pass during crab seasons to process crab delivered to them by catcher vessels. Deliveries are usually made at the end of the season before the catcher vessel returns to port. The floaters are usually in the vicinity for one to two weeks. It is probable that if the harvest level for Tanner crab were high enough to have a fishery 10 days after the closure of the king crab fishery, then a floater could be located near False Pass for the duration of that fishery. Thus, today and in the foreseeable future, if a floater processor is in False Pass, it will only be there for, at the most, the last two weeks of October, one week in November, and one or two weeks in January. This does coincide with the time when Steller's eiders are in the region. No crab fisheries require a floater processor near False Pass in December.

With the ADF&G observer program, vessels that process crab have had 100% observer coverage since 1988, or for the snow crab fishery, catcher processors have had 100% observer coverage since 1991. It is plausible to assume that if another similar strike occurred after 1988, it would have been reported by observers, especially since 1995 when the observers were trained in seabird identification and reporting techniques. No bird strikes have been reported by observers on catcher processors.

Another related question is whether or not crab vessels moor in coastal waters with their lights on in a manner similar to the M/V Northern Endeavor. In the current state of the crab fisheries, seasons are very short, usually about a week or two. The two exceptions are the Aleutian Islands golden king crab fishery, which lasts approximately 9 months, and the Norton Sound red king crab fishery, which lasts approximately two months. Due to the short season for snow crab, Bristol Bay red king crab, St. Matthew's blue king crab, and Pribilof Islands king crab, the vessels either fish or jog through storms and rarely moor during rough weather (Mary Schwenzfeier, ADF&G, and Sue Jorgenson, USCG, personal communication). This is the main reason ADF&G works with the Coast Guard to postpone a season opening if a severe storm is forecasted for the opening date. In 2000, ADF&G postponed the snow crab season due to severe weather and excessive ice coverage. Unless the whole fleet is prevented from fishing, the whole fleet will fish through the storm, because mooring up to wait out a storm could mean missing the fishery. In severe storms, such as during the 2001 Bristol Bay red king crab fishery, small vessels, from communities like King Cove, did moor up near Amak Islands for approximately 12 hours. Amak Islands is not in critical habitat, but it is relatively near the Izembek lagoon unit of Steller's critical habitat.

In addition, ADF&G regulations prevent any crab vessel from being on the fishing grounds prior to the opening of the fishery, within 14 days prior to the opening of the snow crab fishery and within 30 days prior to the opening of the king crab fisheries. Vessels are required to be in port for mandatory tank inspections. Also, vessels are required to return to port within 30 hours of the closure of the fishing season. Therefore, due to ADF&G regulations and the short seasons, vessels do not moor up in any measurable number in or near critical habitat.

While a bird storm is possible because crab catcher processors and floater processors are in areas where a bird strike has occurred in the past, we determine that future bird strikes are not probable given that another bird

strike has not been reported since 1988, significantly fewer crab vessels operate in these areas than in the early eighties, and no evidence is available that proves that the M/V Norther Endeavor was processing crab or that the bird strike was of an endangered or threatened species of eider.

For the fisheries with longer seasons, the vessels return to port during rough weather. For the Aleutian Island fisheries, vessels return to their home port or another port in the Aleutian chain, such as Adak, Kiska, and Atka. In Norton Sound, because this is a local fleet, most vessels return to their home village or to a nearby port (see map 6 for village locations) in inclement weather. If a vessel were to moor, the USCG requires anchored vessels to exhibit, where it can best be seen, a round white light on the top of the mast and at the stern.

FWS is also concerned that since two groundfish vessels encountered Steller's eiders in February 1997, near False Pass, that crab vessels could have similar interactions (Charla Sterne, FWS, personal communication). It was reported that one male Steller's eider landed on the deck of a trawl vessel near the northern entrance to False Pass. The eider climbed to the trawl wall and took off. Also, in February 1997, in False Pass, one male Steller's eider flew into a vessel and was found dead on the deck.

In determining the significance of the two trawl vessel incidents, it is important to determine if crab vessels are in the same area, at the same time, and operating in a similar manner, as the trawl vessels. The only crab fisheries that occur in the vicinity of False Pass are the Bristol bay red king crab fishery and the Tanner crab fishery. No crab fisheries are predicted to occur near False Pass in February. Comparing the inshore pollock trawl fishery to the Bristol Bay red king crab fishery and Tanner crab fishery, more trawl vessels participate closer to shore and for a longer period of time. First, some vessels that participate in the Bristol Bay red king crab fishery do fish near False Pass in October, and it is foreseeable that some vessels targeting Tanner crabs will fish near False Pass in November, once the fishery opens again. However, the majority of effort for both the crab fisheries is concentrated away from shore, outside critical habitat (see map 1 and 5). Also, it is not probable that these fisheries will be longer than one week. Whereas, in 1997, the inshore pollock trawl fleet operated near shore for 30 days, from January 20 to February 19. The inshore pollock trawl fleet fishes closer to shore than crab vessels. It is also not probable that, with such short seasons, crab vessels would leave the fishing grounds for coastal waters during inclement weather. Thus, crab vessels are not in False Pass as long or in as great of a concentration as trawl vessels. Therefore, we conclude that it is not probable that crab fishing vessels would have the same frequency of interactions as trawl vessels.

A limited amount of effort in the Norton Sound fishery occurs in critical habitat. This fishery is a small boat fishery prosecuted by fishermen from the communities around Norton Sound. Many of the vessels are skiffs without wheel houses or refrigerated seawater tanks. Since the fishery occurs in the summer time, and Norton Sound is very far north, most of the fishery occurs in daylight hours. Towards the end of August, when is starts to get dark, some vessels use lights while fishing at night. Practically, a small vessel can emit a limited amount of light due to its size. It is questionable that the amount of light emitted is enough to disorient spectacled eiders, further, if the eiders were disoriented, an flew towards the vessel, the birds would have limited surface area to collide with, unlike the effects of huge sodium lights on a 174 foot floater processor. In discussions with ADF&G staff in Nome and their discussions with crab fishermen, it was determined that seabird strikes are not known to occur and not probable given the nature of the fishery (Betsy Brennan, ADF&G, personal communication). In addition, while only a small portion of the effort is in critical habitat,

it is important to note that because the vessels are small, they fish near their home village and closing critical habitat would disproportionally effect the fishermen in communities near critical habitat, such as Unalakleet.

Since the conclusion of the formal consultation, there have been no reports that indicate vessel strikes of the endangered and threatened species of seabirds by BSAI crab vessels. Information on vessel strikes comes from observer data, anecdotal accounts, and FWS. From these information sources, no endangered or threatened seabird species have been reported to incur injury or mortality in the BSAI crustacean pot fisheries managed under the FMP since the conclusion of the previous consultation. Limited direct interactions between the fishery and seabirds is most likely due to the nature of pot gear, the time of the crab fisheries (in the fall and winter), and the location of majority of fishing effort (far from shore).

4.4 Alteration of Benthic Habitat

The BSAI crab fisheries use pot gear, which is not known to cause extensive damage to the benthic habitat. Maximum size of pots of 10'x10'x 42" is regulated by ADF&G. Typically, the red and blue king, Tanner, and snow crab fisheries use 6'x6'x3.5' or 8'x8'x3.5' rectangular pots. Some fishermen use conical or pyramid shaped pots. Each pot weighs between 6 to 8 hundred pounds. For these fisheries pots are deployed singly, each pot with its own buoy. The number of pots a vessel deploys in each fishery is regulated by vessels size, as explained in section 2 of this document. For the golden king crab, pots are typically pyramid shaped and deployed by longline.

Pot gear type likely affects habitat during setting and retrieval of pots; however, little research quantifying the impacts has been conducted to date. "Ghost-fishing"by derelict pots potentially has large-scale effects. Lost by the fishery, these pots may continue to entrap crab and fish until their netting or escape panels disintegrate (Stevens et al. 2000). Inasmuch as they are unbated, the primary attraction of derelict pots is their physical structure, which adds complexity and vertical relief to a generally featureless environment. Since 1996, ADF&G has required pots to have a panel of degradable mesh to reduce ghost fishing. No evidence indicates the deployment or retrieval of pot irreparably alters the benthic environment. NMFS has begun, through the Essential Fish Habitat process, to identify and research the effects of different types of fishing gear on different habitat types. Through this research, we will gain a better understanding of the effects on pot gear on the benthic habitat.

The golden king crab fishery has the potential to impact the benthic environment in the Aleutian Islands. The golden king crab fishery is prosecuted very differently from the other crab fisheries, as described in section 2.6 of this document. The main difference for this part of the analysis is the fact the golden king crab fisheries longline their pots and do not have pot limits. Also, the golden king crab vessels have 100% observers. The benthic habitat where the golden king crab fisheries operate contain coral. Coral may be damaged by the setting and retrieval of pot gear. Little information exists on the effects of pot gear on coral in the Aleutian Islands. This is an issue that needs directed scientific research. The ADF&G observer program has begun to collect information and build a database on the locations and species of coral brought on deck in Aleutian Islands golden king crab fishery. Continued observer data collection that focused on recording where and which types of coral were brought up in the fishery would improve our understanding of this issue. Since the golden king crab fisheries does not occur in critical habitat, and we know of no links

between coral and listed seabirds, we determine that this potential damage to coral does not adversely effect seabirds or their critical habitat.

Like other fisheries, pot fisheries incur some bycatch of incidental fish and crab. Bycatch in crab pot fisheries includes crabs, octopus, Pacific cod, halibut, and other flatfish (Tracy 1994). However, the vast majority of bycatch in the crab fisheries is females of target species, sublegal males of target species, and non-target crabs. All bycatch of non-legal crabs is discarded at sea. Since pot gear selectively harvests primarily legal sized crab, the crab fisheries do not remove significant amounts of other species from the ecosystem. The State has implemented bycatch reduction measures to reduce the amount of crab bycatch in the directed crab fisheries.

NMFS does not expect the fisheries impacts on habitat to change in the foreseeable future and, therefore, does not expect the crab fisheries to adversely modify spectacled eider or Steller's eider critical habitat or to adversely affect any of the listed seabird species. If the fishing patters do change as a result of future management action, such as a program to allocate harvest shares to fishermen, NMFS will need to reinitiate consultation.

4.5 Cumulative effects

ESA regulations at § 402.02 define 'cumulative effects' as those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Cumulative effects analysis on all actions, including Federal actions, in the Bering Sea and Aleutian Islands is described in detail in the Supplemental Environmental Impact Statement for Steller Sea Lion Protection Measures (NMFS 2001).

Cumulative effects under ESA may include:

1.05 Lease and development of State-controlled, nearshore marine waters; e.g. State and/or municipal harbor projects;
1.06 State fisheries that may impact benthic habitat and community;
1.07 State fisheries that may indirectly impact listed eider species;
1.08 Oil spills resulting from oil transport or transfer;
1.09 Incidental take of the short-tailed albatross in non-US longline fisheries in the North Pacific;
1.10 Direct harvest (subsistence or non-subsistence) of listed eider species.

At present, the State fishery for herring is located in the following areas: Prince William Sound, Cook Inlet, Kodiak, Alaska Peninsula, Bristol Bay, Kuskokwim, Norton Sound, Southeast, and Port Clarence. Harvest methods for herring consist of gillnet, purse seine, and handpicking of roe from kelp. Herring are primarily caught for their roe during the sac roe harvest in the spring. Harvest levels for 1998 are expected to be about 36,000 mt, similar to the last few years. Herring catches by season and by region and the effort level are available from ADF&G. Bristol Bay is the primary producer with recent catches of about 23,000 mt annually. Effort over the last two decades has decreased in Prince William Sound and Cook Inlet, but

increased in Kuskokwim, Kodiak, and Bristol Bay. The potential adverse effects of the State of Alaska herring fishery on short-tailed albatrosses is unlikely and on the two eider species is uncertain.

Clam, abalone, octopus, squid, snail, scallop, geoduck clams, sea urchins, hair crab, and sea cucumbers have been harvested throughout the State. Of these, clams are the most likely prey of eiders and squid are the most likely prey of short-tailed albatrosses. Most of the catch of shellfish is taken from April to September, and they are taken by hand-picking, shovel, trawl, pot, and dredge gear. Harvest levels were relatively consistent through the 1980s, but have increased dramatically in amount and annual variation in the 1990s. The variability has been due, in large part, to recent but sporadic catches in Bristol Bay and the Bering Sea, areas not usually fished for shellfish. With the exception of the recent large catches in these areas, most of the shellfish fisheries have traditionally taken place in the Kodiak and Cook Inlet areas.

The State of Alaska shrimp fishery occurs primarily in the southeast and Yakutat areas, and to a lesser extent in Prince William Sound, Kodiak, Dutch Harbor, Cook Inlet, and the Alaska Peninsula. Shrimp are harvested by pot gear and often sold to floating processors. In 1995, over 45,000 mt of shrimp were harvested by 351 vessels. In the last ten years, effort has increased in the southeast due, in part, to the availability of floating processors, which allow fishing vessels to devote more of their time to fishing.

The State of Alaska manages groundfish within the 3-mile limit for lingcod, Pacific Ocean perch, flathead sole, rex sole, arrowtooth flounder, sablefish, black rockfish, Pacific cod, and pollock. Fisheries occur in the Alaska Peninsula, Kodiak, Bering Sea, Dutch Harbor, Adak and W. Aleutian Islands, Cook Inlet, Prince William Sound, and Southeast areas.

The State of Alaska Pacific cod fishery is undergoing a change in management from Federal to State authorities. A total TAC is set for Pacific cod, and that TAC is divided into Federal and State shares. In 1997 and 1998, the State assumed management responsibility of 15% of the total TAC for cod, and 20% in 1999. In 2000, the State will assume management responsibility of 25% of the total TAC for cod, which is the highest percent allowed under current regulations. The State fishery is limited to pot and jig gear only. The Pacific cod fishing season is primarily in the winter.

The State of Alaska salmon fishery includes five species: chinook, sockeye, coho, pink, and chum. These fisheries are divided into southeast, Prince William Sound, Cook Inlet, Bristol Bay, Kodiak, Chignik, Alaska Peninsula, Kuskokwim, Yukon, Norton Sound, and Kotzebue management areas. The State has a long history of salmon fishing. Salmon are taken by purse seines, gill nets, trolling, and beach seining. The catch in 1974 was just over 60,000 mt, then increased four-fold by 1981, was relatively constant through the 1980s, and then increased in the early 1990s to a record catch of over 450,000 mt. In 1997, 123 million salmon were caught in Alaska, amounting to about 280,000 mt. The 1998 catch was expected to be higher than 1997, but has been low due to poor returns in Bristol Bay. Bristol Bay harvest levels have historically been the highest with Kuskokwim and Chignik being the lowest. In 1997, 26% of the commercial catch was from hatcheries. NMFS operated an MMPA Observer Program in Cook Inlet in the salmon gillnet fisheries during 1999 and 2000. This program began observation of the two Cook Inlet Category II fisheries (salmon drift and Upper and Lower Cook Inlet set gill net) in 1999. Observers were deployed on the first drift gill net opening of June 28. For the drift gill net fishery, 141 net-days (in which a net is fished at least 6 hours in a 24 hour period) were observed of a target 180 net-days coverage, and 256 net-days were observed of a target 300 net-days

coverage for the set gill net fishery. In the drift fishery, observations were made of 744 sets and/or hauls of 102 unique permits for a total of 845 hours observation time. Among the set fishery, 1450 observations were made of soaks and/or hauls of 275 unique permits totaling 1545 hours of observation time. The year 2000 observer program began early enough to observe the June chinook salmon set gill net fisheries. No eiders were observed to be taken in eider year. In 1999 eiders were not observed to approach within 10m of any drift or set gillnet, and were not noted as being observed within 300m of observed nets; i.e., observers didn't report seeing any eiders. Birds that were reported entangled in nets in 1999 were: 3 gulls, 3 common murres (died), 2 loons (1 died), and 1 white-winged scoter. Data have not been summarized for 2000 yet. Similar observer programs were operated in the salmon gillnet fisheries in Prince William Sound and South Unimak in 1990 and in Prince William Sound in 1991. Observer periods occurred during June-September 1990 and May-August 1991. Eiders were never reported entangled or observed within 10m of active set and drift gillnets. NMFS will be developing a request for proposals to observe at least the Kodiak set gill net fishery in 2001, and determine whether sufficient funds exist to include Yakutat set gill net fisheries.

Incidental take of the short-tailed albatross in non-US longline fisheries in the North Pacific is discussed in detail in the Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis for A Regulatory Amendment to Revise Regulations for Seabird Avoidance Measures in the Hook-and-line Fisheries off Alaska To Reduce Bycatch of the Short-tailed Albatross And Other Seabird Species (NMFS 2001). This document is incorporated by reference.

The subsistence or direct harvest of spectacled and Steller's eiders is thought to occur and is expected to continue into the foreseeable future. As is the case for other sources of mortality, the significance of subsistence harvesting may increase as the eider populations decrease in size unless the harvesting rate is reduced accordingly. However, the subsistence or direct harvest may account for only a relatively small portion of the animals currently lost to the population each year. Studies by ADF&G's Division of Subsistence indicate that in the 1980s and 1990s, subsistence hunting, fishing, and gathering in rural Alaska communities were part of a "mixed, subsistence-market economy", meaning that subsistence activities are undertaken by extended family groups using small-scale technologies and each family's subsistence production was supported and supplemented by cash employment (Fall 1990, Wolfe and Bosworth 1994). Of Bristol Bay communities surveyed in the 1980s, approximately 4 percent of the subsistence harvest was composed of birds and their eggs (Fall 1990). Seabird species included sea ducks, gulls, and murres. The two most common seabird species harvested in Alaska during the late 1990s were common murres and crested auklets, with 90 percent of the harvest occurring in the communities of Saint Lawrence and Diomede islands. Other seabirds taken in Alaska include: cormorants, gulls, loons, kittiwakes, puffins, terns, and grebes (Wolfe, pers. comm.) Recent ADF&G reports indicate that in the 1990s, birds made up 2 percent of the composition of the wild food harvest by rural residents and 1 percent of the harvest by urban residents (Wolfe and Bosworth 1994).

The incremental impacts of the crab fisheries, when added to these other actions, does not cause adverse effects to listed seabirds or critical habitat.

5.0 Conclusions

After reviewing the current status of the short-tailed albatross, the spectacled eider, and Steller's eider, the critical habitat designated for the spectacled eider and Steller's eider and the potential effects of the crab fisheries prosecuted under the FMP, NMFS concludes that the actions considered in this Biological Assessment, are not likely to (1) adversely affect the listed seabirds, or (2) destroy or adversely modify designated critical habitat. Therefore, we believe formal consultation is not required.

As detailed in this Biological Assessment, the BSAI crab fisheries, as prosecuted under the FMP, remove a small portion of large male crab compared to total the spawning biomass of each crab species. Bycatch is predominantly small and female crab, all of which is discarded at sea. The majority of the effort in these fisheries occurs far from shore during short (one to two week) seasons in the fall and winter months (October and January). Research conducted to date by NMFS, ADF&G, and Universities, does not indicate that the crab fisheries or the removal of crab significantly impacts other species in the ecosystem. Although we can assume that crab vessels, like all fishing vessels, cause some disturbance to the animals that live in and around the areas where the vessels operate. We do not expect these fishing patterns to change in the foreseeable future and, therefore, do not expect the fisheries prosecuted under the FMP to have adverse, biological effects on listed seabirds. If the fishing patters do change as a result of future management action, such as a program to allocate harvest to fishermen, NMFS is required to reinitiate consultation.

This Biological Assessment evaluates, as required by regulation, the potential direct, indirect, and cumulative effects of the action. Potential direct effects, as identified by FWS, are vessel pollution and vessels strikes. Potential indirect effects, also identified by FWS, are ecosystem changes and alteration of benthic habitat. Cumulative effects include non-Federal fisheries, subsistence, and marine pollution. FWS identified these potential effects for all fisheries. This biological assessment identifies that the only plausible biological interaction between the crab fisheries and threatened and endangered species is vessel strikes by seabirds. While such interactions are possible, the available evidence is not sufficient to argue persuasively that these interactions do occur in today's fisheries and limit the recovery of listed species occurring in the action area.

In working with the ADF&G shellfish observer program to prepare this document, we highlighted a few suggestions for improving observer reporting of listed seabird interactions to FWS. First, we recommend FWS modify the short-tailed albatross reporting form, which it provides for observers to report fishery interactions with this species, to include all listed seabirds in the BSAI. Second, we recommend FWS provide ADF&G with written guidelines on what constitutes an interaction. We also recommend the development of laminated identification cards for the Steller's and spectacled eiders, similar to the cards produced for short-tailed albatross. Finally, we recommend ADF&G be provided with a report form to be faxed to FWS after each fishery summarizing the observer encounters or reporting that no encounters were observed during the fishery. This summary will ensure that FWS received all reported interactions and provide a record in years when no interactions are reported.

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