ENVIRONMENTAL ASSESSMENT/
REGULATORY IMPACT REVIEW/
FINAL REGULATORY FLEXIBILITY ANALYSIS

For Amendment 89 to the
Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and Regulatory Amendments for Bering Sea Habitat Conservation

May 2008

Lead Agency: National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Alaska Region

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Abstract: This Environmental Assessment/Regulatory Impact Review/Final Regulatory Flexibility Analysis (EA/RIR/FRFA) evaluates alternatives to further conserve fish habitat in the eastern Bering Sea (EBS). In February 2005, the North Pacific Fishery Management Council (Council) took final action on the essential fish habitat (EFH) environmental impact statement (EIS) to adopt a suite of measures to conserve EFH in the Gulf of Alaska and Aleutian Islands from potential impacts due to fishing. At the same time, the Council took no action to implement additional conservation measures in the EBS. Since that action, the Council and NMFS are now considering additional precautionary measures to minimize potential adverse effects of nonpelagic trawl fishing in the EBS. This EA tiers off of the 2005 EFH EIS and considers open and closed areas, as well as gear modifications, for the nonpelagic trawl fishery.

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EXECUTIVE SUMMARY

The purpose of this analysis is to evaluate impacts of alternatives to further conserve fish habitat in the Eastern Bering Sea (EBS). In February 2005, the Council took final action on the EFH EIS (NMFS 2005) to adopt a suite of measures to conserve EFH in the Gulf of Alaska (GOA) and Aleutian Islands (AI) from potential impacts due to fishing. Those measures primarily addressed the impacts of nonpelagic trawl gear. At the time of final action for the GOA and AI, the Council chose to take no action to implement additional conservation measures in the EBS, as the analysis found such additional measures were neither required by law nor necessary at that time. Further, the alternatives considered for Bering Sea habitat conservation required additional 'fine-tuning' before they could be considered as practicable measures. Alternatives to modify nonpelagic trawl gear had not been sufficiently researched to understand the scale of beneficial effects on habitat, nor the resulting costs to fisheries (e.g., reduced catch rates, retrofitting gear). The alternatives proposed for open areas in the EBS left out historically important and lucrative fishing grounds, and included rotating closures that were found to have questionable merit. To address these issues, the Council notified the public that it planned to take a more focused examination of potential measures to further conserve fish habitat, including EFH, in the EBS by initiating a separate analysis that would tier off the 2005 EFH EIS. After several meetings deliberating on this issue, the Council decided to focus on reducing the effect of nonpelagic trawling. The reason for this focus is that (1) nonpelagic trawling uses gear that fishes hard on the bottom; (2) nonpelagic trawling had "high" long term effect indices (LEI) on habitat; (3) based on the EIS evaluation, the nonpelagic trawl fishery is widely distributed (i.e., a large footprint); and (4) effort could potentially increase dramatically pending future increases in total allowable catch (TAC) limits for flatfish species. This analysis provides an examination of a range of reasonable alternatives to conserve fish habitat in the EBS by reducing potential impacts of nonpelagic trawling.

Additional analysis, beyond the EFH EIS, is needed to consider measures for the conservation of fish habitat in the Bering Sea. New information on potential gear modifications to protect bottom habitat has become available since the EFH EIS, and allows for a gear modification alternative that could not have been considered in the EFH EIS. The Council wishes to protect fish habitat in support of commercial fisheries and subsistence activities in the Eastern Bering Sea, ensuring consistency with national standard 8 of section 301 of the Magnuson-Stevens Act. Thus, evaluation of additional measures, and their possible implementation, provides a precautionary approach, in light of incomplete knowledge of fish dependence upon habitat and the effects of fisheries on that habitat. The problem statement adopted by the Council for this analysis is provided below:

Problem Statement: The Council intends to evaluate potential new fishery management measures to protect Essential Fish Habitat (EFH) in the Bering Sea. The analysis will tier off of the 2005 EFH Environmental Impact Statement and will consider as alternatives open and closed areas and gear modifications. The purpose of the analysis is to consider practicable and precautionary management measures to reduce potential adverse effects of non pelagic trawl fishing on EFH and to support the continued productivity of Council managed species. Any new management measures will be developed in consideration of local community use.

This EA/RIR/FRFA evaluates the impacts of two primary alternatives to the status quo, along with several minor components, which are considered as options to the alternatives. The alternatives are not mutually exclusive (i.e., any combination can be selected). The options can be chosen in any combination with the alternatives, including the status quo. The locations (latitudes and longitudes) of these areas are defined in Appendix A, attached.

The alternatives and options are as follows:

Alternative 1: Status quo. No additional measures would be taken to conserve benthic habitat.

Alternative 2: Open area approach. This alternative would prohibit nonpelagic trawl gear outside of a designated 'open area'. Nonpelagic trawl gear would be prohibited in the northernmost shelf area and the deepwater basin area of the Bering Sea. There is only one open area analyzed, which is based on the EFH EIS area, modified using nonpelagic trawl effort distribution data through 2005.

Suboption: A new open area approach is added that defines the northern boundary. The wedge would move a portion of the northern boundary northward between Nunivak and St. Matthew Islands to 61° N.

Alternative 3: Gear modifications. This alternative would require gear modifications for all nonpelagic trawl gear used in flatfish target fisheries. Specifically, this alternative would require discs on nonpelagic trawl sweeps to reduce seafloor contact and/or increase clearance between the sweep and substrate. A performance standard of at least 2.5 inches elevation of the sweep from the bottom would be required.

The options below could be selected in combination with any alternative(s) and more than one option can be chosen. All current management actions are still in place (i.e., Pribilof Habitat Conservation Area, Red King Crab Closure Area).

Option 1. Close the area around St. Matthew Island to nonpelagic trawl gear. This area would be configured such that the area near St. Matthew Island is closed to conserve blue king crab habitat.

Option 2. Close an area to nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Strait. This area would be configured such that the area around Nunivak Island and Etolin Strait is closed to conserve nearshore habitats, and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas.

Option 3. Close an area to nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Strait and Kuskokwim Bay. This area would be configured such that the area in southern Etolin Strait and Kuskokwim Bay is closed to conserve nearshore habitat and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas. The boundaries of this closure area are the result of negotiations by representatives of the flatfish industry and coastal communities.

Option 4: Close an area to nonpelagic trawl gear from the northern boundary line of the open area under Alternative 2, stretching from the Russian border around the southern end of St. Matthew Island to and around the southern portion of Nunivak Island and across Kuskokwim Bay to Cape Newenham and designate it as the Northern Bering Sea Research Area (NBSRA). The NBSRA would be closed while a management plan is developed for Council review. The plan will consider and identify protection measures as may be necessary within the NBSRA for king and C. opilio crab, marine mammals, ESA listed species, and subsistence needs of Western Alaska coastal communities in nearshore areas. In addition to establishing these protection measures, the plan will identify areas where nonpelagic trawl fishing is allowed, pursuant to a scientific research plan. The Council requests the NMFS Alaska Fisheries Science Center design an adaptive management experiment in the closed northern area, described under this option, to study the effects of nonpelagic trawl gear in previously untrawled areas. The study should include open and closed areas and appropriate monitoring to study fishing impacts on benthic communities and ecological processes, particularly as this relates to juvenile C. opilio crab. In these open areas, control closures will be established based on representative habitats needed to allow scientifically valid comparisons of the effect of nonpelagic trawl fishing. Access to the NBSRA by nonpelagic trawl will be established once the protection measures and control areas described above are delineated. The adaptive management experiment design will include review by the Scientific and Statistical Committee (SSC). NMFS will provide the draft adaptive management experiment design to the Council for review within 18 months following the Federal Register publication of the final rule for this action.

Suboption: A new closure is added that defines the northern boundary. The wedge would move a portion of the northern boundary northward, between Nunivak and St. Matthew Islands to 61° N.

Option 5: Close the area to nonpelagic trawl gear around St. Lawrence Island. This area would be configured such that the area around St. Lawrence Island is closed to nonpelagic trawl gear to conserve blue king crab habitat and minimize potential interactions with community use and subsistence fisheries taking place in nearshore areas.

The analysis of direct, indirect, and cumulative effects for the proposed action indicated no significant impacts on the human environment from the alternatives or options, as these terms are defined under NEPA. None of the alternatives or options place significant gross first wholesale revenues at risk that cannot easily be mitigated with minimal to no added cost to the primarily affected head and gut catcher processor fleet sector. Some western community concerns have been presented and are addressed in this analysis, in terms of buffer zones for subsistence use close to villages or used shorelines.

The status quo provides protection for vulnerable benthic habitat with existing bottom trawl closures in the Bering Sea. The EFH EIS (NMFS 2005) concluded that the effects of fishing on EFH in Alaska are minimal and no additional measures were required by law, nor necessary. Thus, Alternative 1 is not likely to result in any significant effects regarding habitat, target species, non-target resources, marine mammals, seabird species, or the ecosystem.

The impacts of Alternative 2 are likely similar in magnitude to Alternative 1, due to the slight size change of the open areas compared to the status quo, given the recent and historic distribution of fishing effort. From an environmental perspective, Alternative 2 may have beneficial effects on Steller's eiders and spectacled eiders and have insignificant short-term effects regarding habitat, target species, non-target resources, marine mammal, other seabird species, or the ecosystem. Nevertheless, an open area approach may be a precautionary measure in terms habitat protection. Alternative 2 would set aside areas that would remain in a relatively pristine condition in the future, but, in so doing may impose some economic costs upon the fishery, relative to options to protect communities. These may include limits on future northward fishery expansion, in particular, by the head and gut (H&G) catcher processor sector.

From 2003 through 2005, the estimated first wholesale gross revenue from commercial nonpelagic trawling in the proposed closure area under Alternative 2 averaged $2.4 million (or 1.19% of status quo total gross revenue for this sector). Flatfish and Pacific cod represented the largest proportions of first wholesale gross revenue from the proposed closure area over the three-year period. Retained flatfish revenue accounted for $960,000 (or 1.32%) of the $72.72 million of status quo first wholesale gross revenue in 2003, $2.83 million (or 3.37%) of the $83.98 million status quo first wholesale gross revenue in 2004, and $2.22 million (or 1.83%) of the $121.33 million status quo first wholesale gross revenue in 2005. Pacific cod revenue from this area accounted for $250,000 (or 0.69%) of the $35.91 million total sector-wide status quo first wholesale gross revenue in 2003, $570,000 (or 1.23%) of the $46.39 million sector-wide status quo first wholesale gross revenue in 2004, and $190,000 (or 0.72%) of the $44.3 million status quo total first wholesale gross revenue in 2005.

The economic impact analysis contained in the RIR assumes these amounts approximate the nonpelagic trawl first wholesale gross revenues that could be placed at risk of forfeiture, due to each respective alternative's proposed closures. Here, the "revenue at risk" is that portion of total gross revenue earned, in recent years, from groundfish caught in an area proposed for closure under the Bering Sea Habitat Conservation measures. While it is not possible to predict actual future revenue that may be foregone in the event of a closure, the "revenue at risk" analysis provides a gross revenue impact proxy by examining what the foregone revenue would have been had the closure been in place in each of several recent years. Revenue at risk may be mitigated, to a largely unknown extent, by relocating fishing effort from the proposed closed area to fishing grounds remaining open under the proposed habitat conservation measures. In this respect, these estimates may be regarded as an upper-bound on direct gross revenue impacts. They do not, however, account for additional costs associated with involuntary relocation of fishing activity. These are treated separately in the RIR. The confidence one may place in the accuracy of the impact estimates is directly correlated with the appropriateness of this assumption.

Given that the Alternative 2 open area encompasses more than 95% of current fishing area, the first wholesale gross revenue that could be placed at risk under the proposed action could likely be mitigated by expending additional fishing effort in the area remaining open to nonpelagic trawling. Such mitigation would not be expected to substantially increase operational costs, although some marginal increase may occur if fishermen are required to shift fishing effort to fishing grounds that are more distant, have a lower CPUE, have unfamiliar physical conditions, etc.

The suboption to Alternative 2 would move a portion of the northern boundary of the open area northward between Nunivak and St. Matthew Islands to 61° N. Analysis of this wedge has not revealed any nonpelagic trawl effort in this area during 2003-2005. Thus, the suboption does not affect the estimates of Alternative 2 revenue at risk. However, this northward boundary shift may serve to offset, to an unknown extent and duration, potential northward movement of groundfish stocks potentially brought about by changing climactic conditions. The suboption allows for increased movement of some flatfish species stocks and allows the fleet to compensate for that in the future. In particular, the flathead sole fishery has moved an average of 20 miles a year both north and south within the same longitudinal range, although the industry has not fished within the extent of the wedge described in the suboption under Alternative 2.

In addition to the evaluation of the effects on current fisheries, a designation of an open area could have future effects, depending on fish stock distribution and fishing distribution. Potential economic impact from the open area alternative depends to some extent on how and where fish stocks and fishermen change their distributions in the future. If the fish distribution remains static, the impacts will be negligible. However, if a substantial portion of the flatfish and cod stocks redistribute outside of the open area in the future – and assuming that other stocks don't take their place – there could be some economic impacts to the fleet if they were unable to catch the TACs.

The impacts of Alternative 3 result from reducing gear contact with the bottom. From an environmental perspective, Alternative 3 would have beneficial effects regarding habitat, and insignificant effects regarding target species, non-target resources, marine mammals, seabird species, and the ecosystem. The proposed gear modifications will likely result in additional equipment costs for vessels to comply with the addition of disks to the trawl sweeps and on some vessels may result in modification to operations and/or the cost of additional deck equipment. Gear manufacturers estimate this cost at just under $4,000, per vessel, or about 33% more than the sweep alone.

Option 1 would close the area around St. Matthew Island to nonpelagic trawl gear to conserve blue king crab habitat. This option would provide some positive benefits to the blue king crab habitat that extends southwest protecting juvenile, non-ovigerous (egg-bearing) female and male blue king crab habitat, and northeast protecting ovigerous females' habitat. This crab stock is severely depleted and designated as overfished. There has historically been minor trawl effort, targeting Pacific cod and flatfish species just to the north of St. Matthew. Maps of fishing effort by Fritz et al. (1998) indicate that a strip of ocean immediately north of St. Matthew has been an area with very high CPUEs for Pacific cod and more recent observer data indicate high catch per unit effort (CPUEs) of flatfish species. It is unknown at this time how many vessels have been active there, or how much fish has been harvested by nonpelagic trawls fishing this area. At a maximum, the number of vessels targeting groundfish, and the revenue at risk, would be the same as calculated for Option 4. There may be economic benefits of Option 1 to crab fishermen associated with reduced impacts on crab; however, these effects are likely to be minor, given that blue king crab bycatch is thought to be low in this area (NMFS data review by crab plan team) and the area to the north does not seem as important to blue king crab as compared with the area to the south and areas within State waters.

The RIR provides estimates of the revenue and the percent of baseline revenue potentially placed at risk under Option 1 Table 5.7-3. Average revenue at risk from 2003 through 2005 is estimated to be $310,000, or 0.15% of the status quo average revenue of $201.73 million.

Option 2 would close an area to nonpelagic trawl gear around Nunivak Island, with the southern border extending along the nearshore portion of Etolin Strait, to conserve nearshore habitats and minimize potential interactions with community use and subsistence fisheries. Option 2 may have beneficial effects on Steller's Eiders. The area south of Nunivak Island and Etolin Strait has seen increasing effort by vessels targeting yellowfin sole in recent years, but should not be impacted by this option. There are opportunity costs associated with prohibiting vessels from fishing in other areas. Such impacts were previously discussed in general terms in the evaluation of Alternative 2. The majority of revenue at risk under Option 2 is derived from flatfish. Flatfish revenue at risk would have been $570,000, or 0.78% of the $72.72 million status quo first wholesale gross revenue in 2003, $1.86 million, or 2.21% of the $83.98 million status quo first wholesale gross revenue in 2004, and $60,000, or 0.05% of the $121.33 million status quo first wholesale gross revenue in 2005.

Option 3 would close an area to nonpelagic trawl gear around Nunivak Island, with the southern border extending along the nearshore portion of Etolin Strait and Kuskokwim Bay to conserve nearshore habitat. Option 3 may have beneficial effects on Steller's Eiders. This option would provide some positive benefits to communities to minimize potential interactions with commercial fishing gear and provide protections to nearshore habitats for subsistence use and local fisheries. Because the final boundaries of this closure area are the result of negotiations by representatives of the flatfish industry and coastal communities, it is difficult to quantify the economic impacts. Nonetheless, given the relatively limited amount of effort in the Etolin Strait portion of the closure, and virtually no effort in Kuskokwim Bay, the economic impacts would be expected to be relatively minor. Catch data from 2003 through 2005 indicate that under 5,000 mt of flatfish (all species) were caught in the area proposed for closure under Option 3. Thus, the majority of revenue at risk under Option 3 is derived from flatfish. Flatfish revenue at risk would have been $1.02 million (or 1.4%) of the $72.72 million status quo first wholesale gross revenue in 2003, $2.98 million (or 3.55%) of the $83.98 million status quo first wholesale gross revenue in 2004, and $990,000 (or 0.81%) of the $121.33 million status quo first wholesale gross revenue in 2005. On average, this potential revenue at risk impact appears relatively minor. However, testimony at the Council meetings has suggested that this is an important area to the fleet because fleet has indicated that the catch rates for yellowfin sole can be high while encountering low halibut bycatch rates.

Average revenue at risk from 2003 through 2005 for the combination of Option 1 and Option 3 (equivalent to Option 4, which includes these areas and unfished area to the North) is estimated to be \$1.98 million, or 0.98% of the status quo average revenue of \$201.73 million. Revenue at risk during the analysis period is estimated to be highest in 2004, with \$3.67 million, or 1.88% of the 2004 status quo revenue of \$195.51 million. The low would have occurred in 2005, with \$1.04 million, or 0.42% of the 2005 status quo revenue of \$247.96 million. The majority of this revenue at risk is derived from flatfish. Flatfish revenue at risk would have been \$1.06 million or 1.45% of the \$72.72 million status quo first wholesale gross revenue in 2003, \$3.10 million or 3.69% of the \$83.98 million status quo first wholesale gross revenue in 2004, and \$0.99 million or 0.82% of the \$121.33 million status quo first wholesale gross revenue in 2005.

Option 4 would establish a Northern Bering Sea Research Area, which would be entirely closed to fishing with nonpelagic trawl gear, at least in the short term, until an adaptive management experiment design was developed and approved. The option to provide a closure area in the northern Bering Sea would be a precautionary measure, in terms of habitat protection, by preventing northward expansion of the nonpelagic trawl fishery. However, research and an exempted fishing permit would still provide future access to the area. The option would close roughly 188,157 km^2 of EBS shelf (shelf area to 1,000 m depth), or 23.8% of the 791,731 km^2 of EBS benthic habitat currently open to nonpelagic trawling (shelf area to the 1,000 m depth contour). In terms of revenue at risk, Option 4 is equivalent to the combination of Option 1 and Option 3 as shown in Table 5.8-1. This is because Option 4 includes the area of Option 1 and Option 3, as well as additional unfished area to the north. Thus, Option 4 revenue at risk is identical to that presented previously for the combination of Option 1 and Option 3.

Option 4 Suboption 1: The suboption to Option 4 would move a portion of the northern boundary of the open area southward, between Nunivak and St. Matthew islands. This is essentially the reverse of the suboption of Alternative 2. Thus, the suboptions are mutually exclusive (i.e., only one or the other can be chosen). The suboption makes provisions for possible increased movement of some flatfish stocks, allowing the fleet to compensate for that in the future. In doing so, Option 4 suboption 1 reduces the area that would be protected from fishing gear affects. Analysis of this proposed area has not revealed any nonpelagic trawl effort in this area during 2003 through 2005. Thus, the suboption does not affect the estimates of Option 4 revenue at risk.

Option 5 would close the area to nonpelagic trawl gear around St. Lawrence Island, to conserve blue king crab habitat and minimize potential interactions with community use and subsistence fisheries. Because there is currently no nonpelagic trawl effort as far north as St. Lawrence, there are no economic impacts to the trawl fleet, given the current and historic distribution of target species. Potential future effects of a change in fish distribution were discussed under Option 4, although the impacts of Option 5 would be substantially smaller based on total area closed.

Closures of Etolin Strait waters under Options 2, 3, and 4 may protect walrus during migration through this area from potential incidental takes. Takes of walrus by the flatfish trawl fishery have occurred near this area, and the closure of these waters is likely to reduce the potential for takes. Alternative 2 and Options 2, 3, and 4 may provide some protection from any potential disturbance by nonpelagic fishing vessels by closing waters near areas used by walruses.

Alternative 2 and Options 4 and 5 would prohibit nonpelagic trawling in a portion or most of the spectacled eider designated critical habitat. Alternative 2 and Option 4 would prohibit nonpelagic trawl gear in nearly the entire area of critical habitat. Option 5 would prohibit trawling only in the northeast corner of critical habitat, but may provide protection to habitat for those spectacled eiders that move to the north side of the island in search of ice leads. Alternative 2 and Option 4 may have more of a beneficial impact on the spectacled eiders because they would prohibit nonpelagic trawl gear in areas where the birds have been observed.

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1.0 PURPOSE AND NEED

1.1 Purpose and Need

The purpose of this analysis is to evaluate impacts of alternatives to further conserve fish habitat in the Eastern Bering Sea. In February 2005, the Council took final action on the EFH EIS (NMFS 2005) to adopt a suite of measures to conserve EFH in the GOA and AI from potential impacts due to fishing. At the time of final action, the Council took no action to implement additional conservation measures in the Eastern Bering Sea, as the analysis found such additional measures were neither required by law, nor necessary at that time. Further, the alternatives considered for Bering Sea habitat conservation required additional 'fine-tuning' before they could be considered as practicable measures. Alternatives to modify gear had not been sufficiently researched to understand the scale of beneficial effects they might have on habitat, or the costs they might impose. The alternatives for the open areas had left out historically important and lucrative fishing grounds, and included rotating closures that were found to have questionable conservation merit. So, to address these issues, the Council notified the public that it planned to undertake a more focused examination of potential measures to further conserve fish habitat, including EFH, in the Eastern Bering Sea, by initiating a separate analysis that would tier off of the EFH EIS. The Council deliberated on the scope of this analysis over several meetings, and indicated its intent that only nonpelagic trawl gear would be addressed. The reason for this focus is that nonpelagic trawling uses gear that fishes constantly on the bottom, nonpelagic trawling had high long term effect indices (LEI) on habitat based on the EIS evaluation, the nonpelagic trawl fishery is widely distributed (i.e., a large footprint), and the extent of effort could potentially increase dramatically pending future increases in total allowable catch (TAC) limits for flatfish species. This analysis provides an examination of a range of reasonable alternatives to conserve fish habitat in the Eastern Bering Sea.

The Council recognized that additional analysis, beyond the EFH EIS, would be needed before considering measures for the conservation of fish habitat in the Bering Sea. New information on potential nonpelagic trawl gear modifications to protect bottom habitat has become available since the EFH EIS and allows for a gear modification alternative that could not have been considered in the EFH EIS. The Council wishes to protect fish habitat in support of commercial fisheries and subsistence activities in the EBS, ensuring consistency with national standard 8 of section 301 of the Magnuson-Stevens Act. Thus, evaluation of additional measures, and their possible implementation, provides a precautionary approach in light of incomplete knowledge of fish dependence upon habitat, and the effects of fisheries on that habitat. The problem statement adopted by the Council for this analysis is provided below:

Problem Statement: The Council intends to evaluate potential new fishery management measures to protect Essential Fish Habitat (EFH) in the Bering Sea. The analysis will tier off of the 2005 EFH Environmental Impact Statement and will consider as alternatives, open and closed areas and gear modifications. The purpose of the analysis is to consider practicable and precautionary management measures to reduce potential adverse effects of non pelagic trawl fishing on EFH and to support the continued productivity of Council managed species. Any new management measures will be developed in consideration of local community use.

Based on the analyses in this EA, the Council and NMFS will decide if additional actions should be taken to conserve fish habitat in the EBS. The Council undertook preliminary review of the analysis in February 2007, an initial review in March, and final action in June, 2007. Following Council final action in June 2007, FMP and regulatory amendments may be completed as early as 2008, pending approval by the Secretary of the Department of Commerce.

Organization of the EA

All required components of an environmental assessment (EA) are presented below. These include brief discussions of: the need for the action (Section 1), the alternatives (Section 2), the status of the affected environment (Section 3), and the environmental impacts of the proposed action and alternatives (Section

4). An RIR and IRFA are presented in sections 5 and 6, respectively. A list of agencies and persons consulted is included later in this document in Section 7. References are included as Section 9.

Relevant NEPA Documents

The NEPA documents listed below have detailed information on the groundfish fisheries, and on the natural resources and the economic and social activities and communities affected by those fisheries. These documents contain valuable background for the action under consideration in this EA/RIR/IRFA. The Council on Environmental Quality (CEQ) regulations encourages agencies preparing NEPA documents to incorporate, by reference, the general discussion from a broader EIS and concentrate solely on the issues specific to the environmental assessment subsequently prepared. According to the CEQ regulations, whenever a broader EIS has been prepared and a NEPA analysis is then prepared on an action included within the entire program or policy, the subsequent analysis shall concentrate on the issues specific to the subsequent action. The subsequent EA need only summarize the issues discussed and incorporate discussions in the broader EIS by reference (see 40 CFR 1502.20).

This EA will analyze alternatives to further conserve fish habitat in the EBS. This proposed action derives from the policy established in the preferred alternatives in the Alaska Groudfish Programmatic Supplemental EIS (PSEIS, NMFS 2004) and in the EIS for Identification and Conservation of EFH (NMFS 2005). This EA incorporates, by reference, information from the NEPA documents described below, when applicable, to focus the analysis on the issues ripe for decision, and to eliminate repetitive discussions.

Alaska Groundfish Programmatic Supplemental EIS (PSEIS)

In June 2004, NMFS completed the PSEIS that disclosed the impacts from alternative groundfish fishery management programs on the human environment (NMFS 2004). The following provides information on the relationship between this EA/RIR/FRFA and the PSEIS. NMFS issued a Record of Decision on August 26, 2004, with the simultaneous approval of Amendments 74 and 81 to the fishery management plans (FMPs) to implement the preferred alternative in the PSEIS, respectively. This decision implemented a policy for the groundfish fisheries management programs that is ecosystem-based and is more precautionary when faced with scientific uncertainty. For more information on the PSEIS, see the NMFS Alaska Region website at: http://www.fakr.noaa.gov/sustainablefisheries/seis/default.htm.

The PSEIS brings the decision-maker and the public up to date on the current state of the human environment, while describing the potential environmental, social, and economic consequences of alternative policy approaches and their corresponding management regimes for management of the groundfish fisheries off Alaska. In doing so, it serves as the overarching analytical framework that will be used to define future management policy with a range of potential management actions. Future amendments and actions will logically derive from the chosen policy direction set for the PSEIS' preferred alternative.

As stated in the PSEIS, any specific FMP amendments or regulatory actions proposed in the future will be evaluated by subsequent EAs or EISs that incorporate by reference information from the PSEIS but stand as case-specific NEPA documents and offer more detailed analyses of the specific proposed actions. As a comprehensive foundation for management of the GOA and BSAI groundfish fisheries, the PSEIS functions as a baseline analysis for evaluating subsequent management actions and for incorporation by reference into subsequent EAs and EISs, focusing on specific Federal actions.

Alaska Groundfish Harvest Specifications EIS

In January 2007, NMFS completed the EIS analyzing the impacts of various harvest strategies for the Alaska groundfish fisheries (NMFS 2007a). Except for the no action alternative, the alternatives analyzed would implement the preferred management strategy contained in the PSEIS. This document contains an analysis of the effects of the alternative harvest strategies on target groundfish species, non-target species, prohibited species, marine mammals, seabirds, habitat, ecosystem relationships, and social and economic concerns. The analysis is based on the latest information regarding the status of each of these environmental components and provides the most recent consideration of reasonably foreseeable future actions to consider in the cumulative effects analysis. The EIS provides the latest overall analysis of the impacts of the groundfish fisheries on the environment and will provide a substantial amount of reference material for the purposes of this EA/RIR/FRFA.

Essential Fish Habitat EIS

In 2005, NMFS and the Council completed the EIS for Essential Fish Habitat Identification and Conservation in Alaska (EFH EIS, NMFS 2005). The EFH EIS provided a thorough analysis of alternatives and environmental consequences for amending the Council's FMPs to include EFH information pursuant to Section 303(a)(7) of the Magnuson-Stevens Act and 50 CFR 600.815(a). Specifically, the EFH EIS examined three actions: (1) describing and identifying EFH for Council managed fisheries, (2) adopting an approach to identify Habitat Areas of Particular Concern within EFH, and (3) minimizing to the extent practicable the adverse effects of fishing on EFH. The Council's preferred alternatives from the EFH EIS are implemented through Amendments 78/65 and 73/65 to the GOA and BSAI groundfish FMPs, respectively, Amendments 16 and 12 to the FMP for BSAI King and Tanner Crab, Amendments 9 and 7 to the FMP for the Scallop Fishery off Alaska, and Amendments 7 and 8 to the FMP for Salmon Fisheries in the Exclusive Economic Zone (EEZ) off the Coast of Alaska. A Record of Decision was issued on August 8, 2005. NMFS approved the amendments on May 3, 2006. Regulations implementing the EFH/HAPC protection measures were effective July 28, 2006 (71 FR 36694, June 28, 2006). The Final EIS may be found on the NMFS Alaska Region website at: http://www.fakr.noaa.gov/habitat/seis/efheis.htm.

Several management analytical tools and measures are contained in appendices to the EFH EIS and are summarized below.

Appendix B - Evaluation of Fishing Activities that May Adversely Affect EFH. Appendix B addresses the requirement to conserve and protect fish habitats from adverse fishing activities. Appendix B includes a newly developed model completed by NMFS and reviewed by a panel of independent scientists. The model evaluates current fishing activities on areas specifically described as EFH, incorporates the most accurate and up-to-date fishing gear descriptions, and formulates an effects index. Index values provide a range of fishing gear effects on habitat.

Based on the best available scientific information, the EIS analysis concluded that despite persistent disturbance to certain habitats, the effects on EFH are minimal because the analysis finds no indication that continued fishing activities at the current rate and intensity would alter the capacity of EFH to support healthy populations of managed species over the long term. The EIS concluded that no Council managed fishing activities have more than minimal and temporary adverse effects on EFH for any FMP species, which is the regulatory standard requiring action to minimize adverse effects under the Magnuson-Stevens Act (50 CFR 600.815(a)(2)(ii)). Additionally, the analysis indicated that all fishing activities combined have minimal, but not necessarily temporary, effects on EFH.

Appendix F – Essential Fish Habitat Assessment Reports (HAR). Appendix F is the most recent compilation of habitat related information for each fishery stock by FMP. The HAR contains life history, reproductive traits, and predator/prey relationship information. Additionally, each species profile in the HAR contains a list of references and information sources used by stock assessment experts for that species.

EFH EIS, Section 3.4.1 Magnuson-Stevens Act Managed Fisheries. For each of the five FMPs (GOA Groundfish, BSAI Groundfish, BSAI Crab, Scallops, and Salmon), a subsection accurately describes the fisheries and gear types used within that particular fishery. These descriptions are a product of a workshop held between fisheries managers and fishers regarding specific gear types currently used. This information was used in the fishing effects model to assess gear impacts on different habitat types.

Because the proposed action is a change to an EFH protection area, and the EFH EIS contains the latest information on fishing effects on habitat; the analysis contained in the EFH EIS will be referenced to describe the potential impacts on habitat by the proposed action analyzed in this EA.

Habitat Areas of Particular Concern EA/RIR/IRFA

An EA/RIR/IRFA was prepared two years ago to analyze alternatives to designate and conserve Habitat Areas of Particular Concern (HAPC). HAPCs are site-specific areas of EFH for managed species (NMFS 2006b). Identification of HAPC provides focus for additional conservation efforts on those habitat sites that are ecologically important, sensitive to disturbance, exposed to development activities, or rare. This EA evaluates alternatives for designating HAPC sites in the GOA and the AI and implementing associated fisheries management measures to provide additional conservation of specified HAPC areas.

The significance criteria used to evaluate the effects on habitat and ecosystem are applicable to the evaluation of effects of the alternatives and options in this EA. The criteria were used to evaluate the effects in discrete areas and for certain types of fishing restrictions, similar to the proposed action in this EA. Therefore the significance criteria from the HAPC EA are appropriate for this EA.

BSAI and GOA Harvest Specifications for 2006-2007 EA/Final Regulatory Flexibility Analysis (FRFA)

Harvest specifications for the Alaska groundfish fisheries for 2006 and 2007 were analyzed in an environmental assessment to determine significance of the potential effects of alternative harvest strategies (NMFS 2005). This EA/FRFA provided recent, applicable methods of determining significance of effects on marine mammals and seabirds. These criteria will be used in this Bering Sea Habitat Conservation analysis.

1.2 Action Area

The Federal groundfish fisheries off Alaska are managed under two FMPs, *The Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area* (BSAI) (NPFMC, 2005a) and *The Fishery Management Plan for Groundfish of the Gulf of Alaska* (NPFMC, 2005b). The Council developed (and the Secretary of Commerce approved) these FMPs and their amendments pursuant to the Magnuson-Stevens Act and other applicable Federal laws and Executive Orders (E.O.s). The FMPs guide management of the groundfish fisheries for optimum yield (OY) and allocate harvest among user groups, while preventing overfishing and conserving marine resources. The FMPs, certain amendments, and additional actions necessary to conserve public trust resources, are developed by the Council and NMFS.

The groundfish fisheries occur in the North Pacific Ocean and Bering Sea in the EEZ from 50°N to 62°N. The BSAI groundfish fisheries cover most the Bering Sea under U.S. jurisdiction, extending southward to include the waters south of the Aleutian Islands west of 170° W. longitude to the border of the U.S. EEZ and northward to Saint Lawrence Island. Although the BSAI FMP jurisdiction extends north to the Bering Strait, little groundfish fishing effort has been expended, to date, in the area north of St. Matthew Island Island. However, with increasing sea temperatures and receding ice cover, fishing activity may extend further northward in the future.

1.3 Description of the Nonpelagic Trawl Fishery

Nonpelagic trawl gear is defined as a trawl, other than a pelagic trawl (50 CFR 679.2). Features of pelagic gear are described in the authorized gear definition and include the lack of bobbins, discs or rollers, which are used on nonpelagic trawl gear to facilitate fishing on the bottom. Nonpelagic trawl gear that is the focus of this action is further described below.

The yellowfin sole fishery is prosecuted with otter trawls (Figure 1.3-1) rigged to fish effectively for flatfish, which live on or very near the substrate. Approximately 20 to 30 trawl catcher-processor vessels are currently involved with this fishery in the EBS. Typical vessel length overall (LOA) for boats targeting yellowfin sole is from 107 ft to 341 ft. Yellowfin sole are fished with a two- or four-seam trawl with a relatively low vertical opening (typically 1 to 3 fathoms). Nets are made of polyethylene netting, with codends and intermediates using 5.5-inch to 8-inch mesh, in square or diamond configuration. Trawl codends are usually made with polyethylene netting attached to four longitudinal riblines. The riblines are typically chain, wire, or synthetic rope. Floats are attached along the length of the codend to counteract the weight of the steel components. Container lines around the circumference are attached along the length of the codend to restrict the expansion of the netting, preventing damage and allowing the codend to be hauled up a stern ramp. Sacrificial chafing gear, typically polyethylene fiber, is attached to the codend to protect it from abrasion on the stern ramp and occasional contact with the seafloor.

Otter board or doors are used to spread the net and keep it open during towing. Steel trawl doors, ranging in size from 5 m^2 to 11 m^2, spread the nets horizontally. Door spread varies with fishing depth and rigging style, but generally ranges from 100 m to 200 m (328 ft to 656 ft). The rigging between the net and the doors includes bridles and sweeps, ranging in length from 30 m to 366 m (98 ft to 1200 ft), which herd fish into the path of the trawl. Sweeps are made of steel cable covered by rubber disks ('mudgear'), or cables with a steel core and fiber outside ('combination rope'). These range from 2 inches - 4 inches in diameter. Footropes keep the front of the net off the bottom to protect it from damage. They are made of rubber disks and bobbins 12 inches to 18 inches in diameter, strung on chain or wire at 18- inch to 48-inch intervals. Bobbins are mostly rubber, but sometimes are hollow steel balls designed to roll along the seabed.

Contact with the seafloor is predominantly from doors, sweeps, footropes, and to a lesser extent from the codend. Although codends are usually rigged with some poly twine chafing gear, a design objective for modern flatfish nets is to employ sufficient poly floats to buoy the net body and codend to keep it mostly off the bottom, or at least reduce the drag on the bottom to the greatest extent possible. This reduces the problem of sand and mud in the catch (which lowers product value and complicates processing). Flotation on the net headrope provides lift to the footrope to reduce unnecessary drag and increase towing efficiency and performance. Some headrope/footrope combinations are designed to be as much as 70 percent buoyant at depth. Footropes typically extend 100 ft to 200 ft.

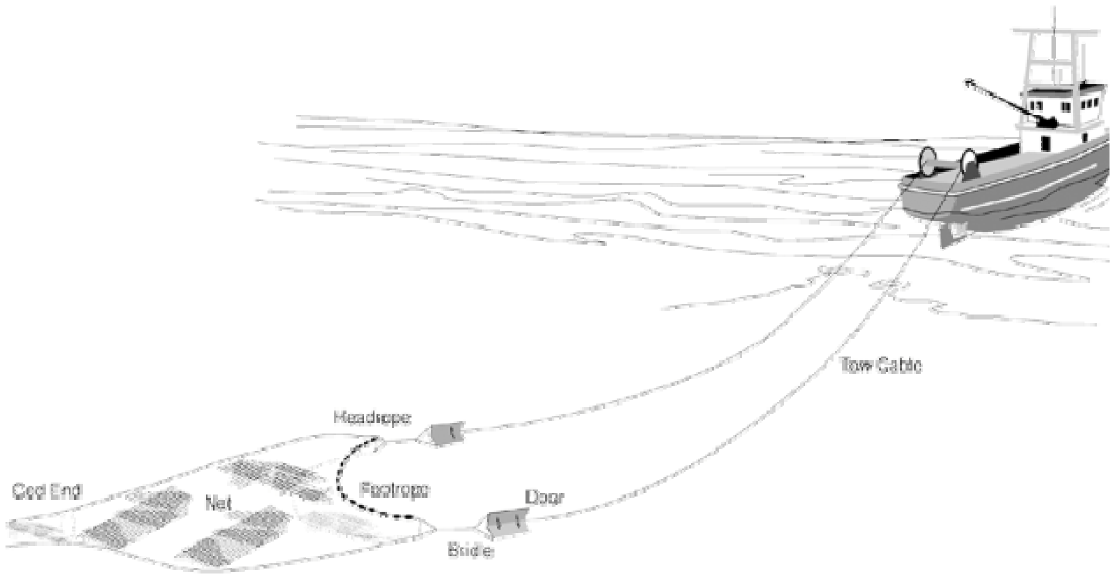

Figure 1.3-1 Depiction of otter trawl gear

When set, the net is unwound from a net reel or from trawl winches, the sweeps are attached, and then the doors are attached. Wire cable attached to each door is let out to a distance of approximately 3 times the water depth. Modern trawl winches are designed to automatically adjust tension and release when necessary. The tow duration in this fishery is about 1 hour to 4 hours, at a speed of 3 knots to 4 knots. Tows may be in a straight line, or may be adjusted to curve around depth contours, or to avoid location of hangs and fixed gear. They also may be pushed by current, or for other reasons. At haulback, the setting procedure is reversed, and the codend is dumped into the fish-hold below decks.

2.0 DESCRIPTION OF THE ALTERNATIVES

2.1 Development of the alternatives

The process of developing alternatives began with the evaluation of alternatives for Bering Sea habitat conservation in the EFH EIS (NMFS 2005). As described in Section 1.1, the EFH EIS examined several alternatives to minimize the effects of fishing on EFH in the GOA, Bering Sea, and Aleutian Islands. The measures examined for the Bering Sea included, an open area for nonpelagic trawl fishing combined with rolling closures to nonpelagic trawl fishing, and nonpelagic trawl gear modifications for vessels targeting flatfish species. At the time of final action on the EFH EIS in February 2005, the Council did not adopt measures to conserve habitat in the Bering Sea, but rather initiated a more detailed examination of reasonable alternatives and options for this area.

In December 2005, the Council and its Scientific and Statistical Committee (SSC) and Advisory Panel (AP) received a report from staff on a proposed problem statement and preliminary alternatives drawn from the EFH EIS. Public input was provided at the Council, SSC, and AP meetings. Following staff, SSC, and AP reports, as well as public testimony, the Council deliberated on this issue. The Council modified the suite of alternatives to exclude the rotations in the area-based measures, but include a gear modification alternative based on recent research, and updated alternatives for open areas based on location of recent nonpelagic trawl effort.

In June 2006, the Council and its advisory committees further discussed potential alternatives for Bering Sea habitat conservation. The Council remained concerned about defining a northern boundary of the open area alternative, and tasked staff with developing an open area approach that would utilize fishing data through 2005. The Council requested the existing open area defined in the EFH EIS, developed through a multi-year public process of the Council's EFH Committee, be extended to include areas of more recent nonpelagic trawl fishing locations through 2005. The original open area approach was developed using both historic fishing data (Fritz et.al 1998) and observed nonpelagic trawl locations from 1998 through 2002. Public comment reported a recent trend northward, to increase catch per unit effort (CPUE) of some flatfish stocks, while reducing prohibited species catch rates.

The Council noted that an open area, based on older fishing patterns, may not adequately represent the distribution of current nonpelagic trawl fisheries, as effort may have expanded northward in response to fish distribution (according to public testimony). This is believed to be primarily due to shifts in the ecosystem; a northward shift in response to changing temperatures, atmospheric forcing, and compositional changes in the predominant groundfish biomass structure. Recent fishing effort depicts this northern shift in fishing effort, particularly in the flatfish fisheries (yellowfin sole, rock sole, flathead sole and other flatfish). The Council expressed concern in June 2006, that the open area described and analyzed in the EFH EIS does not reflect recent effort in the northern areas (St. Matthew and south of Nunivak island) or consider reporting area 519 (Bogoslof). Thus, the open area alternative was subsequently modified to include the original bounds analyzed within the EFH EIS, adjusted to incorporate more recent information on the location of the nonpelagic trawl fishery.

These adjustments of the open area were based on more recent observed nonpelagic trawl effort that occurred outside the boundaries of the open area analyzed in the EFH EIS. The 1990 through 2005 observer data were analyzed by fishing location, fishery target, and frequency / 100 km^2 areas. The data were selected to identify current nonpelagic trawl fisheries. To identify these locations, the data were culled to remove pollock target records, those positions inside current closure areas (e.g., nearshore Bristol Bay and the Red King Crab Savings Areas), and locations in depths greater than 1,000 m. The bounds of the previous open area were extended or reduced to capture nonpelagic trawl sets that occurred more than one trawl/100 km^2, by bathymetric and land mass features, while considering enforcement concerns. It is noted that some nonpelagic trawling occurred in 1992, in the area north of St. Matthew Island and to the south of St. Lawrence Island, however these hauls did not meet the more than 1 trawl/100 km^2 criterion, and did not accurately portray the extent of the fishing footprint for nonpelagic trawl gear. The specific extensions included areas near Bogoslof, south of Nunivak Island, and the 10° longitudinal strip on the south end of the Red King Crab Savings Area, and areas to the north and east of St. Matthew Island.

NMFS sent a letter to the Council on June 1, 2006, noting that the EFH EIS had determined that pelagic trawl gear was likely to contact the soft substrates of the Bering Sea, and suggested that the developing Bering Sea habitat conservation analysis assess the effects of pelagic gear on the Bering Sea bottom habitat. Further, if the Council considered restrictions on pelagic trawl gear to reduce potential adverse effects, a review of the current performance standard should be included in the analysis. This request was supported by the SSC and some comments made in public testimony to the Council. However, the Council felt that the potential adverse effects of pelagic trawl gear on Bering Sea habitat were thoroughly evaluated in the EFH EIS, the current regulations and performance standards were adequate, and that no additional measures needed to be considered at that time, as they were neither warranted by regulations nor reasonable and practicable in terms of operations or costs to the fishery. Rather, the Council decided to focus on nonpelagic trawling in this analysis. The reason for this focus is that nonpelagic trawling uses gear that fishes constantly on the bottom, the fishery is widely distributed (i.e., a large footprint) over the shelf, and based on the EFH EIS evaluation had high long term effect indices (LEI) within the sand/mud habitat where much of the footprint is located. The Council expressed concern that this effort could potentially increase dramatically pending future increases in total allowable catch (TAC) limits for flatfish species. The intent of this action is to provide a broad range of alternatives to protect sand/mud and the slope from the effects of nonpelagic trawl gear.

In October 2006, the Council reviewed the open area concept and suggested that the northern boundary of the open area should be configured such that the area south and west of St. Matthew Island is excluded from the open area to conserve blue king crab (BKC) habitat. They further suggested options for modifying the northern boundary of the proposed open areas. The blue king crab (BKC) savings area is near St Matthew Island and extends southwest to protect juvenile, non-ovigerous (non egg-bearing) female and male blue king crab habitat, and northeast to protect areas used by ovigerous females. This area has been found by the NMFS and ADF&G surveys to contain juvenile and mature BKC. Prohibited species catch (PSC) of crab species in the rock sole trawl fleet has occurred in this area; and this area has direct observations from the directed crab fishery. Given these concerns, the area near St. Matthew was excluded from all open area alternatives. Industry comments indicate that increased flatfish trawl effort has been progressing northward on average 20 miles/year. Some of this effort is occurring near St. Matthew Island. This area's crab stock is severely depleted; the last pot survey found only 5 legal male BKC in the area (Krygier, 2007 personal communication). More recent information from 2005 and 2006 EBS trawl research surveys indicates a presence of high density areas of C. opilio crab in the areas south and north of St. Matthew Island.

In December 2006, following staff reports and recommendations by the SSC and AP, as well as public testimony, the Council finalized alternatives for analysis, focusing on open and closed areas to nonpelagic trawling, as well as gear modifications for nonpelagic trawl operations targeting flatfish. Dr. Craig Rose of the Alaska Fisheries Sciences Center provided preliminary results of research on the development and evaluation of trawl groundgear modification to reduce damage to living structure in soft bottom areas. Gear modifications were proposed only to apply to those vessels targeting flatfish, based on the research study in 2004-2005. Gear modifications have yet to be examined on different net structure for other target species. A workshop was held in conjunction with the December 2006 Council meeting to discuss the practical implementation of using disks or bobbins on sweeps of nonpelagic trawls in the Bering Sea. Subsequently, the Council requested that a preliminary draft analysis of these alternatives be presented at the following meeting.

In February 2007, the Council's SSC and Advisory Panel reviewed a preliminary draft of this document and provided comments to the Council regarding this action, including suggested improvements for the next draft of the analysis. Based on these suggestions and public comment, the Council recommended restructuring the alternatives in a manner to improve the comparisons of the alternatives and options, so that different combinations of alternatives and options could be chosen, and the effects of each combination clearly analyzed in the document.

Specifically, the SSC commented that the EA was tiered off the findings in the EFH EIS (including the no more than minimal and long-term impact of nonpelagic trawling on habitat finding), and as the range of alternatives did not change fishing rate, intensity, or increase area fished, significant habitat impacts due to nonpelagic trawling were unlikely to occur. The SSC continued to say that the analysis in the EA assumes that fish stock distribution and fishing effort distribution will remain static into the future. However, much of the potential economic impact from this action depends on how (and to where) fish stocks and fishermen change their distributions in the future. These dynamics were not captured in the EA, and therefore the SSC suggested a more thorough description in the final draft. This has been addressed in this version of the EA/RIR/FRFA.

Additionally, the Council discussed the areas near St. Matthew Island and St. Lawrence Island that may provide important habitat for C. opilio crab stocks, in addition to BKC stocks. The Council requested staff to provide the most recent information from the NMFS and ADf&G surveys in the revised document. A suboption was created in both the open area (Alternative 2) and the Northern Bering Sea Research Area to provide protection to areas of the C. opilio crab stocks, while allowing for some expansion of the flathead sole and other flatfish fleet.

The initial draft EA/RIR/IRFA was reviewed at the April 2007 Council meeting. The Council's Scientific and Statistical Committee and Advisory Panel reviewed the initial draft document and provided comment to the Council regarding this action and the analysis. Public comment on the initial draft document was received by the Council during public testimony at that meeting. An additional opportunity for written and oral public comment was provided at the Council meeting in June 2007, prior to the Council taking any action on the analysis.

Based on both the AP and SSC comments, the Council modified the purpose and need statement such that any new management measures will be developed in consideration of local community use. The Council had requested that the industry work with the communities to discuss concerns on proposed boundaries of alternatives and options near the Nunivak /Etolin Strait/Kuskokwim area, under options 2, 3 and 4 in the EA/RIR/IRFA. Members of Association of Village Council Presidents (AVCP) and participants from the flatfish trawl fleet met in January and March, 2007, to determine recommendations for the Southern boundary line in this area for Alternative 2 and options 2, 3, and 4. The community concern is based on potential habitat disturbance from nonpelagic trawl fishing, and the importance of the Etolin Strait and Kuskokwim Bay areas for long-term community use. The group discussed the southern boundary, near Etolin Strait, as presented in the initial draft analysis. The AVCP presented a southern boundary line that followed the extent of traditional fishing and hunting grounds as documented by Cenaliulriit marine mammal and fishery subsistence maps provided by AVCP (Appendix E). Subsistence harvests in this area include ice seals, beluga whale, seabirds, and halibut. The flatfish industry presented information on the timing and location of tows in this area by the yellowfin sole H&G fleet for high CPUE and low halibut PSC, during the later spring months. The proposed southern boundary provided by AVCP extended south of the boundaries shown in the preliminary and initial review draft analysis.

Because of the need to delineate a line for the analysis, the participants agreed to establish a southern boundary to protect benthic habitat. Industry members committed to continue to work with the communities to educate users of the resources of the scientific knowledge that is available for the area, and to also gather Local and Traditional Knowledge (LTK). The results are to be used to determine if any additional changes to the southern boundary may be warranted to meet the goal of protecting the community resources. A 2-year review by the Council of the Nunivak/Etolin boundary, as per the industry/village agreement would apply to Alt. 2, Option 2, 3, 4. The negotiated line was only agreeable to AVCP with the 2-year review.

The SSC recommended further discussion of area restrictions that may change where fishing occurs, and consequently may impact incidental catch and PSC. The document should include a brief summary of available data on northward progression of fish stocks and fishing effort, by target species. Also, an analysis, or at least a brief discussion, should include the likely effects of a continuing trend in the northward movement of flatfish, by species, in relation to the actual reduction in available biomass that might occur under Alternative 2. This analysis should consider the buffer between actual catches and the ABC, and how this might mitigate northward trends. The motivation for this request is that the color maps presented to the SSC showing the time series of trawl locations since 1991 do not show a strong trend in northward movement of fishing effort. The SSC also recommended an expanded discussion of the implementations of gear modification within Alternative 3. These discussions were added to this document.

The final draft EA/RIR/IRFA was reviewed at the June 2007 Council meeting. The Council's AP reviewed this document and provided comment to the Council regarding this action and the analysis. Written and oral public comment on the document was received by the Council during public testimony at the meeting, prior to the Council taking any action on the analysis.

Based on both AP and public comments, the Council adopted a preferred alternative and options for this analysis. The Council adopted Alterntive 2 with an adjusted Western Boundary to match that analyzed in the EFH EIS. This area includes all non-pollock historic non–pelagic trawl fishing grounds and is intended to accommodate the developing arrowtooth flounder fishery. (Figure 2.2.2) Because of the overlap between the proposed closures under the options and this alternative, one area to the west of the open area would be closed as part of this alternative. The portion of waters to the north of the open area is closed by the options, and therefore, does not need to be closed under this alternative to implement the Council's intent for the entire Bering Sea habitat conservation action.

The Council endorsed Alternative 3 trawl sweep modifications that reduce the potential impacts on benthic habitat from gear contact with the seafloor, but acknowledged that the sweep modifications needed additional time for testing. The Council will provide recommendations to NMFS for the specific gear modifications in June 2008, following additional gear testing by the flatfish trawl industry, so the agency can undertake rulemaking after that date. The Council understands that depending on the final gear modifications, such a regulatory amendment may require supplementing the EA/RIR/IRFA analysis. The wedge area described under the suboption of Alternative 2 may be opened if the Secretary has approved, and NMFS has implemented, a gear modification for nonpelagic trawl gear for the BS flatfish fishery to reduce bottom habitat impacts.

The Council also discussed the set of options in this analysis. Measures establishing nonpelagic trawl closures around Nunivak, St. Matthew, and St. Lawrence Islands are separate actions and not affected by any measures developed for the Northern Bering Sea Research Area ([NBSRA] Option 4).

The Council also provided some clarification of Option 4 (NBSRA): The intent of this option was such that inside the NBSRA, nonpelagic trawl fishing would be prohibited for a period of time during which a management plan for the NBSRA will be developed for Council review. The plan will consider and identify protection measures as may be necessary within the NBSRA for king and C. opilio crabs, marine mammals, ESA listed species, and subsistence needs of Western Alaska coastal communities in nearshore areas. In addition to establishing these protection measures, the plan will identify areas where NBSRA fishing is allowed pursuant to a scientific research plan. In these open areas, control closures will be established, based on representative habitats needed to allow scientifically valid comparisons of the effect of nonpelagic trawl fishing. Access to the NBSRA by nonpelagic trawl vessels will be established once the protection measures and control areas under the research plan described above are delineated. The plan shall be developed within 18 months, and implemented within 3 years, of final action on this item. Council would review this program in 5 years.

Background on Open Area Approaches:

The premise of the open area approach is that 'the first pass of a trawl is the worst pass (trawling over undisturbed bottom has more adverse habitat impacts than subsequent trawl passes). Thus, constraining trawling to areas that have already been impacted has habitat conservation benefits. Allowing trawling in previously untrawled areas could potentially result in acute local changes to the benthos and, overall, an increase in the long-term effects indices (LEI). The LEIs were the tools used in the EFH EIS to assess the impacts of fisheries on EFH.

Limiting the trawl fishery to those areas traditionally fished provides a precautionary approach by setting aside relatively pristine areas before they become impacted. This habitat conservation measure mirrors the approach used for protecting terrestrial areas from development (e.g., National parks). The EFH EIS analysis (Chapter 4) discusses potential benefits of prohibiting nonpelagic trawling in the northern Bering Sea areas, particularly to conserve C. opilio crab habitat and habitats used by other species (NMFS 2005).

The creation of an open area that encompasses historically fished areas would not reduce the effects of fishing that generated the LEI scores. On the other hand, creation of closure areas in areas currently fished may redirect effort into areas with lower catch rates and, in turn, may cause more adverse impacts on EFH.

Background on Gear Modifications Approach

Early on, the idea of modifying nonpelagic trawl gear seemed a reasonable approach to minimize the effects of fishing on habitat. Gear modification alternatives for EBS nonpelagic trawls were evaluated in the EFH EIS (NMFS 2005). The rationale behind modifying nonpelagic trawl gear is to minimize contact of trawl components on the seafloor and epifauna, and, thus, reduce habitat effects. Unlike area closures, gear modifications do not require redistribution of fishing effort.

Additional research has been completed since the time the EFH EIS was written (see Appendix A). The results of this research indicate that elevating devices (discs or bobbins) on the sweeps of nonpelagic trawl gear can reduce bottom contact, without decreasing the efficiency of the net to catch target species. The research to date only focuses on those vessels that target flatfish species. This modified gear has not been tested on nonpelagic trawl gear used to target other species; and therefore, the application of modified gear at this time is limited to flatfish fishing.

2.2 Alternatives Analyzed

The following alternatives are not mutually exclusive, and more than one alternative may be selected. Most of the options can be chosen in any combination, with any of the alternative(s) (including the status quo), and more than one option can be chosen. The exception is Option 2, which is a subset of Option 3; and therefore, only one of these two options can be selected. Note that existing fishery closures will remain in place. The alternatives and options are as follows. The preferred options and alternatives are the ones recommended by the Council.

<u>Alternative 1:</u> Status quo. No additional measures would be taken to conserve benthic habitat (Figure 2.2-1).

<u>Alternative 2:</u> **Preferred Alternative.** Open area approach. This alternative would prohibit use of nonpelagic trawl gear in the EBS outside of a designated 'open area'. Nonpelagic trawl gear would be prohibited in the northernmost shelf area and the western deepwater basin area of the EBS. One open area was analyzed, which is based on the EFH EIS area, modified using nonpelagic trawl effort distribution data through 2005 (Figure 2.2-2).

Suboption: A new open area approach is added that defines the northern boundary. The resulting "wedge", as described by the attached map, would move a portion of the northern boundary between Nunivak and St. Matthew Islands to 61° N, northward (Figure 2.2-3).

<u>Alternative 3:</u> Gear modifications. This alternative would require gear modifications for all nonpelagic trawl gear used in flatfish target fisheries in the EBS. Specifically, this alternative would require disks on nonpelagic trawl sweeps to reduce seafloor contact and/or increase clearance between the sweep and substrate. A performance standard of at least 2.5 inches elevation of the sweep from the bottom would be required. This alternative applies only to the flatfish trawl fishery.

The options below could be selected in combination with any alternative and more than one option can be chosen. With the exception of Options 2 and 3, any combination of options may be selected with the alternatives. Because Option 2 is a subset of the closure area of Option 3, these options are mutually exclusive of each other.

<u>Option 1.</u> **Preferred Option.** Close the area around St. Matthew Island to use of nonpelagic trawl gear. This area would be configured such that the area near St. Matthew Island is closed, to conserve blue king crab habitat (Figure 2.2-4).

<u>Option 2.</u> Close an area to use of nonpelagic trawl gear around Nunivak Island, with the southern border extending along the nearshore portion of Etolin Strait. This area would be configured such that the area around Nunivak Island and Etolin Strait is closed, to conserve nearshore habitats, and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas (Figure 2.2-5).

<u>Option 3.</u> **Preferred Option.** Close an area to use of nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Strait and Kuskokwim Bay. This area would be configured such that the area in southern Etolin Strait and Kuskokwim Bay is closed to conserve nearshore habitat and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas. The proposed boundaries of this closure area are the result of negotiations by representatives of the flatfish industry and coastal communities (Figure 2.2-6).

Option 4: **Preferred Option.** Close an area to use of nonpelagic trawl gear from the northern boundary line of the open area under Alternative 2, stretching from the Russian border, around the southern end of St. Matthew Island, to and around the southern portion of Nunivak Island, and across Kuskokwim Bay, to Cape Newenham. This would delineate the Northern Bering Sea Experimental Fishing Area (NBSRA). The NBSRA would be closed, while a management plan is developed for Council review. The plan will consider and identify protection measures as may be necessary within the NBSRA for king and C. opilio crab, marine mammals, ESA listed species, and subsistence needs in nearshore areas for Western Alaska costal communities. In addition to establishing these protection measures, the plan will identify areas where nonpelagic trawl fishing is allowed, pursuant to a scientific research plan. The Council requests NMFS Alaska Fisheries Science Center design an adaptive management experiment in the closed northern area, described under this option, to study the effects of nonpelagic trawl gear in previously untrawled areas. The study should include open and closed areas and appropriate monitoring to study fishing impacts on benthic communities and ecological process, particularly as this relates to juvenile C. opilio crab. In these open areas, control closures will be established based on representative habitats needed to allow scientifically valid comparisons of the effect of nonpelagic trawl fishing. Access to the NBSRA by operations fishing nonpelagic trawls will be established, once the protection measures and control areas described above, are delineated in regulations. The adaptive management experiment design will include review by the SSC. NMFS will provide the draft adaptive management experimental design to the Council for review within 18 months, following the Federal Register publication of the final rule for this action (Figure 2.2-7).

> Suboption: A new closure is added that defines the northern boundary. The resulting "wedge", as described by the attached map, would move a portion of the northern boundary northward, between Nunivak and St. Matthew Islands, to 61° N (Figure 2.2-8).

Option 4 could be selected with Alternative 2 open area approach (either the option or set of suboptions). Alternative 2 would specify a fishery closure outside the designated open area. Tying Option 4 in with Alternative 2 would also require an adaptive management experiment as describe above.

Option 5: **Preferred Option.** Close the area to nonpelagic trawl gear around St. Lawrence Island. This area would be configured such that the area around St. Lawrence Island is closed to use of nonpelagic trawl gear, to conserve blue king crab habitat and minimize potential interactions with community use and subsistence fisheries taking place in nearshore areas (Figure 2.2-9).

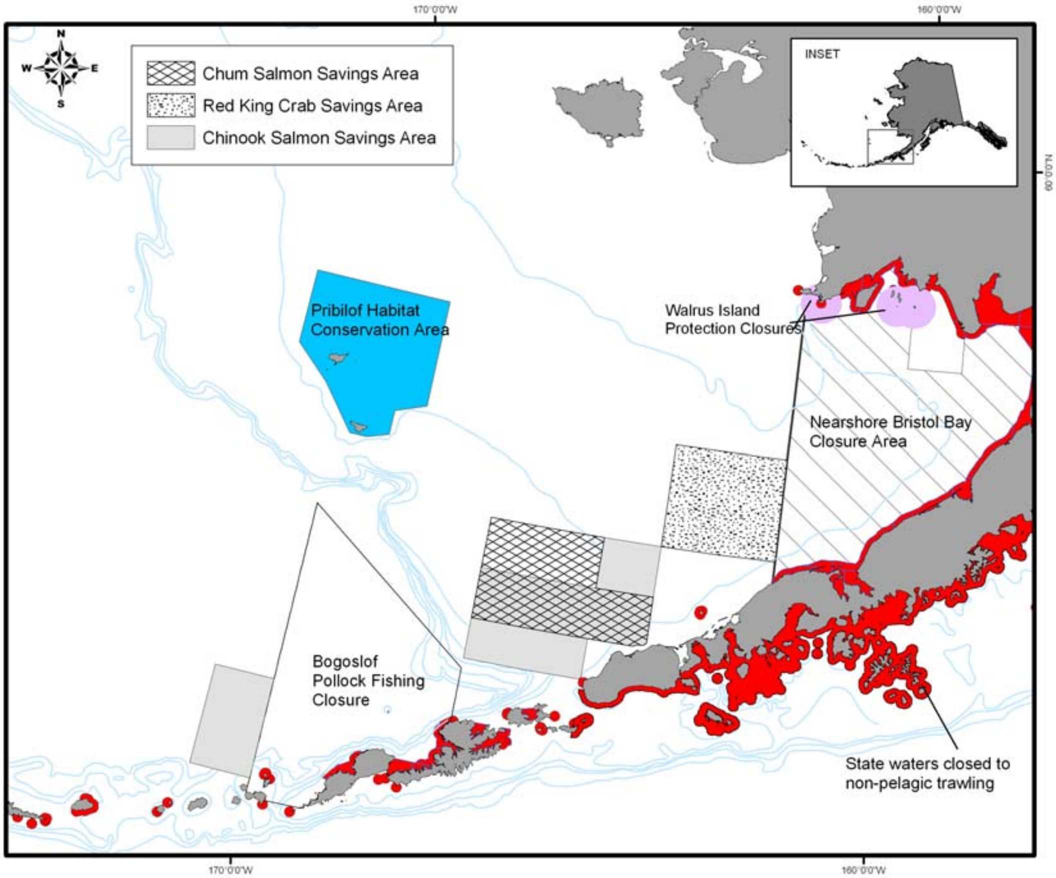

Figure 2.2-1. Fishery Closures to certain nonpelagic trawl fisheries thru 2006, these closures represent the current status of fishing available to nonpelagic trawl gear under the Status quo. Further information on fishery closures is provided in 50CFR 679.22.

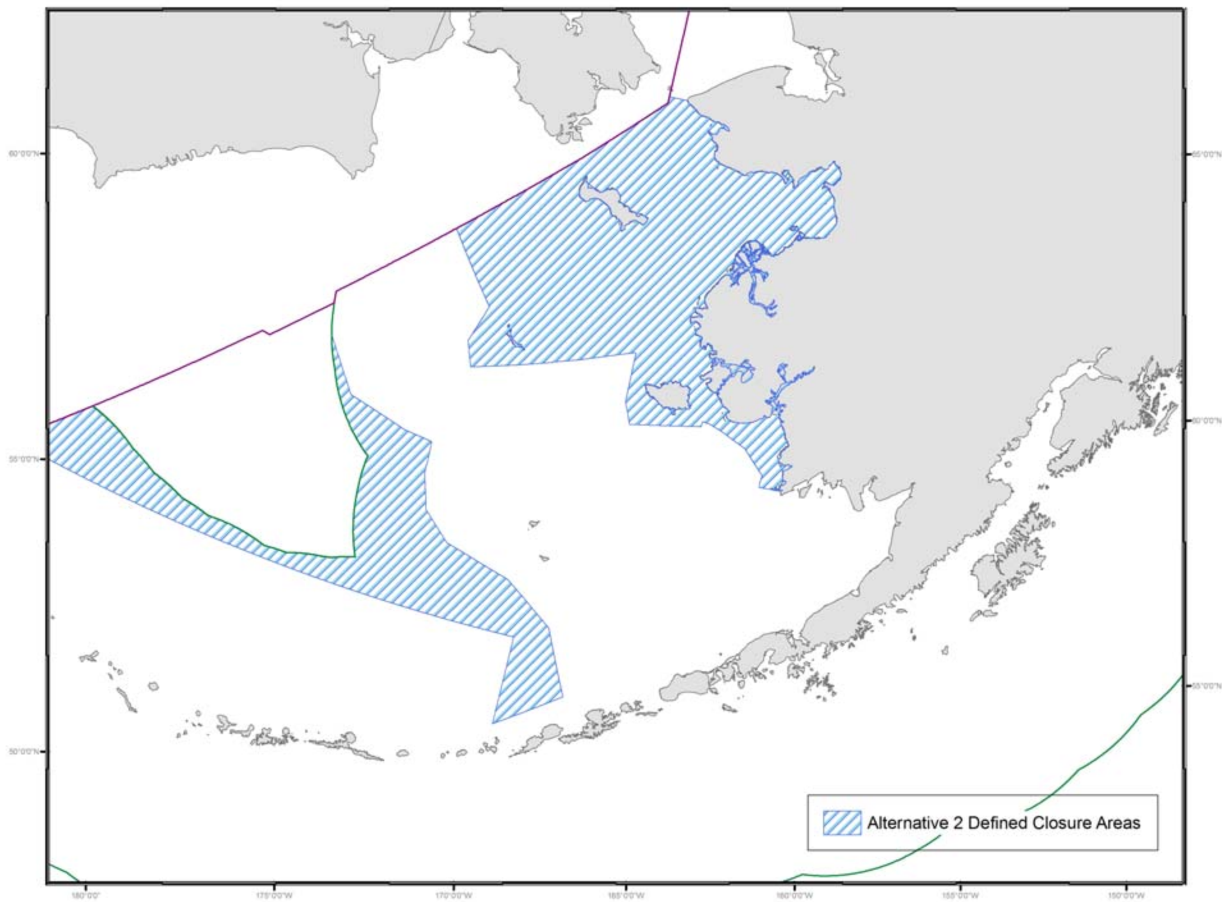

Figure 2.2-2. Alternative 2 Open Area Approach for Bering Sea. This alternative would prohibit nonpelagic trawl gear outside of a designated 'open area'. Nonpelagic trawl gear would be prohibited in the northernmost shelf area and the deepwater basin area of the Bering Sea.

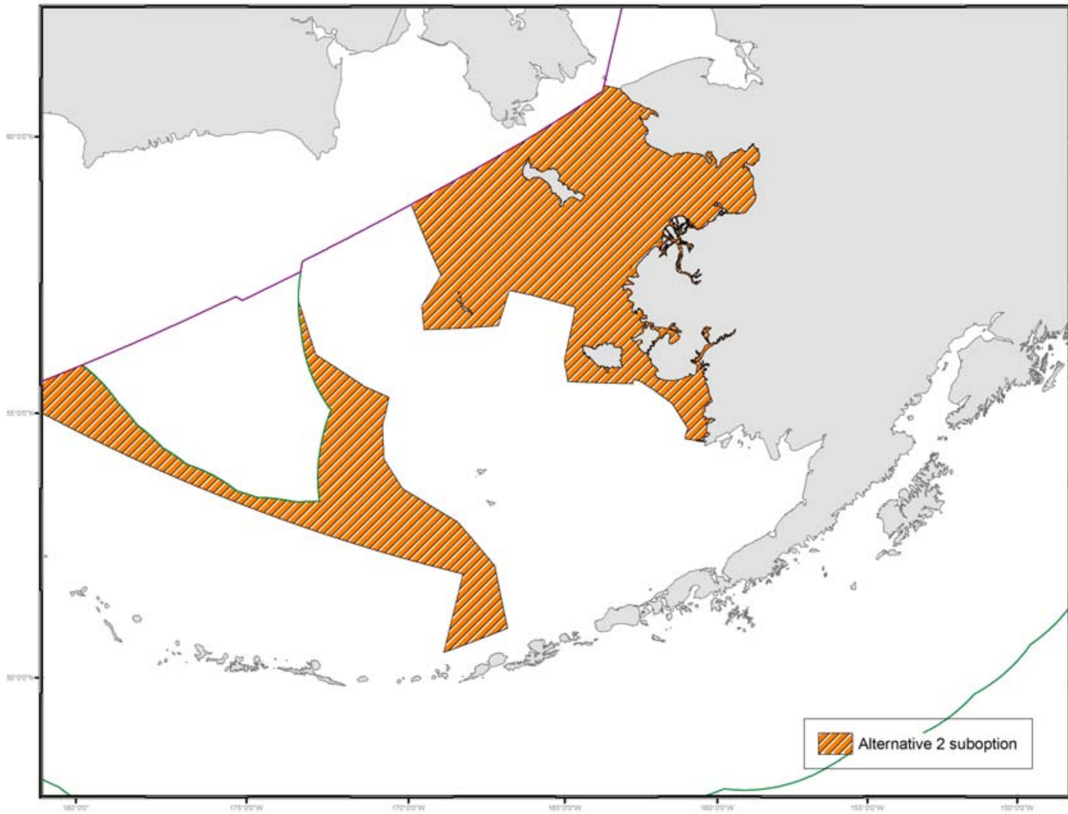

Figure 2.2-3. Alternative 2 suboption1. Open Area Approach for Bering Sea. The suboption would move a portion of the northern boundary northward between Nunivak and St. Matthew Islands to 61° N This alternative would prohibit nonpelagic trawl gear outside of a designated 'open area'. Nonpelagic trawl gear would be prohibited in the northernmost shelf area and the deepwater basin area of the Bering Sea

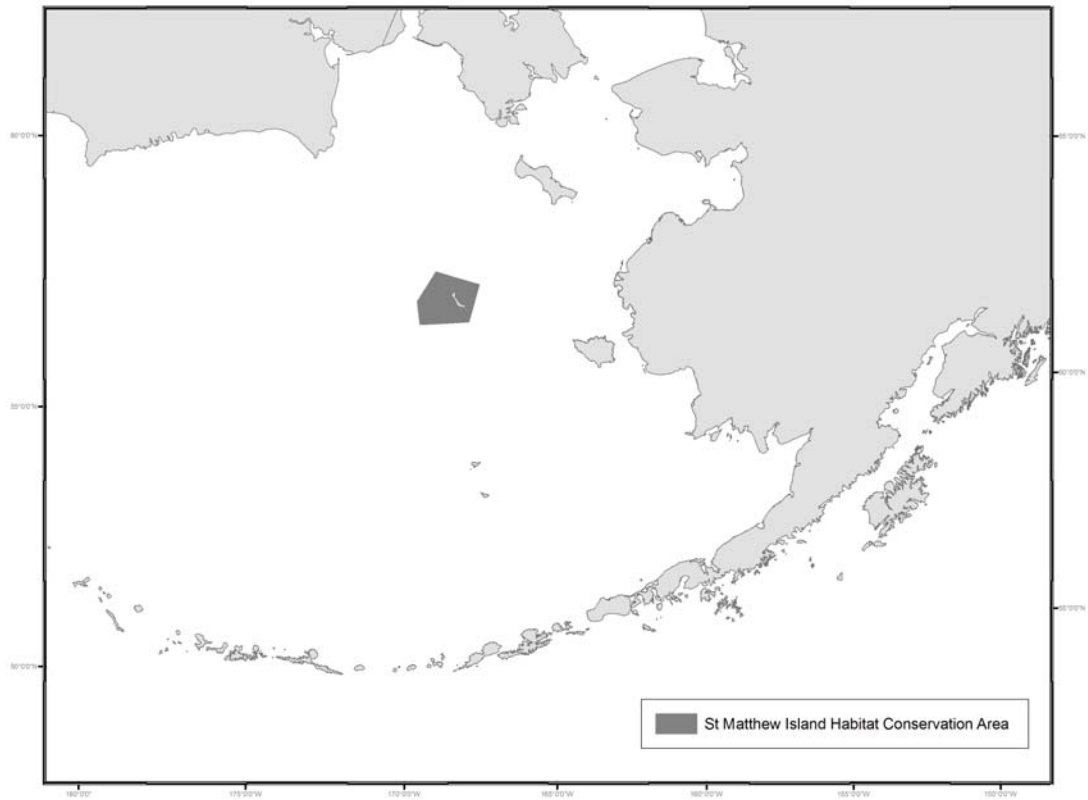

Figure 2.2-4 Option 1. Close the area around St. Matthew Island to nonpelagic trawl gear to conserve blue king crab habitat.

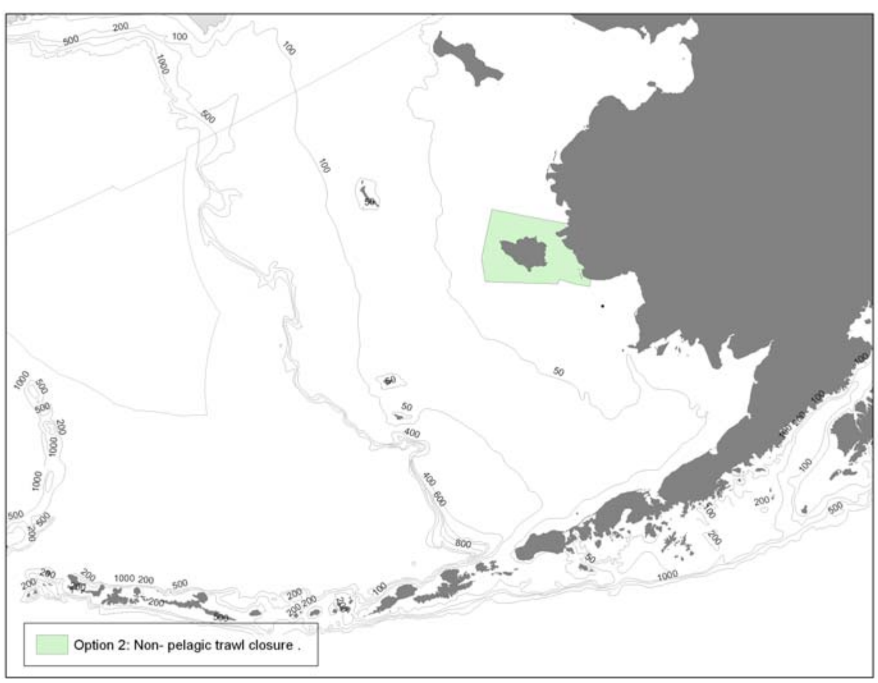

Figure 2.2-5. Option 2. Close an area to nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Strait such that the area is closed to conserve nearshore habitats, and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas.

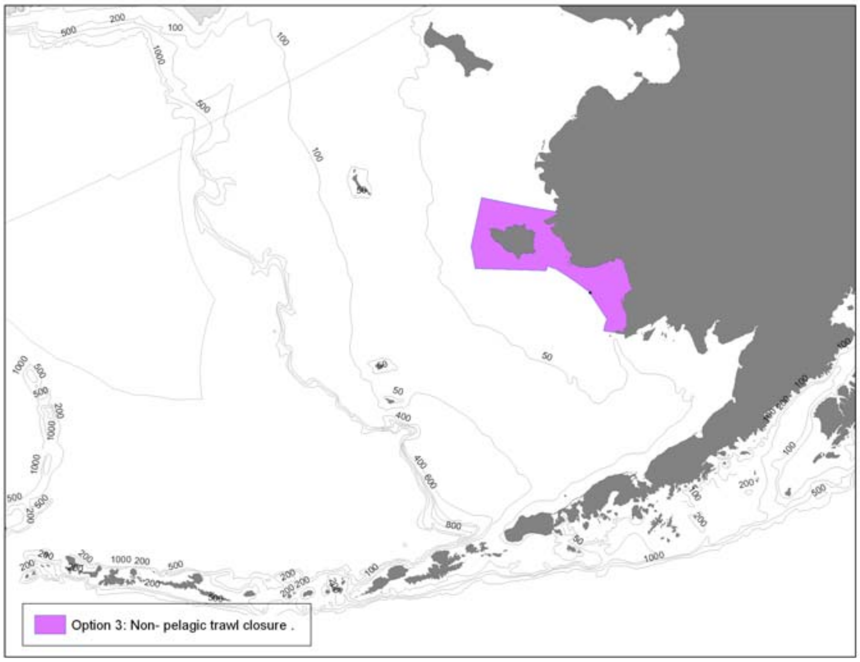

Figure 2.2-6. Option 3. Close an area to nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Strait and Kuskokwim Bay to conserve nearshore habitat and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas. The boundaries of this closure area are the result of negotiations by representatives of the flatfish industry and coastal communities.

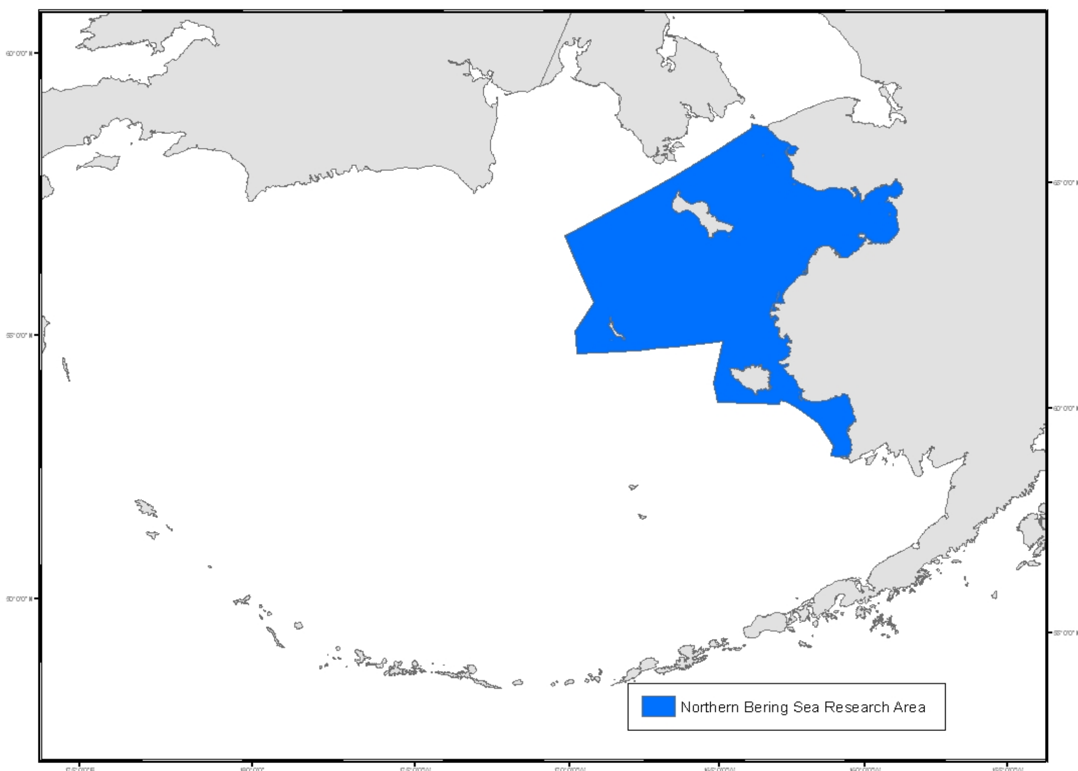

Figure 2.2-7. Option 4 The Northern Bering Sea Research Area would be closed to fishing with nonpelagic trawl gear.

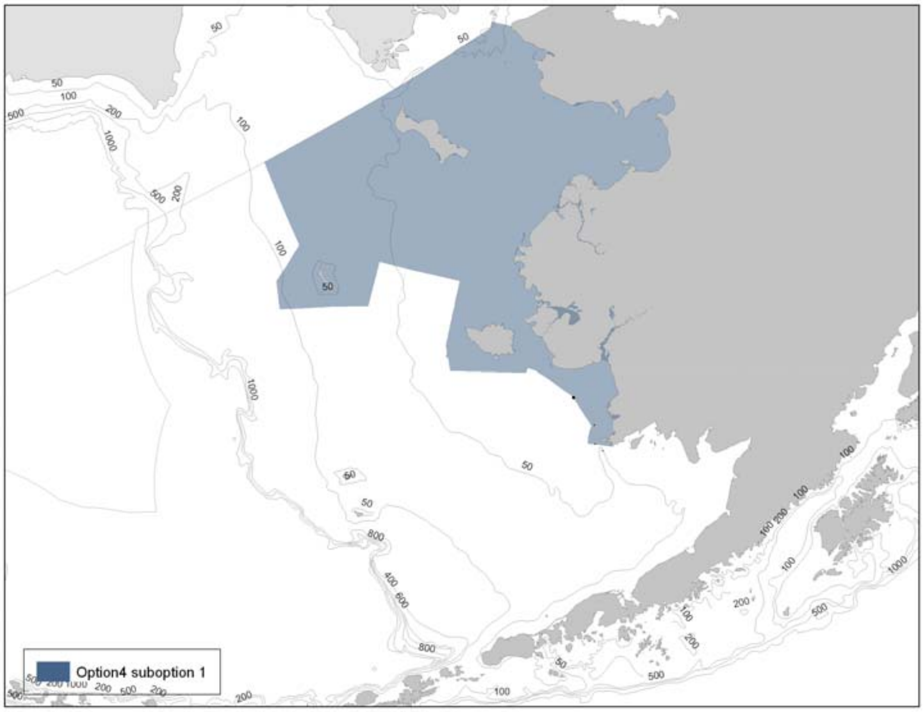

Figure 2.2-8. Option 4 suboption. The Northern Bering Sea Research Area would be closed to fishing with nonpelagic trawl gear. The suboption would move a portion of the northern boundary northward between Nunivak and St. Matthew Islands to 61° N.

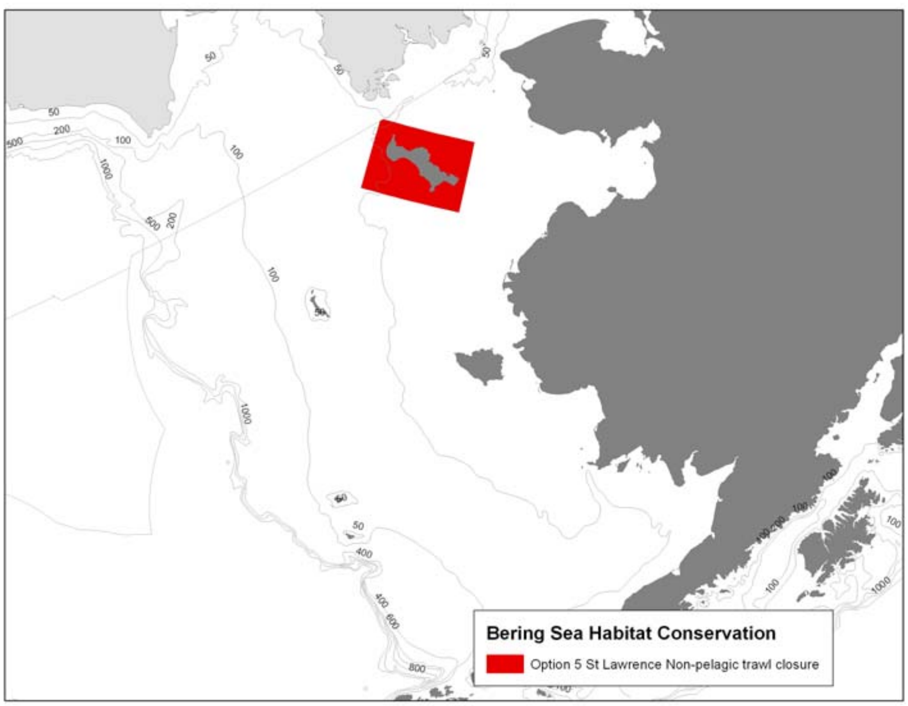

Figure 2.2-9. Option 5 Close the area to nonpelagic trawl gear around St. Lawrence Island to conserve blue king crab habitat and minimize potential interactions with community use and subsistence fisheries taking place in nearshore areas.

Alternatives Considered But Rejected

During the process of developing the alternatives, a number of ideas were suggested as possible ways to further conserve fish habitat in the Bering Sea. Some of these were reasonable and practicable, and appeared to address the problem statement; these alternatives are examined in detail in this analysis. Other ideas were discussed, but dropped from further consideration as they were determined to be unreasonable, not practicable, and/or did not address the specified problem. The following is a brief summary of the alternatives that were considered, but not further evaluated.

A smaller open area that excluded locations used by C. opilio crabs. In June 2006, the Council requested staff and the BSAI Crab Plan Team consider additional protection areas for Bering Sea C. opilio crab (C. C. opilio). Data on C. opilio crab distribution and bycatch were examined and evaluated by the team. The plan team concluded that additional measures specifically designed for C. opilio crab habitat conservation were unnecessary, given existing scientific information. The plan team further noted that while there may be bycatch concerns in the future should the nonpelagic trawl effort continue to push northward, the team had no habitat related concerns at this time. In October, the Council received these reports, and determined that habitat conservation measures for C. opilio crab were unnecessary and not practicable. Nevertheless, this analysis evaluates the impacts of prohibiting nonpelagic trawling the St. Matthew area, and other northern areas that currently include EFH for C. opilio crab habitat.

Two smaller open area options with more southerly boundaries. In October 2006, the Council requested staff examine options for the open area boundary based on the intensity of nonpelagic trawl effort in the northern area. Three options were developed and considered based on ranges for relatively low to relatively high trawl effort. The analysis indicated that the two boundary options that extended more southerly (and thus providing for a smaller open area) would eliminate a substantial portion of the historic grounds for nonpelagic trawling. In other words, the areas considered have been important fishing grounds for the fleet, with 7-13% of the groundfish catch coming from those areas, and 7-12% of the groundfish nonpelagic trawl effort (1990-2005). The number of nonpelagic trawl hauls observed in this region exceeded 18,500 hauls for the medium intensity option, and over 33,000 hauls for the high intensity boundary option. The data clearly show that this northerly area has received substantial nonpelagic trawl effort, and thus the area would already be considered impacted to some degree. Given that the purpose of an open area approach is to prevent expansion of fishing effort into new grounds, a smaller open area alternative would go beyond this purpose. Any gains in habitat conservation may be offset by effort redistribution, with more intensive trawling (possibly with reduced catch rates or higher PSC bycatch rates) in the remaining open areas.

A smaller open area with several canyon areas excluded. In June and October 2006, the Scientific and Statistical Committee (SSC) recommended that the Council consider canyon areas (Pribilof, Pervenets, and Zhemchug canyons) in the Bering Sea for possible habitat conservation measures. In response, the Council requested a discussion paper be prepared to examine available scientific information on the canyon areas (and skate nursery areas). Scientists at the NMFS Alaska Fisheries Science Center prepared this paper (NMFS 2006c), and concluded that the available scientific information does "not support any proposals for closures based on the existence of unique and/or essential habitat, nor do they make the case for inordinately sensitive habitat in need of immediate protection". Further, the canyon areas are important fishing grounds for the trawl fleet, with substantial catches of pollock, rockfish, and flatfish species taken from the canyon areas. Relatively high amounts of trawl effort have occurred in the canyon areas. Given these conclusions, the Council decided that an alternative to not include the canyons in the open area was neither reasonable or practicable, nor scientifically warranted at this time. Rather, the Council adopted the Scientific and Statistical Committee's recommendation to gather more information on the Bering Sea slope canyons, and suggested that this be a top research priority for the North Pacific Research Board.

Skate nursery area closures. Recent research has discovered several discrete locations in the Bering Sea where three skate species (Alaska skate, Aleutian skate, and Bering skate) deposit their egg cases to develop, with evidence for extended embryonic development of > 3 years (Hoff 2006). The nursery areas were identified in a retrospective analysis analyzing both survey and catch data. Additionally directed research has occurred since 2004 to examine these nursery sites in detail. Both nonpelagic trawl and video camera technology were used to examine biological aspects of the nurseries including species identification, habitat use, seasonality, mortality sources, and development timing. To date, six nursery sites on the EBS slope have been examined, and a seventh site is scheduled to be examined in 2007. It was noted that skate egg cases consistently were recorded in the catch for these same areas. As with the canyon areas, the SSC had recommended that the Council consider these skate nursery areas for conservation measures. In response, the Council requested a discussion paper be prepared to examine available scientific information on the skate nursery areas. Scientists at the NMFS Alaska Fisheries Science Center prepared this paper (NMFS 2006c), and concluded that "areas supporting large numbers of egg cases are extremely important and warrant special consideration…It seems prudent to consider protecting these nursery areas until such a time as the extent of their contribution to the skate populations in the EBS (and perhaps elsewhere) is better understood."

The Council acknowledged that these areas may be important for skates. However, the Council did not consider conservation measures for these areas as practicable or reasonable alternatives for this current action. These three skate species are considered to be at sustainable population levels, and these populations have persisted, despite more than 30 years of nonpelagic trawling in the Bering Sea. There is no evidence that nonpelagic trawling impacts these egg cases or the EFH for this life stage, and it is unknown how many of these nursery areas exist. In June 2007, the Council decided that it is premature to initiate a call for HAPC proposals, as there are no identified conservation concerns at this time for skate nurseries and that additional research is needed for the nurseries and canyon areas.

3.0 STATUS OF THE AFFECTED ENVIRONMENT

Essential Fish Habitat (EFH) means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of EFH, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' entire life cycle.

This chapter contains brief descriptions of the environment of the Bering Sea, including physical environment, major living marine resources and their habitats, and the social and economic conditions associated with the various fisheries. Additional information can be found in the Section 3.1.2 of the EFH EIS (2006a) and in Chapter 3 of the Alaska Groundfish PSEIS (NMFS 2004). The information in this chapter is important when predicting the direct, indirect, and cumulative impacts that will accrue from the proposed action.

3.1 Physical Environment

The Bering Sea is a semi-enclosed, high-latitude sea. Of its total area of 2.3 million sq km, 44 percent is continental shelf, 13 percent is continental slope, and 43 percent is deep-water basin. A special feature of the BS is the pack ice that covers most of its eastern and northern continental shelf during winter and spring. The dominant circulation of the water begins with the passage of north Pacific water (the Alaska Stream) into the BS through the major passes in the AI. There is net water transport eastward along the north side of the AI and a turn northward at the continental shelf break and at the eastern perimeter of Bristol Bay. Eventually BS water exits northward through the Bering Strait, or westward and south along the Russian coast, entering the western north Pacific via the Kamchatka Strait.

The eastern BS sediments are a mixture of the major sediment grades representing the full range of potential grain sizes of mud (subgrades clay and silt), sand, and gravel. The relative composition of such constituents determines the type of sediment at any one location. Sand and silt are the primary components over most of the seafloor, with sand composing the sediment in waters with a depth less than 60 m. Overall, there is often a tendency of the fraction of finer-grade sediments to increase (and average grain size to decrease) with increasing depth and distance from shore. This grading is particularly noticeable on the southeastern BS continental shelf in Bristol Bay and immediately westward.

The distribution of benthic sediment types in the eastern BS shelf is related to depth. Considerable local variability is indicated in areas along the shore of Bristol Bay and the north coast of the Alaska Peninsula, as well as west and north of Bristol Bay, especially near the Pribilof Islands. Nonetheless, there is a general pattern whereby nearshore sediments in the east and southeast on the inner shelf (0 to 50 m depth) often are sandy gravel and gravelly sand. These give way to plain sand farther offshore and west. On the middle shelf (50 to 100 m), sand gives way to muddy sand and sandy mud, which continues over much of the outer shelf (100 to 200 m) to the start of the continental slope. Sediments on the central and northeastern shelf (including Norton Sound) have not been so extensively sampled, but while sand is dominant in places here, as it is in the southeast, there are concentrations of silt both in shallow nearshore waters and in deep areas near the shelf slope. In addition, there are areas of exposed relic gravel, possibly resulting from glacial deposits.

Available sediment data for the BS shelf were classified in the EFH EIS to describe four habitat types. The first, situated around the shallow eastern and southern perimeter and near the Pribilof Islands, has primarily sand substrates with a little gravel. The second, across the central shelf out to the 100 m contour, has mixtures of sand and mud. A third, west of a line between St. Matthew and St. Lawrence islands, has primarily mud (silt) substrates, with some mixing with sand. Finally, the areas north and east of St. Lawrence Island, including Norton Sound, have a complex mixture of substrates. The distribution of sediments in the Bering Sea is shown in Figure 3.1-1.

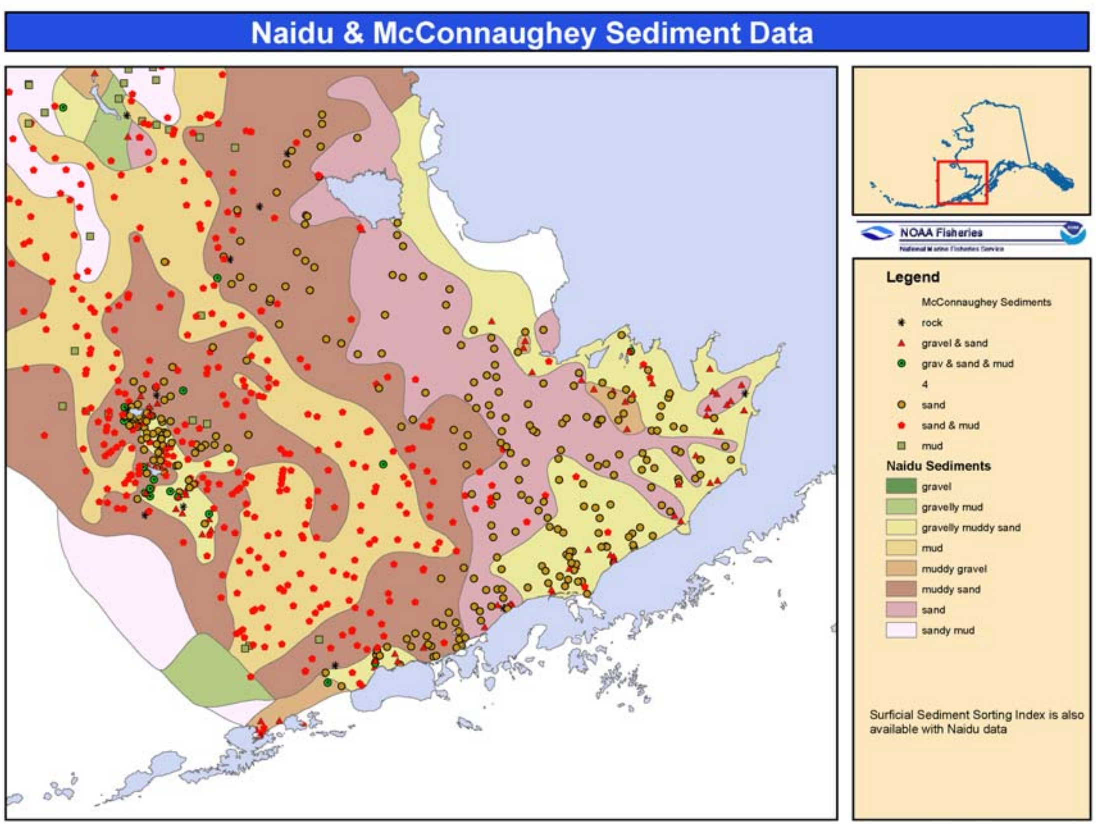

Figure 3.1-1. Available sediment data in the Bering Sea Source: Naidu and McConnaughey, NOAA Fisheries Alaska Fisheries Science Center.

Nearshore areas of the central and northern Bering Sea have been studied. However many studies are dated (Hood & Calder), narrowly focused to certain species, or not consistently sampled. Historically, NOAA/OCSEAP investigations (current remnant NOAA programs include Fisheries Oceanography and Coordinated Investigation, and Pacific Marine Environmental Laboratory) and environmental studies funded through the US Dept. of Interior Minerals Management Service have provided the majority of nearshore and benthic species information for areas northward of the BS FMP management boundary. Several sources reiterate the findings of these investigations (Louglin and Ohtani 1999) and synthesize these investagtions. However, a re-occurring theme is that information is sparse for the northern Bering Sea as compared to the north and south, such as the Chukchi Sea and the southern Bering Sea, respectively. Noteworthy though is the accuracy of how these older data sets still provide information related to northern regime shifts and ice edge movements and species response to these variable seasonal and annuals events.

Shorelines were classified by NOAA in order to build an inventory of shoreline types. A series of Environmental Sensitivity Index (ESI) maps exist for the Bristol Bay and Western Alaska coastlines. The focus was to standardize shoreline compositions, characteristics, and features. This information would then be available to management and response teams to assess oil spill related incidents for these areas. This information is also dated yet offers an excellent source of otherwise unknown conditions. ESI exist for other areas throughout Alaska. Currently, the Alaska Shorezone (Shorezone Maps) assessment effort has began to groundtruth ESI maps and expands this effort to include substrate type, marine vegetative cover, and species composition through sampling. ESI maps data sets are available both electrically and paper formats (NOAA ESI Maps). Additionally, the State of Alaska has drafted complimentary maps that identify Most Environmentally Sensitive Areas (MESA Maps). Together, these resource data inventories provide information for those needing to make informed decisions should areas face exposure to oil related incident or other affect.

The following section is excerpted from the 2007 Ecosystem SAFE (Boldt et al., 2006).

Ice and Temperature Trends in the Bering Sea

The Bering Sea was subject to a change in the physical environment and an ecosystem response after 1977, a minor influence from shifts in Arctic atmospheric circulation in the early 1990s, and persistent warm conditions over the previous 4 years. A major transformation, or regime shift, of the Bering Sea occurred in atmospheric conditions around 1977, changing from a predominantly cold Arctic climate to a warmer sub arctic maritime climate as part of the Pacific Decadal Oscillation (PDO). This shift in physical forcing was accompanied by a major reorganization of the marine ecosystem on the Bering Sea shelf over the following decade. Surveys show an increase in the importance of pollock to the ecosystem. Weather data beginning in the 1910s and proxy data (e.g., tree rings) back to 1800 suggest that, except for a period in the 1930s, the Bering Sea was generally cool before 1977, with sufficient time for slow growing, long-lived, cold-adapted species to adjust. Thus the last few decades appear to be a transition period for the Bering Sea ecosystem.

A comprehensive report (National Research Council 1996) attributes the ecosystem reorganization toward pollock to the combination of fishing and the 1976 regime shift. They hypothesize that fishing of large whales increased the availability of planktonic prey, fishing on herring reduced competition, and fishing on flatfish reduced predation. The modeling study of Trites et al. (1999) noted that the increase in pollock biomass could not be explained solely by trophic interaction from these removals, and favored environmental shifts as an explanation. While the physical shift after 1976 was abrupt and pollock biomass increased rapidly, the ecosystem adjustment probably took a prolonged period as relative biomass shifted within the ecosystem. Biodiversity measures (richness and evenness) of roundfish, excluding pollock, decreased throughout the 1980s and were stable in the 1990s (Hoff 2003). Jellyfish, which share a common trophic level with juvenile pollock and herring, may have played a role in the ecosystem adjustment as their biomass increased exponentially beginning in the early 1980s, but recently have crashed in 2001-2003.

A specific Arctic influence on the Bering Sea began in the early 1990s, as a shift in polar vortex winds (the Arctic Oscillation – AO) reinforced the warm Bering conditions, especially promoting an earlier timing of spring melt back of sea ice. Flatfish increased in the mid-1980s due to changes in larval advection (Wilderbuer et al. 2002), but the AO shift to weaker winds have since reduced these favorable conditions (Overland et al. 1999).

Warm conditions tend to favor pelagic over benthic components of the ecosystem (Hunt et al. 2002, Palmer 2003). Cold water species, i.e., Greenland turbot, Arctic cod, C. opilio crab and a cold water amphipod, are no longer found in abundance in the SE Bering Sea, and the range of Pacific walrus is moving northward. While it is difficult to show direct causality, the timing of the reduction in some marine mammals suggests it is due to some loss of their traditional Arctic habitat. Although physical conditions appear mostly stable over the last decade, the warmest water column temperatures have occurred in 2001—2005 on the southeast Bering Sea shelf, despite considerable year-to-year variability in the AO and PDO.

The overall climate change occurring in the Arctic, as indicated by warmer atmospheric and oceanic temperatures and loss of 15 % of sea ice and tundra area over the previous two decades, is hypothesized to make the Bering Sea less sensitive to the intrinsic climate variability of the North Pacific. Indeed, when the waters off of west coast of the continental U.S. shifted to cooler conditions after 1998, the subarctic did not change (Victoria pattern), in contrast to three earlier PDO shifts in the 20th century. Neither the PDO nor the Victoria indices can fully explain an abrupt shift to warmer conditions in the Bering Sea since 2000. In the current warm regime, the magnitude of Surface Air Temperature (SAT) fluctuations has been steadily increasing since the mid-1980s, and the Bering Sea may become even warmer before it will switch to a new cold regime. If the regime concept is true, this switch may happen anytime soon, especially given the uncertain state of the North Pacific climate, suggesting that it may be in a transition phase.

The warming trend in the Arctic is illustrated in the adjacent Figure 3.1-2, which shows the Northern Hemisphere sea ice extent in March, as measured from passive microwave instruments onboard NOAA satellites. March is the month when Arctic sea ice reaches its maximum extent. The overall downward trend in the sea ice extent has accelerated in the past four years. In 2006 it was 14.5 million square kilometers, the lowest value for any March on record. This is 1.2 million square kilometers below the long-term (1979-2000) mean. The implications of this trend for the North Pacific are likely to include a tendency for a shorter season during which intense cold-air outbreaks of arctic origin can occur.

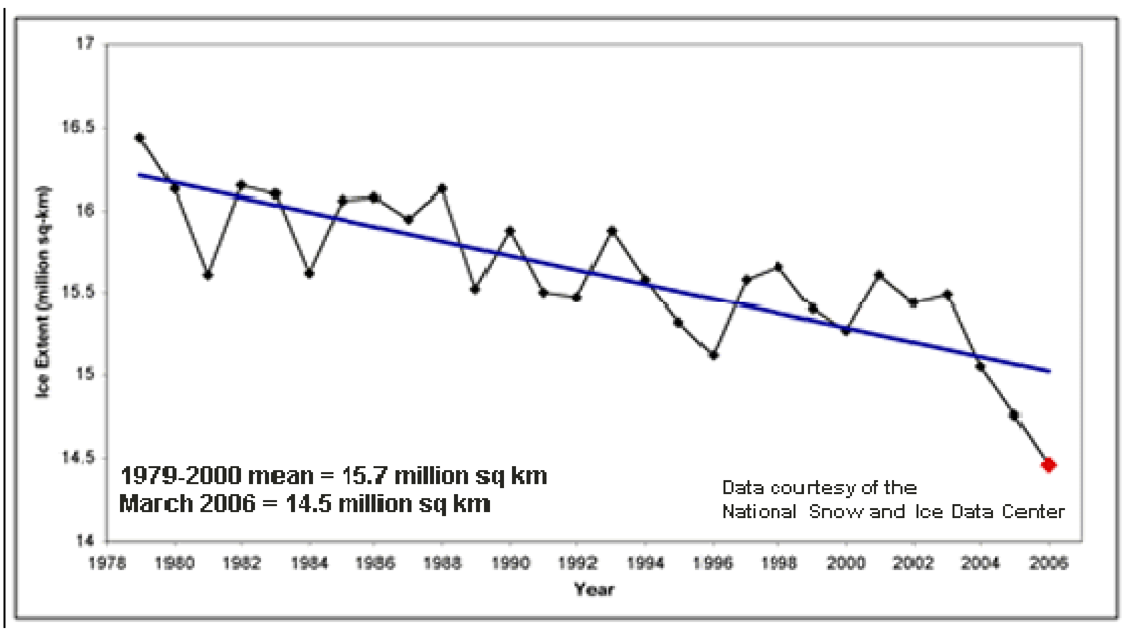

Figure 3.1-2. March sea-ice extent (in millions of square kilometers) across the Northern Hemisphere.

The high degree of variability within the 2006 winter season is also seen in ice cover surrounding Mooring 2. Ice appeared in the area in mid-January, which is an average start date of the ice season there (Figure 3.1-3).

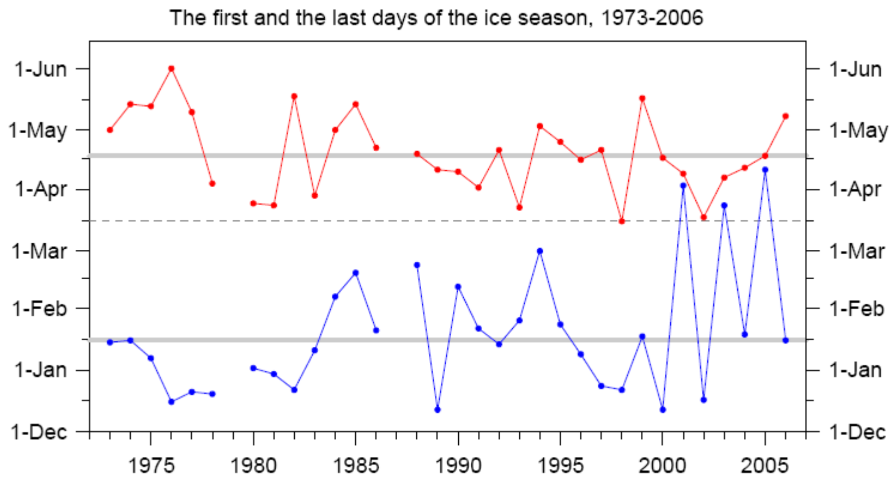

Figure 3.1-3. The first and last days of the ice season, 1973-2006. The gray solid horizontal lines are the mean dates for these two variables. The dashed line (March 15) is used as a threshold to calculate the ice retreat index. No ice was present in the box in 1979 and 1987 (source).

Due to very cold weather in January, ice quickly extended south, covering more than 80% of the box. Anomalously mild and stormy weather occurred in February and March causing ice to retreat as quickly as it arrived. Because of cold weather spells later in spring, ice peaked again around April 1 and May 1. Ice finally cleared the box in the second week of May, which made the ice retreat index the highest since 1999 (Figure 29 of the Ecosystem SAFE- see figure below).

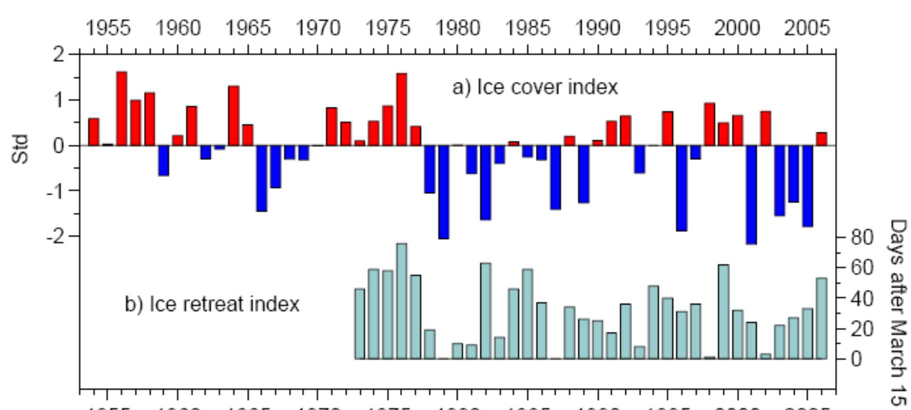

Figure 29. a) Ice cover index, 1954-2006, and b) ice retreat index, 1973-2006.

It is interesting that the Bering Sea was about the only place in the Arctic where sea ice extent anomalies in January 2006 were positive and ice extent was south of its median position for the period 1979-2000. By March 2006, however, sea ice concentration anomalies were negative practically everywhere along the periphery of Arctic ice extent. The total Arctic sea ice extent for this month was 14.5 million km^2, or 1.2 million km^2 below the 1979-2000 mean value. This makes March 2006 the record low March for the entire period of observations since 1979. In April sea ice in the Bering Sea advanced again. Figure 3.1-4 illustrates how far south the ice edge was compared to the previous five years.

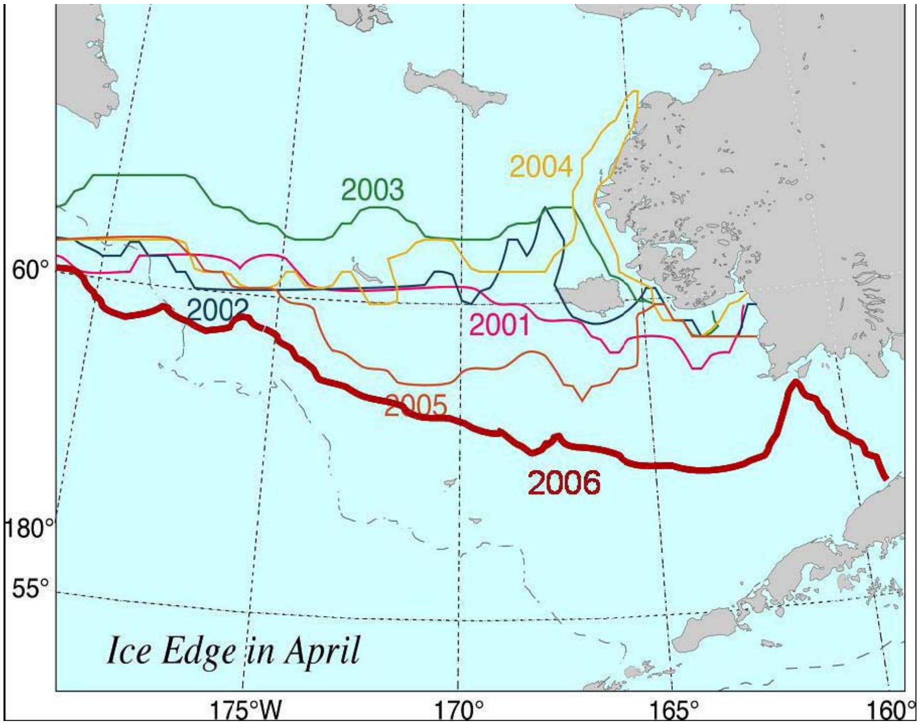

Figure 3.1-4. Location of ice edge in April between 2001 and 2006. (source Ecosystem SAFE)

In May, sea ice concentration anomalies in the Bering Sea remained positive, and sea ice extent was much farther south than its median position for this month. Due to anomalous ice cover extent, average sea surface temperature (SST) over the EBS in May was sharply lower. May SST is a good predictor of summer bottom temperatures and the extent of the cold pool. Although sea ice concentration in the EBS was not particularly high after early February, especially as compared with other heavy ice years, ice stayed longer in the area than in any other year since 1999. Mooring 2 records indicate 2006 has been a remarkably cold year, mainly because the ice persisted into May and heating of the water column did not really begin until late May. In contrast, 2005 was the warmest year on record at the Mooring 2 site, since 1995.

Bottom temperature data for the summer of 2006 was unavailable at the time of writing, but given the relatively late ice retreat, it is strongly suspected that the cold pool was the most prominent it has been since 1999. The extent of the cold pool relates not only to the near-bottom habitat, but also impacts the overall thermal stratification and ultimately the mixing of nutrient-rich water from depth into the euphotic zone. Regarding the latter process, June-July wind mixing at M2 during 2006 was the strongest since 1996, and the second strongest since 1979. All in all, it appears that the most important aspect of the physical environmental conditions in the EBS during 2006 was the unusually late retreat of the sea ice in the spring.

Bottom temperature data for the Bering Sea are available from the NMFS summer bottom trawl survey the annual AFSC bottom trawl survey for 2006 started on May 30 and finished on July 28. The average bottom temperature was 1.87°C, well below the 1982-2005 mean of 2.62°C (see Figure 3.1-5). Bottom temperature anomalies from the long-term station means were negative over most of the shelf region except for the southwestern sections of the inner and middle shelf regions. Maximum anomalies occurred in the inner and middle domain where bottom temperatures were < -1°C. The ‘Cold Pool’, usually defined as an area with temperatures < 2°C, extended much further to the south and east into Bristol Bay compared to 2005.

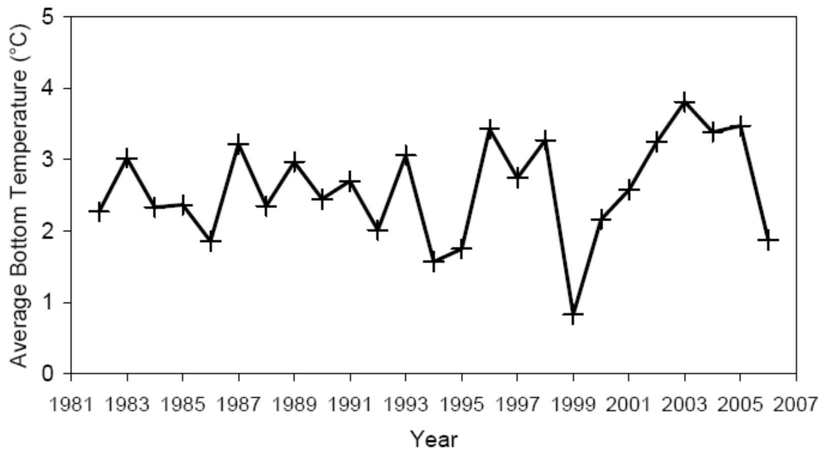

Figure 3.1-5. Mean summer bottom temperature (°C) in the standard bottom trawl survey area of the eastern Bering Sea Shelf, 1975-2006. Temperatures for each tow are weighted by the proportion of their assigned stratum area.

3.2 Biological Environment

3.2.1 Target Fish Stocks

The Bering Sea contains about 300 species of fish and 150 species of crustaceans and molluscs. Groundfish species that are the target of BS fisheries include pollock, cod, sablefish, Atka mackerel, and several species of flatfish, including arrowtooth, Pacific halibut, rock sole, flathead sole, Rex Sole, and Dover sole. Squid, sharks, sculpins, and salmon are also found along the shelf, as well as forage species such as herring, sand lance, and capelin. Large invertebrates subject to fishing on the shelf include red king crab, blue king crab, C. opilio crab, and Tanner crab, as well as golden king crab on the continental slope.

The primary target species affected by the alternatives and options are rocksole and yellowfin sole, Alaska plaice, walleye pollock, Pacific cod, blue king crab, and C. opilio crab (C. C. opilio). Several sculpin species, as well as two forage species (capelin and candlefish) also occur in the northern Bering Sea region. A summary of the biological information for the target species is included in this section. For more information on the stock status or management, refer to the annual *Stock Assessment and Fishery Evaluation* report (NMFS 2007a, Appendix A) and the Groundfish PSEIS (NMFS 2004b). Habitat information for these stocks is contained in the EFH EIS (NMFS 2005).

Rock Sole

Northern rock sole are distributed primarily on the EBS continental shelf and in much lesser amounts in the Aleutian Islands region. Two species of rock sole are known to occur in the North Pacific Ocean, a northern rock sole (*Lepidopsetta polyxystra*) and a southern rock sole (*L. bilineata*) (Orr and Matarese 2000). These species have an overlapping distribution in the Gulf of Alaska, but the northern species comprise the majority of the Bering Sea and Aleutian Islands populations where they are managed as a single stock. Adults exhibit a benthic lifestyle and occupy separate winter (spawning) and summertime feeding distributions on the southeastern Bering Sea continental shelf. Northern rock sole spawn during the winter-early spring period of December-March.

Rock sole catches from 1989 - 2005 (domestic only) have averaged 48,175 t annually. Rock sole are important as the target of a high value roe fishery occurring in February and March, which accounts for the majority of the annual catch (62% in 2006). About 58% of the 2006 catch came from management areas 509 and 513, with the rest from areas 513, 517, and 521. The 2006 catch of 35,907 t comprised 29% of the ABC of 126,000 t (89% of the TAC). Thus, rock sole remain lightly harvested in the Bering Sea and Aleutian Islands.

During the 2006 fishing season rock sole harvesting was temporarily closed in the Bering Sea and Aleutian Islands due to halibut bycatch restrictions on February 21 and April 12 (first and second seasonal apportionments were obtained). On August 7, directed rock sole harvesting was closed due to the attainment of the annual halibut bycatch allowance, after which the species could only be retained as bycatch.

Yellowfin Sole

Yellowfin sole are distributed in North American waters from off British Columbia, Canada, (approximately 49° N. latitude) to the Chukchi Sea (about 70° N. latitude) and south along the Asian coast to about 35° N. latitude off the South Korean coast in the Sea of Japan. Adults exhibit a benthic lifestyle and occupy separate winter spawning and summertime feeding distributions on the eastern Bering Sea shelf. From over-winter grounds near the shelf margins, adults begin a migration onto the inner shelf in April or early May each year for spawning and feeding. A protracted and variable spawning period may range from as early as late May through August occurring primarily in shallow water. As with most Bering Sea flatfish, the larvae are planktonic for at least 2-3 months until metamorphosis occurs, and they settle into shallow areas. The adults spawn and feed on sandy substrates of the EBS shelf, feeding mainly on bivalves, polychaetes, amphipods and echiurids.

Yellowfin sole is one of the most abundant flatfish species in the EBS. The yellowfin sole stock biomass has grown since the 1970s to very high and stable levels, with a projected 2007 biomass of 2,000,000 mt. The catch in 2006 was 97,648 mt, and the 2007 TAC was set at 136,000 mt.

Yellowfin sole are caught in nonpelagic trawls both as a directed fishery and in the pursuit of other bottom dwelling species. Recruitment begins at about age 6, and they are fully selected at age 13. Historically, the fishery has occurred throughout the mid and inner Bering Sea shelf during ice-free conditions although much effort has been directed at the spawning concentrations in nearshore northern Bristol Bay. The directed fishery is prosecuted beginning in late January or February, and continuing through to the early fall. The target fishery is allocated a halibut PSC allowance in four seasons, and the fishery has been constrained by this cap. Once the halibut PSC allowance is used, the directed fishery must close until the next PSC seasonal allowance is allocated. In 2004, however, the yellowfin sole fishery did not exceed the halibut PSC limit, but was in fact closed to directed fishing on June 4th as it approached its TAC limit. In recent years, the yellowfin sole fishery has also been constrained by the red king crab PSC limit.

Alaska plaice

Alaska plaice inhabit continental shelf waters of the North Pacific ranging from the Gulf of Alaska to the Bering and Chukchi Seas and in Asian waters as far south as Peter the Great Bay. Adults exhibit a benthic lifestyle and live year round on the shelf and move seasonally within its limits. From over-winter grounds near the shelf margins, adults begin a migration onto the central and northern shelf of the EBS, primarily at depths of less than 100 m. Spawning usually occurs in March and April on hard sandy ground. The eggs and larvae are pelagic and transparent and have been found in ichthyoplankton sampling in late spring and early summer over a widespread area of the continental shelf. The adults feed on sandy substrates of the EBS shelf.

The biomass of Alaska plaice is quite high, projected to be 1,340,000 mt for 2007. Although the stock could sustain significantly higher removal rates, catch limits have been set relatively low to allow higher valued flatfish to be caught given a limited about of halibut PSC bycatch available to the trawl fleet. The

ABC for 2007 was set at 190,000 mt, whereas the TAC was set at only 25,000 mt. The catch in 2006 was 17,871 mt.

Alaska plaice are caught in nonpelagic trawls both as a directed fishery and in the pursuit of other bottom-dwelling species. Recruitment begins at about age 6, and they are fully selected at age 12. The fishery occurs throughout the mid and inner Bering Sea shelf during ice-free conditions. They are caught as bycatch in Pacific cod, bottom pollock and other flatfish fisheries and are caught with these species and Pacific halibut the directed fishery.

Pacific cod

Pacific cod is a transoceanic species, occurring at depths from shoreline to 500 m. The southern limit of the species' distribution is about 34° N. latitude, with a northern limit of about 63° N. latitude. Adults are demersal and form aggregations during the peak spawning season, which extends approximately from January through May. Spawning takes place in the sublittoral-bathyal zone (40-290 m) near bottom. Eggs sink to the bottom after fertilization, and are somewhat adhesive. Larvae are epipelagic, occurring primarily in the upper 45 m of the water column shortly after hatching, moving downward in the water column as they grow. Pacific cod juveniles occur mostly over the inner continental shelf at depths of 60-150 m, and adults occur in depths from the shoreline to 500 m. Average depth of occurrence tends to vary directly with age for at least the first few years of life, with mature fish concentrated on the outer continental shelf. Preferred substrate is soft sediment, from mud and clay to sand.

Pacific cod are relatively abundant in the Bering Sea, but recruitment has declined below average for recent years. The projected 2007 exploitable biomass was 960,000 mt. The Federal water TAC for 2007 was set at 170,720 mt.

The fishery is conducted with nonpelagic trawl, longline, pot, and jig gear. The age at 50 percent recruitment varies between gear types and regions. In the BSAI, the age at 50 percent recruitment is 3 years for trawl gear and 4 years for other longline and pot gear. More than 100 vessels participated in each of the three largest fisheries (trawl, longline, pot). The trawl fishery is typically concentrated during the first few months of the year, whereas fixed-gear fisheries may sometimes run essentially year-round. Bycatch of crab and halibut often causes the Pacific cod fisheries to close prior to reaching the total allowable catch. In the BSAI, trawl fishing is concentrated immediately north of Unimak Island, whereas the longline fishery is distributed along the shelf edge to the north and west of the Pribilof Islands.

Walleye Pollock

Pollock occur throughout the BSAI and GOA FMP management areas, and straddle into the Canadian and Russian exclusive economic zones (EEZs), the international waters of the central Bering Sea, and into the Chukchi Sea. The most abundant stock of pollock is the EBS stock which is primarily distributed over the EBS outer continental shelf between approximately 70-200 m.

Pollock is the most abundant species within the EBS comprising about 75 percent of the catch and 50 percent of the biomass. Although still very abundant (biomass projected at 6,360,000 mt for 2007), the stock is projected to decline through 2008, when an apparently strong 2005 year class begins to recruit to the fishery. The TAC for 2007 was set at 1,394,000 mt.

Peak pollock spawning occurs on the southeastern Bering Sea and eastern Aleutian Islands along the outer continental shelf around mid-March. North of the Pribilof Islands spawning occurs later (April-May) in smaller spawning aggregations. Spawning occurs pelagically and eggs develop throughout the water column (70-80 m in the Bering Sea shelf). Larvae are also distributed in the upper water column, with the larval period lasting approximately 60 days.

At age 1 pollock are found throughout the EBS both pelagically and on bottom. Age 1 pollock from strong year-classes appear to be found in great numbers on the inner shelf, and further north on the shelf than weak year classes which appear to be more concentrated on the outer continental shelf. From age 2-3, pollock are primarily pelagic and then appear to be most abundant on the outer and mid-shelf northwest of the Pribilof Islands. As pollock reach maturity (age 4), they appear to move from the northwest to the southeast shelf to recruit to the adult spawning population. Adults occur both pelagically and demersally on the outer and mid-continental shelf of the EBS and Aleutian Islands. In the EBS few adult pollock occur in waters shallower than 70 m.

By regulation, the EBS pollock fishery has been divided into two fishing periods: a roe-bearing “A” season fishery generally occurring in January-March, and a nonroe-bearing “B” season fishery generally occurring in August-October. The “A” season concentrates fishing effort on prespawning pollock in the southeastern Bering Sea. During the “B” season, fishing is still primarily in the southeastern Bering Sea, but some fishing also occurs on the northwestern shelf. Also during the “B” season, catcher processor vessels are required to fish north of 56° N. latitude because the area to the south is reserved for catcher vessels delivering to shoreside processing plants on Unalaska and Akutan. Only pelagic trawl gear can be used in the Bering Sea pollock fishery.

Blue King Crab

Blue king crab (Paralithodes platypus) has a discontinuous distribution throughout their range (Hokkaido Japan to Southeast Alaska). In the Bering Sea, discrete populations exist around the Pribilof Islands, St. Matthew Island, and St. Lawrence Island. EFH distribution of blue king crab is in Figure 3.2-1. Smaller populations have been found around Nunivak and King Island. Blue king crab molt multiple times as juveniles. 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. Juvenile blue king crab require cobble habitat with shell hash, or other protective cover. Adult male blue king crab occur at an average depth of 70 m and an average temperature of 0.6°. The nearshore state water areas are used extensively by ovigerous female blue king crabs, and these state waters are closed to all state managed fisheries.

This stock is annually surveyed by the NMFS Crab/Groundfish annual trawl survey in July. During 2005-6, the survey areas has sampled more in the northwest portion of the EBS. The NMFS EBS survey area is divided into 20 nmi x 20 nmi squares that represent stations. Survey tows are performed in the centers of the stations except for certain areas, including an area south of St. Matthew Island, where tows are also performed at the “corners” of the stations. The trawl survey does not tow in waters shallower than 20 fm (37 m) and rarely in waters shallower than 30 fm (55 m) in the vicinity of St. Matthew Island. Ovigerous female distribution from the trawl survey (years 1990 to 2005) together with trawl effort and existing closures are shown in Figure 3.2-2. Directed crab fishery catch from 1997-2000 is shown with ovigerous females and nonpelagic trawl effort in Figure 3.2-3. Catch distribution of males from the 2005 and 2006 NMFS survey in the vicinity of St. Matthew Island are shown in Figure 3.2-4 and Figure 3.2-5.

Concentrations of ovigerous females with uneyed eggs are rarely encountered in standard surveys, but were, however, identified by nearshore work (<20 fm) performed by ADF&G to supplement the standard pot survey. Highest densities of ovigerous females with uneyed eggs were observed on the southern side of St. Matthew Island, and there was a general increase in their densities with decreasing depth (Pengilly 2003). Catch distribution of females from the 2005 and 2006 NMFS trawl survey in the vicinity of St. Matthew Island are shown in Figure 3.2-6 and Figure 3.2-7. Further information on ovigerous females Blue King Crab in the St. Matthew region is in Appendix E.

The limited spatial distribution of the St. Matthew blue king crab stock and presence of rocky bottom habitat within that distribution poses problems in using the NMFS EBS trawl survey to assess the stock. Although the trawl survey station density is increased in the vicinity of St. Matthew Island to better sample from the blue king crab stock, important nearshore areas are not adequately sampled to detect important trends in stock distribution (Vining et al. 2001). Females, in particular, are poorly sampled by the trawl survey and abundance estimates for females from the survey data are considered unreliable. Additionally, only a small portion of the trawl survey effort in the St. Matthew Island Section is expended within the area that the commercial fishery typically occurred or, apparently, in the area that the crabs most likely to be harvested tend to occupy preseason (Pengilly and Watson 2004). Slight changes in distribution of stock components from year to year could affect vulnerability to the trawl survey and the resulting abundance estimates.

The St. Matthew Island Blue King Crab fishery was closed in 1999 due to low mature male abundance (Zheng and Kruse 1999) and to total mature biomass (TMB) being estimated as below minimum stock size threshold (MSST) (Stevens et al. 2000). It has remained closed since. The stock was declared overfished in 1999 and a rebuilding plan was implemented in 2000. This stock remains in "overfished" condition (Figure 3.2-8). Survey estimates for St. Matthew Island blue king crabs indicated dramatic declines of both male and female crabs in all size categories in 1999. Recruitment to this stock had been declining for several years, but the sharp decline in all sizes of crabs suggested large survey measurement errors, a large increase in natural mortality, or some combination of both.

The St. Matthew Island Island blue king crab stock remains at low biomass levels. The TMB in 2006 was estimated to be 11.2 million pounds. Although this is at its second highest level since the overfished declaration of 1999, it is at approximately ½ the "rebuilt" level of 22.0- million pounds. From all indications, this stock continues to remain at a depressed level, comparable to that of the mid-1980s. Unlike the mid-1980s, however, the stock is in a prolonged period (now in its seventh year) of depressed status. There are some promising indications for the stock, however, as the 2006 survey estimated higher numbers at all sizes than observed in 2005. As always with this stock, forecasts of the stock's future, particularly the future recruitment into the mature size class, should be viewed with some skepticism. Abundance estimates are heavily influenced by the catch in relatively few tows and precision of estimates is generally poor. Total mature biomass would need to increase nearly double to 22.0 million pounds from the 2006 estimate for the stock to be considered "rebuilt." Data from the 2006 survey do not provide any expectations for such an increase in the near-term future; the estimates from 1999 through 2006 indicate at best only a weakly increasing trend in total mature biomass.

Table 3.2-1 St. Matthew blue king crab fishery harvest relative to harvest strategy target and guideline harvest level (GHL), 1993-2006.

Fishery Year	Harvest Strategy Target[a]	Actual[b]	Number of males >104 mm CL[c]	Number Harvested[d]	GHL[e]	Harvest[f]
1993	20%	16%	3.98	0.63	4.4	3.00
1994	20%	20%	4.11	0.83	3.0	3.76
1995	20%	17%	3.99	0.67	2.4	3.17
1996	20%	15%	4.38	0.66	4.3	3.08
1997	20%	20%	4.70	0.94	5.0	4.65
1998	20%	15%	4.13	0.63	4.0	2.87
1999	Fishery closed		1.01	0	0	0
2000	Fishery closed		1.21	0	0	0
2001	Fishery closed		1.34	0	0	0
2002	Fishery closed		1.47	0	0	0
2003	Fishery closed		1.33	0	0	0
2004	Fishery closed		1.29	0	0	0
2005	Fishery closed		0.90	0	0	0
2006	Fishery closed		2.12	0	0	0

[a] Harvest strategy in effect for 1993-1998 seasons targeted 20% of abundance of males >104-mm carapace length (CL) as estimated from preseason survey.
[b] Actual number of legal males harvested as percentage of preseason estimated abundance of males >104-mm carapace length (CL).
[c] Estimated abundance of males >104-mm carapace length (CL) from preseason survey (millions of animals). From Vining and Zheng (2004).
[d] Millions of animals. **2005-2006 information from BSAI Crab SAFE (2006) includes number of sublegal mature males (105 -119mm) and legal males >=120mm
[e] GHL established preseason (millions of pounds).
[f] Actual harvest (millions of pounds).

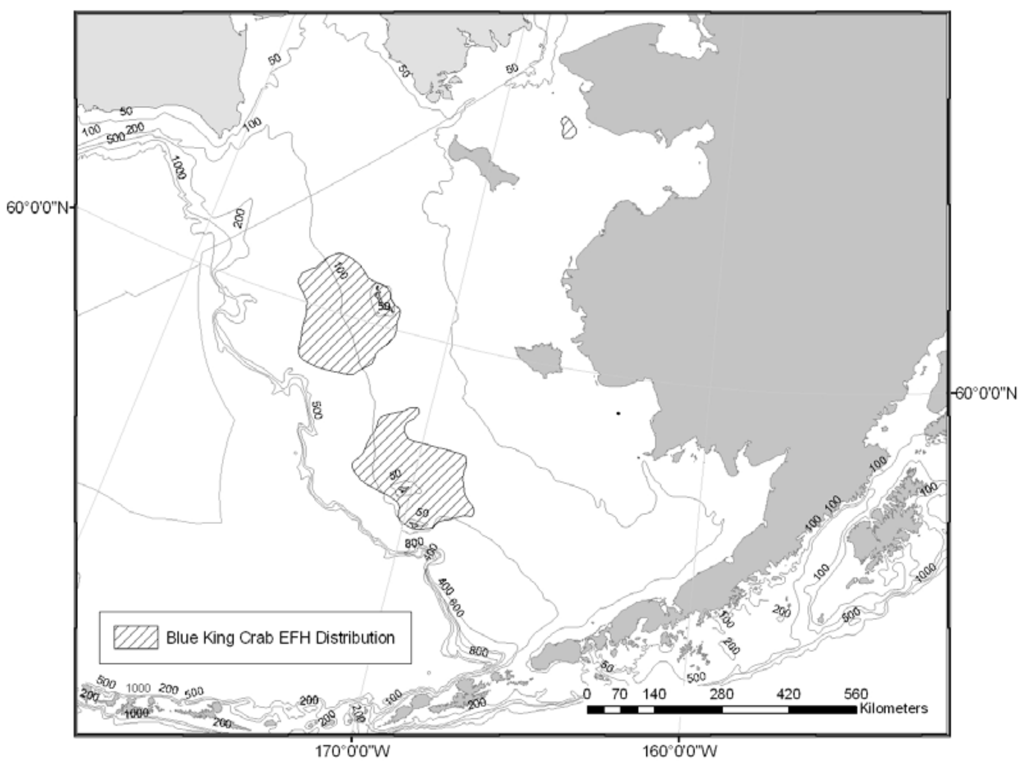

Figure 3.2-1. EFH Distribution of BSAI Blue King Crab Adults

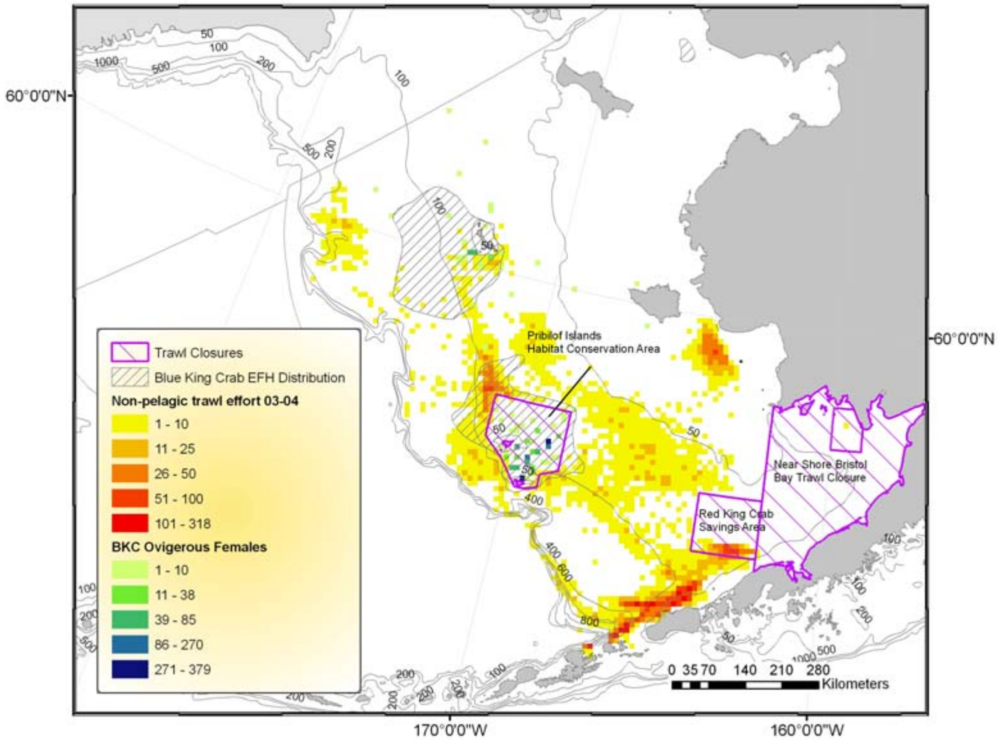

Figure 3.2-2 Map of the Eastern Bering Sea with the current fishery closures, BKC EFH, Non pelagic trawl effort from 2003-4 and locations of BKC ovigerous females from the EBS trawl survey 1990-2004

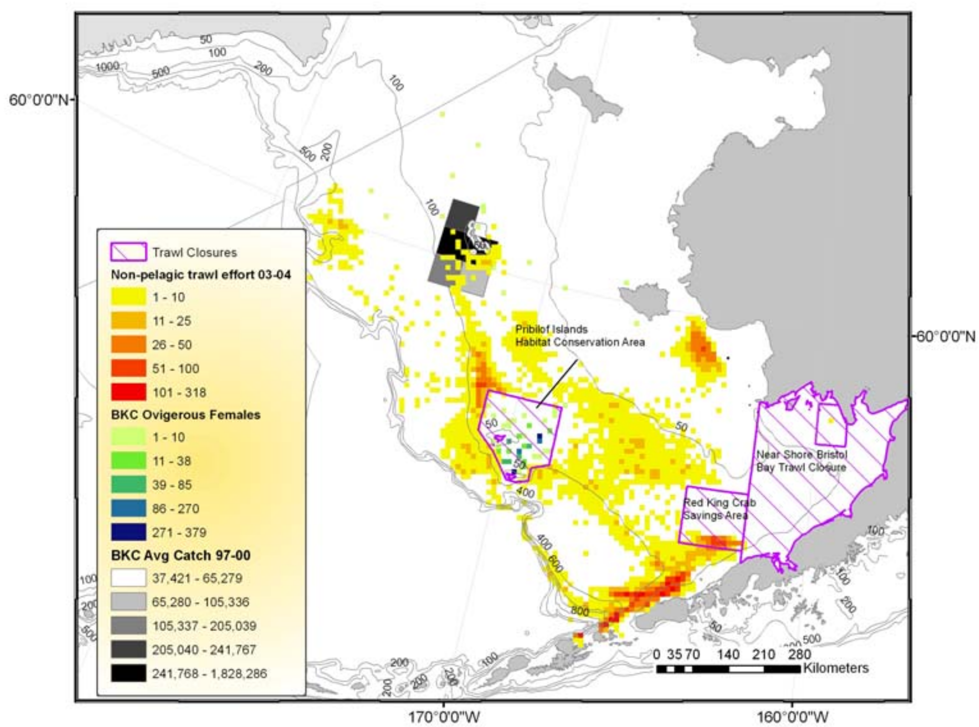

Figure 3.2-3. Map of the Eastern Bering Sea with the current fishery closures, BKC EFH, Non pelagic trawl effort from 2003-4 and locations of BKC ovigerous females from the EBS trawl survey 1990-2004, with locations of BKC average catch from 1997-2000.

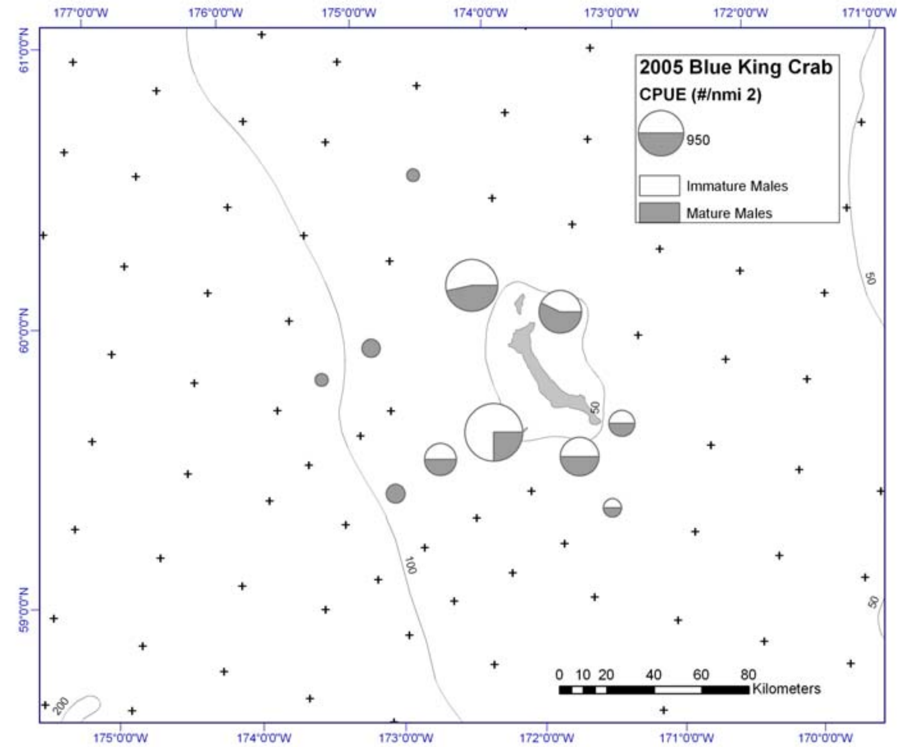

Figure 3.2-4. **Catch distribution of male blue king crab in the St. Matthew Island Island and Norton Sound Sections of the Northern District of Area Q the 2005 NOAA Fisheries EBS trawl survey (data source D. Pengilly, ADF&G)**

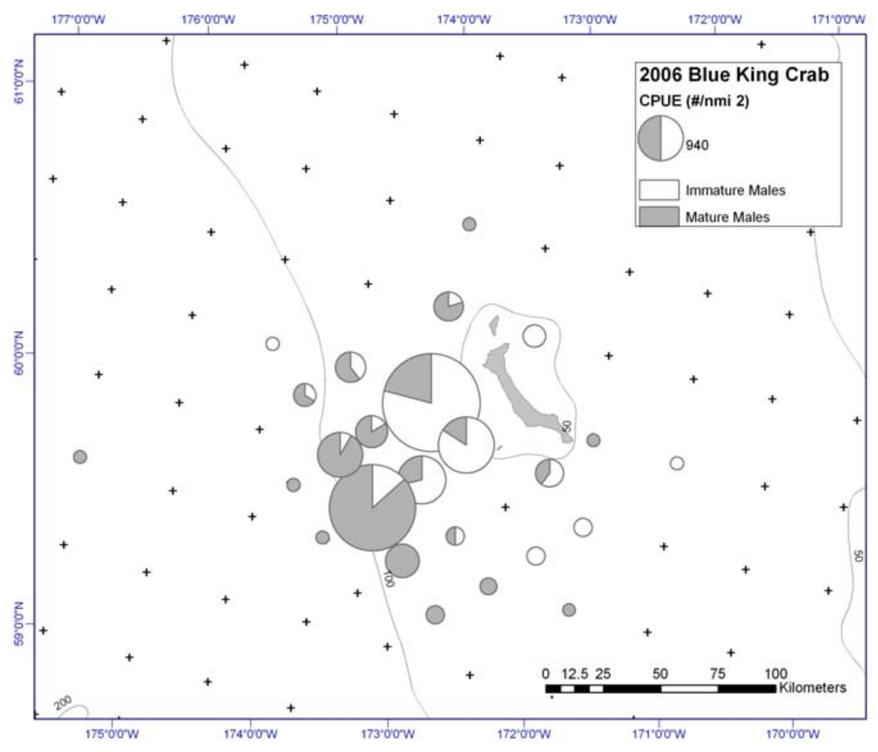

Figure 3.2-5. **Catch distribution of male blue king crab in the St. Matthew Island Island and Norton Sound Sections of the Northern District of Area Q the 2006 NOAA Fisheries EBS trawl survey (data source D. Pengilly, ADF&G)**

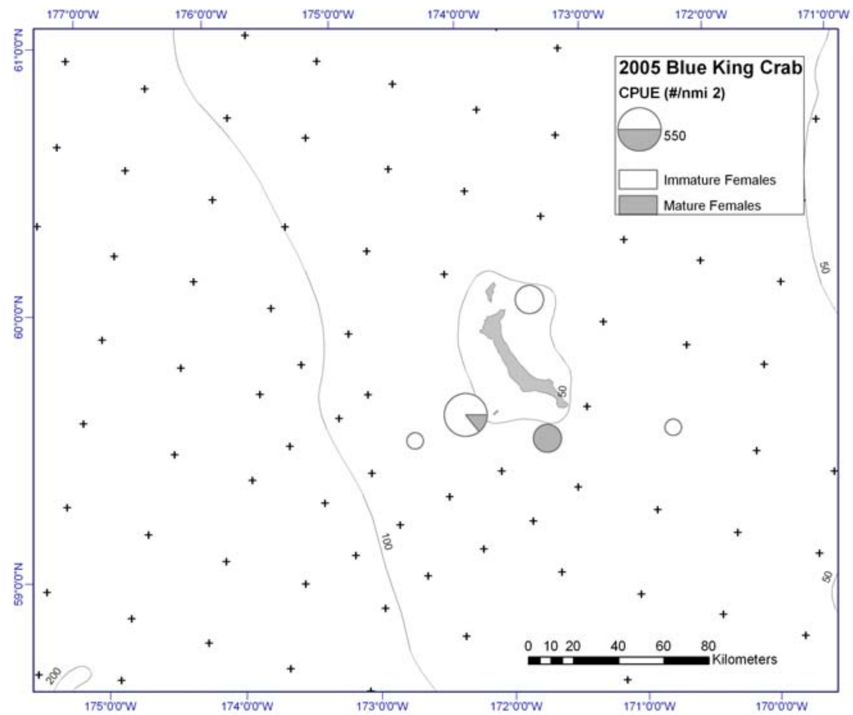

Figure 3.2-6. Catch distribution of female blue king crab in the St. Matthew Island Island and Norton Sound Sections of the Northern District of Area Q the 2005 NOAA Fisheries EBS trawl survey (data source D. Pengilly, ADF&G, Kodiak)

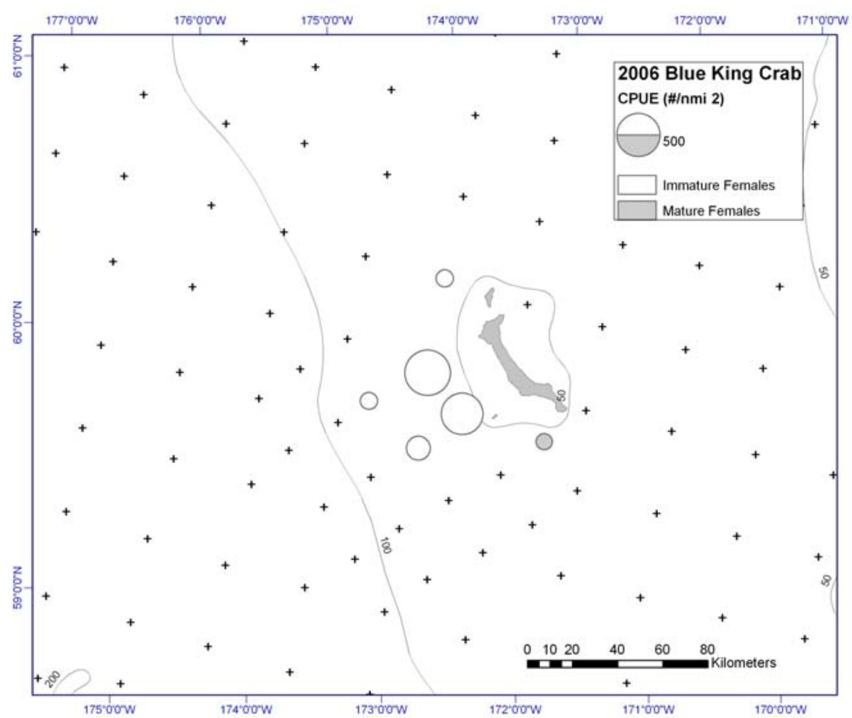

Figure 3.2-7. Catch distribution of female blue king crab during the 2006 NMFS EBS trawl survey near St. Matthew Island, (data source D. Pengilly, ADF&G, Kodiak)

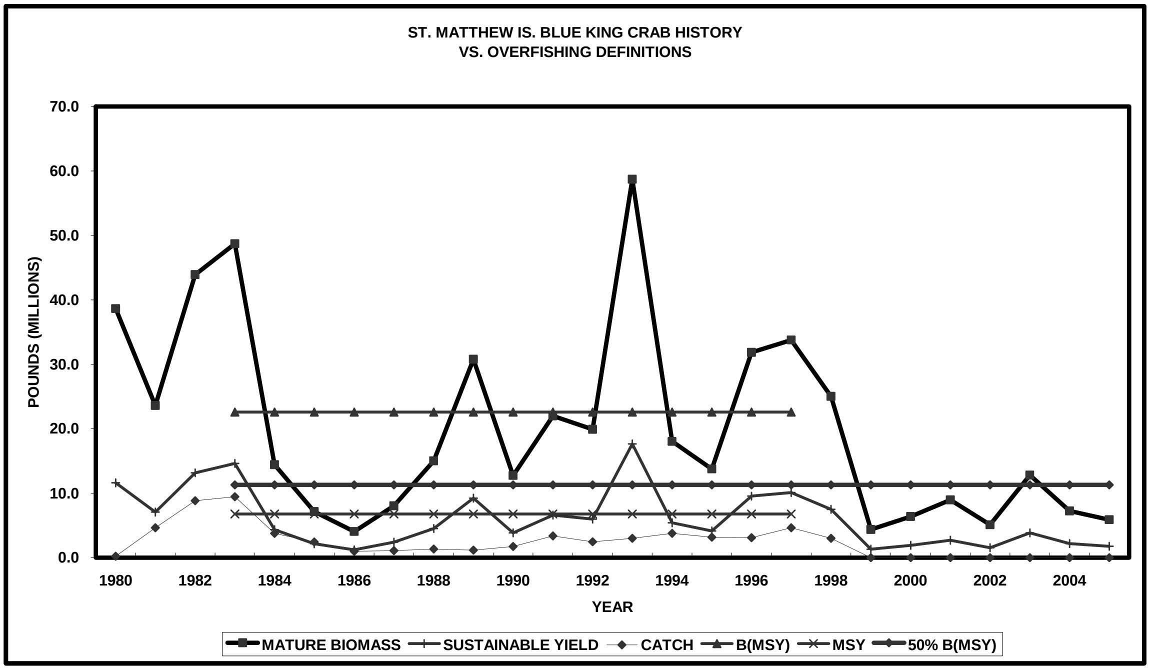

Figure 3.2-8 St Matthew blue king crab mature biomass, catch and biological reference points in relation to overfished status 1980-2005.

Saint Lawrence blue king crab

This stock is not annually surveyed by NMFS. Little is known about stock status of blue king crab in the St. Lawrence Island region. Commercial harvests in the St. Lawrence Section have only been reported for four years. The largest of these four was a harvest of 52,557 pounds (24 t) in 1983. This was caught primarily near the southeast shore of St. Lawrence Island (Kohler and Soong, 2005). The following year regulations were adopted which closed all waters within ten miles of all inhabited islands in the St. Lawrence Section (St. Lawrence Island, Little Diomede and King Island) to commercial crabbing. Since that time the other three harvests on record are 984 pounds (0.4 t) in 1989, 53 pounds (0.02 t) in 1992, and 7,913 pounds (3.6 t) in 1995 (Kohler and Soong, 2005). This stock is not surveyed and while commercial harvest and sale of blue king crab from near shore during winter are permitted under regulations, there are no reports to ADF&G of commercial sales in recent years (Kohler and Soong, 2005). Both red and blue king crab have been a part of the winter diet in the Norton Sound and Bering Strait villages. No recent data on the extent of that usage is available. In 1984, the ADF&G – Division of Subsistence conducted a survey in Gambell. Out of 15 surveyed households, nine houses reported catching approximately 733 crab (Magdanze & Olanna, 1985). Subsistence crabbing in Savoonga and its neighboring villages (Kookoolik and Powwiliak) varies depending on activities associated with whaling and ice conditions. The survey was not continued due to budgetary reasons.

C. opilio crab

Chionoecetes opilio (*C. opilio*) crabs are distributed on the continental shelf of the BS, the Arctic Ocean, and in the western Atlantic Ocean as far south as Maine. In the BS, they are common at depths of no more than 200 m. The eastern BS population within United States waters is managed as a single stock; however, the distribution of the population extends into Russian waters to an unknown degree. EFH Distribution of C. opilio crab is in Figure 3.2-9.

C. opilio crab feed on an extensive variety of benthic organisms including bivalves, brittle stars, crustaceans (including other C. opilio 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 (Turnock and Rugolo, 2005).

C. opilio crab were harvested in the Bering Sea by the Japanese from the 1960s until 1980 due to the limitations on foreign fishing found in the Magnuson Act. Retained catch in the domestic fishery increased in the late 1980's to a high of about 328 million lbs in 1991, declined to 65 million lbs in 1996, increased to 243 million lbs in 1998 then declined to 33.5 million lbs in the 2000 fishery (Table 3.2-2). Due to low abundance and a reduced harvest rate, retained catches remained low and were 32.7 million lbs in the 2002 fishery (36.2 million lbs total catch), 28.3 million lbs of retained catch in 2003 (39 million lbs total catch), and 23.66 million lbs of retained catch in 2004 (27.54 million lbs total catch). Retained catch in the 2005 fishery was 26 million lbs (Turnock and Rugolo, 2005).

Table 3.2-2 Eastern Bering Sea C. opilio crab fishery harvest relative to harvest strategy target and guideline harvest level (GHL), 1994-2005 (from NPFMC 2005)

Fishery Year	Harvest Strategy Target[a]	Actual[b]	Mature Male Biomass[c]	GHL[d]	Harvest[e]
1994	N/A[f]	36.3%	412.3	105.8	149.8
1995	N/A[f]	22.6%	332.9	55.7	75.3
1996	N/A[f]	13.9%	474.0	50.7	65.7
1997	N/A[f]	17.2%	694.4	117.0	119.5
1998	N/A[f]	34.6%	729.7	234.8	252.2
1999	N/A[f]	38.3%	502.6	195.9	192.3
2000	N/A[g]	16.9%	197.1	28.6	33.3
2001	14.7%	13.8%	182.8	27.3	25.3
2002	10.2%	10.6%	308.6	31.0	32.7
2003	11.5%	12.7%	224.9	25.8	28.5
2004	11.4%	13.1%	183.2	20.8	23.9
2005	12.0%	14.1%	176.4	20.9	24.8

[a] Harvest strategy in effect since 2001 targets a percentage of the preseason survey estimate of mature male biomass.
[b] Actual harvest as a percentage of the preseason survey estimate of mature male biomass.
[c] Preseason estimate of mature male biomass provided by NMFS (millions of pounds).
[d] GHL established preseason (millions of pounds).
[e] Actual harvest (millions of pounds).
[f] GHL established as 58% percentage of males >101-mm carapace width.
[g] GHL established as 22% percentage of males >101-mm carapace width.

NMFS EBS trawl survey data are used to compute the estimates of abundance needed to apply the harvest strategy and to determine the TAC. Since 1989, the survey has sampled stations farther north than previous years. Juvenile crabs tend to occupy more inshore northern regions (up to about 63 degrees N) and mature crabs deeper areas to the south of the juveniles (Zheng et al. 2001).

Ovigerous female distribution from the trawl survey (years 1990 to 2005) together with trawl effort and existing closures are shown in Figure 3.2-10. Directed crab fishery catch from 1997-2000 is shown with ovigerous females and nonpelagic trawl effort in Figure 3.2-11. Survey abundance for 2005 are shown in Figure 3.2-12 .

The spatial distribution of C. opilio crab in the 2006 survey was similar to 2005. Female crab > 49 mm occurred in higher concentration in generally three areas, just north of the Pribilof Islands, just south and west of St. Matthew Island Island, and to the north and west of St. Matthew Island. Males > 78 mm were distributed in similar areas to females, except the highest concentrations were between the Pribilof Islands and St. Matthew Island.

This stock in 2006 was estimated at 547.6-million pounds, above the minimum stock size threshold but slightly below the estimate for 2005 (610.7-million pounds). The estimated total mature biomass in 2006 remains below the rebuilt level (it is 59% of the ‘rebuilt’ level of 921.6-million pounds) and maintains the trend of ‘hovering about’ the minimum stock size threshold for the last 8 surveys without any apparent trend towards rebuilding. The abundance estimate for males ≥ 4-inches carapace width in 2006 (143.89-million crabs) is by far the highest value since 1998 and twice the estimate for 2005 (72.1-million crabs). However, this area-swept estimate of abundance of males ≥ 4-inches in 2006 is associated with poor precision (±76.4% of the point estimate) and the doubling of abundance from 2005 is unexpected from the 2005 survey data; the 2006 C. opilio crab model estimate for this value in 2006 is 80.9-million crabs. Despite the increase in estimated abundance of males ≥ 4-inches, the 2006 standard survey area-swept estimates provide no strong evidence that the stock is currently or potentially rebuilding.

The EBS C. opilio crab stock remains under a rebuilding plan, although the 2005 TMB is estimated to be above the MSST. The stock has not rebuilt to its B_{msy} level under the rebuilding plan, however the TMB estimate for 2005 relative to those for 2002-2004 indicated a trend towards rebuilding (NPFMC 2005). Biomass estimates for this stock however have been highly variable over the years.

Some harvest of C. opilio crab occurs annually under the harvest strategy approved in the rebuilding plan. Conservation concerns have been noted (Turnock 2004, Crab Plan Team 2004, Turnock and Rugolo 2005) due to the differential harvest of C. opilio crab north and south of 58.5º by the directed crab fishery. No specific conservation concerns have been noted recently with respect to the trawl bycatch of C. opilio crabs. The groundfish trawl industry bycatch is limited by the BSAI C. Opilio Crab Bycatch Limitation Zone triggered area closure. Additional area closures were considered under the analysis of the rebuilding plan but not brought forward into the alternatives due to a lack of supporting evidence that these areas were candidates for restricting fishing activities at that time. The impact of continued trawl fishery bycatch of C. opilio crab is unknown; however the observer estimates of bycatch by fishery in comparison with population abundance are summarized annually in the Crab SAFE report (e.g.,, NPFMC 2005).

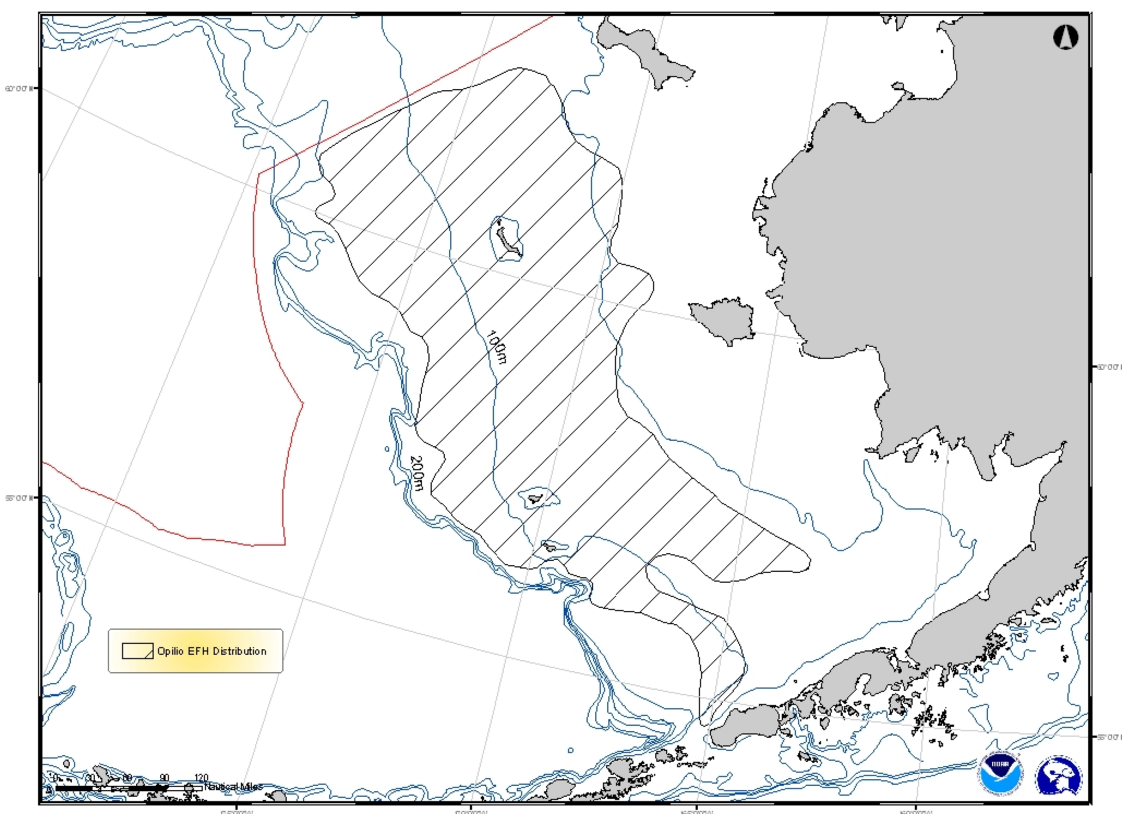

Figure 3.2-9. EFH Distribution of BSAI C. opilio Crab (C. opilio crab)

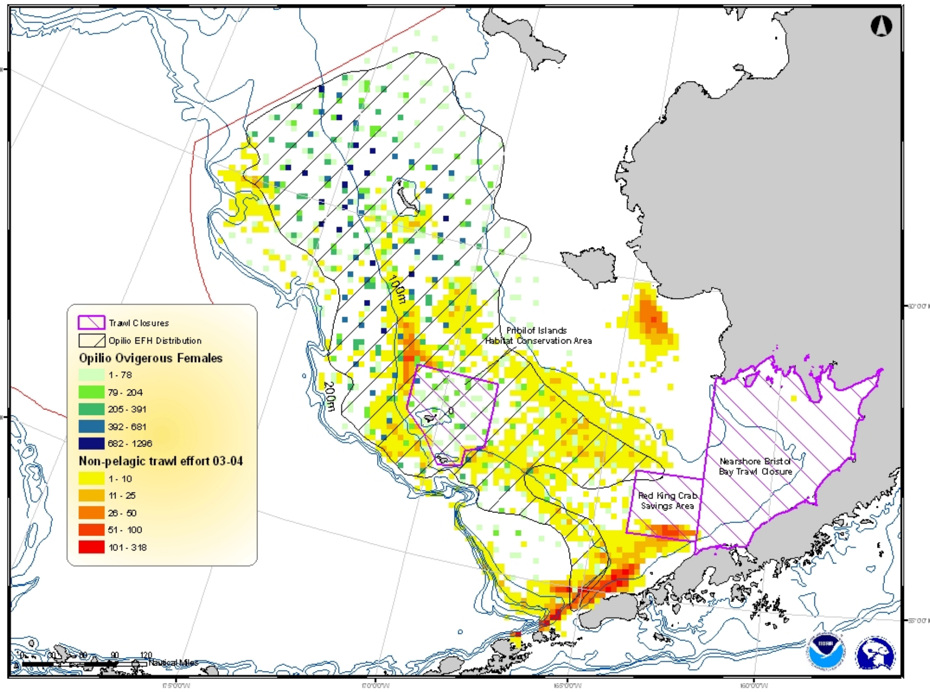

Figure 3.2-10 Map of the Eastern Bering Sea with the current fishery closures, C. opilio EFH, Nonpelagic trawl effort from 2003-4 and locations of C. opilio ovigerous females from the EBS trawl survey 1990-2004.

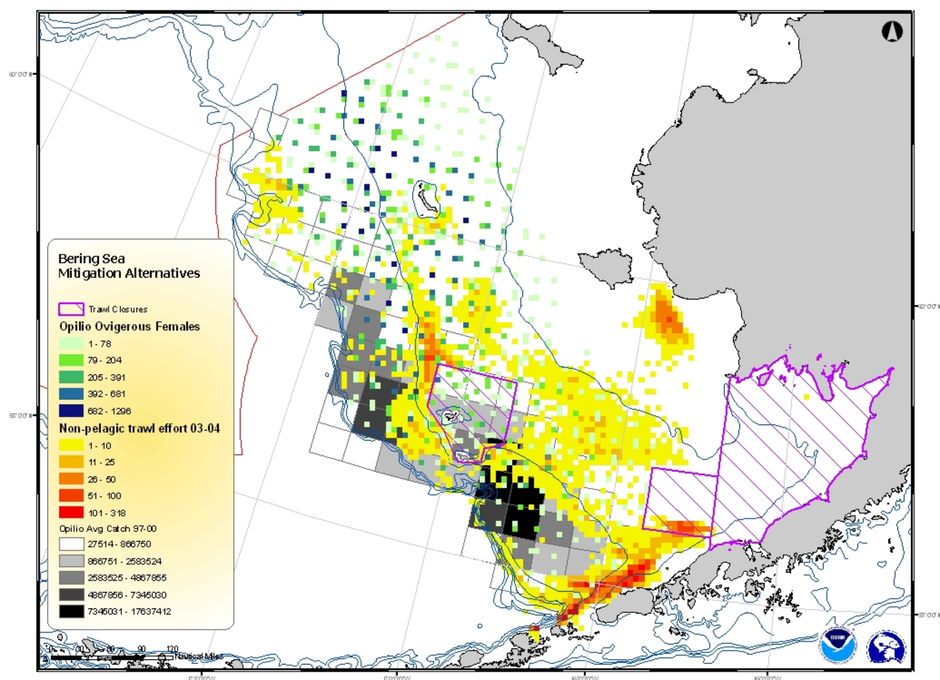

Figure 3.2-11 Map of the Eastern Bering Sea with the current fishery closures, C. opilio EFH, Nonpelagic trawl effort from 2003-4 and locations of C. opilio ovigerous females from the EBS trawl survey 1990-2004, with locations of C. opilio average catch from 1997-2000.

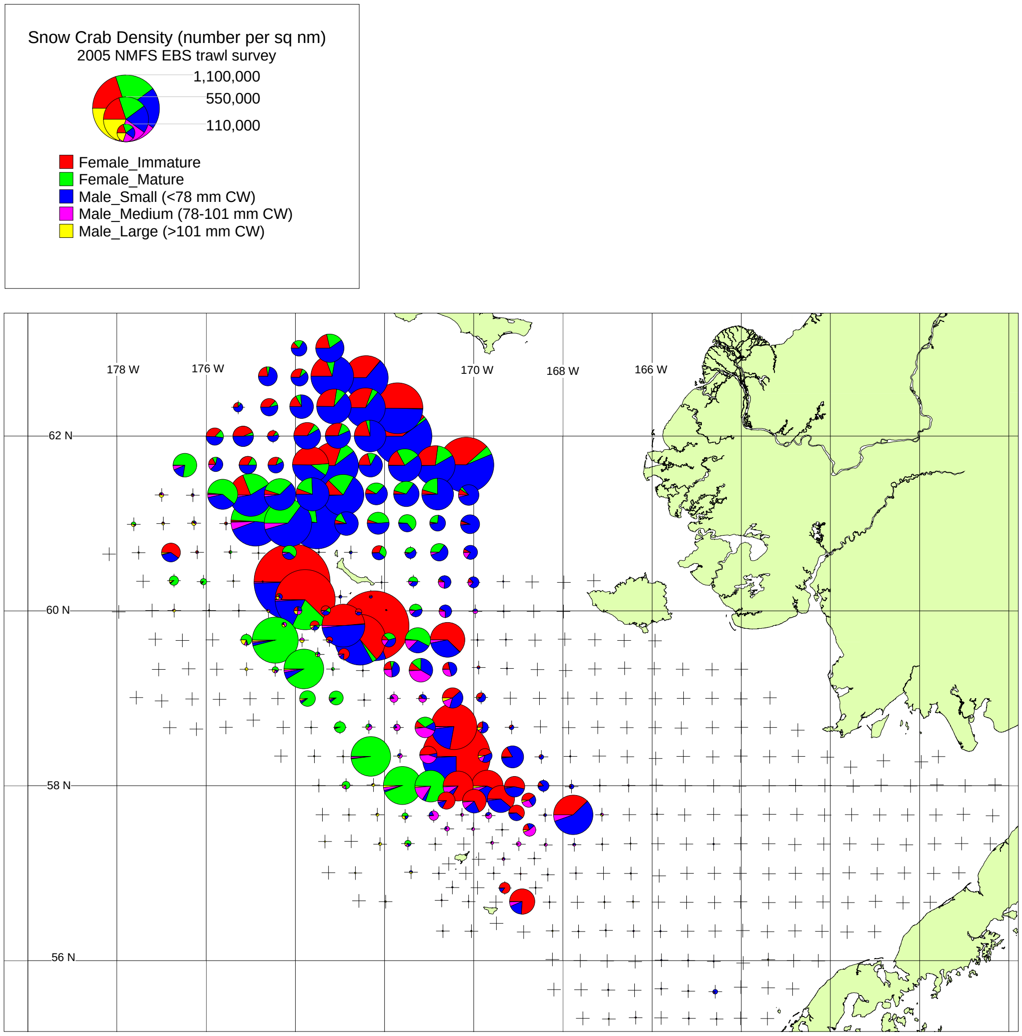

Figure 3.2-12 Density per square nautical mile (number captured per square nautical mile towed) of C. opilio crabs during the 2005 NMFS EBS trawl survey. Immature females are distinguished from mature females as being coded with EggColor = 0, EggCond = 0, and Clutch = 0. Small males are males <78 mm CW. Medium males are males 78-101 mm CW. Large males are males ≥102 mm CW.

3.2.2 Prohibited Species

Prohibited species in the BSAI Groundfish FMP are Pacific halibut, Pacific herring, Pacific salmon and steelhead, king crab, and Tanner crab. These species must be avoided while fishing for groundfish, and must be returned to the sea with a minimum of injury except when their retention is authorized by other applicable law. In order to control the catch of those species in the groundfish fisheries, the Council has instituted prohibited species catch limits for the trawl fisheries for halibut, herring, red king crab, *Chionoecetes bairdi* crab, *C. opilio* crab, and Chinook and other salmon (Witherell and Pautzke, 1997). These PSC limits are applied by target fishery and season.

PSC limits are important in this analysis because the PSC limits constrain the nonpelagic trawl fleets ability to catch the available TAC for Pacific cod and flatfish stocks, in particular. Because any closure area established for nonpelagic trawling would limit where a vessel can fish, that vessel may be unable to fish in locations that have lower PSC bycatch rates. Higher PSC bycatch rates would thus result in lower catches of flatfish overall. Similarly, gear requirements that reduce catch rates disproportionately to PSC bycatch rates would have the same effect.

Pacific Halibut

Pacific halibut fisheries are managed by the International Pacific Halibut Commission (IPHC), under a treaty between the U.S. and Canada. The IPHC management process and stock assessments take into account all fishery removals (bycatch in the Federal and State groundfish fisheries, and catch in the IPHC-regulated commercial, subsistence, and sport fisheries) when determining halibut allocations to the directed fisheries. In recent years, incidental bycatch mortality of halibut has represented about 13 percent of total fishery mortality.

Pacific halibut are considered a single stock from the Pacific west coast to the Bering Sea. During the summer Pacific halibut are found along the northeast continental shelf, and adults make seasonal migrations between summer feeding grounds and deeper spawning grounds. The halibut resource is considered to be healthy, and total catch has been near record levels in recent years.

The BSAI Groundfish FMP employs mechanisms to reduce the incidental catch of halibut in the groundfish fisheries. The total Bering Sea trawl halibut mortality limit is 3,400 mt, of which about 1,665 mt has been allocated to flatfish fisheries, on average. Most of the remaining halibut mortality allowance is allocated to the Pacific cod trawl fishery.

Crab

The interactions of the groundfish fisheries with three types of crab are monitored in the BSAI Groundfish FMP: red king crab, *C. opilio*, and *C. bairdi*. The directed crab fisheries are managed by the State of Alaska, with Federal oversight established in the BSAI King and Tanner Crab FMP.

Red king crab are widely distributed throughout the BSAI, along the shelf up to depths of 250 m. Bairdi Tanner crab are distributed on the continental shelf, and are concentrated around the Pribilof Islands and immediately north of the Alaska Peninsula. C. opilio Tanner crabs are distributed on the continental shelf and are common at depths of no more than 200m.

Numerous trawl closure areas have been implemented in the BSAI Groundfish FMP to mitigate potential concerns about unobserved crab mortality (crab wounded or killed but not captured) and possible habitat degradation due to trawling or dredging. The FMP also establishes PSC limits for these species based on the total abundance of the species. The upper limits are approximately 0.5 percent of total animals for red king crab, 1.2 percent for *C. bairdi*, and 0.1 percent for *C. opilio* (Witherell et al. 2000). Because incidental catch of crab is small, relative to other sources of mortality, time and area closures for trawl gear are thought to be more effective in reducing effects on crab stocks (Witherell and Harrington 1996).

PSC limits apply to crab caught within specified PSC Limitation Zones, and are apportioned by gear, target fishery, and season. The table below demonstrates the PSC limits and bycatch of crab species during the last three years, for the target flatfish fisheries. For the *C. opilio* and *C. bairdi* crab, bycatch levels are far less than the PSC limit, and catch of Tanner crab does not constrain the flatfish fisheries. Attainment of the red king crab PSC limit closed Zone 1 to the yellowfin sole fishery in May of 2002 and 2003, and closed it to the remaining flatfish target fisheries in February of 2002.

Table 3.2-3 Crab PSC Limits for Target Flatfish Fisheries, and Bycatch, in numbers of crab

Year	Zone 1 red king crab PSC limit	Zone 1 red king crab bycatch	*C. opilio* PSC limit	*C. opilio* bycatch	Zone 1 *C. bairdi* PSC limit	Zone 1 *C. bairdi* bycatch	Zone 2 *C. bairdi* PSC limit	Zone 2 *C. bairdi* bycatch
2002	76,446	77,219	3,746,111	787,577	706,164	312,746	2,384,643	528,683
2003	76,446	75,157	3,746,111	556,442	706,164	256,670	2,384,643	498,738
2004	155,256	68,497	3,746,111	1,631,939	706,164	147,166	2,384,643	248,285
2005	197,000	96,830	4,858,992	3,240,405	980,000	235,024	2,970,000	450,804
2006	197,000	75,287	5,761,764	953,898	980,000	210,222	2,970,000	636,429

NOTE: Zone 1 encompasses much of the waters of Bristol Bay west to 165º W. longitude; adjacent to the west, Zone 2 extends northwest and encompasses the Pribilof Islands. The *C. C. opilio* PSC limit applies to crab caught within the *C. C. opilio* Bycatch Limitation Zone, which encompasses the Pribilof Islands and extends northwest.

Salmon

The status description of salmon is in the Alaska Groundfish Harvest Specifications EIS and adopted by reference for this analysis (NMFS 2007a). The majority of salmon taken in the groundfish fisheries is in the pollock fishery. The nonpelagic trawl fishery took only 5 percent of the total salmon bycatch in the 2006 BSAI groundfish fisheries (Mecum 2007). The Lower Columbia River and Upper Willamette River stocks of Pacific salmon are listed under the ESA and occur in the Bering Sea. Very few fish from these stocks likely are taken in the BSAI trawl fisheries and most are probably taken in the pollock trawl fishery due to the large amount of Chinook salmon bycatch in the pollock trawl fishery compared to the nonpelagic trawl fisheries (NMFS 2006e and Mecum 2007). Because the alternative and options are not likely to affect nonpelagic trawl fishing activities in a manner that would change salmon bycatch amounts (no change in basic gear type, broad location, or amount of harvest), it is unlikely this action would have any effect on ESA-listed salmon beyond those effects already considered in previous consultations (NMFS 2007b) nor any effect on salmon bycatch in general for the BSAI groundfish fisheries.

3.2.3 Fish Habitat

The EFH EIS contained the description and location of EFH for all managed fish stocks off Alaska. When overlaid, all areas of habitat are considered essential for some species life stage. In the Bering Sea area, the pelagic waters over the deepwater basin areas are essential for juvenile Pacific salmon. The continental slope area is considered essential fish habitat for Bering Sea rockfish species, Greenland turbot, and sablefish. The shelf area is essential fish habitat for virtually every life stage of nearly all flatfish species, walleye pollock, Pacific cod, red and blue king crabs, Tanner crabs, *C. opilio* crabs, and other managed stocks. More information is available in the EFH EIS, and discussed in more detail relative to the northern open area boundary in Chapter 4. Descriptions of EFH for managed species in the northern Bering Sea area (those most pertinent to the area affected by the action) are attached as Appendix B of this analysis. A thorough literature review of the effects of fishing on fish habitat was contained in the EFH EIS and is incorporated by reference in this analysis.

The EFH EIS evaluated the effects of fishing on habitat by using a quantitative mathematical model developed by the NMFS Alaska Fisheries Science Center (see EFH EIS, Appendix B). The model estimated the proportional reductions in habitat features relative to an unfished state, assuming that fishing will continue at the current intensity and distribution until the alterations to habitat and the recovery of disturbed habitat reach equilibrium. The model provided a tool for bringing together all available information on the effects of fishing on habitat, such as fishing gear types and sizes used in Alaska fisheries, fishing intensity information from observer data, and gear impacts and recovery rates for different habitat types. Due to the uncertainty regarding some input parameters (e.g.,, recovery rates of different habitat types); the results of the model were displayed as point estimates, as well as a range of potential effects. Nevertheless, the model was deemed to provide the best available scientific information for assessing effects of fishing on habitat by NMFS, the Council, and the Council's SSC, and the Council of Independent Experts.

The analysis indicated that fishing, and particularly nonpelagic trawling, has long-term effects on benthic habitat features off Alaska, but these effects were considered to have minimal impacts of fish stock productivity. If the current pattern of fishing intensity and distribution continues into the future, living habitat features that provide managed species with structure for refuge would be reduced by 0 to 11 percent in each habitat area, with the largest reduction occurring on soft substrates of the Aleutian slope area. There would be almost no reduction (0 to 3 percent) in infaunal and epifaunal prey for managed species. Viewed another way, habitat loss due to fishing off Alaska is relatively small overall, with most of the available habitats unaffected by fishing (infaunal prey are 97 to 100 percent unaffected, epifaunal prey are 97 to 100 percent unaffected, living structure is 89 to 100 percent unaffected, and hard corals are 84 to 98 percent unaffected). The model's long term effect indices (LEI) values for the Bering Sea habitat features are shown in Table 3.2-4. The relative contribution of the different Bering Sea target fisheries to these LEI values are shown in Table 3.2-5.

Table 3.2-4 Long-term effect indices (LEI in % reduction) for fishing effects on benthic habitat features of the Bering Sea (from EFH EIS Table B.2-9).

Habitat Features	Sand	Sand/mud	Mud	Slope
Infauna prey	0	2	0	3
Epifauna prey	0	2	0	3
Living structure	4	11	0	11
Non-living structure	0	1	0	4

Table 3.2-5 Long-term effect indices (LEI in % reduction) for nonpelagic trawl gear fishing effects on soft substrate biostructure of the Bering Sea by fishery (from EFH EIS Table B.2-9).

Fishery	Sand/mud	Slope
Yellowfin sole bottom trawl	2.9%	0.2%
Flathead sole/flatfish bottom trawl	1.8%	1.6%
Rock sole bottom trawl	0.9%	0.2%
Pollock bottom trawl	0.4%	0.6%
Pacific cod bottom trawl	0.2%	0.4%
Sablefish/turbot bottom trawl	0.1%	0.7%
Rockfish bottom trawl	0.0%	0.0%
TOTAL	**6.3%**	**3.7%**

Potential effects of fishing activities on sessile invertebrates have been of particular concern, as they account for the higher LEI values in the sand/mud habitat of the Bering Sea. There are a number of benthic invertebrate species in the Bering Sea that as a group are considered emergent epifauna available for potential use as fish habitat, including sponges, bryozoans, sea raspberries, sea whips and sea pens, anemones, and ascidians. Sea whips and sea pens (Pennatulacea) are distributed along the slope area. Sponges (Porifera) are found on the continental shelf, particularly in outer Bristol Bay. Anemones (Actiniaria), ascidians (Ascidiacea), and bryozoans (Ectoprocta) are found at mid-depths of the shelf, particularly in the vicinity of the Pribilof Islands and in Bristol Bay. Information on the effects of trawl fisheries on these invertebrate species is provided in Appendix B of the EFH EIS. A comprehensive review of the distribution of these invertebrates can be found in the EFH EIS and in Malecha et al. (2005).

A review of habitat conservation measures implemented for Alaska fisheries prior to implementation of recent EFH mitigation measures is provided in the EFH EIS (NMFS 2005). Measures included fishing equipment restrictions, marine protected areas, harvest limits, and effort controls. These measures were further augmented by the EFH mitigation measures and HAPC protection measures implemented in August 2006. These measures established new and expansive marine protected areas (Witherell and Woodby 2005). To date, over 388,000 nm^2 of the EEZ have been closed to bottom trawling. In addition, over 5,400 nm^2 of habitat have been protected from commercial bottom contact gear. These areas include coral gardens, Primnoa coral thickets, and all seamounts off Alaska. Figure 2.2-1 includes the year-round bottom trawl closure areas to protect fish habitat off Alaska.

3.2.4 Marine Mammals and Seabird Status

A number of concerns may be related to marine mammals and seabirds and potential impacts of fishing. For individual species, these concerns include:

- listing as endangered or threatened under the ESA,
- protection under the Marine Mammal Protection Act (MMPA),
- announcement as candidate or being considered as candidates for ESA listings,
- declining populations in a manner of concern to State or federal agencies,

- experiencing large bycatch or other mortality related to fishing activities, or
- being vulnerable to direct or indirect adverse effects from some fishing activities.

Marine mammals and seabirds have been given various levels of protection under the current FMPs of the Council, and are the subjects of continuing research and monitoring to further define the nature and extent of fishery impacts on these species. A current description of status and ESA consultations for each listed species is contained in section 3.4 of the harvest specifications EIS (NMFS 2007a). The Alaska Groundfish Harvest Specifications EIS (NMFS 2007a) provides the most recent status information on marine mammals and seabirds that may be impacted by the action. The status description in that EIS is incorporated here by reference.

Marine mammals and seabirds, including those currently listed as endangered or threatened under the ESA, that may be present in the BSAI are listed in Table 3.2-6. The group includes great whales, pinnipeds, and seabirds. NMFS is the expert agency for ESA-listed Pacific salmon and marine mammals, except sea otters and polar bears. The U.S. Fish and Wildlife Service (USFWS) is the expert agency for ESA-listed seabirds, sea otters and polar bears. Of the species listed under the ESA and present in the action area, several species may be adversely affected by groundfish commercial fishing. These include Steller sea lions, humpback whales, sperm whales, and short tailed albatross (NMFS 2006d, USFWS 2003a and 2003b). Both USFWS BiOps concluded that the groundfish fisheries and the annual setting of harvest specifications were unlikely to cause the jeopardy of extinction, or the adverse modification or destruction of critical habitat for ESA-listed seabirds. Pacific salmon is discussed in section 3.2.2. All BSAI and GOA fisheries must be in compliance with the ESA.

Section 7 consultations with respect to the actions of the Federal groundfish fisheries have been completed for all the ESA-listed species, either individually or in groups. On November 30, 2000, an FMP-level biological opinion was issued pursuant to Section 7 of the ESA on all NMFS managed ESA-listed species present in the fishery management areas for all groundfish fisheries. That FMP-level biological opinion concluded that the FMPs are likely to jeopardize the continued existence and adversely modify designated critical habitat of the Steller sea lion. On October 19, 2001, NMFS released a biological opinion for the Steller sea lion protection measures that concluded that the fisheries conducted according to the protection measures are not likely to jeopardize the Steller sea lion or adversely modify or destroy its designated critical habitat. For additional information, see the Steller sea lion EIS (NMFS 2001). Additional information on all endangered or threatened species in the BSAI can be found in the PSEIS (NMFS 2004) and in sections 3.4 and 8.2 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a). Because of new information and the passage of time since the last FMP-level consultation, NMFS has reinitiated FMP level section 7 consultations on the effect of the groundfish fisheries on Steller sea lions, humpback whales and sperm whales. The consultation is scheduled for completion in 2008, after completion of the Steller sea lion recovery plan.

Table 3.2-6 Marine Mammals and ESA-listed Seabirds in the BSAI

Common Name	Scientific Name	ESA Status
Northern Right Whale[3]	*Balaena glacialis*	Endangered
Bowhead Whale [1]	*Balaena mysticetus*	Endangered
Sei Whale	*Balaenoptera borealis*	Endangered
Blue Whale	*Balaenoptera musculus*	Endangered
Fin Whale	*Balaenoptera physalus*	Endangered
Humpback Whale	*Megaptera novaeangliae*	Endangered
Sperm Whale	*Physeter macrocephalus*	Endangered
Short-tailed Albatross[4]	*Phoebaotria albatrus*	Endangered
Steller Sea Lion	*Eumetopias jubatus*	Endangered [2]
Spectacled Eider[4]	*Somateria fishcheri*	Threatened
Steller's Eider[4]	*Polysticta stelleri*	Threatened
Kittlitz's Murrelet[4]	*Brachyramphus brevirostris*	Candidate
Beluga Whale	*Delphinapterus leucas*	None
Minke Whale	*Balaenoptera acutorostrata*	None
Killer Whale	*Orcinus orca*	None
Dall's Porpoise	*Phocoenoides dalli*	None
Harbor Porpoise	*Phocoena phocoena*	None
Pacific White-sided Dolphin	*Lagenorhynchus obliquidens*	None
Beaked Whales	*Berardius bairdii* and *Mesoplodon* spp.	None
Northern Fur Seal	*Callorhinus ursinus*	None
Pacific Harbor Seal	*Phoca vitulina*	None
Pacific Walrus	*Odobenus rosmarus divergens*	None
Northern Elephant Seal	*Mirounga angustirostris*	None
Bearded Seal	*Erignathus barbatus*	None
Spotted Seal	*Phoca largha*	None
Ringed Seal	*Phoca hispida*	None
Ribbon Seal	*Phoca fasciata*	None
Northern Sea Otter[4]	*Enhydra lutris*	Threatened
Polar Bear[5]	*Ursus maritimus*	Proposed threatened

[1] The bowhead whale is present in the Bering Sea area only.
[2] Steller sea lion are listed as endangered west of Cape Suckling.
[3]NMFS designated critical habitat for the northern right whale on July 6, 2006 (71 FR 38277).
[4] The Steller's eider, short-tailed albatross, spectacled eider, Kittlitz's murrelet, polar bear, and Northern sea otter are species under the jurisdiction of the USFWS. For the bird species, critical habitat has been established for the Steller's eider (66 FR 8850, February 2, 2001) and for the spectacled eider (66 FR 9146, February 6, 2001). The Kittlitz's murrelet has been proposed as a candidate species by the USFWS (69 FR 24875, May 4, 2004).
[5]Proposed to be listed as threatened, January 9, 2007 by USFWS, (72 FR 1064)

3.2.4.1 Marine Mammals

Some marine mammal species are resident throughout the year, while others migrate into or out of Alaska fisheries management areas. The BSAI supports one of the richest assemblages of marine mammals in the world. Twenty-five species are present from the orders Pinnipedia (seals, sea lion, and walrus), Carnivora (sea otter and polar bear), and Cetacea (whales, dolphins, and porpoises). Marine mammals occur in diverse habitats, including deep oceanic waters, the continental slope, and the continental shelf (Lowry et al. 1982).

The PSEIS (NMFS 2004) provides descriptions of the range, habitat, diet, abundance, and population status for marine mammals. The most recent marine mammal stock assessment reports (SARs) for nearly all marine mammals occurring in the BSAI were completed in 2005 based on 2002 though 2004 data (Angliss and Outlaw 2007). Northern elephant seals, and marine mammals under USFWS jurisdiction, were assessed in 2002 (Angliss and Outlaw 2005). This information is incorporated by reference.

Direct and indirect interactions between marine mammals and groundfish harvest occur due to overlap in the size and species of groundfish harvested in the fisheries that are also important marine mammal prey and due to temporal and spatial overlap in marine mammal foraging and commercial fishing activities.

The Steller sea lion inhabits many of the shoreline areas of the BSAI, using these habitats as seasonal rookeries and year-round haulouts. The Steller sea lion has been listed as threatened under the ESA since 1990. In 1997 the population was split into two stocks or distinct population segments (DPS) based on genetic and demographic dissimilarities, the western and eastern stocks. Because of a pattern of continued decline in the western DPS, it was listed as endangered on May 5, 1997 (62 FR 30772), while the eastern DPS remained under threatened status. The western DPS inhabits an area of Alaska approximately from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters.

Throughout the 1990s, particularly after critical habitat was designated, various closures of areas around rookeries and haulouts and some offshore foraging areas affected commercial harvest of pollock, Pacific cod, and Atka mackerel, important components of the western DPS of Steller sea lion diet. In 2001, a biological opinion was released that provided protection measures that would not jeopardize the continued existence of the Steller sea lion nor adversely modify its critical habitat; that opinion was supplemented in 2003, and after court challenge, these protection measures remain in effect today (NMFS 2001, Appendix A). A detailed analysis of the effects of these protection measures is provided in the *Steller Sea Lion Protection Measures Supplemental EIS* (NMFS 2001).

The Bering Sea subarea has several closures in place for Steller sea lions including no transit zones, rookeries, haulouts, and the Steller Sea Lion Conservation Area. Pacific cod and Atka mackerel are important prey species for Steller sea lions (NMFS 2001). The proposed action would not change the Atka mackerel, Pacific cod, pollock, and groundfish closures associated with the five Steller sea lion sites located at Sea lion Rock, Bogoslof I./Fire I., Adugak I., and Walrus I. The harvest of Pacific cod in the Bering Sea subarea is temporally dispersed (§ 679.20). The harvest of Atka mackerel and Pacific cod is spatially dispersed through area closures (§ 679.22). These harvest restrictions on the Atka mackerel, pollock, and Pacific cod fisheries decrease the likelihood of disturbance, incidental take, and competition for prey to ensure the groundfish fisheries do not jeopardize the continued existence or adversely modify the designated critical habitat of Steller sea lions (NMFS 2000 and NMFS 2001).

Several species of whales use the Bering Sea as summer feeding grounds and then return to seasonal wintering and calving areas further south. The endangered North Pacific right whale is perhaps of most concern given its very small known population size. This whale moves through the Aleutian Island region annually to occupy feeding habitat in the EBS; it is very rare, and only up to 25 individuals have been seen annually in recent surveys. The latest confirmed sighting was reported by scientists on the NOAA research vessel Miller Freeman off Kodiak Island during Chiniak Gully pollock research in August 2006 (Tom Pearson, personal communication, September 6, 2006). Critical habitat for the North Pacific right whale is designated in the Bering Sea east of the Pribilof Islands (Figure 4.1-5). This designation was finalized July 6, 2006 (71 FR 38277). The area was designated based on the presence of foraging right whales and their zooplankton prey species in concentrations necessary for foraging.

NMFS also proposed listing the North Pacific right whale as a separate species from the Atlantic right whale (71 FR 77694, December 27, 2006). Designation of a species is a trigger for reinitiation of formal consultation under the ESA regulations (50 CFR 402.16). Consultation on the new species listing will be reinitiated once the species designation is finalized. NMFS has determined through informal consultation that the Alaska groundfish fisheries are not likely to adversely affect North Pacific right whales or their designated critical habitat (NMFS 2006d). Northern right whales are rarely seen in Alaskan waters. Because the action is limited to the nonpelagic trawl fisheries which does not affect the pelagic zooplankton that is important right whale prey, right whale occurrence is very rare, and fishing activities where right whales may occur is not likely to change, this action is not likely to have any impacts on North Pacific right whales or their designated critical habitat.

Northern fur seals forage in the pelagic area of the Bering Sea and reproduce on the Pribilof and Bogoslof Islands. On June 17, 1988, NMFS declared northern fur seal stock of the Pribilof Islands, Alaska (St. Paul and St. George Islands), to be depleted under the MMPA. The Pribilof Islands population was designated depleted because it declined to less than 50 percent of levels observed in the late 1950s, and no compelling evidence suggested that carrying capacity has changed substantially since the late 1950s (NMFS 2006f). Recent pup counts show a continuing decline in the number of pups surviving in the Pribilofs Islands. NMFS researchers found an approximately nine percent decrease in the number of pups born between 2004 and 2006. The pup estimate decreased most sharply on Saint Paul Island. Saint George Island showed a small increase over 2004, though it still registered a decrease of three percent from the 2002 estimate. (Available from http://www.fakr.noaa.gov/newsreleases/2007/fursealpups 020207.htm). The diet of fur seals in the Bering Sea does not indicate that there would be any competition between the nonpelagic trawl fisheries and fur seals. Fur seals eat primarily pollock and squid in the Bering Sea, and no evidence of flatfish prey exists from Bering Sea diet studies (NMFS 2006f). A draft conservation plan has been developed for northern fur seals and is available at http://www.fakr.noaa.gov/protectedresources/seals/fur/cplan/draft0506.pdf. Even though prey availability does not appear to be an issue for this action, fur seals are incidentally taken by the flatfish trawl fishery and may experience disturbance and entanglement in marine debris (NMFS 2007a).

An informal consultation with the USFWS on the effects of the groundfish fisheries on the southwest Alaska DPS of northern sea otters was completed in 2006 (Mecum 2006). The southwest Alaska DPS of northern sea otter is listed as threatened under the ESA (70 FR 46365, August 9, 2005). Overall, this DPS has declined by more than half since the 1980s and by 90 percent in some locations. The USFWS is developing a recovery plan for the southwest Alaska DPS of northern sea otters under the ESA. On December 19, 2006, the Center for Biological Diversity (CBD) sued the USFWS for violation of Section 4 of the ESA for failure to designate critical habitat for the southwest Alaska DPS of northern sea otters. The CBD and the USFWS settled the lawsuit in April 9, 2007, and agreed that the USFWS will study whether critical habitat can be designated. By November 30, 2008, the USFWS must publish a *Federal Register* notice designating critical habitat or explaining why critical habitat cannot be designated. If critical habitat is proposed to be designated, the final designation must by published by October 1, 2009. In 2006 and 2007, the sea otter recovery team is developing a recovery plan including identifying the areas and features needed for critical habitat for northern sea otters.

The informal consultation concluded that the groundfish fisheries were not likely to adversely affect northern sea otters (Mecum 2006). The USFWS has determined that, based on available data, sea otter abundance is not likely to be significantly affected by commercial fishery interaction at present (Angliss and Outlaw 2007), and commercial fishing is not likely a factor in the population decline (70 FR 46365, August 9, 2005). Northern sea otters are not likely to interact with groundfish fisheries in the EEZ off Alaska because the areas of fishing and the types of prey preferred by otters do not overlap with the groundfish fisheries. Otters feed primarily in the rocky near shore areas on invertebrates, while groundfish fisheries are conducted further offshore on groundfish species (Funk 2003). Otters may also feed on clams in Federal waters in the soft sediment substrate of Bristol Bay and Kodiak areas (70 FR 46365, August 9, 2005). Portions of the EEZ used by sea otters in Bristol Bay are closed to trawling (50 CFR 679.22(a)(9)). This trawl closure reduces potential interaction between trawl vessels and sea otters and ensures the clam habitat used by sea otters is not disturbed. NMFS observer's monitored incidental take in the 1990–2000 groundfish trawl, longline, and pot fisheries. No mortality or serious injuries to sea otters were observed in the EEZ. One sea otter mortality in the trawl fishery of the BSAI was reported in 1997, but no other sea otter mortality in the groundfish fisheries in the EEZ off Alaska has been reported (Funk 2003). Because this action is limited to the nonpelagic trawl fisheries and would make no changes to the fisheries that may impact sea otters, this action is not likely to affect northern sea otters in any manner not already considered under previous ESA consultations.

Polar bears are primarily located in the Chukchi and Beaufort Sea regions using pack ice year round and may spend short times on shore. The bears may extend their range to the southern most proximity of the ice into the Bering Sea in the winter (72 FR 1064, January 9, 2007). Historical information indicated that they may have ranged as far south as St. Matthew Island and the Pribilof Islands, but they have not occurred in these areas for decades, potentially due to hunting and changes in sea ice (B. Cummings, Center for Biological Diversity, pers. comm. February 6, 2006, and 72 FR 1064, January 9, 2007)). There is no evidence of interactions between polar bear and groundfish fisheries, and groundfish fisheries are not listed as a potential threat to polar bears (72 FR 1064, January 9, 2007). Very few of the polar bear prey species are taken incidentally in the groundfish fisheries (Table 4.1-3); and therefore, fisheries are unlikely to result in reducing the availability of prey. The proposed action would likely have no effects on polar bears.

Management of the Pacific walrus is under the jurisdiction of the USFWS. They occur in the shelf waters of the Bering and Chukchi Sea and some attempts at population estimates range from 200,000 to 246,000 animals (USFWS 2002). No reliable population estimates or trends are available. In April 2006, the Federal and state agencies conducted satellite tagging and aerial surveys of walrus in the Bering Sea to develop an abundance estimate (http://alaska.usgs.gov/science/biology/walrus/2006_tagging.html). The shallow productive waters of the Northern Aleutian Basin (NAB) support some of the largest concentrations of Pacific walruses in the world. Large breeding aggregations form in late winter in the broken pack ice of northern Bristol Bay. Females and dependent young migrate out of the region in spring, following the retreating pack-ice to summer feeding areas in the Chukchi Sea. Thousands of primarily adult male walruses remain in the Bristol Bay region through the ice free season, foraging on rich beds of benthic invertebrates and resting at isolated coastal haulout sites. The most heavily used coastal haulouts in Bristol Bay are located at Round Island (Walrus Islands State Game Sanctuary), Cape Peirce and Cape Newenham (Togiak National Wildlife Refuge), and Cape Seniavin on the Alaska Peninsula. Less consistently used haulout sites are found at Cape Constantine, Amak Island, Big Twin Island, Crooked Island, High Island and Hagemister Island. Walruses have also occasionally been observed at isolated beaches near Port Moller, Port Heiden, and Egegik Bay. Foraging patterns and locations are poorly understood. The number of walruses attending coastal haulout sites in northern Bristol Bay (Round Island, Cape Peirce and Cape Newenham) has declined in recent years, while the number of animals using haulouts along the Alaska Peninsula (principally at Cape Seniavin) has increased.

3.2.4.2 Seabirds

The seabird resource includes the seabird populations that nest within, or that migrate into and spend time within, the action area. Birds included in the seabird resource are listed inTable 3.2-7.[1]

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[1] This list is based on the list of seabirds in the PSEIS (NMFS 2004, pp. 3.7-18 to 3.7-87), with the addition of the common and king eiders.

Table 3.2-7. Seabird species occurring in Alaska waters

Albatrosses • Black-footed • Short-tailed • Laysan	Gulls • Glaucous-winged • Glaucous • Herring • Mew • Bonaparte's • Sabine	Murres • Common • Thick-billed
Northern fulmar	Jaegers • Long-tailed • Parasitic • Pomarine	Guillemots • Black • Pigeon
Shearwaters • Short-tailed • Sooty	Eiders • Common • King • Spectacled • Steller's	Murrelets • Marbled • Kittlitz's • Ancient
Storm petrels • Leach's • Fork-tailed	Kittiwakes • Black-legged • Red-legged	Auklets • Cassin's • Parakeet • Least • Whiskered • Crested
Cormorants • Pelagic • Red-faced • Double-crested	Terns • Arctic • Aleutian	Puffins • Rhinoceros • Horned • Tufted

Seabirds spend the majority of their life at sea rather than on land. The group includes albatrosses, shearwaters, petrels (*Procellariiformes*), cormorants (*Pelecaniformes*), and two families of *Charadriiformes*, gulls (*Laridae*), and auks (*Alcidae*), such as puffins, murres, auklets, and murrelets. Several species of sea ducks (*Merganini*) also spend much of their lives in marine waters. Other bird groups contain pelagic members, such as swimming shorebirds (*Phalaropodidae*), but they seldom interact with groundfish fisheries, and therefore will not be further discussed.

Thirty-eight species of seabirds breed in Alaska. More than 1,600 colonies have been documented, ranging in size from a few pairs to 3.5 million birds. The USFWS is the lead federal agency for managing and conserving seabirds and is responsible for monitoring the distribution and abundance of populations. Breeding populations are estimated to contain 36 million individual birds in the Bering Sea; total population size (including subadults and nonbreeders) is estimated to be approximately 30 percent higher. Five additional species that occur in Alaskan waters during the summer months contribute another 30 million birds.

The PSEIS (NMFS 2004) provides descriptions of the range, habitat, diet, abundance, and population status for these seabirds. Additional details on specific species population trends, breeding status, and diet are available from Dragoo, Bryd, and Irons (2006).

<u>Species nesting in Alaska</u>

- Tubenoses: Northern fulmar, Fork-tailed storm-petrel, Leach's stormpetrel
- Kittiwakes and terns: Black-legged kittiwake, Red-legged kittiwake, Arctic tern, Aleutian tern
- Pelicans and cormorants: Double-crested cormorant, Brandt's cormorant, Pelagic cormorant, Red-faced cormorant
- Jaegers and gulls: Pomarine jaeger, Parasitic jaeger, long-tailed jaeger, Bonaparte's gull, Mew gull, Herring gull, Glaucous-winged gull, Glaucous gull, Sabine's gull
- Auks: Common murre, Thick-billed murre, Black guillemot, Pigeon guillemot, Marbled murrelet, Kittlitz's murrelet, Ancient murrelet, Cassin's auklet, Parakeet auklet, Least auklet, Wiskered auklet, Crested auklet, Rhinoceros auklet, Tufted puffin, Horned puffin

Seabirds that visit Alaskan waters when they are not breeding

- Tubenoses: Short-tailed albatross, Black-footed albatross, Laysan albatross, Sooty shearwaters, Short-tailed shearwater
- Gulls: Ross's gull, Ivory gull

Conservation concerns over black-footed albatross have risen in recent years. Melvin et al. note that the World Conservation Union changed the conservation status of the black-footed albatross from vulnerable to endangered in 2003 (Melvin, et al. 2006, p. 4). In September 2004, the USFWS received a petition to list the black-footed albatross as threatened or endangered under the ESA. The petition is under review at this time (S. Fitzgerald, pers. comm., 2006; Melvin et al. 2006).

Spectacled eiders (*Somateria fischeri*) 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 open leads in the pack ice in the central Bering Sea between Saint Lawrence and St. Matthew Island Islands (USFWS 2006). 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 40 m to 70 m in the wintering area. Because nearly all individuals of this species may spend each winter occupying an area of ocean less than 50 km (31 mi) in diameter, they may be particularly vulnerable to chance events during this time (USFWS 2003a). Critical habitat has been designated for the spectacled eider in their wintering area between St. Lawrence and St. Matthew Islands (Figure 4.1-7). The most important feature of the critical habitat is the density of benthic fauna available to foraging eiders (Greg Balogh, USFWS pers. comm. February 22, 2007). A 2001 survey of prey eaten by spectacled eiders in this winter habitat showed almost exclusive use of *Nuculana radiata* clams, a dominant species (Lovvorn, et. al, 2003). They will eat other bivalve species and may eat other benthic prey, such as polychaetes and amphipods, depending on abundance (Lovvorn, University of Wyoming, pers. comm. February 22, 2007).

The numbers of spectacled eiders breeding on the Yukon-Kuskokwim Delta dropped by about 94 percent from about 48,000 pairs in the 1970s to less than 5,000 by 1992 (Ely et al. 1994, Stehn et al. 1993). Surveys suggest the Yukon-Kuskokwim Delta population now stands at about 8,000 birds and has stabilized or increased slightly from 1992–1999 (Bowman et al. 1999). Surveys on the North Slope of Alaska suggest a fairly stable trend from 1993–1999 (Larned et al. 1999). Nothing is known about spectacled eider population trends in Russia due to the lack of systematic surveys.

Recent information provided by the USFWS indicates that short-tailed albatross may gather in large numbers in a portion of the Bering Sea near the Donut Hole (Figure 3.2-13) in the fall. On September 24, 2004, Mr. Jason Everett on the vessel Blue Gadus photographed a flock of 150-330 short-tailed albatross at 60º 5'N latitude, 178º 39 minutes W longitude, above Pervenets Canyon. This aggregation is unusual behavior for short-tailed albatross which are generally solitary or in small groups in the open ocean (Greg Balogh, USFWS, per. comm., February 2007). The USFWS maintains an opportunistic sighting data set comprised of voluntary reports submitted primarily by fishermen and fishery observers. This data set contained other notable September concentrations of short-tailed albatross in the Pervenets canyon area, as well as on the waters of Zhemchug Canyon. Preliminary information suggests that Short-tailed albatross may congregate in the waters of Pervenets and Zhemchug canyons each fall.

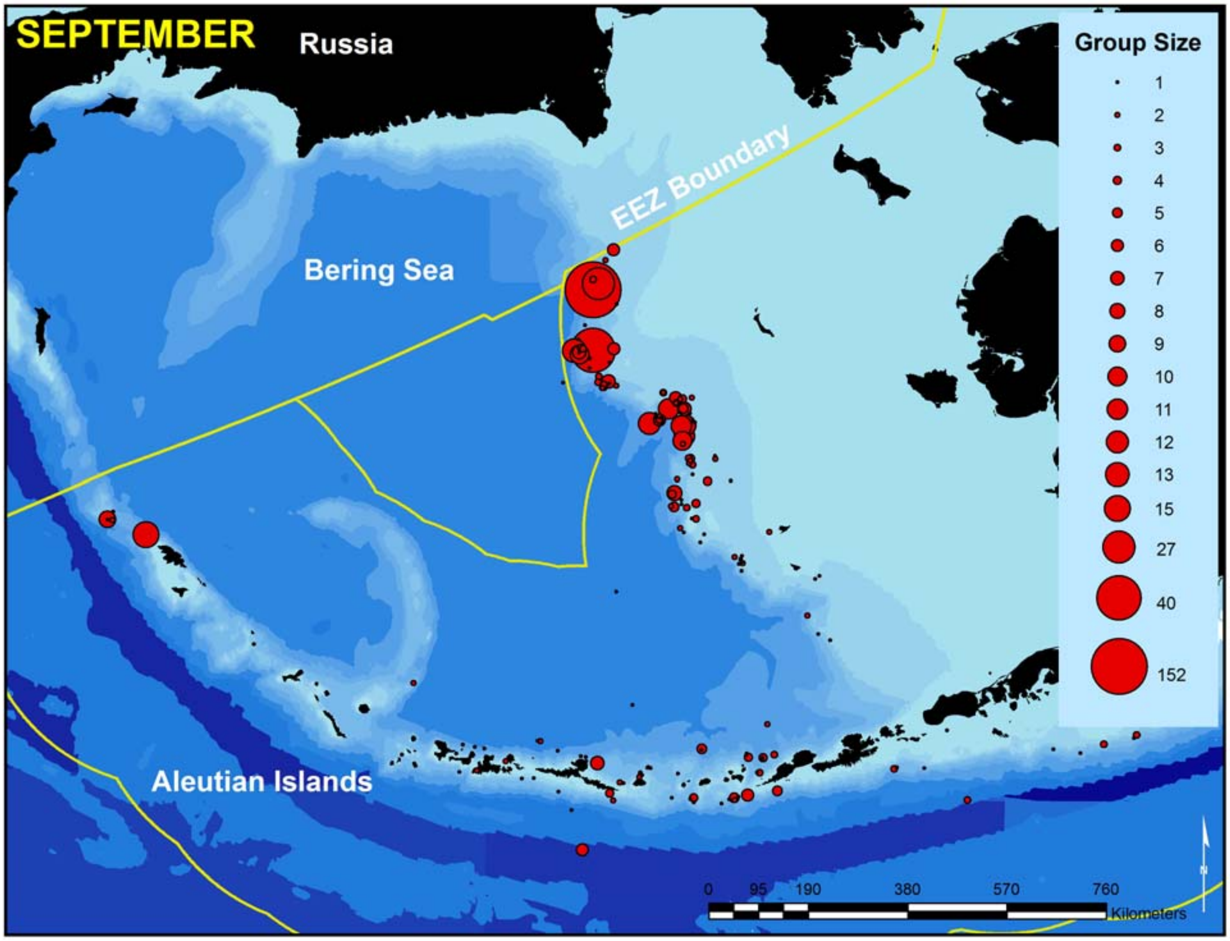


Figure 3.2-13 Location of short-tailed albatross sightings during September. (Source: Greg Balogh, USFWS presentation to the Council in April 2007)

3.3 Socioeconomic Environment

During public testimony before the AP, the issue was raised of the potential for gear conflict between Head and Gut trawl catcher processor vessels operating in proposed (and currently) open trawl areas near some small western Alaska communities and small fishing vessels, especially halibut vessels, from those communities. A further concern about conflicts between subsistence use areas and an open area approach was brought forward by residents of the Nunivak Island/Etolin Strait/Kuskokwim Bay and St. Lawrence Island areas.

The alternatives considered in this analysis would affect the prosecution of fisheries using nonpelagic trawl gear. Nonpelagic trawl gear is used in the Bering Sea to catch various flatfish species, Pacific cod, and rockfish. The standard rigging is approximately the same for all of the nonpelagic trawl target fisheries on the continental shelf, so a description of the yellowfin sole trawl fisheries is provided here as an example. Other flatfish target fisheries using nonpelagic trawl gear include rock sole, flathead sole and ‘other’ flatfish.

For reasons related to their proximity to various alternative open and closed areas detailed in the analysis of alternatives discussion, this issue focuses on the western Alaska communities of Kipnuk, Chefornak, and Platinum. In addition, information on the nearby communities of Mekoryuk, Savoonga, Gambell, Goodnews Bay, Kwigillingok, Umkumuite, Nightmute, and Tununak is provided. All of these communities are predominantly and traditionally Yup’ik Eskimo communities. A more thorough description of the communities is in section 5.6.5.5. These communities, and other native communities inland, use the nearshore marine resources of the Bering Sea to support subsistence activities (Pers. comm., AVCP representative, April 2007). Harvests of fish, invertebrates, seabirds, and marine mammals may occur. The Eskimo Walrus Commission has notified the Council and NMFS regarding their concerns over the potential effects of nonpelagic trawling on walrus habitat and other habitat that may be needed for cultural, natural, and subsistence use of animals dependent directly or indirectly on bottom habitat (Brower 2007). The Alaska Department of Fish and Game website contains numerous technical papers on specific subsistence resources, which are available at http://www.subsistence.adfg.state.ak.us/geninfo/publctns/techpap.cfm. No summary documents appear to be available with recent information on the various types of subsistence activities that may occur in the near shore areas of the Bering Sea.

The Cenaliulriit is a collection of Bering Sea coastal villages and tribes which comprise a coastal resource service area. Their website contains a series of subsistence activity maps that provide details of locations where subsistence activities occur, based on the type of resource harvested (http://www.cenaliulriit.org/Cenaliulriit%20Files/Subsistence%20Maps.htm). See Appendix D of this EA/RIR/IRFA for maps. Waterfowl harvests occur primarily in the very nearshore areas and inland areas. Clam, shellfish, and herring egg harvest may occur further out from shore, into Etolin Strait but still primarily within the nearshore areas. Fishing and marine mammal harvests extend throughout the nearshore and into waters beyond 3 nm. Additional information on selected marine mammal subsistence harvest also is in Table 4.1-7. Those subsistence activities that spatially overlap with fishing activities have a greater potential to be impacted by commercial fishing activities.

4.0 ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

An EA must consider whether an action will have a significant effect on the quality of the human environment (40 CFR 1508.27; NAO 216-6, 6.01b). Significance is determined by considering the contexts (geographic, temporal, and societal) in which the action will occur, and the intensity of the effects of the action. The evaluation of intensity should include consideration of the magnitude of the impact, the degree of certainty in the evaluation, the cumulative impact when the action is related to other actions, the degree of controversy, and consistency with other laws. If an impact is not considered significant, a Finding of No Significant Impact (FONSI) is issued.

The proposed action is limited the EBS and to nonpelagic trawl fishing. Any effects of this action are therefore limited to these locations and to any component of the environment that may be impacted by nonpelagic trawl fishing in these locations.

4.1 Significance Criteria

This section describes the criteria by which the impacts of the proposed action are analyzed for each of the following resource categories:

- Habitat
- Target Species
- Non-target species
- Marine mammals and seabirds
- Ecosystem

Evaluation criteria have been developed for each of these categories recently within the Habitat Areas of Particular Concern (HAPC) EA (NMFS 2006b) and in the 2006-2007 Groundfish Harvest Specifications EA (NMFS 2005). The EFH EIS, (NMFS 2005) provide recent information on the effects of fishing on EFH. The analysis used in this EA draws upon the evaluations used in the EFH EIS and adopts the significance criteria used in the HAPC EA (NMFS 2006b) and the 2006-2007 Groundfish Harvest Specifications EA (NMFS 2005) because of the similar type of action analyzed and the latest information provided by these analyses.

The four ratings used to assess each potential effect are:

Significantly negative: Significant adverse effect in relation to the reference point. Information, data, and/or professional judgment indicate that the action will cause a significant adverse effect on the resource.

Insignificant impact: Insignificant effect in relation to the reference point. Information, data, or professional judgment suggests that the action will not cause a significant adverse effect on the resource.

Significantly positive: Significant beneficial effect in relation to the reference point.
Information, data, and/or professional judgment indicate that the action will cause a significant benefit to the resource.

Unknown: Unknown effect in relation to the reference point. Information is absent to determine a reference point for the resource, species, or issue and data is insufficient to adequately assess the effect of the action or the direction of the effect of the action. Professional judgment also is not able to determine the effect of the action on the resource.

The reference point condition, where used, represents the state of the environmental component in a stable condition or in a condition judged not to be threatened at the present time. For example, a reference point condition for a fish stock would be the state of that stock in a healthy condition, able to sustain itself, successfully reproducing, and not threatened with a population-level decline. The following subsections describe the significance criteria used to evaluate the proposed alternatives. Significance criteria are provided for each of the resource categories listed above, except for socioeconomic effects. Significance findings for social and economic impacts would not by themselves require the preparation of an EIS; see 40 CFR 1508.14. Economic and social impacts are described in Sections 5 and 6. In light of 40 CFR 1508.14, significance determinations are not made for these impacts.

The EFH EIS provided some background discussion of the effects of the alternatives in this EA/RIR/IRFA (through its evaluation of EFH-Action 3 Alternative 1 (status quo), Alternative 4 (Bering Sea) and Alternative 5 (Bering Sea) in the EFH EIS) for effects on fish habitat, target species, other fisheries and fishery resources, protected species, ecosystems, and cumulative effects (NMFS 2005). Updated information on cumulative effects is in the Harvest Specifications EIS (NMFS 2007). No new information is available to support different criteria or conclusions other than those presented in the EFH and Harvest Specifications EISs and therefore, the Alternative 1 (status quo) effects analysis incorporates by reference analysis from the EFH and harvest specifications EISs (NMFS 2005 and 2007).

This section will focus on the effects of Alternatives 2 & 3 and the options on fish habitat, target species, non-target species, marine mammals and seabirds, ecosystems, and cumulative effects on the human environment. Effects will be compared to the significance criteria for each component and compare the effects toAlternative 1 status quo effects. The section will provide additional details beyond the EFH EIS (NMFS 2005) for these Alternatives since the concepts of the open areas and gear modifications analyzed in the EFH EIS were similar in concept but do not mirror these alternatives. Additional consideration is needed for global warming and a potential for a northward migration of the nonpelagic trawl fishing fleet.

The action is limited to changes in nonpelagic trawling, and therefore, the analysis will focus on the effects of allowing or prohibiting nonpelagic trawling in areas identified in Alternative 2 Options 1-5, and gear modifications for the nonpelagic trawl fleet identified in Alternative 3.

4.1.1 Habitat

The issues of primary concern with respect to the effects of fishing on benthic habitat are the potential for damage or removal of fragile biota within each area that are used by fish as habitat and the potential reduction of habitat complexity, benthic biodiversity, and habitat suitability. Habitat complexity is a function of the structural components of the living and nonliving substrate and could be affected by a potential reduction in benthic diversity from long-lasting changes to the species mix. Many factors contribute to the intensity of these effects, including the type of gear used, the type of bottom, the frequency and intensity of natural disturbance cycles, history of fishing in an area and recovery rates of habitat features. This process is presented in more detail in Section 3.2 of the HAPC EA (NMFS 2006b) as well as Section 3.4.3 of the EFH EIS (NMFS 2005). A specific description of the effects of nonpelagic trawl on habitat is in Section 3.2.1 of the HAPC EA and is adopted here by reference. Benthic habitat that has not been previously fished could potentially be fished in the future due to global warming and the potential for some target fish stocks to migrate into northern waters.

Based on the information available to date, the predominant direct effects caused by nonpelagic trawling include smoothing of sediments, moving and turning of rocks and boulders, resuspension and mixing of sediments, removal of seagrasses, damage to corals, and damage or removal of epibenthic organisms (Auster et al. 1996, Heifetz 1997, Hutchings 1990, ICES 1973, Lindeboom and de Groot 1998, McConnaughey et al. 2000). Trawls affect the seafloor through contact of the doors and sweeps, footropes and footrope gear, and the net sweeping along the seafloor (Goudey and Loverich 1987). Trawl doors leave furrows in the sediments that vary in depth and width depending on the shoe size, door weight, and seabed composition. The footropes and net can disrupt benthic biota and dislodge rocks. Larger seafloor features or biota are more vulnerable to fishing contact, and, larger diameter, lighter footropes may reduce damage to some epifauna and infauna (Moran and Stephenson 2000). An Alaska-based fishery impacts assessment model analyzes the effect of fishing gears on habitats, including fragile biota. Appendix B of the EFH EIS (NMFS 2005) further explains this model and its uses.

In terms of habitat the BS has a mix of substrates, defined in part by the continental shelf, continental break and a deep-water basin. The distributions of benthic sediment types in the EBS shelf are related to these depth features and are described in Chapter 3 of this document. Each of the substrates by depth zone may have different effects on them.

Each alternative was rated by significance criteria for any effect on marine benthic habitat. The significance criteria are outlined in Table 4.1.1 and are grouped into four categories:

1. Mortality and damage to living habitat species: Damage to or removal of benthic biota (such as seapens/whips, anemones, soft corals, and sponges) by direct contact with fishing gear;
2. Modification of non-living substrate by direct contact with fishing gear (non-living substrates such as sand, mud, gravel, rock, and shell);
3. Modification of the community structure in terms of benthic biodiversity;
4. Modification of habitat suitability to support healthy fish populations.

Each of the criteria was assessed qualitatively, due to the lack of existing habitat data. Specifically, the second category, "modifications to nonliving substrate by gear" is somewhat hypothetical, as problems have been identified in assessing impacts for fishing gears. The third category identifies effects from fishing that may result in a change in the biodiversity within the habitat area. Intense or high frequency fishing activities within a relatively small area may result in a change in diversity by removing resident species and by attracting opportunistic fish species that feed on injured or uncovered marine organisms disturbed in the wake of the tow.

Specific impacts to habitat from different management regimes are very difficult to predict. The ability to predict the potential effects on benthic habitat from mitigation measures that change the geographical and seasonal patterns of fishing depends on having detailed information regarding habitat features, life histories of living substrates, the natural disturbance regime, and how fishing with nonpelagic trawl gear at different levels of intensity affects different habitat types.

Several simplifying assumptions were made:

1. Disturbances, such as fishing, in sensitive habitats may add additional stress on areas with slow recovery times and fragile, sessile marine organisms. Some natural disturbances occur on the Bering Sea Shelf in shallow areas.
2. Closing areas to disturbances benefits benthic habitat.
3. Disruption of non-living structure, such as gravel and sand, may alter habitat for species
4. If more area is restricted or closed to fishing, fewer alterations and disturbances to marine habitat from fishing are expected. Conversely, increasing the fishing effort in an area will place additional stress on benthic habitat.
5. Management measures proposed to protect one area will likely result in benefits to that area, with only slight increased stress on habitats elsewhere.

Criteria used in this EA to evaluate effects of the proposed action on habitat are provided in Table 4.1-1. The reference point against which the criteria are applied is the current size and quality of marine benthic habitat and other essential fish habitat in the Bering Sea and are adopted from the HAPC EA (NMFS 2006b).

Table 4.1-1Criteria used to determine significance of effects on habitat.

Effect	Criteria			
	Significantly Negative (-)	**Insignificant (I)**	**Significantly Positive (+)**	**Unknown (U)**
Habitat complexity: Mortality and damage to living habitat species	Substantial increase in mortality and damage; long-term irreversible impacts to living habitat species species.	Likely not to substantially change mortality or damage to living habitat species.	Substantial decrease in mortality or damage to living habitat species.	Information, magnitude and/or direction of effects are unknown.
Habitat complexity: (non-living substrates such as gravel sand and shell hash)	Substantial increase in the rate of removal or damage of non-living substrates.	Likely not to substantially change alteration or damage non-living substrates.	Substantial decrease in the rate of removal or damage of non-living substrates.	Information, magnitude and/or direction of effects are unknown.
Benthic biodiversity	Substantial decrease in community structure from baseline.	Likely not to substantially change community structure.	Substantial increase in community structure from baseline.	Information, magnitude and/or direction of effects are unknown.
Habitat suitability	Substantial decrease in habitat suitability over time.	Likely not to substantially change habitat suitability over time.	Substantial increase in habitat suitability over time.	Information, magnitude and/or direction of effects are unknown.

4.1.1.1 Habitat Complexity- living species

Section 4.3.2.1 of the EFH EIS addressed the effects of Alternative 1, the status quo, on fish habitat in the Bering Sea (NMFS 2005). On the whole, current protection measures provide minimal long term impacts on structure forming habitat features. Within the Bering Sea the sand/mud and slope habitats had the highest (11%) effects for decreases in biological structure long term effect indices (LEI) values for non-living structures identified in Appendix B of the EFH EIS (NMFS 2005). The status quo in the EFH EIS was rated as an indiscernible effect, and the current status quo in this analysis is thus rated as (I) insignificant.

Increases in long term reductions in structure-forming habitat features were not different from the status quo for any of the habitats or feature types in the EBS under Alternative 2 open area. Freezing the footprint of the fishery would have similar impacts on habitat complexity as the status quo. Fishing under Alternative 2 and Alternative 1 would occur in the same locations and result in the same minimal long term reduction in structure forming habitat, as described in the EFH EIS (NMFS 2005). The methodology to select the open area approach is to make the open area best represent the historic nonpelagic trawl footprint while preventing future expansions. The Alternative 2 open area approach would prevent expansion of the nonpelagic trawl fleet into newer areas to the north. Alternative suboption 1 would be a somewhat larger area than the current fishing footprint. The differences in area between the two open area approaches would also be expected to have similar reduction in habitat complexity to the status quo. The non-suboption Alternative 2 may have a higher beneficial affects on the biological structure than the suboption by protecting areas in which nonpelagic trawl gear had been previously use. However, because Alternative 2 with or without the suboption is not expected to substantially change the mortality and damage to living habitat species, the impacts of Alternative 2 with and without the suboption on habitat complexity is likely insignificant.

Alternative 3 gear modifications may have beneficial effects on the amount of biological structure in the Bering Sea compared to the status quo, due to the changes in the amount of contact of the trawl sweeps to the sea bed. This alternative would likely have a less adverse effect on habitat compared to the status quo because the gear modification would result in less contact with the seafloor. Gear modification resulted in a decrease of the trawl sweeps contact with seabed by about 90% and was effective in reducing trawl sweep impact effects to basketstars and sea whips (Dr. Craig Rose, pers. com. 1/3/2007). Dr. Rose is currently conducting research to determine if the elevating devices on the sweeps may be effective at larger spacings on the sweep. If the standards allow for larger spacing there may be more potential for contact with the seafloor if the elevating devices become worn and are not well maintained. This may result in more contact and potentially more mortality for benthic organisms than closer spacing of elevating devices. Regardless of the spacing of the elevating devices, some contact with living habitat species would continue, although Dr. Rose' research suggests that this contact will be significantly reduced. Therefore, fishery-wide adoption of devices to reduce seafloor contact with trawl sweeps is expected to be significantly positive. Because potential recovery of some living habitat species after exposure to nonpelagic trawling may occur, and trawling will continue in areas already impacted, the overall impacts on habitat complexity is not expected to be a substantial change from status quo. Therefore, the effects of Alternative 3 on habitat complexity are likely insignificant. This alternative would likely have a less adverse effect on benthic habitat compared to the status quo because the proposed flatfish trawl sweep modification would radically decrease the amount of surface directly contacted per hour of nonpelagic trawling (Craig Rose, AFSC pers. comm. February 2007).

Option 1 would provide some benefits to habitat complexity for living species by creating a closure around St. Matthew Island. The area to the south and east is documented with abundances of many invertebrate species, which rely upon similar habitats of those of commercial species. The area in the northwest portion of the island has been fished in recent years and consequently does have some disturbed bottom habitat. Habitat complexities of living structures are not well documented in this area. But waters beyond the State of Alaska 3 mile closure may have important habitat for both blue king crab and C. opilio crab species. The impacts of the closure is confined to a relatively small area in comparison to the entire Bering Sea benthic habitat and therefore the effects of Option 1 on habitat complexity overall is likely similar to status quo. Because no substantial change to habitat complexity is expected for the Bering Sea subarea, the effects of Option 1 on habitat complexity may be substantial locally, but are likely insignificant at the scale of the entire action area.

Options 2 and 3 would provide some benefits to habitat complexity for living species by closing near shore areas in the vicinity of Nunivak Island, Etolin Strait, and Kuskokwim Bay. These areas are shallow in depth and have high levels of natural physical disturbances. Habitat complexities of living structures are not well documented in this area, although some shallow areas may have important habitat for herring, halibut, and some crab species. Because this area already experience high levels of natural disturbance, the closures of these waters to nonpelagic trawling is not likely to result in a substantial change in mortality or damage to living habitat species compared to status quo. Therefore, options 2 and 3 are likely to cause insignificant effects on habitat complexity although a positive benefit is anticipated.

Option 4 would provide some benefits to habitat complexity for living species by creating a Northern Bering Sea Research Closure area that would only allow expansion of the fishing fleet by experimental fishing or an exempted fishing permit in the northward portion of the Bering Sea that has not been fished and has undisturbed bottom habitat. EFPs would be issued only after a request and careful review of the proposed experimental design. Habitat complexities of living structures are not well documented in the northern portion of the BS. Because this area has experienced little or no nonpelagic trawling, Option 4 is unlikely to have impacts different than the status quo. Therefore, the effects of Option 4 are likely insignificant on habitat complexity.

Option 5 would provide some benefits to habitat complexity for living species by creating a closure around St. Lawrence Island. The area has not been fished commercially with nonpelagic gear, however may have some disturbed bottom habitat from the commercial crab fishery. A closure in this area would be a slight benefit to blue king crab habitat. Habitat complexities of living structure are not well documented in the northern portion of the BS near St. Lawrence Island but an area further south has samples abundances of various bivalve, amphipod and crustacean species. Recent benthic studies show that benthic productivity has been decreasing over the past two decades southwest and northeast of St. Lawrence Island (Grebmeier and Dunton 2000, Moore, 2003 Simpkins et al. 2003). As with options 2 and 3, the area impacted is limited compared to the entire Bering Sea benthic habitat. Therefore, while the effects of Option 5 on the mortality and damage to living habitat species may be locally substantial, they are likely insignificant at the scale of the entire action area, and are not expected to be different than status quo.

4.1.1.2 Habitat Complexity to non living substrate

Section 4.3.2.1 of the EFH EIS addressed the effects of Alternative 1 (status quo) on fish habitat in the Bering Sea (NMFS 2005). The status quo in the EFH EIS was rated as an indiscernible effect. No new information is available to change this determination; and therefore, the current status quo in this analysis likely has the same effect as the status quo in the EFH EIS and is thus rated as (I) insignificant. LEI values for non-living structure were all less than 5 percent for all habitat types. All the habitat types included unfished, lightly fished and heavily fished areas. On the EBS shelf, effects were primarily concentrated into many small discrete pockets. On the EBS slope, there were two larger areas where high-effect values were concentrated: 1) an area of sand/mud habitat between Bristol Bay and the Pribilof Islands and 2) an area of sand habitat north of Unimak Island and Unimak Pass mostly inside of the 100m contour. These areas have been fished long enough that the current state of non-living habitat features are not likely to change with additional fishing activity. The status quo Alternative 1 receives an insignificant impact.

Like the status quo, Alternative 2 also would impose an insignificant impact on habitat complexity to non living species since the open area approach mimics fishing impacts under the status quo. The Alternative 2 open area approach would prevent expansion of the nonpelagic trawl fleet into newer areas to the north. Alternative 2, suboption 1 would be a somewhat larger area than the current fishing footprint by providing the additional area open to fishing east of St. Matthews Island. The differences in area between the two open area approaches would also be expected to have similar reduction in habitat complexity to the status quo. The non-suboption Alternative 2 may have a higher beneficial affects on the non-living substrate structure than the suboption by preventing fishing in areas that have not been previously fished with nonpelagic trawl gear.

It is likely that Alternative 3 would provide no further decreases to non-living species' habitat complexity and would likely provide some benefit to non-living substrates. The extent of the effect would depend on the substrate and the intensity of fishing. Because fishing is likely to occur in the same locations as used historically, the repeated fishing in an area with modified gear is not likely to show a substantial improvement for non-living substrate, and therefore Alternative 3 would receive in insignificant impact.

Options 1-5 would provide some positive benefits to non-living species habitat complexities and would likely provide some benefit to non-living substrates as discussed above. Habitat complexities of non-living substrates are not well documented in the Northern portion of the Bering Sea. However, some recent studies suggest that hydrographic changes are occurring in the Northern Bering Sea affecting both sediments deposition and re-suspension. Because these options are limited to local areas or to areas not previously impacted by nonpelagic trawling, the impacts are likely similar to status quo. None of the options allow for additional fishing with nonpelagic trawl gear and the impacts of Alternative 1 on non-living habitat complexity are insignificant. Therefore, impacts from options 1-5 on non-living habitat complexity are likely insignificant.

4.1.1.3 Benthic biodiversity

Benthic biodiversity is qualitatively analyzed based on potential modification of community structure. Section 4.3.2.1 of the EFH EIS addressed the effects of Alternative 1 (status quo) on fish habitat in the Bering Sea (NMFS 2005). The Bering Sea is mostly comprised of habitats that support organisms with faster recovery rates than the slow long-lived hard corals. However, these organisms or living substrates combined with non-living substrates serve as important functional roles to fish and invertebrates with structural habitat for living, breeding, and growth to maturity. The status quo impacts have shown consistent long term fishing patterns in the Bering Sea and the effects were classified as indiscernible in regards to benthic biodiversity in the EFH EIS (2005). Areas of primary concern would be those that contain long-lived species, such as hard corals or seawhips. Hard corals are generally absent in the Bering Sea; sea whips are locally common near the shelf break and in the canyons. The current status quo Alternative 1 receives an insignificant rating in this analysis because the current rates of fishing are not going to substantially increase or decrease community structure.

Alternative 2 open area approaches (both options) will not increase the fishing activities under the current status quo and thus would also receive an (I) insignificant rating. The suboption would increase the area that is currently not exposed to commercial fishing under Alternative 2; however, any anticipated changes of effort in that area are not expected to create a difference in benthic biodiversity.

Alternative 3 would reduce potential destruction of benthic species and potentially preserve benthic biodiversity and likely would provide some benefit to non-living substrates. The extent of this protection is dependent on the benthic diversity in the area and the intensity of fishing. Because the areas have been previously fished, any protection is not likely to result in substantial beneficial effects on benthic biodiversity and therefore, Alternative 3 would result in an insignificant impact.

Options 1-5 would provide some positive benefits to benthic species and would likely provide some benefit to benthic biodiversity. Because these options are limited to local areas or to areas not previously impacted by nonpelagic trawling, the impacts are likely similar to status quo in the amount of impact on the benthic biodiversity of the Bering Sea. Therefore, impacts from options 1-5 on benthic biodiversiy are likely insignificant.

4.1.1.4 Habitat suitability

The EFH EIS concluded there were indiscernible effects for the status quo, from the current fishing patterns on benthic biodiversity and habitat complexity (NMFS 2005). Habitat suitability is in part composed of these indices and no new information indicates to the contrary. Therefore, the current status quo in the Bering Sea is rated insignificant for habitat suitability for this analysis.

Under Alternative 2, the open area approach, there would be no change from the status quo and its effect on habitat suitability, the effect of this alternative and its suboption would also be insignificant for this action. The open area alternative would likely result in indiscernible effects as described in the EFH EIS (NMFS 2005) because it maintains current fishing patterns.

Alternative 3 would provide no further decreases to habitat suitability and may provide some benefit to habitats, particularly substrates, thus overall habitat suitability may benefit over time. Because this would occur in an area that has already been impacted by fishing, any beneficial impacts are not expected to be substantial. Alternative 3 would receive an insignificant rating.

Options 1-5 would provide some positive benefits to habitat suitability although any beneficial impacts are not expected to be substantial and would receive an insignificant rating. Because these options are limited to local areas or to areas not previously impacted by nonpelagic trawling, the impacts are likely similar to status quo.

4.1.2 Target Species

Target species for the Bering Sea are managed within the Bering Sea subarea and those species are described in Section 3.2.1. In terms of target species, the FMP describes the target fisheries as those species which are commercially important and for which a sufficient database exists that allows each to be managed on its own biological merits. Catch of each species must be recorded and reported. This category includes pollock, Pacific cod, yellowfin sole, Greenland turbot, arrowtooth flounder, rock sole, 'other flatfish' sablefish, Pacific Ocean Perch, 'other rockfish, Atka mackerel, and squid. Other non-groundfish targeted FMP species in Federal waters include crab and scallops.

The significance criteria used to evaluate the effects of the action on target species is in Table 4.1-2. These criteria are adopted from the significance criteria used in the HAPC EA (NMFS 2006b).

Table 4.1-2. Criteria used to estimate the significance of effects on the FMP managed target stocks.

Effect	Criteria			
	Significantly Negative (-)	**Insignificant (I)**	**Significantly Positive (+)**	**Unknown (U)**
Stock Biomass: Potential for increasing and reducing stock size	Changes in fishing mortality are expected to jeopardize the ability of the stock to sustain itself at or above its MSST	Changes in fishing mortality are expected to maintain the stock's ability to sustain itself above MSST	Changes in fishing mortality are expected to enhance the stocks ability to sustain itself at or above its MSST	Magnitude and/or direction of effects are unknown
Fishing mortality	Reasonably expected to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Reasonably expected not to jeopardize the capacity of the stock to yield sustainable biomass on a continuing basis.	Action allows the stock to return to its unfished biomass.	Magnitude and/or direction of effects are unknown
Spatial or temporal distribution	Reasonably expected to adversely affect the distribution of harvested stocks either spatially or temporally such that it jeopardizes the ability of the stock to sustain itself.	Unlikely to affect the distribution of harvested stocks either spatially or temporally such that it has an effect on the ability of the stock to sustain itself.	Reasonably expected to positively affect the harvested stocks through spatial or temporal increases in abundance such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown
Change in prey availability	Evidence that the action may lead to changed prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action will not lead to a change in prey availability such that it jeopardizes the ability of the stock to sustain itself.	Evidence that the action may result in a change in prey availability such that it enhances the ability of the stock to sustain itself.	Magnitude and/or direction of effects are unknown

It was determined within the EFH EIS (NMFS 2005) that considerable scientific uncertainty remains regarding the consequences of habitat changes for managed species. Nevertheless, the EIS analysis concluded that the effects on EFH from fishing target species are minimal because no indication exists that continued fishing at the current rate and intensity would alter the capacity of EFH to support healthy populations of managed species over the long term and no new information exists to the contrary. Therefore, Alternative 1 Status quo is rated as insignificant for all target species in terms of stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability. If fish distribution remains the same as status quo, catch of target species is expected to remain the same under all alternatives and options; and no changes in stock biomass, fishing mortality, and prey species availability would be anticipated under any of the alternatives or options.

Alternative 2 Open area approaches will not increase fishing effort for target species. Effort on target species were not different from the status quo in terms of stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability based on the current fishing practices because the size differences of the open area are small compared to status quo. Therefore groundfish target species receive an insignificant rating since the stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability would be the same as the status quo. In terms of invertebrate species blue king crab, C. opilio, and Tanner crab stocks have no directed fishing occurring with nonpelagic trawl gear. Potential impacts could occur to these stocks in terms of fishing mortality from incidental bycatch or disruption of habitat. However, the spatial distributions of these stocks are currently near St. Matthew Island and are outside of the proposed open areas. Therefore, the effects of Alternative 2 receive an insignificant rating for shellfish target species since the stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability would be the same as the status quo.

The effects of the open area alternative depend on fish stock distribution and fishing distribution. Potential economic impact from the open area alternative depends to some extent on how and where fish stocks and fishers change their distributions in the future. If the fish distribution remains static, the impacts will be negligible. However, if a substantial portion of the flatfish and cod stocks redistribute outside of the open area in the future – and assuming that other stocks do not take their place – there could be some economic impacts to the fleet if they were unable to catch the TACs. This would result in reduced fishing mortality for stocks currently harvested to their TAC limits.

Fish distribution can change with changes in stock biomass and environmental conditions. When a population grows, the distribution generally expands, and when a population declines, it generally contracts to the core of its range. Changes in distribution can be further driven by environmental forces as appears to be the case in the Bering Sea.

With the warming trend of the Bering Sea, it is possible that the nonpelagic trawl fisheries would shift north with the target stocks of some flatfish species. Dr. Paul Spencer of the AFSC has studied the relationship between the EBS flatfish spatial distribution and environmental variability from 1982-2004 (Boldt 2006, page 207). He compared flatfish catch per unit effort of the summer trawl survey to temperature and found that some flatfish species distribution appears to be correlated with temperature. Flathead sole and rock sole were distributed further to the north and northwest during warm periods. As ocean temperatures increase, it is likely flathead sole and rock sole may be harvested further north than in colder time periods; but the extent of movement of the fisheries cannot be predicted. The suboption recognizes the potential for movement of some flatfish species stocks and allows the fleet to compensate for that in the future. In particular the flathead sole fishery has moved in average 20 miles a year both north and south within the same longitudinal range although the industry has not fished within the extent of the suboption.

Few other studies have examined the question of fish distribution and temperature changes in the Bering Sea. Zheng and Kruse (2006) looked at crab changes (red king, Tanner, and C. opilio crab) and a few crab predators – Pacific cod, rock sole, and skates. They noted that during recent years, some groundfish showed a clear trend in changes of centers of distribution. Pacific cod, flathead sole, and arrowtooth flounder populations shifted to the northwest, and rock sole, skates, and Alaska plaice shifted to the northeast, whereas yellowfin sole population showed no change in distribution. For arrowtooth flounder, Pacific cod, and skates, these distribution changes are directly related to mean bottom temperature. Litzow and Mueter (in review) have examined changes in groundfish species distributions more fully. The area formerly covered by sea ice (and associated cold pool) has become favorable habitat for many subarctic species, and consequently, increases in biomass for most fish stocks have been observed in the area. Although there has been a linear response to bottom temperatures, there is an additional accelerating shift that cannot be accounted for by temperature alone. Hence, predictions into the future under a warming scenario are extremely uncertain (F. Mueter, pers. com.).

Alternative 2 effects are not likely to result in changes in stock biomass, fishing mortality, prey availability, or temporal distribution of fishing that would result in changes in the sustainability of the target species stocks. Spatial distribution of the fisheries under this alternative and suboption is the most likely potential effect but the TAC limits would likely prevent the fishery from affecting the sustainability of the fish stocks. For these reasons, Alternative 2 and the suboption likely have insignificant effects on target species.

Alternative 3 Gear modifications is not expected to have any net decrease in the fishing target catch rates compared to that of status quo conditions. In side-by side field studies conducted by NMFS, the catch of target flatfish species with the modified gear was not significantly different than the catch of unmodified gear when equipped with 6 to 8 inch diameter disk that elevated the sweeps 2.5 inches off the seabed between disks. Additionally the bycatch rates of invertebrate species are not anticipated to differ from status quo. Therefore, the effects of Alternative 3 receive an insignificant rating for groundfish and invertebrate target species since the stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability would be the same under Alternative 3 as the status quo.

Option 1 would close the area around St. Matthew Island to nonpelagic trawl gear to conserve blue king crab habitat. Some trawl effort has occurred on the north side of St. Matthew, targeting P. Cod, yellowfin sole and flathead sole. This area closure would affect less than .001% of the overall bottom trawl effort (1990-2005). It is unknown at his time how many vessels, or how much fish harvested by these vessels to their overall harvest is at this time. However, the overall catch of target species is not expected to be different than the status quo. Therefore, the effects of Option 1 receive an insignificant rating for groundfish and invertebrate target species since the stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability would be the nearly same under Option 1 as the status quo. Option 1 may provide some unquantified benefits to subsistence harvesters in the future.

Option 2 would close an area to nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Straits. Option 3 would do the same but additionally includes nearshore waters of Kuskokwim Bay. The waters in the southern portion of Etolin Strait have had very little historic fishing with nonpelagic gear (2000-2005). The predominant catch with nonpelagic gear has been yellowfin sole and prosecuted by the head and gut catcher processor fleet. Although the number of vessels utilizing the area is small, the fleet moves into this area to reduce bycatch rates of halibut. The catch of target species would not expect to be affected by this closure area on a large scale, and the vessels utilizing this area would be able to take their fishing in other open areas. The halibut bycatch rates have a potential to be higher with this closure. However the effects of Options 2 & 3 receive an insignificant rating for groundfish and invertebrate target species since the stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability would be nearly the same under Options 2 and 3 as the status quo. Nevertheless, Options 2 & 3 may provide some benefits to subsistence harvesters and local halibut fisherman by reducing competition and gear conflicts with local fisherman.

Additionally Option 4 may provide increased protection for some target species by creating a Northern Bering Sea Research Closure area, that would only allow expansion of the fishing fleet by experimental fishing or an exempted fishing permit in the northward portion of the Bering Sea that minimally has been fished. Very minimal fishing has occurred in these proposed northern areas. The affects of Option 4 receive an insignificant rating for groundfish and invertebrate target species since the stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability would be the nearly same under Option 4as the status quo.

Option 5 would close an area to nonpelagic gear around St. Lawrence Island. Currently no nonpelagic fishing occurs in this area. The effects of Option 5 receive an insignificant rating for groundfish and invertebrate target species since the stock biomass, fishing mortality, spatial and temporal distribution, and change in prey availability would be nearly the same under Option 5 as the status quo.

4.1.3 Economic and Socioeconomic Aspects of Federally Managed Fisheries:

The reference point against which the alternatives and options were evaluated was the current economic and socioeconomic conditions from the current EBS nonpelagic trawl fisheries. No significance determination is required for this component of the analysis. A thorough discussion of the socioeconomic effects of the proposed action is contained in sections 5 and 6 of this EA/RIR/IRFA.

The analysis generally finds that under Alternative 2, flatfish and Pacific cod represented the largest first wholesale gross revenue sources potentially placed at risk over the three year period examined (2003-2005), but no one species exceeded $600,000, or 4.0% of estimated status quo first wholesale gross revenue. The first wholesale gross revenue at risk under the proposed action could be mitigated, in whole or in part, by additional fishing effort in the area(s) remaining open to nonpelagic trawl. Under Alternative 2, no vessel would have had 5 percent or more of its EBS trawl revenue placed at risk for any year 2003 through 2005, had this rule been in place in these fishing years.

In addition to the evaluation of the effects on current fisheries, a designation of an open area could have future effects, depending on stock distribution and fishing effort distribution. Potential economic impacts from the open area alternative depend, to some extent, on how fish stocks redistribute themselves, and how fishermen change their effort and practices in the future. If the fish distribution remains static, the impacts will be negligible. However, if a substantial portion of the flatfish and cod stocks redistribute outside of the open area in the future – and assuming that other stocks don't take their place – there could be a substantial adverse economic impact on the fleet, if they were unable to catch the TACs.

The analysis generally finds that in Alternative 3, no first wholesale gross revenue is at risk due to the proposed gear modification, since the field studies have shown no significant diminiution in target flatfish species catch rates when using the modified gear.

The proposed gear modifications will likely result in direct equipment costs for vessels to comply with the addition of disks to the trawl sweeps and, on some vessels, to modify operations and/or acquire additional deck equipment. Gear manufacturers estimate this cost at just under $4,000 per vessel, or about 33% more than the sweep alone.

NMFS is investigating the type of implementation program that would be necessary for the gear modification alternative. A program similar to that used for seabird avoidance gear would likely apply to the nonpelagic trawl gear modifications, because of the similarity of the type of action needed (enforcing the use of a gear type). The regulations used to implement seabird avoidance gear requirements have successfully reduced the incidence of seabird bycatch and requires fewer NMFS staff to manage compared to other equipment related programs, such as vessel monitoring systems (VMS) or scales. Because no information is collected by gear, the details of the VMS and scales programs to ensure accuracy of information would not be required for nonpelagic trawl gear modifications. Therefore, a less complicated program for implementation would suffice. Development of a gear modification program will require careful coordination with the Alaska Fisheries Science Center, fishermen, NOAA OLE, U.S. Coast Guard, North Pacific Groundfish Observer Program, and gear manufacturers.

Option 1, the proposed closure around St. Matthew Island to use of nonpelagic trawl gear could have some effect on the gross revenues of vessels trawling for Pacific cod and/or flatfish. Flatfish, pollock, and Pacific cod represented the largest first wholesale gross revenue at risk over the three year period (2003-2005), with average revenue at risk of roughly $310,000, or 0.15 % of the wholesale gross revenue for this sector. The first wholesale gross revenue at risk under the proposed action could be mitigated by expending fishing effort in the area remaining open to nonpelagic trawl.

Option 2 would close an area to nonpelagic trawl gear around Nunivak Island, with the southern border extending along the nearshore portion of Etolin Strait, to conserve nearshore habitats, and minimize potential interactions with community use and subsistence fisheries. The majority of revenue at risk under Option 2 would be derived from flatfish. The average revenue at risk is $830,000 or 1.01 % of the first wholesale gross revenue for the sector in 2003 through 2005. The first wholesale gross revenue at risk under the proposed action could be mitigated by expending fishing effort in the area remaining open to nonpelagic trawl.

Option 3 would close an area around Nunivak Island to use of nonpelagic trawl gear, with the southern border extending along the nearshore portion of Etolin Strait and Kuskokwim Bay, to conserve nearshore habitat and minimize potential interactions with community use and subsistence fisheries. The majority of revenue at risk under Option 3 is derived from flatfish. Flatfish revenue at risk would have been $1.02 million, or 1.4% of the $72.72 million status quo first wholesale gross revenue in 2003, $2.98 million, or 3.55% of the $83.98 million status quo first wholesale gross revenue in 2004, and $990,000, or 0.81% of the $121.33 million status quo first wholesale gross revenue in 2005, had this closure been inplace in those years. On average, this potential revenue at risk impact appears relatively minor. However, based on testimony before the Council, this is an important area to the fleet because the fleet indicated that the catch rates for yellowfin sole can be high while encountering low halibut bycatch rates.

The Northern Bering Sea Research Area, considered under Option 4, would close 188,157 km^2 of EBS shelf (shelf area to 1,000 m depth), or 23.8% of the 791,731 km^2 of EBS benthic habitat currently open to nonpelagic trawling (shelf area to the 1,000 m depth contour). Average revenue at risk from 2003 through 2005 for the combined Option 1 and Option 3 (equivalent to Option 4, which includes these areas, plus unfished area to the North) is estimated to be $1.98 million, or 0.98% of the status quo average revenue of $201.73 million. Estimated revenue at risk during the period under analysis would have been highest in 2004, with $3.67 million, or 1.88% of the 2004 status quo revenue of $195.51 million; while the lowest would have occurred in 2005, with $1.04 million, or 0.42% of the 2005 status quo revenue of $247.96 million. The majority of this revenue at risk would have been derived from flatfish. Flatfish revenue at risk would have been $1.06 million, or 1.45% of the $72.72 million status quo first wholesale gross revenue in 2003, $3.10 million, or 3.69% of the $83.98 million status quo first wholesale gross revenue in 2004, and $990,000, or 0.81% of the $121.33 million status quo first wholesale gross revenue in 2005.

Option 4 Suboption 1: The suboption to Option 4 would move a portion of the northern boundary of the open area, southward between Nunivak and St. Matthew Islands. The suboption provides for the possibility of increased movement of some flatfish species stocks, by allowing the fleet to compensate for that in the future. This reduces the area that would be protected from fishing gear affects. Analysis of the resulting “wedge” has not revealed any nonpelagic trawl effort in this area during 2003 through 2005. Thus, the suboption does not affect the estimates of Option 4 revenue at risk.

Option 5 would close the area to nonpelagic trawl gear around St. Lawrence Island to conserve blue king crab habitat and minimize potential interactions with community use and subsistence fisheries. Because there is currently no nonpelagic trawl effort as far north as St. Lawrence, there would be no displacement of, and thus no economic impacts on, the trawl fleet given the current and historic distribution of target species. Potential future effects of a change in fish distribution were discussed under Option 4, although the impacts of Option 5 would be substantially smaller, based on total area closed.

4.1.4 Non-Target Resources:

Non-target resources include groundfish species taken as bycatch in the other targeted fisheries, prohibited species, non-specified species, and forage fish. Retention of prohibited species (PSC) is forbidden in the BSAI groundfish fisheries. The prohibited species include: Pacific salmon, steelhead trout, Pacific halibut, Pacific herring, and Alaska king, Tanner, and C. opilio crab. Among the large number of Pacific salmon present in the BSAI are believed to be several ESA-listed evolutionarily significant unit (ESU) populations. Pacific salmon are primarily taken as incidental catch in the EBS pollock pelagic trawl fishery, although many are also taken in the EBS nonpelagic trawl fisheries (3,426 fish in the 2006, NMFS Inseason Management data). No changes in the potential takes of ESA-listed salmon are expected with this action. Management measures to reduce the potential for incidental takes of PSC species are currently in 50 CFR 679.21. These measures include limits on the take of certain PSC species and closures of areas to protect places where PSC species may occur.

At present no active management, and only limited monitoring, of species in the ‘other’ species and non-specified species categories occurs. Most of these animals are not currently considered commercially important and are not targeted or retained in groundfish fisheries. The information available for non-specified species is much more limited than that available for target fish species. Directed fishing for forage fish species is prohibited, and most of the bycatch of these occurs in the pollock pelagic trawl fishery.

The significance criteria used in the 2006-2007 Groundfish Harvest Specifications EA/FRFA for non-specified species is applicable to this analysis of the effects on non-target species (NMFS 2005) (Tables 4.1-3 and 4.1-4). This EA/FRFA provided the latest ideas on determining the significance of effects on non-target species of the groundfish fisheries, considering the lack of data regarding biomass and sustainability of most non-target species; and no new information is available since this EA/FRFA. The first criterion in the table was further refined for this analysis from the Groundfish Harvest Specifications EA/FRFA (NMFS 2005), to clearly provide a criterion for assessing a NEPA “insignificant impact” and to be consistent with other analyses of environmental components in this EA/RIR/IRFA. This analysis and the 2006-2007 EA/FRFA analyze the effects of groundfish fisheries on non-target resources in the Bering Sea subarea, but this proposed action is focused on only the Bering Sea subarea.

The status description of salmon is in the Alaska Groundfish Harvest Specifications EIS and incorporated by reference for this analysis (NMFS 2007a). As previsouly noted, the majority of salmon taken in the groundfish fisheries is in the pollock fishery. The nonpelagic trawl fishery took only 5 percent of the total salmon bycatch in the 2006 BSAI groundfish fisheries (Mecum 2007). The Lower Columbia River and Upper Willamette River stocks of Chinook salmon are listed under the ESA and occur in the Bering Sea. Very few of these stocks are taken in the BSAI trawl fisheries and, those that are, are likely taken in pollock trawl fisheries (NMFS 2006e and Mecum 2007). Because the alternatives and options are not likely to affect nonpelagic trawl fishing activities in a manner that would change salmon bycatch amounts (no change in basic gear type, broad location, or amount of harvest), it is unlikely the alternatives and options would have any effect on ESA-listed salmon, beyond those effects already considered in previous consultations (NMFS 2007b), nor any effect on salmon bycatch in general for the BSAI groundfish fisheries.

Due to limited information, a mostly qualitative assessment of the relative impacts of Alternatives 2 and 3 are made in relationship to the status quo. The proportion of non-target species (non-specified forage fish, and PSC) removed would not be very different, in relationship to the entire management, compared to the status quo. In terms of bycatch of non-target species it is not expected that any negative incremental changes would occur from an open area approaches (Alternatives 2), or from gear modifications under Alternative 3. The incidental take of prohibited species is not anticipated to be different among Alternatives 1, 2, and 3; and the same amount of target species is expected to be harvested under each alternative. Because the groundfish harvest is not expected to increase, the harvest of non-specific, PSC species and forage species also are not expected to increase. Therefore, the effects of any of the alternatives are expected to be the same and to be insignificant.

Additionally, the options analyzed under this analysis are not likely to change groundfish harvests in a way that would impact non-target species harvests. This determination is due to the small area closure sizes. Therefore, the options’ effects on non-target species are not expected to be substantial. It is noted, however, that PSC limits are important in this analysis because the PSC limits constrain the nonpelagic trawl fleets ability to catch the available TAC for both Pacific cod and flatfish stocks. Table 3.2-3 4.1-5 summarizes the flatfish fishery targets, by year for 2003 through 2006, and demonstrates that halibut PSC limits often require closure of these fisheries prior to the TAC being caught. Any constraints to the flatfish nonpelagic trawl fishery would limit where a vessel can fish, and could limit a vessel’s ability to fish in locations that have lower PSC bycatch rates. Higher PSC bycatch rates would thus result in lower catches of flatfish overall. Similarly, gear requirements that reduce catch rates disproportionately to PSC bycatch rates would have the same effect. Notwithstanding these observations, the incidental takes of prohibited species is not anticipated to be significantly different between Alternatives 1 and Alternatives 2 or 3, nor the 5 options, and relatively the same amount of target species is expected to be harvested under each alternative at the present time. Note that no PSC catch is reported under Option 5, since no fishery current occurs in the area delineated under that option. Future affects on non-target species, due do warming climates and decreases in the southern boundary of the ice edge, may have some consequences for the catch rates of non-target species, the extent of those effects are not quantifiable at this time.

Table 4.1-3 Criteria used to estimate the significance of effects on forage and non-specified species.

Insignificant Impact	The fishery would have insignificant impact on non-specified fish stocks if it did not change sustainable non-target species biomass.
Adverse impact	A substantial reduction in the sustainable biomass of non-target species stocks would be an adverse impact.
Beneficial impact	An increase in stocks above the levels they would reach in the absence of the fishery (perhaps due to the harvest of groundfish that compete for non-specified species prey) would be a beneficial impact.
Significantly adverse impact	Non-target species bycatches that were not consistent with sustainable non-specified species populations would be a significantly adverse impact. For the purpose of this analysis, the bycatch of non-target species will be assumed to be proportional to the sum of fishery TACs. A 50% increase in the harvest of target species from the baseline level is used as a proxy for an adverse significant threshold for non-target species
Significantly beneficial impact	No benchmark is available for a significantly beneficial impact, and this is not defined in this instance.
Unknown impact	Insufficient information available to predict target fish harvest change.

4.1-4 Criteria used to estimate the significance of impacts on prohibited species

	Halibut	Herring	Salmon and Steelhead	Crab
No impact	No incidental take of the prohibited species in question.			
Adverse impact	There are incidental takes of the prohibited species in question			
Beneficial impact	Natural at-sea mortality of the prohibited species in question would be reduced – perhaps by the harvest of a predator or by the harvest of a species that competes for prey.			
Significantly adverse impact	Fisheries are subject to operational constraints under PSC management measures. Groundfish fisheries without the PSC management measures would be a significantly adverse effect.			
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the prohibited species, and significantly beneficial impacts are not defined for these species.			
Unknown impact	Not applicable			

4.1-5 Nonpelagic flatfish trawl closures by target species, date, PSC cap for years 2004-2006.

Fishery	2004		2005		2006	
	Closure Date	Reason	Closure Date	Reason	Closure Date	Reason
Flathead sole	24-Feb	Halibut	1-Mar	Halibut	21-Feb	Halibut
	16-Apr	Halibut	22-Apr	Halibut	13-Apr	Halibut
	31-Jul	TAC	18-Aug	Halibut	8-Aug	Halibut
Other Flatfish	24-Feb	Halibut	1-Mar	Halibut	21-Feb	Halibut
	16-Apr	Halibut	22-Apr	Halibut	13-Apr	Halibut
	4-Jun	TAC	6-Jul	Halibut	8-Aug	Halibut
Rock sole	24-Feb	Halibut	1-Mar	Halibut	21-Feb	Halibut
	1-Apr	TAC	22-Apr	Halibut	13-Apr	Halibut
	14-Aug	TAC	5-Jul	Halibut	8-Aug	Halibut
Yellowfin sole	4-Jun	TAC	16-Mar	Red King Crab	20-Apr	Halibut
			19-May	TAC	8-Jun	Halibut
			18-Aug	Halibut	19-Jun	TAC
			17-Sep	TAC	8-Aug	TAC

4.1.5 Marine mammal and Seabird Species Impacts

Many measures are already in place to protect marine mammals and seabirds from adverse encounters with fishing activities. These measures include seasonal and geographic closed areas, requirements for seabird avoidance devices (§ 679.24(e)), observer requirements, and voluntary industry research activities to reduce vessel and gear encounters with marine mammals and seabird species. These measures will remain in place in the future, under this action. As new knowledge becomes available to minimize adverse impacts of fishing activities on marine mammals and seabirds, the Council and NMFS likely will consider employing additional or modified measures to further reduce adverse interactions.

Assumed in this analysis is the potential for fuel spills, other accidental contaminant releases, and accidental loss of fishing gear (nets, lines, or buoys) from fishing activities throughout the North Pacific. Much of this lost gear or released contaminants disperse in the ocean, settle to the sea floor, or wash up on shore along the Alaskan or other coastlines. Some of the lost gear may entangle fish, marine mammals, or birds, and this is further discussed below. Some contaminants may contact swimming fish, mammals, or birds and be absorbed by animal tissues. While these instances of contamination are most likely not lethal, some mortalities may occur to these species that are unseen and undocumented.

Vessel strikes of mammals and sea birds also may occur and be either unknown to the vessel operator or unreported. Thus there likely are some unrecorded mortalities to marine mammals and seabirds from ship strikes, but Angliss and Lodge (2002) note that the mortality levels from such instances can only be estimated. They have made some attempts to estimate a minimum mortality level to marine mammals from vessel strikes, where possible. It is likely that strikes are few in number and have little effect on overall animal populations in the North Pacific. To summarize, these elements of fishing activities cannot be quantified to the extent necessary to be evaluated in any one fishery, region, or season, but are considered here generally, and recognized as a probable byproduct of commercial fishing in the North Pacific.

Descriptions of how fisheries in the North Pacific may interact with marine mammals and seabirds are provided in many other documents. These relevant discussions were incorporated from the following: Wilson (2003), the EFH EIS (NMFS 2005), the PSEIS (NMFS 2004), the Stock Assessment and Fishery

Evaluation reports for 2006 (Boldt 2006), Alaska Groundfish Harvest Specifications EIS (NMFS 2007a), and Angliss and Outlaw (2007).

Because this proposed action impacts only the location of nonpelagic trawling, the potential impacts are isolated to those marine mammals and seabirds that may use the locations that are to be either opened or closed. Because the amount of harvest is expected to be the same under each alternative, impacts are likely to be limited to certain direct and indirect effects on marine mammals and seabirds. These include:

1. Disturbance by fishing vessels
2. Potential localized depletion of prey resources where trawling is allowed
3. Incidental take by fishing gear or ship strikes
4. Changes to benthic habitat

The criteria for determining significance of effect from various fisheries were developed based on known interactions of marine mammals and seabirds with commercial fisheries in the North Pacific.

4.1.5.1 Marine Mammals:

Direct and indirect interactions between marine mammals and groundfish harvest activity may occur due to overlap of groundfish fishery activities and marine mammal habitat. Fishing activities may either directly take marine mammals through injury, death, or disturbance, or indirectly affect these animals by removing prey important for growth and nutrition or cause sufficient disturbance that marine mammals avoid or abandon important habitat. Fishing also may result in loss or discard of fishing nets, line, etc. that may ultimately entangle marine mammals causing injury or death.

Table 4.1-6 contains the significance criteria for analyzing the effects of the proposed action on marine mammals. These criteria are from the 2006-2007 groundfish harvest specifications EA/FRFA (NMFS 2005). These criteria are applicable to this action because this analysis and the harvest specifications analysis both analyze the effects of groundfish fisheries on marine mammals. The EA/FRFA provided the latest ideas on determining the significance of effects on marine mammals based on similar information that is available for this EA/RIR/IRFA, and no new information is available. The first criterion in the table was further refined for this analysis from NMFS 2005 to clearly provide a criterion for "insignificant impact" and to be consistent with other analyses of environmental components in this EA/RIR/IRFA.

Table 4.1-6 Criteria for determining significance of impacts to marine mammals.

	Incidental take and entanglement in marine debris	Harvest of prey species	Disturbance
Adverse impact	Mammals are taken incidentally to fishing operations, or become entangled in marine debris	Fisheries reduce the availability of marine mammal prey.	Fishing operations disturb marine mammals
Beneficial impact	There is no beneficial impact.	There are no beneficial impacts.	There is no beneficial impact.
Insignificant impact	No substantial change in incidental take by fishing operations, or in entanglement in marine debris	No substantial change in competition for key marine mammal prey species by the fishery.	No substantial change in disturbance of mammals.
Significantly adverse impact	Incidental take is more than PBR or is considered major in relation to estimated population when PBR is undefined.	Competition for key prey species likely to constrain foraging success of marine mammal species causing population decline.	Disturbance of mammal or such that population is likely to decrease.
Significantly beneficial impact	Not applicable	Not applicable	Not applicable
Unknown impact	Insufficient information available on take rates	Insufficient information as to what constitutes a key area or important time of year	Insufficient information as to what constitutes disturbance.

Incidental Take and Entanglement

The Marine Mammal Stock Assessment Reports (SARs) document the quantifiable effects on marine mammals. The National Marine Mammal Laboratory (NMML) completes SARs for marine mammals occurring in Alaskan waters (Angliss and Outlaw 2007). The SARs are reviewed annually for stocks designated as strategic under the Marine Mammal Protection Act (MMPA), annually for stocks where significant new information is available, and at least once every three years for all other stocks, as required by the MMPA. The reports are available at the NMFS Alaska Region website at: http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2006.pdf.

The SARs provide population estimates, population trends, and estimates of the potential biological removal levels (PBR) for each stock. The SARs also identify potential causes of mortality and whether the stock is considered a strategic stock under the MMPA.

To understand the level of potential impact of incidental take by the groundfish fisheries, the projected take of marine mammals is compared to the PBR and the Zero Mortality Rate Goal (ZMRG). The PBR is the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population, as defined by the MMPA (16 U.S.C. 1362 (20)). When available, the PBR is used as the measure of potential impact from fisheries mortality. The PBR is identified in the marine mammal stock assessments (Angliss and Outlaw 2007) as the level at which animals may be removed from the stocks while the stocks achieve sustainable populations. Incidental take is predicted to significantly, adversely affect marine mammal populations when the proposed harvest levels result in a take that may exceed the PBR.

NMFS' management goal, as required by the MMPA, is total marine mammal mortality below the ZMRG for all commercial fisheries. NMFS has defined ZMRG as 10 percent of the PBR (69 FR 43338). When the total marine mammal mortality and serious injury for all fisheries is above 10 percent of PBR for a given marine mammal stock, an individual fishery that resulted in mortality or serious injury less than 1 percent of the PBR is considered to have met ZMRG for that marine mammal stock. Marine mammal mortality and serious injury below the ZMRG is considered to be at an insignificant level approaching a zero rate.

Marine mammals taken in the BSAI flatfish and Pacific cod trawl fisheries are in Table 4.1-7. NMFS annually categorizes all U.S. commercial fisheries (State and Federal) under the MMPA List of Fisheries according to the levels of marine mammal mortality and serious injury. Each fishery is classified through a two-tiered analysis which assesses the potential cumulative impact of all fisheries, as well as individual fisheries impacts, on a marine mammal stock by comparing mortality and serious injury levels to the PBR of each marine mammal stock. The List of Fisheries for 2007 was published in the *Federal Register* on March 28, 2007 (72 FR 14466). Category III fisheries interact with marine mammal stocks with annual mortality and serious injury less than or equal to 1 percent of the marine mammal's PBR level and total fishery-related mortality less than 10 percent of PBR. Any fishery in Category III is considered to have achieved the target levels of mortality and serious injury under the ZMRG (NMFS 2004b). Category II fisheries have a level of mortality and serious injury that exceeds 1 percent but is less than 50 percent of the stock's PBR level, if total fishery related mortality is greater than or equal to 10 percent of the PBR. Category I fisheries have frequent mortality and serious injury of marine mammal resulting in annual mortality greater than or equal to 50 percent of PBR. No Alaska groundfish fisheries are included in Category I. The majority of species and numbers of marine mammal taken are by the BSAI flatfish trawl fisheries, a Category II fishery.

Table 4.1-7. Category II and III Alaska groundfish fisheries with documented marine mammal takes from the List of Fisheries for 2007 (72 FR 14466; March 28, 2007)

Fishery	Marine Mammal Stocks Taken
Category II	
BSAI flatfish trawl	*Killer whale, AK resident
	Bearded seal, AK
	Harbor porpoise, Bering Sea
	Harbor seal, Bering Sea
	Northern fur seal, Eastern North Pacific
	Spotted seal, AK
	Walrus, AK
	*Steller sea lions, Western U. S
Category III	
BSAI Pacific cod trawl	Harbor seals, Bering Sea
	Steller sea lions, Western U. S.
BSAI Atka mackerel trawl	Steller sea lions, Western U. S.

*Serious injuries and mortalities of this stock are greater than 1 percent, but less than 50 percent of the stock's PBR, therefore bycatch of this stock determines this fishery's classification.

Marine mammals that are not listed in Table 4.1-7 are assumed to be unlikely to be incidentally taken by any of the alternatives due to the absence of incidental take and entanglement records. No records of Alaska groundfish fisheries takes of North Pacific right whales exist. Figure 4.1-1 shows the location of incidentally taken marine mammals in the BSAI flatfish trawl fishery between 1998 and 2004. Incidental takes of marine mammals southeast of Nunivak Island are in the same area where marine mammal subsistence hunting takes place (Appendix D). Considering the amount of marine mammals taken incidentally in the flatfish fishery, it is unlikely the incidental takes would impact the ability to use the subsistence resources.

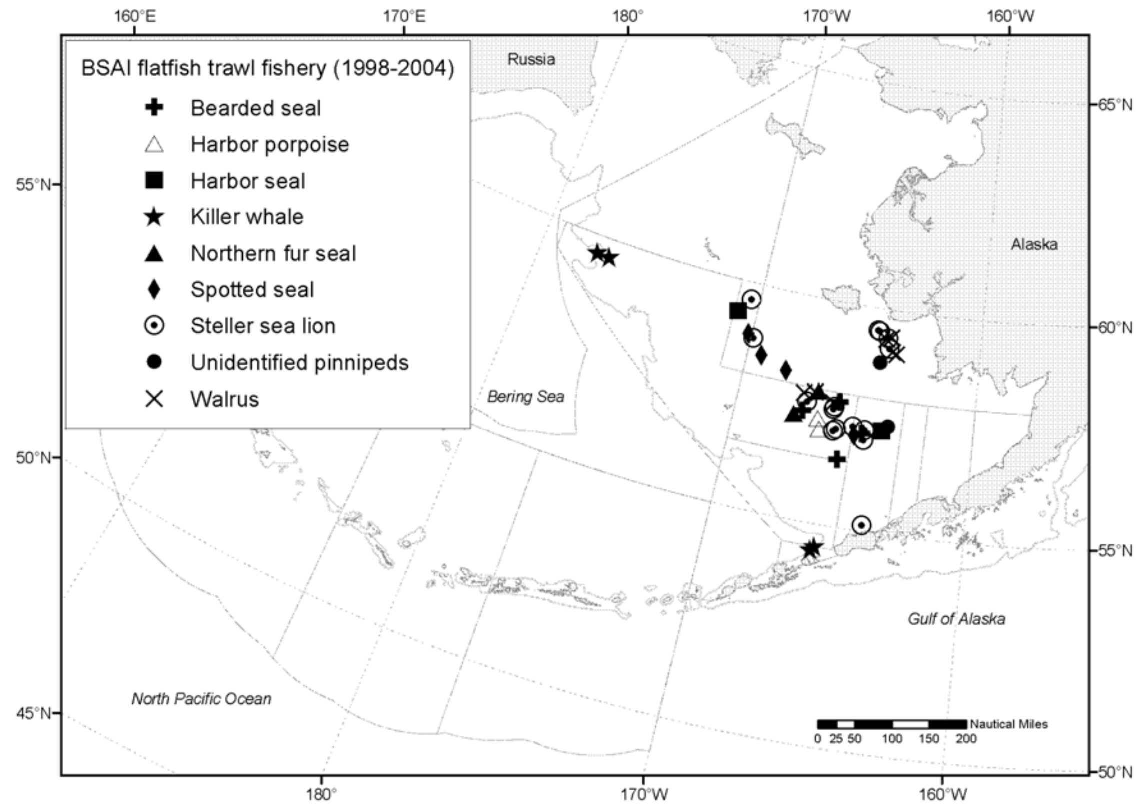


Figure 4.1-1 Locations of marine mammals taken incidentally in the Bering Sea flatfish trawl fishery in 1998-2004. Data include only animals seriously injured or killed. (Perez 2006)

Table 4.1-11 compares the estimated incidental take of marine mammals to the PBR established in the 2006 Marine Mammal SAR (Angliss and Outlaw 2007) for those animals that are shown in taken in BSAI nonpelagic trawl fisheries. Annual levels of incidental mortality for the groundfish fisheries are based on observed takes, extrapolated to all (observed and unobserved) groundfish harvest. Therefore, qualitative estimates of potential incidental take and entanglement based levels of fishing in an area where the marine mammals may occur are appropriate.

4.1-8 Estimated mean annual mortality of marine mammals from observed BSAI and GOA groundfish fisheries compared to the total mean annual human-caused mortality and potential biological removal for each stock.

Mean annual mortality, expressed in number of animals, includes both incidental takes and entanglements, as data are available, and averaged over several years of data. Years chosen vary by species. Groundfish fisheries mortality calculated based on Angliss and Outlaw (2007).

Marine Mammal	Mean annual mortality, from BSAI and GOA groundfish fisheries	Total mean annual human-caused mortality *	PBR
**Steller sea lions (western)	9.7	215.6	234
Northern fur seal	0.48	756	15,762
Harbor seal (BSAI)	1.25	176.2	603
Spotted seal	0.88	5,265	Undetermined
Bearded seal	0.68	6,788	Undetermined
Killer whale Eastern North Pacific AK resident	1.48	1.5	11.2
Killer whale Eastern North Pacific Northern resident	0	0	2.16
Harbor porpoise BSAI	0.35	0.35	545
Pacific walrus	1.2	5,794	Undetermined

* Does not include research mortality. Other human-caused mortality is predominantly subsistence harvests for seals, sea lions, otters, bowhead whales, and walrus.
** ESA-listed stock.

The incidental take of marine mammals by the BSAI nonpelagic trawl fisheries is well below either the species PBR or a small fraction of the total mean annual human-caused mortality. Under Alternatives 1, 2, and 3 the overall amounts of fishing and locations of fishing are expected to be similar, and no substantial change in incidental take by fishing operations, or entanglement in marine debris is expected. Under Alternative 2, portions of the Bering Sea would be closed to prevent further expansion into untrawled areas, which would reduce the potential for incidental take and entanglement for those animals that may occur in the closed area. In addition, all options considered would close waters in specific areas to nonpelagic trawl gear, which would reduce the potential for entanglement and incidental take in these areas where marine mammals may be present. Closures of Etolin Strait waters under Alternative 2 (including the suboption), and options 2, 3, and 4 may protect walrus during migration through this area from potential incidental takes (Figure 4.1-7).

These limited areas of closures under Alternative 2 and the options are not likely to result in any population level effects and are not likely to have a discernable effect compared to Alternative 1 because of the currently small number of marine mammals taken in the BSAI groundfish fisheries. Alternative 3 would only modify the gear to protect bottom habitat and no evidence indicates that the modified sweeps would result in a different level of incidental take and entanglement compared to status quo. For these reasons, Alternatives 1, 2 and 3, options 1 through 5, and the suboption would have an insignificant effect on the incidental take and entanglement of marine mammals.

Harvest of Prey

Under this action, direct competition for prey between the nonpelagic trawl fisheries and marine mammals is limited to Steller sea lions. Some impact to prey resources may also occur for marine mammals dependent on benthic fauna, such as walruses, which is discussed further below. The action includes the harvest of Atka mackerel and Pacific cod by nonpelagic trawl gear in the EBS. These species are important prey species for Steller sea lions. All Steller sea lion critical habitat in the Bering Sea is closed to Atka mackerel directed fishing by trawl gear (Figure 4.1-2). Some portions of the critical habitat in the Bering Sea are open to Pacific cod trawling. (Figure 4.1-3). By closing these areas, the potential competition between the nonpelagic trawl fisheries for Pacific cod and Atka mackerel and

Steller sea lions is reduced. This reduction is greater for the directed Atka mackerel fishery which is entirely prohibited in Steller sea lion protection areas in the Bering Sea. In addition, Pacific cod trawl harvest in the Bering Sea is seasonally apportioned among A, B, and C seasons as shown in Table 4.1-9. The seasonal apportionments reduce the potential for seasonal depletion of prey by limiting concentration of harvest in time. These seasonal apportionments remain unchanged under any of the alternatives and options. The proposed action only would affect the location of harvests outside of the Steller sea lion protection measures and therefore would have the potential to affect only those animals that may depend on prey resources outside of Steller sea lion protection areas.

Table 4.1-9 Pacific Cod Trawl Sector Seasonal Apportionments in the Bering Sea

Sector	A season	B season	C season
Trawl	60 percent	20 percent	20 percent
Trawl CV	70 percent	10 percent	20 percent
Trawl CP	50 percent	30 percent	20 percent

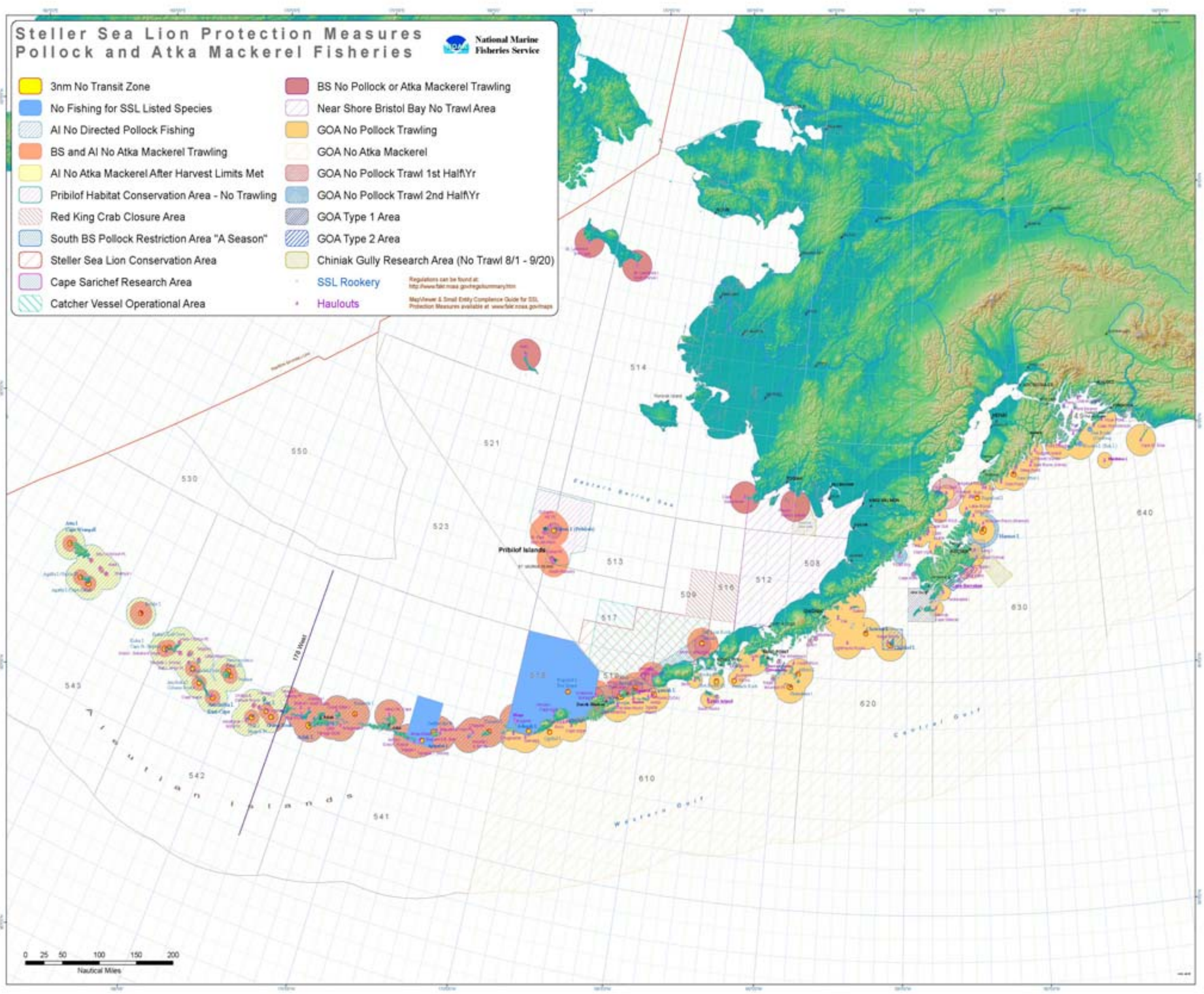


Figure 4.1-2. Atka Mackerel Trawl Fishery Closures Under Steller Sea Lion Protection Measures

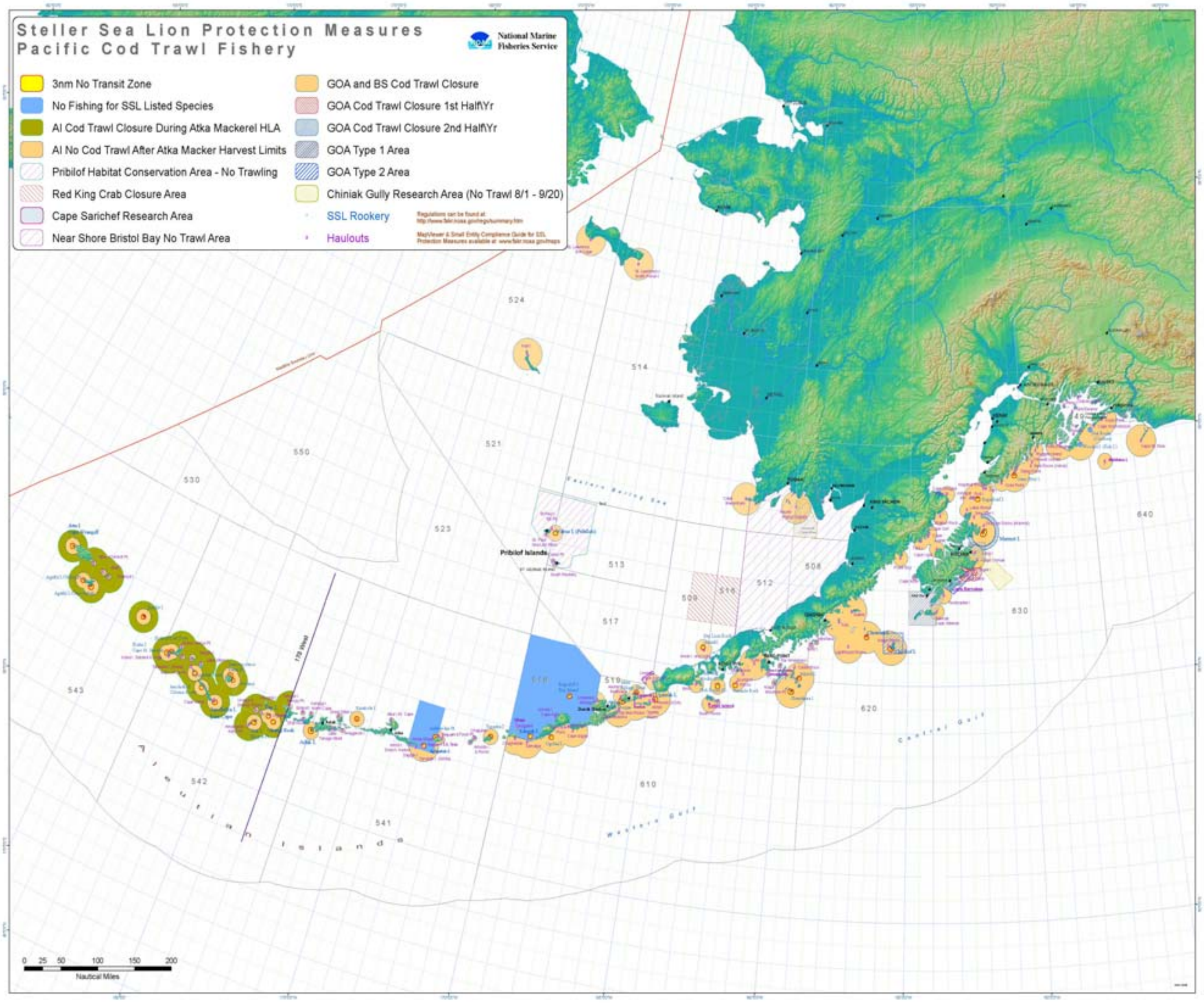


Figure 4.1-3. Pacific Cod Trawl Closures under Steller Sea Lion Protection Measures.

Because regional and seasonal Steller sea lion diets vary in Alaska waters, it is likely that Steller sea lions target prey nearshore when densely schooled in spawning or migratory aggregations (Sinclair and Zeppelin 2002). Very little prey data are available for the Bering Sea (Tanya Zeppelin, NMML, pers. comm. February 2007). Sampling of Steller sea lion scat has occurred at Bogoslof Island and Seal Rocks/Amak, which are very different environments (pelagic deep water compared to shallow shelf), and the diet varies accordingly.

Overall harvest of prey species is expected to be similar under all alternatives. Alternatives 1, 2, and 3, and the options and suboption would not change the implementation of the Steller sea lion protection measures. Some beneficial effect may occur for individual Steller sea lions that may forage in areas that would be closed to Pacific cod and Atka mackerel fishing under Alternative 2 and options 1-5 and that are not currently closed under the Steller sea lion protection measures. These areas are shown in Figure 4.1-4 and Figure 4.1-5. Steller sea lions near Cape Newenham, St. Lawrence Island (SW Cape and S Punuk) and St. Matthew Island (Hall) may benefit from these additional waters closed to nonpelagic trawl gear, reducing any potential for competition for prey species in waters outside of Steller sea lion protection areas. Animals that may travel north from Cape Newenham may benefit from the closure that would occur under Alternative 2 and options 3 and 4.

Any effect on prey availability is expected to be small because the closures are limited to areas that currently have very little or no fishing and very few Steller sea lions appear to occur in the closure areas under the options and alternatives. This effect is not likely to result in any population level effect since the additional protection would be limited to Pacific cod and Atka mackerel, few animals occur in the area, and the additional closure areas under the options and alternatives are not identified as important to the population under the Steller sea lion protection measures (NMFS 2001). In addition, Options 2, 3, and 4 and Alternative 2, which would close the waters of Etolin Strait to nonpelagic trawling, may provide a beneficial effect for walrus that depend on benthic invertebrates. Option 5 may provide some protection to walruses in the St. Lawrence Island area by preventing any disturbance of near shore benthic prey. Because there is so little nonpelagic effort in these areas at this time, there is unlikely to be a substantial change in the availability of walrus prey from these alternatives and options. Therefore, Alternatives 1 and 2 and the options would have insignificant effects on the harvest of prey species for marine mammals.

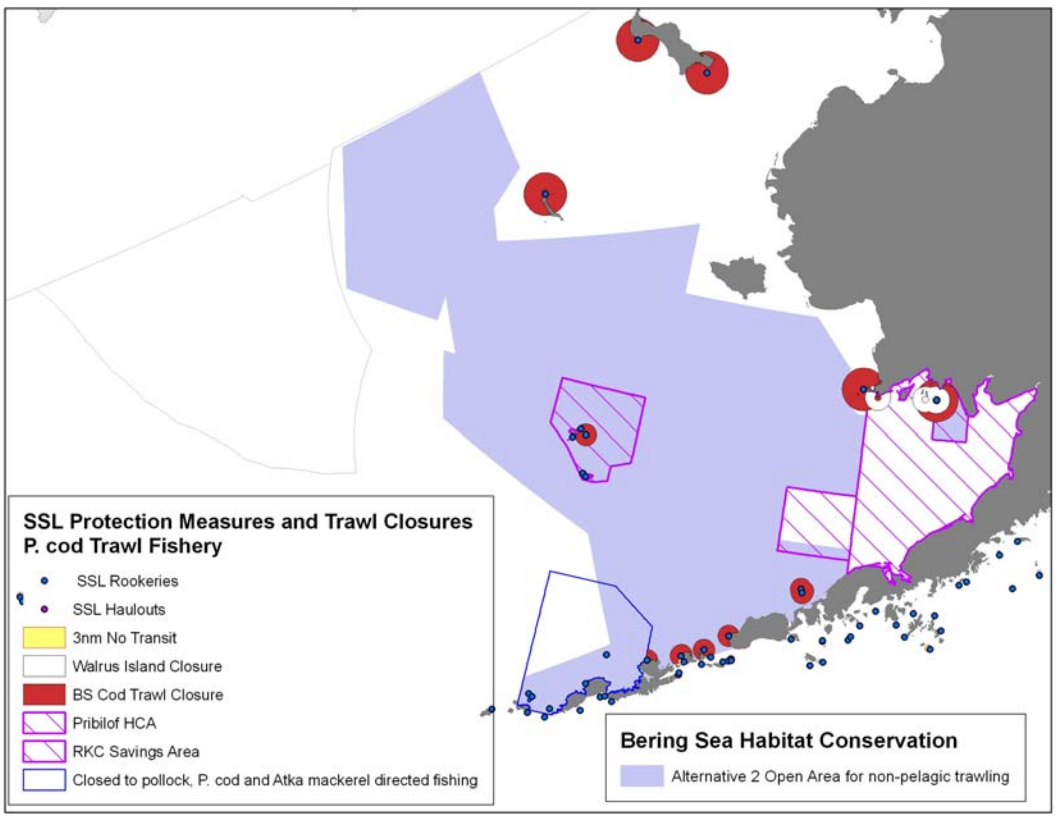


Figure 4.1-4. Pacific cod Trawl Closures under the Steller Sea Lion Protection Measures and Alternative 2.

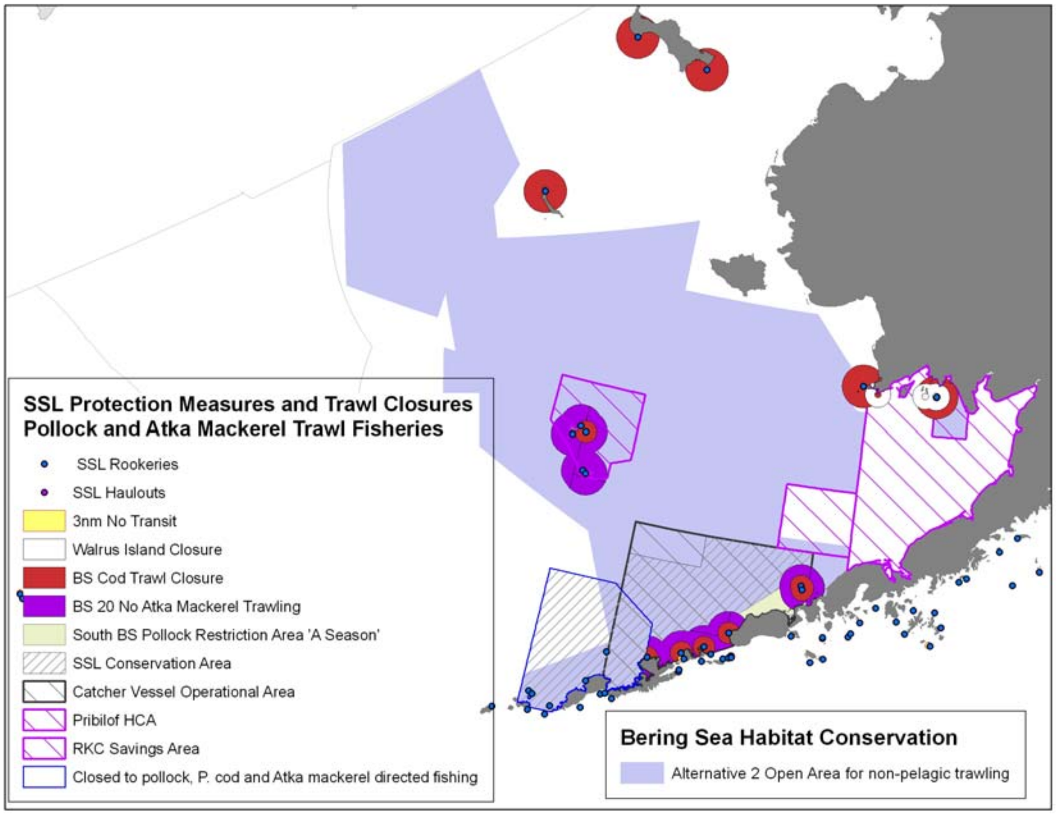


Figure 4.1-5. Atka Mackerel Trawl Closures under the Steller Sea Lion Protection Measures and Alt 2

Alternative 3 would have no effect on the availability of prey species for Steller sea lions because it involves only the method of harvest of flatfish and is not expected to affect the harvest of prey species. Alternative 3 may improve prey availability for those marine mammals that depend on benthic organisms for prey, such as walrus and some seals. The effect would depend on the overlap between the fisheries and foraging areas for these marine mammals and the amount of impact the modified trawl would have on the prey species. No information indicates the current flatfish fishery is having an effect on the ability of marine mammal to use benthic habitat for prey; and therefore, any reduced effect on the benthic habitat is not likely to result in substantial change prey availability. Alternative 3 would have an insignificant effect on the availability of prey species for marine mammals.

Disturbance

The level of overall fishing activities is expected to be the same under all alternatives and options because the closures are limited to areas with little or no fishing. Individual animals that occurred in areas that would be closed under Alternative 2 and the options may experience less potential for disturbance from fishing vessels. This potential beneficial impact is not likely to result in any population level changes for Steller sea lions due to the closure of additional areas that were not identified as needing closure under the Steller sea lion protection measures. Likewise, disturbance of other marine mammals may be less likely in areas that would be closed under Alternative 2 and the options, but the benefit is not likely to be very different from status quo because much of the proposed closure areas have little or no fishing at this time.

None of the alternatives or options is likely to result in a chance of potential disturbance of northern right whale occurring in critical habitat. Nonpelagic trawl fishing within critical habitat is the same under all of the alternatives and options. The overlay of Alternative 2 and critical habitat is shown in Figure 4.1-5. The closed area of the Red King Crab Savings Area occurs under all of the alternatives and options. This area has been closed to nonpelagic trawl gear for the past 10 years (Mary Furuness, NMFS inseason management, pers. comm. February 2007). The northern right whale population in the Bering Sea is very small, and only 25 have been seen in the critical habitat area in recent years. There is no known interaction with northern right whales and the groundfish fisheries. Therefore, Alternatives 1 and 2 would likely have no effect on the disturbance of northern right whales and no effect on critical habitat. Alternatives 3 and the options would have no effect on disturbance of northern right whales because they would result in no change in the level of fishing or interaction with northern right whale, especially in designated critical habitat.

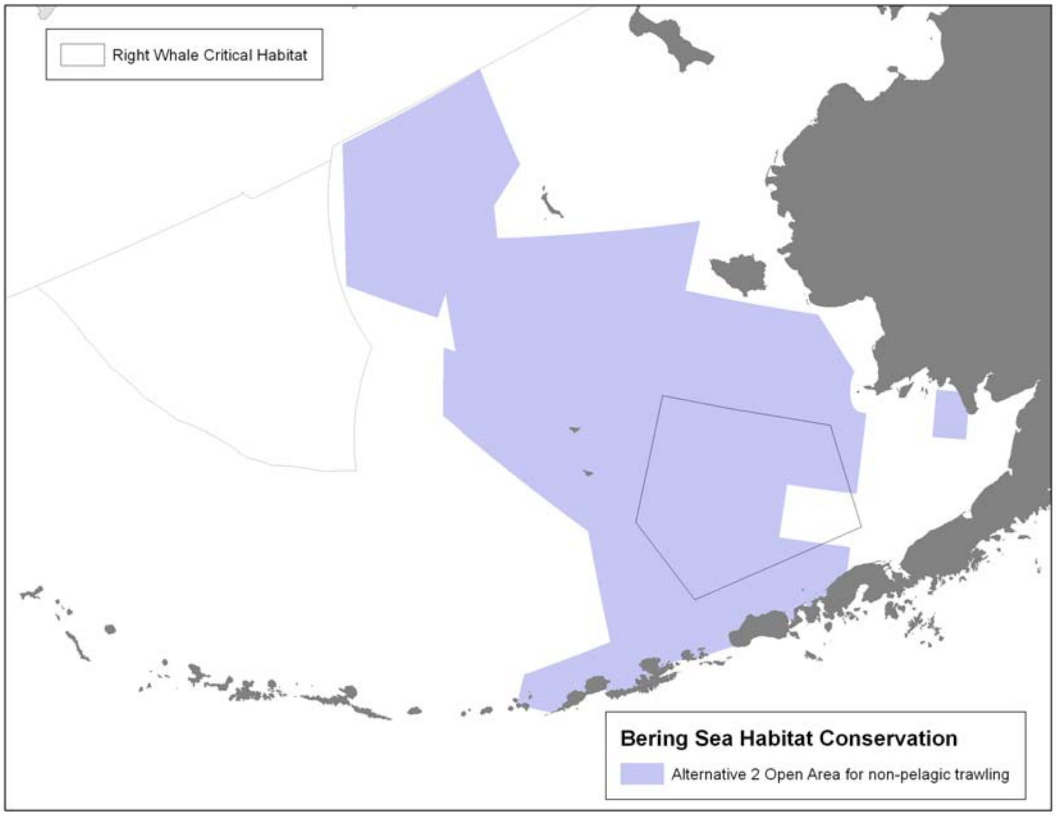


Figure 4.1-6. Northern Right Whale Critical Habitat and Alternative 2.

Walruses are highly sensitive to disturbance (USWFS personal communication, Greg Balogh April 2007 and unpublished analysis of North Aleutian Basin oil lease sale). Disturbance events are known to temporarily displace individuals from land or ice haulouts, occasionally resulting in animal injuries and mortalities. The potential for long-term displacement of animals due to continuous or regular and frequent disturbances is also of concern. The abandonment of preferred haulout locations, breeding and feeding areas could potentially result in long term changes in productivity, survival and abundance. At this time there is no indication that commercial groundfish fishing vessels have disturbed walrus. Alternative 2 and Options 2, 3, and 4 may provide some protection from potential disturbance by nonpelagic fishing vessels by closing waters near areas used by walruses. The Etolin Strait is a particularly important area for walrus movement into the northern waters from the Bristol Bay Area (Figure 4.1-6). St Lawrence Island is also identified as a breeding area for walrus. It is not known if these walrus would be present when fishing is taking place and if Option 5 may provide any protection from potential fishing vessel disturbance. The prevention of potential disturbance by the Alternative and options is not likely to result in a substantial change over effects under status quo; and therefore, any potential beneficial effects are likely insignificant.

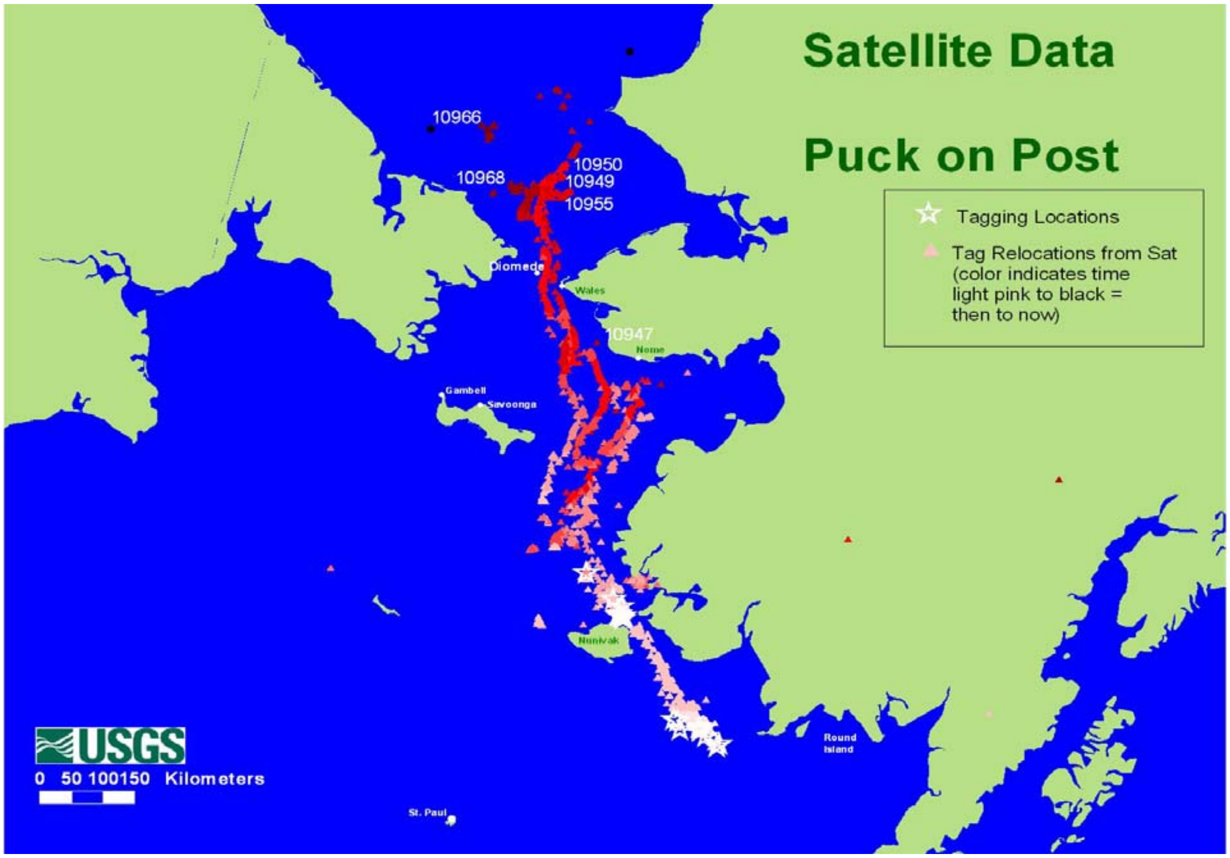


Figure 4.1-7 Female and pup walrus movement during April and May pack ice retreat. Movement is from the Bristol Bay area to summer feeding areas in the Chukchi Sea (Source: From presentation prepared by the USFWS, Greg Balogh April 2007)

Alternative 3 would have no effect on the direct disturbance of marine mammals since it is limited to a change in gear to protect bottom habitat and would not have any impacts on interactions with marine mammals. It may have a potential beneficial effect related to disturbance of benthic prey for marine mammals that depend on benthic invertebrates. Any potential beneficial effect is not expected to be a substantial change over the potential disturbance under status quo, and is therefore considered insignificant.

4.1.5.2 Seabirds:

The impacts of groundfish fisheries on seabirds are difficult to predict due to the lack of information on many aspects of seabird ecology. A summary of known information, both general and species-specific, can be found in Section 3.7 of the PSEIS (NMFS 2004). An analysis of the programmatic level preferred alternative for management of BSAI groundfish fisheries is in Section 4.9.7 of that document. Section 9 of the Alaska Groundfish Harvest Specifications EIS has a more recent analysis of the impact of the groundfish fisheries on prey availability, incidental take and benthic habitat (NMFS 2007a).

Table 4.1-10 contains the significance criteria for analyzing the effects of the proposed action on seabirds. These criteria are from the 2006-2007 groundfish harvest specifications EA/FRFA (NMFS 2005). These criteria are applicable to this action because this analysis and the harvest specifications analysis both analyze the effects of groundfish fisheries on seabirds. The EA/FRFA provided the latest ideas on determining the significance of effects on seabirds based on similar information that is available for this EA/RIR/IRFA, and no new information is available. The first criterion in the table was further refined for this analysis from NMFS 2005 to clearly provide a criterion for “insignificant impact” and to be consistent with other analyses of environmental components in this EA/RIR/IRFA

Table 4.1-10 Criteria used to determine significance of impacts on seabirds.

	Incidental take	Prey availability	Benthic habitat
Insignificant	No substantive change in bycatch of seabirds during the operation of fishing gear.	No substantive change in forage available to seabird populations.	No substantive change in gear impact on benthic habitat used by seabirds for foraging.
Adverse impact	Non-zero take of seabirds by fishing gear.	Reduction in forage fish populations, or the availability of forage fish, to seabird populations.	Gear contact with benthic habitat used by benthic feeding seabirds reduces amount or availability of prey.
Beneficial impact	No beneficial impact can be identified.	Availability of offal from fishing operations or plants may provide additional, readily accessible, sources of food.	No beneficial impact can be identified.
Significantly adverse impact	Trawl and hook-and-line take levels increase substantially from the baseline level, or level of take is likely to have population level impact on species.	Food availability decreased substantially from baseline such that seabird population level survival or reproduction success is likely to decrease.	Impact to benthic habitat decreases seabird prey base substantially from baseline such that seabird population level survival or reproductive success is likely to decrease. (ESA listed eider impacts may be evaluated at the population level).
Significantly beneficial impact	No threshold can be identified.	Food availability increased substantially from baseline such that seabird population level survival or reproduction success is likely to increase.	No threshold can be identified.
Unknown impacts	Insufficient information available on take rates or population levels.	Insufficient information available on abundance of key prey species or the scope of fishery impacts on prey.	Insufficient information available on the scope or mechanism of benthic habitat impacts on food web.

For this analysis, seabirds have been grouped as follows:

• Northern fulmar. Impacts on the northern fulmar are considered separately because this species accounts for the vast majority of incidental take that occurs in the hook-and-line fisheries of the BSAI and GOA and is one of the most abundant species that breeds in Alaska colonies.
• Short-tailed albatross. Short-tailed albatross is listed separately because of the special management concerns for animals listed under the ESA, and because of the precarious state of the population.
• Laysan and black-footed albatrosses. Laysan and black-footed albatrosses are treated separately because they belong to a taxonomic group of seabirds (Procellariiformes) that are globally threatened (Birdlife International), both species are on the USFWS's Birds of Conservation Concern list (USFWS, 2002), and the black-footed albatross has been petitioned for listing under the ESA.
• Spectacled and Steller's eiders. Steller's eider are treated as representative of other seaducks because, except for considerations of critical habitat, the impacts on other seaducks such as scoters, long-tailed ducks, and harlequin ducks would be similar to the impacts on these two eider species. Spectacled eiders are a more pelagic species (because they do not occur in mixed flocks at sea).The two eider species are singled out because of special ESA management concerns.
• Shearwaters. Shearwaters are migratory birds that do not breed in Alaska.
• Piscivorous seabird species. Piscivorous seabird species are fish-eating seabirds that do breed in Alaska, including murres, kittiwakes, gulls, rhinoceros auklets, puffins, cormorants, jaegers, terns, guillemots, and murrelets.
• Other seabird species. All other seabird species not listed above, such as storm-petrels, crested auklet, and least auklet, are considered as a separate group.

This grouping is a modified version of the approach used in the Steller sea lion SEIS (NMFS 2001, pp. 4-236). The modification is the separate treatment of black-footed and Laysan albatrosses, and shearwaters. These species were grouped together in the PSEIS (NMFS 2004).

Incidental Takes

Estimated incidental take of birds recovered in the nets from trawling operations in the BSAI is approximately 855 birds per year (NMFS 2007a). Gull, shearwaters and fulmars make up 78 percent of the average annual trawl incidental catch for Alaska waters (NMFS 2007a). Additional bird mortality may occur by striking the trawl warps and third wire cables. This cable-strike mortality is unknown and is not included in any take estimates as these birds do not show up in any observer samples. The estimated takes of gulls, fulmars and shearwaters in the entire groundfish fishery are very small portions of these species populations (NMFS 2007a). The location of the short-tailed albatross aggregate (Figure 3.2-13) discussed above is within the open area that would be established under Alternative 2. Medium to high trawling effort currently occurs in this area. Alternative 1, 2, 3 and the options would not change the potential for takes in the trawl fisheries for short-tailed albatross because the alternatives and options would not change the fishing activities currently occurring in the short-tailed albatross area of congregation.

The level of fishing effort may be an indication of the potential take of seabird species. Because the overall amount of harvest in the nonpelagic trawl fishery is not expected to change under the alternatives and options, the amount of incidental take of seabird species in the nonpelagic trawl fisheries is expected to be the same as status quo. Because the impact of incidental take is not expected to change under the alternatives and options, the effect of the alternatives and options on the incidental take of seabirds is insignificant.

Prey Availability and Benthic Habitat

A description of the effects of prey abundance and availability on seabirds is in Section 3.7.1 of the PSEIS (NMFS 2004) and Section 9 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a). Detailed conclusions or predictions cannot be made regarding the effects of forage fish bycatch on seabird populations or colonies. However, the present understanding is that fisheries management measures affecting abundance and availability of forage fish or other prey species could affect seabird populations (NMFS 2001; NMFS 2004), although commercial fisheries do not greatly compete directly with seabirds. There is no directed commercial fishery for those species that compose the forage fish management group, and seabirds typically target juvenile stages rather than adults for those target species where there is an overlap between seabirds and commercial fisheries. Most of the forage fish bycatch is smelt taken in the pollock fishery, which is not included in this action.

The Alaska Groundfish Harvest Specifications EIS found that the potential impact of the entire groundfish fisheries on seabird prey availability was limited due to little or no overlap between the fisheries and foraging seabirds based on either prey size, dispersed foraging locations or different prey (NMFS 2007a). The majority of bird groups feed in vast areas of the oceans, are either plankton feeders or surface or mid-water fish feeders and are not likely to have their prey availability impacted by the nonpelagic trawl fisheries. The possible exception is seaducks that depend on benthic habitat. These include the Steller's eiders, scoters, cormorants and guillemots, which may feed in areas that could be directly impacted by nonpelagic trawl gear (NMFS 2004). These eider species are further discussed below. Additional impacts from nonpelagic trawling may occur, if sand lance habitat is adversely impacted. This would affect a wider array of piscivorous seabirds that feed on sand lance, particularly during the breeding season, when this forage fish is also used for feeding chicks. Little is known about cormorant and guillemot species in the Bering Sea. No recent data of population trends, breeding status or diet in the Bering Sea are available for guillemots (Dragoo, Byrd, and Irons, 2006). Within the nearshore area, guillemots eat primarily fish and pelagic cormorants eat a variety of fish and invertebrates (http://www.absc.usgs.gov/research/seabird_foragefish/seabirds/index.html). Productivity data at Pierce and Round Island for pelagic cormorants is available from Dragoo, Burns, and Irons 2003.

Alternative 1 is likely to have an insignificant impact on prey availability for seabirds because no changes in prey availability are expected for foraging seabirds. Very little nonpelagic trawl gear has occurred in spectacled eider critical habitat under the status quo (Figure 4.1-9). Alternative 3 only applies to modifying the trawl sweeps and would have no impact on the harvest of prey species in pelagic waters. Alternative 3 may reduce the potential for reducing prey availability in those areas where nonpelagic trawl gear and seabird benthic foraging overlap. These foraging areas are very limited and fishing effort is low as discussed below. Further discussion of Alternative 3 impacts on the benthic habitat that may affect availability for benthic forage species for some seaducks follows.

Spectacled eider designated critical habitat occurs in waters between St. Matthew Island and St. Lawrence Island in the Bering Sea (Figure 4.1-8). Critical habitat for the spectacled eider has been designated for areas off Norton Sound and Ledyard Bay, but no observed nonpelagic trawl fishing has occurred in these areas. Norton Sound and Ledyard Bay are so far north that nonpelagic trawl fishing is not expected in the future. In 3 of the 4 surveys of spectacled eiders since 1995, the birds have been located in the northwest corner of the critical habitat (G. Balogh, USFWS pers. comm. March 2007). The birds were located in the southeast corner in 1995 (G. Balogh, USFWS and J. Lovvorn, U. of Wyoming pers. comm. March 2007). The abundance and distribution information for spectacle eiders is more than a decade old. Anecdotal information indicates that the spectacled eiders may move to the north side of St. Lawrence Island if ice leads are not available on the south side. Newer information may provide more confidence in estimating potential impacts based on current conditions (Greg Balogh, USFWS, pers. comm. March 5, 2007).

Alternative 2 and Options 4 and 5 would prohibit nonpelagic trawling in a portion or most of the spectacled eider designated critical habitat. Alternative 2 and Option 4 would prohibit nonpelagic trawl gear in nearly the entire area of critical habitat. Option 5 would prohibit trawling only in the northeast corner of critical habitat, but may provide protection to habitat for those spectacled eiders that move to the north side of the island in search of ice leads. Alternative 2 and Option 4 may have more of an impact on the spectacled eiders since they would prohibit nonpelagic trawl gear in areas where the birds have been observed.

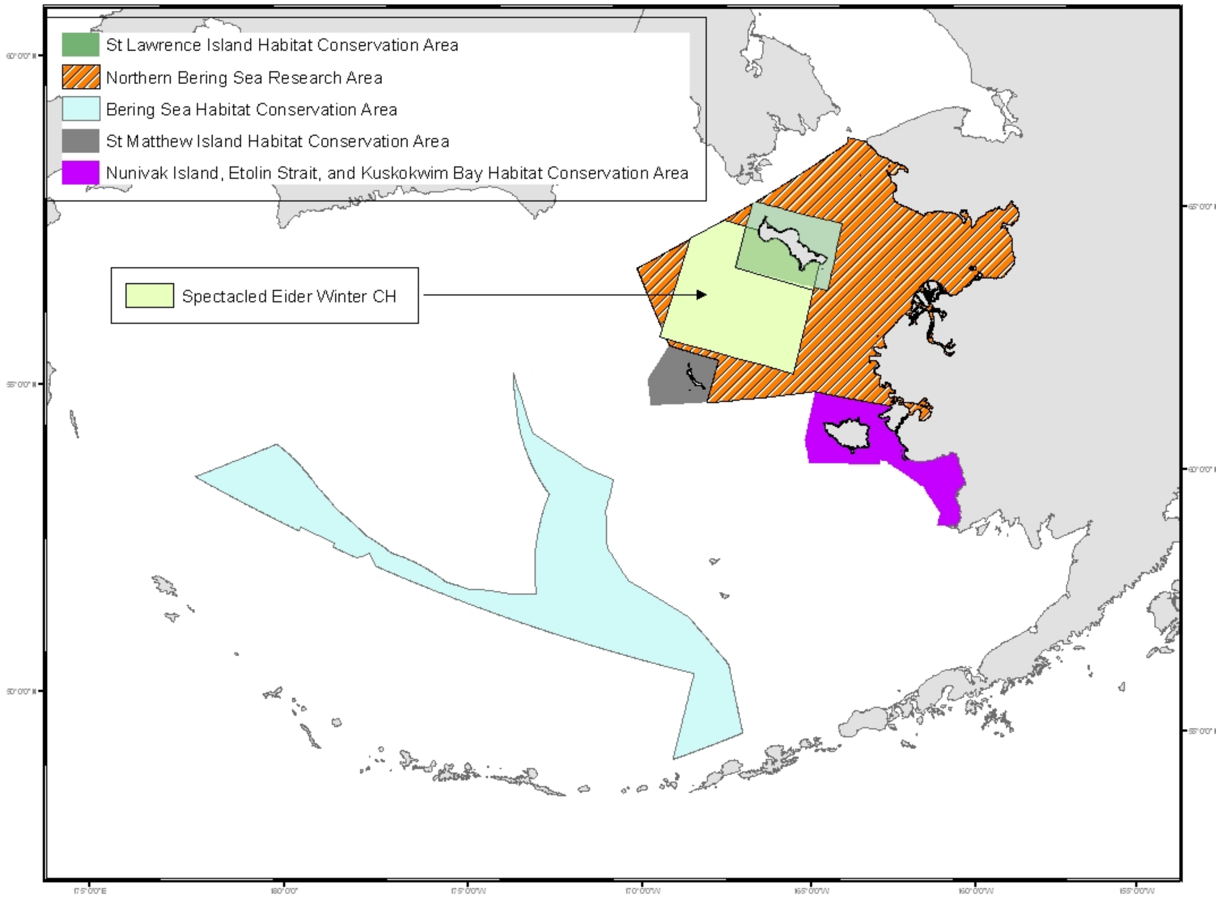


Figure 4.1-8. **Spectacled Eider Critical Habitat and Alternative and Options Closures**

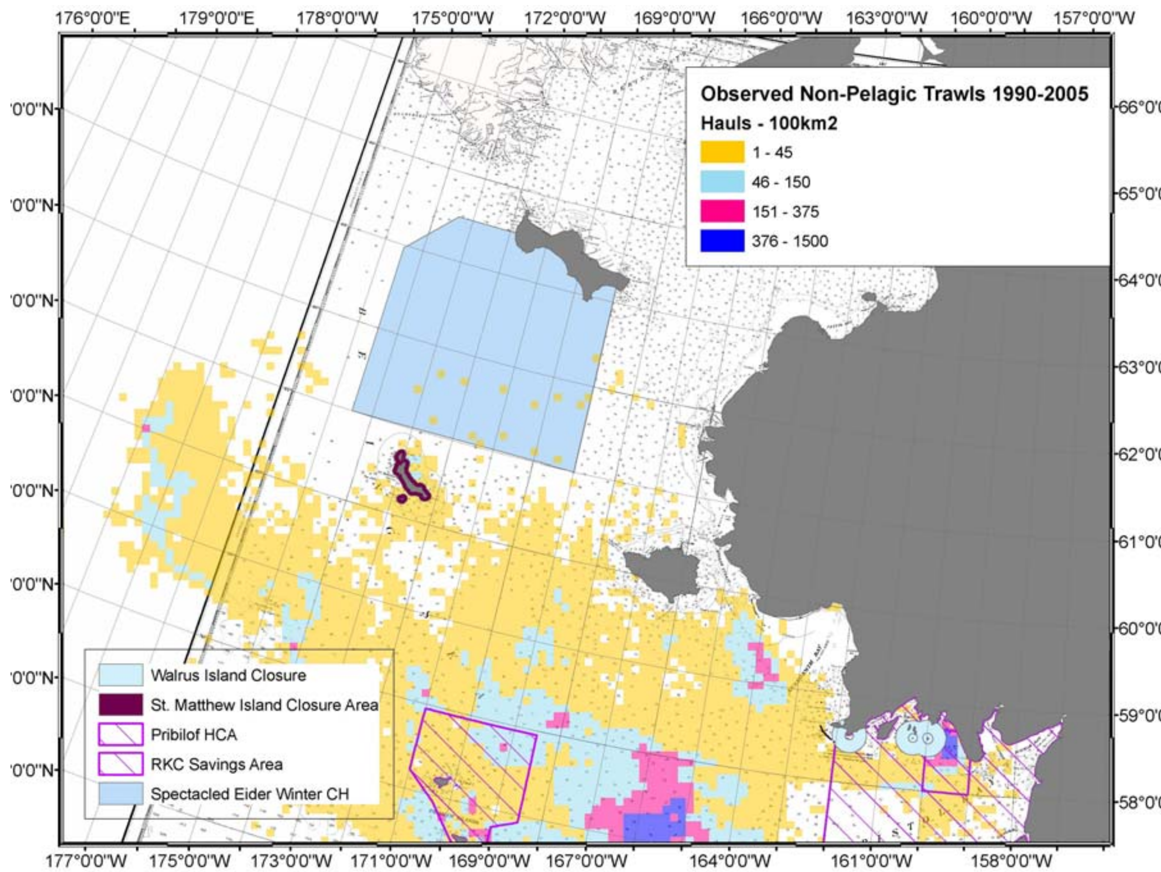


Figure 4.1-9. **Observed Nonpelagic Trawls 1990-2005 and Spectacled Eider Winter Critical Habitat (Cathy Coon, NPFMC, February 2007)**

Spectacled eiders use the open leads of ice in the winter in the critical habitat area to aggregate and to feed on benthic organisms. These ducks dive 40-70 m to eat clams (exclusively *Nuculana radiata*) in the winter critical habitat area (Lovvorn et al 2003). In the fall and summer, the birds are more dispersed (Greg Balogh, USFWS, February 2007), and vessels are likely to encounter the dispersed population only in October before the sea ice develops. Direct disturbance of the eiders are unlikely because of their dispersed presence in locations of fishing during a limited time of the year.

The important feature of the winter critical habitat area is the presence of clams available to foraging spectacle eiders (Greg Balogh, USFWS, per. comm. February 2007). Because nonpelagic trawl gear contacts the bottom, nonpelagic trawl gear in the critical habitat may have an impact on spectacle eider prey. These impacts on prey could be from uncovering the clams or from exposing the clams to the abundant predators (starfish and crabs) occurring in the area (Lovvorn, U of Wyoming, per. comm. February 2007). Very limited nonpelagic trawl gear has been observed within the spectacled eider critical habitat. Out of 280,000 trawls in a 15 year period only 14 occurred inside the critical habitat area, these all occurred in 1992 from two vessels fishing for yellowfin sole or pollock. (Figure 4.1-9) (Cathy Coon, NPFMC, pers. comm. March 2007).

Studies on the effects of nonpelagic trawl gear on soft sediment fauna have similar results for mollusks in general. Results may depend on the species studied and the type of sediment. A 3-year otter trawling study in sandy bottom of the Grand Banks showed either no effect or increased abundance in molluscs species after trawling (Kenchington, et. al 2001). Clam abundance in these studies was depressed for the first 3 years after trawling occurred. McConnaughey, Mier, and Dew (2000) studied trawling effects using the Bristol Bay area Crab and Halibut Protection Zone. They found more abundant infaunal bivalves (not including *Nuculana radiata*) in the highly fished area compared to the unfished area. This type of effect may or may not be seen for *Nuculana radiata,* depending on any similarity in life histories. In addition to abundance, clam size is of huge importance to these birds. For example, a diet of very small clams is not the same as a lower number of moderate sized clams. Handling time is very important to birds foraging in the benthos, and their caloric needs would change if a stable large clam population is converted to a very dense population of small first year clams.

Recovery of fauna after the use of nonpelagic trawl gear may also depend on the type of sediment. A study in the North Sea found biomass and production in sand and gravel sediments recovering faster (2 years) than in muddy sediments (4 years) (Hiddink, Jennings and Kaiser 2006). The recovery rate may be affected by the animal's ability to rebury itself after disturbance. Clams species may vary in their ability to rebury themselves based on grain size and whether they are substrate generalist, substrate specialist, or substrate sensitive species (Alexander, Stanton, and Dodd. 1993). It is not known which category *Nuculana radiata* or other potential spectacled eider prey may occupy. The sediment types in spectacled eider critical habitat are shown in Figure 4.1-10. The sediments occurring in the area between St. Matthew Island and St Lawrence Island appear to be primarily mud mixed with sand and gravel. If the life history of *N. radiata* is similar to bivalves studies in the North Sea, it is possible that recovery from nonpelagic trawl gear may take several years.

This potential loss of clam abundance may not be a problem for the eiders if the loss occurs in an area that is not under an ice lead used by the eiders. The location of ice leads depends on the winds that are quite variable. When the spectacled eiders were first found (1995), they were in a very southern area of their wintering habitat but have not been seen in this area since. In general, lead density appears to be high enough that the birds' distribution is determined more by the dispersion of their prey. However, the 1995 situation did not conform to that generality for a period of unknown duration (J. Lovvorn, University of Wyoming, pers. comm. March 2007).

The potential for reduced foraging success is increased if the ice leads occurs throughout critical habitat, the clams are evenly distributed and fishing activity is even distributed. A presentation by J. Grebmeier of the University of Tennessee indicates that bivalves are distributed throughout the area between St. Matthew Island and St. Lawrence Island (available from http://dels.nas.edu/prb/aon/pdfs/grebmeier.pdf).

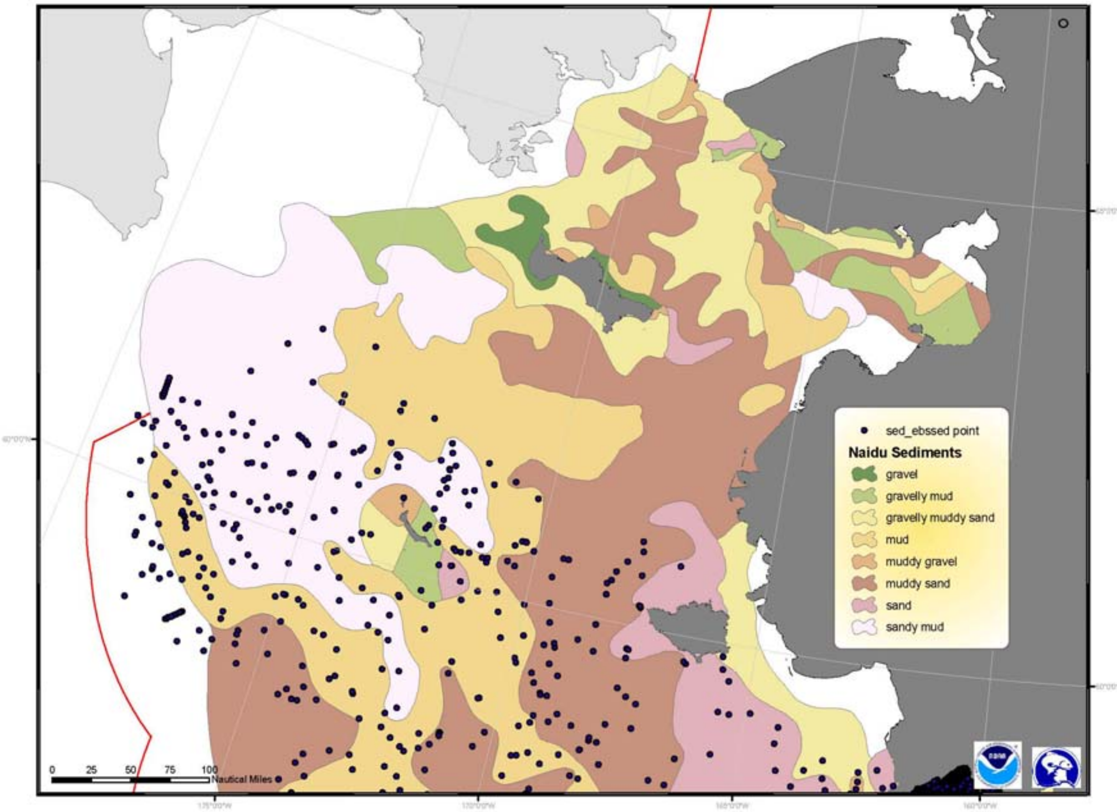


Figure 4.1-10. Sediments in Northern Bering Sea (Developed from Naidu and McConnaughey sediment data. John Olson, Habitat Conservation Division, NMFS Alaska Region, March 2007)

To understand potential effects of closing the spectacle eider critical habitat to nonpelagic trawl, one would need to consider whether trawls have had any detectable effects on the clams, how much effect per contact over an area, frequency of trawling (Craig Rose, AFSC, per. comm. February 2006), and the potential recovery time. The EFH EIS estimated the distribution of infauna effects relative to 1998 - 2002 fishing (Figure B.2-2a in NMFS 2005). Fishing would have to shift more than 200 nautical miles Northwest in comparable depths before trawl effects on infauna greater than 5% moved north of St. Matthew Island (Craig Rose per. comm. February 2007).

Under Alternative 2 and Options 4 and 5, prohibited nonpelagic trawl gear is likely more protective of spectacled eiders by preventing the disturbance of *Nuculana radiata* prey in critical habitat. Investigation of trawl effects on benthic biota showed a temporary reduction in clam numbers followed by an increase in clam numbers but not necessarily clam size (McConnaghey, Mier and Dew 2000). The recovery time for infauna species in muddy sediments in the North Sea study indicates that immediately after trawling, there may be a reduction in infauna species with several years for recovery. Since trawling is likely to occur in the summer or fall, and eider foraging needs to occur immediately following in the winter, infauna species recovery from trawling is not likely to occur quickly enough to ensure available clam abundance for foraging if the birds use ice leads occurring over a trawled area. Option 1 would be protective of any seaducks that may use benthic habitat off St. Matthew Island by preventing potential disturbance of the benthic fauna prey. Option 4 is less protective than Alternative 2 because limited experimental fishing would be allowed under an EFP. ESA consultation with the USFWS would be necessary before the issuance of any EFP if nonpelagic trawl gear within the spectacle eider critical habitat is requested.

Steller's eider have critical habitat designated in locations that have nonpelagic trawl gear observed between 1990 and 2005 (Figure 4.1-11). More intensive trawling has been observed in the southwest edge of the habitat. Out of 282,442 observed nonpelagic trawls between 1990 and 2005, 178 occurred in this Steller's eider critical habitat area. Eight vessels targeted yellowfin sole in this area during this time period (Cathy Coon, NPFMC, pers. comm. March 2007).

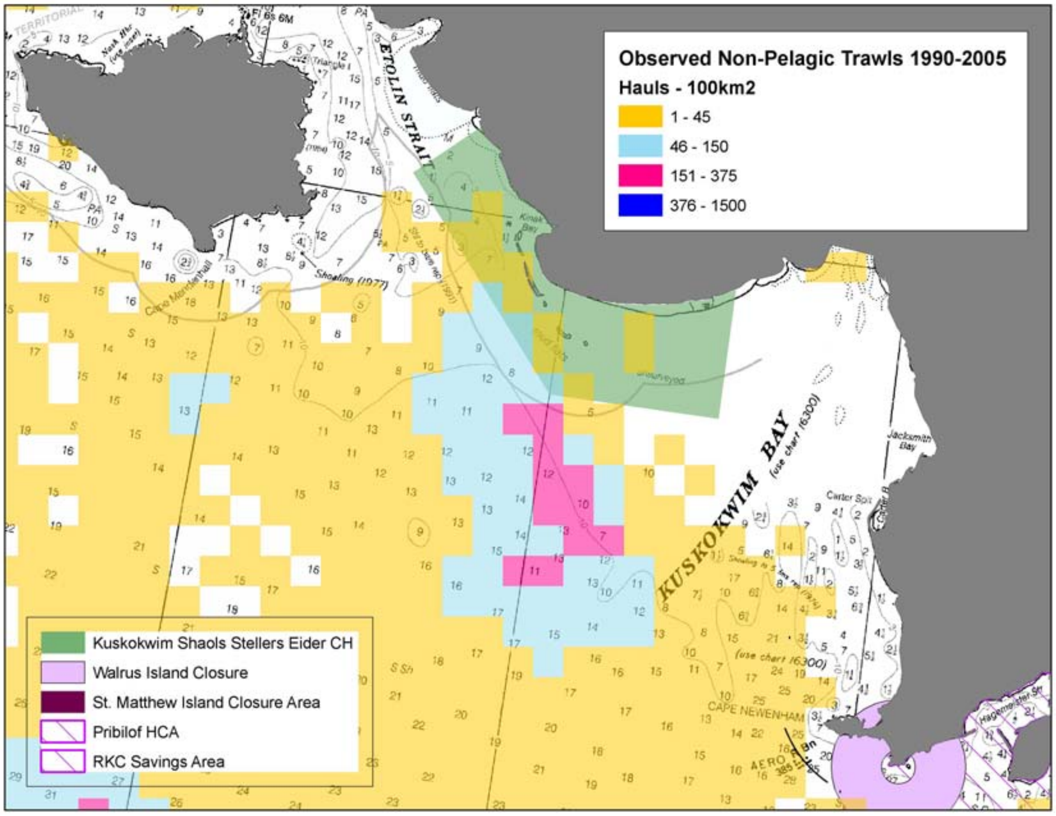


Figure 4.1-11. Steller's Eider Critical Habitat and Nonpelagic Trawl Effort (Cathy Coon, NPFMC March 2007)

Figure 4.1-12 shows the overlap of the closures under Alternative 2 and Options 2 and 3 and the Steller's eider critical habitat in the Kuskokwim area. Closure under Option 4 extends to the same area as Option 3. Alternative 2 and Option 3 would prohibit nonpelagic trawl gear in the entire Steller's eider critical habitat area. Option 4 would allow nonpelagic trawl gear only under an EFP. Depending on the location of the study in the Northern Research Area, an ESA consultation with the USFWS for any effects on Steller's eider critical habitat would be necessary before issuing an EFP. Option 4 would therefore provide some protection to critical habitat, but not as much as the closures specified under Alternative 2 and Option 3. Options 2 would include a closure in the Etolin Strait area near Kipnuk and may provide additional protection to Steller's eider critical habitat in this portion of the area. Options 1 and 5 would have no effects because they are not near this critical habitat area.

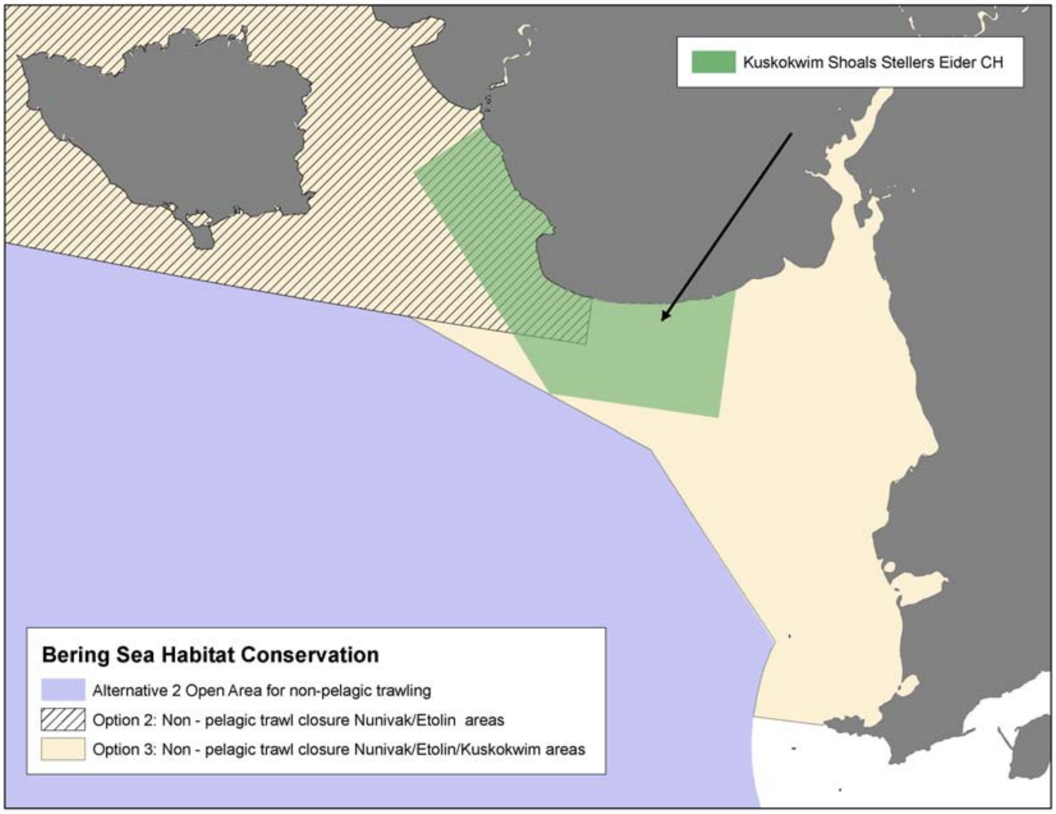


Figure 4.1-12. **Alternative 2 and options 2 and 3 Closures and Steller's Eider Critical Habitat (Cathy Coon, NPFMC March 2007)**

As described under the spectacled eider discussion above, the impacts of the closures would depend on the prey needed by the foraging ducks, the potential for recovery from trawling effects, fishing intensity, and the sediment types. Diet information specific to this critical habitat area is not available (Greg. Balogh, USFWS, pers. comm. March 2007). Studies of Steller's eider diet from other locations indicate that they eat mollusks and crustaceans in shallow waters (USFWS 2006). Figure 4.1-10 shows the sediments occurring in the critical habitat area are mud and sandy mud which may result in longer recovery times after trawling activities than gravel sediments. The water depth is less than 5 fathoms for much of the critical habitat area and it appears that much of the trawling effort is in the waters deeper than 5 fathoms (Figure 4.1-10). Steller's eiders use this critical habitat in the fall while molting so any interaction with fishing vessels may cause stress to the animal as they are unable to fly away from the vessels. The closure of all or a portion of this area would reduce the potential for vessel interaction and may be beneficial to Steller's eiders compared to status quo.

Under Alternative 3, undisturbed benthic habitat available to seabirds for prey in the Bering Sea likely would increase more than the status quo, due to the changes in the amount of contact of the trawl sweeps to the sea bed in the flatfish fisheries. This alternative would likely have a less adverse effect on benthic habitat compared to the status quo because the proposed flatfish trawl sweep modification would radically decrease the amount of surface directly contacted per hour of nonpelagic trawling (Craig Rose, AFSC pers. comm. February 2007). For spectacled eiders, this alternative would be more protective than the status quo, but less protective then Alternative 2 and Options 4 and 5 that would close all or portions of the eider critical habitat to nonpelagic trawl gear. The closure of the area around St. Matthew Island under Option 1 is likely more beneficial to benthic habitat than Alternative 3 because it would eliminate any potential for benthic disturbance in this area.

For the Steller's eiders and other birds that may depend on the benthic habitat, Alternative 3 is likely more protective of critical habitat than Alternative 1 because nonpelagic trawl gear has been observed in this area, and the gear modification would reduce potential impact on the benthic habitat compared to status quo. The nonpelagic trawl closures of all or portions of Steller's eider critical habitat under Alternative 2 and Options 2, 3, and 4 would be more protective of prey than Alternative 3, which may result in some impact, but much less than status quo. Because the area fished with nonpelagic gear is only a portion of the critical habitat and is not in the nearshore location, the potential beneficial effects of the gear modification for prey availability and benthic habitat are not likely substantial, and therefore, the effects of Alternative 3 on prey availability and benthic habitat are likely insignificant.

Any beneficial impacts of the alternatives and options for seabirds dependent on benthic habitat are likely to be isolated to those locations where trawling may no longer occur under the alternatives and options and that are used for foraging. Because the impacts are limited to these benthic habitat areas where trawling and foraging overlap, the overall impacts on prey availability and benthic habitat are not likely to be substantial. Trawling in habitat used by benthic foragers is relatively low compared to trawling efforts in other portions of the Bering Sea. Closures in areas with little or no trawling and gear modification to protect the benthic habitat are not likely to have a significant impact on the overall availability of benthic prey species and on the benthic habitat that supports these species. Therefore, the effects of Alternatives 2, 3, and Options 1 through 5 on prey availability and benthic habitat are insignificant.

4.1.6 Ecosystem

The proposed action could affect the marine ecosystem through spatial removals of fish biomass or alteration of the habitat. Three primary means of measurement of ecosystem change are evaluated here: predator-prey relationships, energy flow and balance, and ecosystem diversity. The criteria used to evaluate the significance of the effects on the ecosystem from the proposed action are provided in Table 4.1-11. The reference point for predator-prey relationships against which the criteria are compared are fishery induced changes outside the natural level of abundance or variability for a prey species relative to predator demands. The reference point for energy flow and balance will be based on bottom gear effort (qualitative measure of unobserved gear mortality, particularly on bottom organisms) and a quantitative assessment of trends in retained catch levels over time in the area. The reference point for ecosystem diversity will be a qualitative assessment whether removals of one or more species (target, non-target) effects overall species or functional diversity of the area.

Table 4.1-11 Significance thresholds for fishery induced effects on ecosystem attributes.

Effect	Criteria			
	Significantly Negative (-)	**Insignificant (I)**	**Significantly Positive (+)**	**Unknown (U)**
Predator-prey relationships	A decline outside of the natural level of abundance or variability for a prey species relative to predator demands.	No observed changes outside the natural level of abundance or variability for a prey species relative to predator demands	Increases of abundance or variability for a prey species relative to predator demands	Magnitude and/or direction of effects are unknown
Energy flow and balance:	Long-term changes in system biomass, respiration, production or energy cycling, due to removals.	No observed changes in system biomass, respiration, production or energy cycling, due to removals.	Increases in system biomass, respiration, production or energy cycling, due to lack of removals.	Magnitude and/or direction of effects are unknown
Ecosystem Diversity	Removals from area decreases either species diversity or the functional diversity outside the range of natural variability. Or loss in one or more genetic components of a stock that would cause the stock biomass to fall below minimum biologically acceptable limits	No observed changes outside the natural level for species diversity, functional diversity or genetic components of a stock.	Non-removal from the area increases the species diversity or functional diversity or improves the genetic components of a stock.	Magnitude and/or direction of effects are unknown

Fisheries can remove predators, prey, or competitors and thus alter predator-prey relationships relative to an unfished system. Fishing has the potential to impact food webs, but each ecosystem must be examined to determine how important the potential impacts to the food webs are for that ecosystem. A review of fishing impacts to marine ecosystems and food webs of the North Pacific under the status quo and other alternative management regimes was provided in the programmatic groundfish SEIS (NMFS 2004) and in Appendix C of NMFS 2007a.

Fishing may alter the amount and flow of energy in an ecosystem by removing energy and altering energetic pathways through the return of discards and fish processing offal back into the sea. From an ecosystem point of view, total fishing removals are a small proportion of the total system energy budget and are small relative to internal sources of interannual variability in production.

Fishing can alter different measures of diversity. Species level diversity, or the number of species, can be altered if fishing removes a species from the system. Fishing can alter functional or trophic diversity if it selectively removes a trophic guild member and changes the way biomass is distributed within a trophic guild. Fishing can alter genetic level diversity by selectively removing faster growing fish or removing spawning aggregations that might have different genetic characteristics than other spawning aggregations. Large, old fishes may be more heterozygous (i.e., have more genetic differences or diversity) and some stock structures may have a genetic component, thus one would expect a decline in genetic diversity due to heavy exploitation.

Section 4.3.8.6 of the EFH EIS provided an analysis of the effects of Alternative 1 (through its evaluation of EFH – Action 3 Alternatives 4 and 5 for effects on the ecosystem) (NMFS 2005). The scale of the proposed action is similar in area (Bering Sea region) and the impacts of this action to the ecosystem are similar, and the findings of the effects between the three alternatives (besides the status quo) are also similar for effects on marine ecosystems.

Predator-Prey Relationships– Insignificant effects on predator-prey relationships are expected for Alternative 2 and 3, and the options. No substantial changes would be anticipated in biomass or numbers in prey populations, nor would there be an increase in the catch of higher trophic levels, nor changes in the risk of exotic species introductions. No large changes would be expected in species composition in the ecosystem. The trophic level of the catch would not differ much from the status quo, and little change would be expected in the species composition of the groundfish community, or in the removal of top predators. Alternative 2 would likely have the same insignificant effects on predator-prey relationships as status quo because of the similar fishing locations between the alternatives and the same types of species and amounts expected to be harvested. Alternative 3 likely would have a slight positive effect on predator-prey relationships because the gear modification would results in less contact with the seafloor, and may lead to more prey availability. This effect is not likely to be observable because predator-prey relationships are not well documented in the northern portion of the Bering Sea. Therefore, Alternative 3 would have an insignificant effect on predator-prey relationships. Options 1, 2, 3, and 5 are very localized and therefore any effect on predator-prey relationships are likely to be isolated and not observable on regional basis. Additionally, Option 4 would provide additional protection by creating a Northern Bering Sea Research Closure area, which would only allow expansion of the fishing fleet with an experimental fishing or an exempted fishing permit in the northward portion of the Bering Sea that has not been fished and has undisturbed bottom habitat.

Energy Flow and Balance – The amount and flow of energy in the ecosystem under the alternatives and options would be the same as the status quo with regard to the total level of catch biomass removals from groundfish fisheries. No substantial changes in groundfish catch or discarding would be expected. Therefore the effects on energy flow and balance under Alternatives 2, 3 and the options are the same and insignificant.

Diversity – A net change in nonpelagic trawling would not occur along the Bering Sea shelf and slope by either open area approaches identified in Alternative 2 and its suboption. The gear modification identified in Alternative 3 may lessen the impact of nonpelagic trawling and therefore may be more protective of benthic habitat in general but is not expected to have observable effects on diversity. Thus, species level diversity would remain the same relative to the status quo, and is rated as insignificant for Alternatives 2 and 3. The proposed creation of a Northern Bering Sea Research Closure area under Option 4 would only allow expansion of the fishing fleet by experimental fishing or an exempted fishing permit in the northward portion of the Bering Sea that has not been fished and has undisturbed bottom habitat only after careful review and a request. Species diversity is not well documented in the northern portion of the BS. However a slight positive impact is likely to help to maintain or enhance productive fish habitat and sustain fish populations that occur in these northern areas. Structural habitat diversity supported by living substrates would provide substantial protection. Genetic diversity could increase slightly if older, more heterozygous individuals were left in the populations in those areas closed under Alternative 2 and Options 1-5. Any effect on diversity by Options 1 and 5 are not likely observable and insignificant. Effects of Options 2 and 3 also are localized and occur in areas of high waves and currents so it likely is not possible to observer changes to diversity that may be related to Options 2 and 3. The impacts of options 2 and 3 on diversity are likely insignificant.

4.2 Cumulative Effects

This section analyzed the cumulative effects of the actions considered in this environmental assessment. A cumulative effects analysis includes the effects of past, present and reasonably foreseeable future action (RFFA). The past and present actions are described in several documents and are incorporated by reference. These include the PSEIS (NMFS 2004), the EFH EIS (NMFS 2005) and the harvest specifications EIS (NMFS 2007a). This analysis provides a brief review of the RFFA that may affect environmental quality and result in cumulative effects. Future effects include harvest of federally managed fish species and current habitat protection from federal fishery management measures, harvests from state-managed fisheries and their associated protection measures, efforts to protect endangered species by other federal agencies, and other non-fishing activities and natural events.

The most recent analysis of RFFAs for the groundfish fisheries is in the Harvest Specifications EIS (NMFS 2007). No additional RFFAs have been identified for this proposed action. The RFFAs are described in the Harvest Specifications EIS section 3.3 (NMFS 2007), are applicable for this analysis, and are incorporated by reference. A summary table of these RFFAs is provided below (Table 4.2-1). The table summarizes the RFFAs identified applicable to this analysis that are likely to have an impact on a resource component within the action area and timeframe. Actions are understood to be human actions (e.g., a proposed rule to designate northern right whale critical habitat in the Pacific Ocean), as distinguished from natural events (e.g.,, an ecological regime shift). CEQ regulations require a consideration of actions, whether taken by a government or by private persons, which are reasonably foreseeable. This is interpreted as indicating actions that are more than merely possible or speculative. Actions have been considered reasonably foreseeable if some concrete step has been taken toward implementation, such as a Council recommendation or the publication of a proposed rule. Actions simply “under consideration” have not generally been included because they may change substantially or may not be adopted, and so cannot be reasonably described, predicted, or foreseen. Identification of actions likely to impact a resource component within this action’s area and time frame will allow the public and Council to make a reasoned choice among alternatives.

Table 4.2-1 Reasonable foreseeable future actions.

Ecosystem-sensitive management	• Increasing understanding of the interactions between ecosystem components, and on-going efforts to bring these understandings to bear in stock assessments, • Increasing protection of ESA-listed and other non-target species components of the ecosystem, • Increasing integration of ecosystems considerations into fisheries decision-making
Fishery rationalization	• Continuing rationalization of Federal fisheries off Alaska, • Fewer, more profitable, fishing operations, • Better harvest and bycatch control, • Rationalization of groundfish in Alaskan waters, • Expansion of community participation in rationalization programs
Traditional management tools	• Authorization of groundfish fisheries in future years, • Increasing enforcement responsibilities, • Technical and program changes that will improve enforcement and management
Other Federal, State, and international agencies	• Future exploration and development of offshore mineral resources • Reductions in United States Coast Guard fisheries enforcement activities • Continuing oversight of seabirds and some marine mammal species by the USFWS • Expansion and construction of boat harbors • Expansion of State groundfish fisheries • Other State actions • Ongoing EPA monitoring of seafood processor effluent discharges
Private actions	• Commercial fishing • Increasing levels of economic activity in Alaska’s waters and coastal zone • Expansion of aquaculture

RFFA that may affect target and prohibited species are shown in Table 4.2-1. Ecosystem management, rationalization and traditional management tools are likely to improve the protection and management of target and prohibited species and are not likely to result in significant effects when combined with the direct and indirect effects of Alternative 2 open area approach, Alternative 3 gear modification, and any of the closure Options 1-5 considered. The Council is pursuing methods of reducing salmon and halibut bycatch through FMP amendments and exempted fishing permits to allow testing of salmon and halibut excluder devices. Other government actions and private actions may increase pressure on the sustainability of target and prohibited fish stocks either through extraction or changes in the habitat or may decrease the market through aquaculture competition, but it is not clear that these would result in significant cumulative effects. Any increase in extraction of target species would likely be offset by federal management. These are further discussed in Sections 4.1.3 and 7.3 of the Harvest Specifications EIS (NMFS 2007a).

RFFA for non-specified and forage species include ecosystem-sensitive management, traditional management tools, and private actions. Impacts of ecosystem-sensitive management and traditional management tools are likely to be beneficial as more attention is brought to the taking of non-specified species in the fisheries and accounting for such takes.

RFFA for marine mammals and seabirds include ecosystem-sensitive management, rationalization, traditional management tools, actions by other federal, state and international agencies, and private actions, as detailed in Sections 8.4 and 9.3 of the Harvest Specifications EIS (NMFS 2007a). Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to marine mammals and seabirds by considering these species more in management decisions and by improving the management of the fisheries through the observer program, catch accounting, seabird avoidance measures, and vessel monitoring systems (VMS). Any action by other entities that may impact marine mammals and seabirds will likely be offset by additional protective measures for the federal fisheries to ensure ESA-listed mammals and seabirds are not likely to experience jeopardy or adverse modification of critical habitat. Direct mortality by subsistence harvest is likely to continue, but these harvests are tracked and considered in the assessment of marine mammals and seabirds. The cumulative effect of these impacts in combination with Alternative 2 is similar to the status quo and is not likely to be significant. The cumulative effect of these impacts in combination with Alternative 3 is likely to be primarily beneficial and is not likely to be significant because of the limited costs and habitat benefits of Alternative 3. Options 1, 2, 3, and 5 in combination with ecosystem management and improved fisheries management would provide additional habitat protection by small areas closures. Option 4 would provide additional habitat protections by creating a Northern Bering Sea Research Closure area, that would only allow expansion of the fishing fleet only by experimental fishing or an exempted fishing permit in the northward portion of the Bering Sea that has not been fished and has undisturbed bottom habitat only after careful review of a request. Because this area is not currently utilized and in consideration of ecosystem approaches to fisheries management, there would be a slight positive cumulative effect although the rating would still be insignificant.

RFFA for habitat and the ecosystem include ecosystem-sensitive management, rationalization, traditional management tools, actions by other federal, state and international agencies, and private actions, as detailed in Sections 10.3 and 11.3 of the Harvest Specifications EIS (NMFS 2007). Ecosystem-sensitive management, rationalization, and traditional management tools are likely to increase protection to ecosystems and habitat by considering ecosystems and habitat more in management decisions and by improving the management of the fisheries through the observer program, catch accounting, seabird and marine mammal protection, gear restrictions, and VMS. Continued fishing under the harvest specifications is likely the most important cumulative effect on EFH but the EFH EIS (NMFS 2005) has determined that this effect is minimal. The Council is also considering improving the management of non-specified species incidental takes in the fisheries to provide more protection to this component of the ecosystem. Any shift of fishing activities from federal waters into state waters would likely result in a reduction in potential impacts to EFH because state regulations prohibit the use of trawl gear in much of state waters. Nearshore impacts of coastal development and the management of the Alaska Water Quality Standards may have an impact on EFH, depending on the nature of the action and the level of protection the standards may afford. Development in the coastal zone is likely to continue, but Alaska overall is lightly developed compared to coastal areas elsewhere and therefore overall impact to EFH are not likely to be great. The BSAI Pacific cod fishery recently received Marine Stewardship Certification for ensuring harvests is conducted in a manner that maintains structure, productivity, function, and diversity of the ecosystem. Other groundfish fisheries are likely to strive for this honor to improve markets. Overall, the cumulative effects on habitat and ecosystems are beneficial but not likely to result in significant impacts in combination with the impacts from Alternative 2. The cumulative effect of these impacts in combination with Alternative 3 is likely to be primarily beneficial and is not likely to be significant because of the limited costs and habitat benefits of Alternative 3. Additionally, closures under options 1 through 5 in combination with these actions are not likely to result in substantial or observable changes to habitat or the ecosystem and therefore the impacts are cumulatively insignificant. Option 4 would provide additional habitat protections by creating a Northern Bering Sea Research Closure area, that would only allow expansion of the fishing fleet by experimental fishing or an exempted fishing permit in the northward portion of the Bering Sea that has not been fished and has undisturbed bottom habitat after careful review of a request. Since this area is not currently utilized there would be a slight positive cumulative effect although the rating would still be insignificant.

Changes in the Bering Sea due to global warming may be of a concern to the organisms that live within this environment. The release of carbon to the atmosphere from the burning of fossil fuels likely contributes to global warming. The impacts of global warning in the Bering Sea can include a rise in sea surface temperature, retreat of sea ice and acidification of marine waters. Sea surface temperature and sea ice also are discussed in Section 3.1.

The following information is from the January 9, 2007 *Federal Register* notice regarding the proposed listing of polar bears (72 FR 1064). This is a recent, general description of the potential changes in sea ice and the marine ecosystem due to Arctic warming.

> All models predict continued Arctic warming and continued decreases in the Arctic sea ice cover in the 21st century (Johannessen 2004, p. 328) due to increasing global temperatures, although the level of increase varies between models. Comiso (2005, p. 43) found that for each 1° Centigrade (C) (1.6 °F) increase in surface temperature (global average) there is a corresponding decrease in perennial sea ice cover of about 1.48 million km^2 (.57 million mi^2). Further, due to increased warming in the Arctic region, accepted models project almost no sea ice cover during summer in the Arctic Ocean by the end of the 21st century (Johannessen et al. 2004, p. 335). More recently, the [National Snow and Ice Data Center] cautioned that the Arctic will be ice-free by 2060 if current warming trends continue (Serreze [and Rigor] 2006, p. 2). The winter maximum sea ice extent in 2005 and 2006 were both about 6 percent lower than average values, indicating significant decline in the winter sea ice cover. In both cases, the observed surface temperatures were also significantly warmer and the onset of freeze-up was later than normal. In both years, onset of melt also happened early (Comiso in press). A continued decline would mean an advance to the north of the 0 °C (32 °F) isotherm temperature gradient, and a warmer ocean in the peripheral seas of the Arctic Ocean. This in turn may result in a further decline in winter ice cover. Predicted Arctic atmospheric and oceanographic changes for time periods through the year 2080 include increased air temperatures, increased precipitation and run-off, and reduced sea ice extent and duration (ACIA 2005, tables on pp. 470 and 476).
>
> A recent study of the Bering Sea, one of the most productive marine ecosystems on the planet, concluded ‘‘[a] change from arctic to subarctic conditions is underway in the northern Bering Sea’’ (Grebmeier et al. 2006, p. 1461). This is being caused by warmer air and water temperatures, and less sea ice. ‘‘These observations support a continued trend toward more subarctic ecosystem conditions in the northern Bering Sea, which may have profound impacts on Arctic marine mammal and diving seabird populations as well as commercial and subsistence fisheries’’ (Grebmeier et al. 2006, p. 1463).

With the increase in atmospheric carbon dioxide, additional carbon dioxide may be absorbed by marine waters resulting in acidification (The Royal Society 2005). The acidification may have an impact on those organisms that depend on calcium carbonate for skeletal structure, such as copepods, pteropods, and clams. Human inputs of carbon into the atmosphere may acidify marine waters, which may impact benthic organisms that depend on calcium carbonate for skeletal structure. This potential effect in combination with the potential effects of nonpelagic trawling on benthic habitat may result in cumulative adverse impacts for organisms depending directly and indirectly on the benthic habitat. The effects of acidification and ocean warming may be widespread while nonpelagic trawling effects would be limited to locations where trawling occurs. It is not possible to predict the level of impact the combined effect may have because the level of acidification and the organisms' responses are not clearly understood. No evidence exists that a significant cumulative impact is occurring at this time, but additional studies should be encouraged to provide a better understanding of future impacts.

Considering the direct and indirect impacts of the proposed action when added to the impacts of past and present actions previously analyzed in other documents that are incorporated by reference and the impacts of the reasonably foreseeable future actions listed above, the cumulative impacts of the proposed action are determined to be not significant.

4.3 Environmental Analysis Conclusions of the Alternatives

The significance of impacts of the actions analyzed in this EA was determined through consideration of NEPA, NOAA Administrative Order (NAO) 216-6, Sec. 6.01b and 40 CFR 1508.27. Significance was determined by considering the contexts (geographic, temporal, and societal) in which the action would occur, and the intensity of the effects of the action. The evaluation of intensity included consideration of the magnitude of the impact, the degree of certainty in the evaluation, the cumulative impact when the action is related to other actions, the degree of controversy, and consistency with other laws.

For these actions, the setting is the groundfish fisheries of the BS. Any effects of these actions are limited to these areas. The effects of these actions on society within these areas are on individuals directly and indirectly participating in these fisheries and on those who use the ocean resources. Because these actions may result in the protection of a present and future resource, these actions may have impacts on society as a whole or regionally.

Intensity: Listings of considerations to determine intensity of the impacts are in 40 CFR 1508.28(b) and in the NOAA Administrative Order 216-6, Section 6. Each consideration is addressed below in order as it appears in the NMFS Instruction 30-124-1, dated July 22, 2005, Guidelines for Preparation of a FONSI. The range of the alternatives provides the focus of the responses to the questions.

1. Can the proposed action be reasonably expected to jeopardize the sustainability of any target species that may be affected by the action? *No. No significant adverse impacts were identified for Alternatives 2, 3, or the options. No changes in overall harvest of target species are expected with any of the alternatives in the proposed action (EA Section 4.1.3).*

2. Can the proposed action be reasonably expected to jeopardize the sustainability of any non-target species or prohibited species? *No. Potential effects of Alternatives 2, 3, or the options on non-target/ prohibited species were expected to be insignificant and similar to status quo because no overall harvest changes to target species were expected (EA Section 4.1.5).*

3. Can the proposed action be reasonably expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs? *No. No significant adverse impacts were identified for Alternatives 2, 3, or the options. Alternative 2 and Options 1-5 provide additional protection to areas in the Bering Sea that have not been fished and have undisturbed bottom habitat, or are identified as important nearshore areas that need protection. No significant effects were expected on ocean or coastal habitat or EFH by Alternatives 2, 3, or the options. (EA Section 4.1.2).*

4. Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety? *No. Public health and safety will not be affected in any way not evaluated under previous actions or disproportionately as a result of the proposed action. The proposed action for Alternative 2 and Options 1-5 will not change fishing methods (including gear types), timing of fishing or quota assignments to gear groups, which are based on previously established seasons and allocation formulas in regulations. Alternatives 3 and Options1-5 would change some fishing methods for the flatfish nonpelagic trawl fleet, but would not have a significant adverse impact on public health or safety.*

5. Can the proposed action be reasonably expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species? *No. The only ESA-listed animals that may be impacted by the action are the western DPS of Steller sea lion and spectacled and Steller's eiders. The proposed action would not change the Steller sea lion protection measures, ensuring the action is not likely to result in adverse effects not already considered under previous ESA consultations for Steller sea lions and their critical habitat. Portions of critical habitat for Steller's and spectacled eiders would receive additional protection with implementation of closure areas or a research area north of St. Matthew Island under Alternative 2 and Options 1-5 (EA Section 4.1.6).*

6. Can the proposed action be expected to have a substantial impact on biodiversity and ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)? *No. No significant adverse impacts were identified for Alternatives 2, 3, or the options. No significant effects were expected on biodiversity, the ecosystem, marine mammals, or seabirds (EA Section 4.0).*

7. Are social or economic impacts interrelated with natural or physical environmental effects? *Socioeconomic impacts of this action are limited to the prohibition of nonpelagic trawling in certain locations in the Bering Sea. Much of the closure areas are locations that have not been previously trawled; and therefore, the entire action would impact a small portion of the overall revenue estimated for the nonpelagic trawl fisheries. Beneficial social impacts are likely for those who depend on subsistence resources supported by bottom habitat protected by this action. No significant adverse impacts were identified for Alternatives 2, 3, or the options for social or economic impacts interrelated with natural or physical environmental effects (EA Section 4.1.4 and Sections 5 and 6).*

8. Are the effects on the quality of the human environment likely to be highly controversial? *No. This action is limited to the Bering Sea region, an area historically of value to the nonpelagic trawl fleet. Development of the proposed action has involved participants from the scientific and fishing communities. No issues of controversy were identified in the process (EA Section 1.0).*

9. Can the proposed action be reasonably expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers, essential fish habitat, or ecologically critical areas? *No. This action takes place in the geographic area of the Bering Sea. The land adjacent to this marine area may contain archeological sites of native villages. This action would occur in adjacent marine waters so no impacts on these cultural sites are expected. The marine waters where the fisheries occur contain ecologically critical areas. Effects on the unique characteristics of these areas are not anticipated to occur with this action because of the amount of fish removed by vessels are within the total allowable catch (TAC) specified harvest levels and the alternatives and options provide protection to EFH and ecologically critical nearshore areas (EA section 2.0).*

10. Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks? *No. The potential effects of the action are well understood because of the fish species, harvest method involved, and area of the activity. For the Steller sea lions, enough research has been conducted to know about the animals' abundance, distribution, and feeding behavior to determine that this action is not likely to result in population effects (EA Section 4.1.6). The potential impacts of bottom trawling on habitat also are well understood as described in the EFH EIS (NMFS 2005) (EA Section 3.0).*

11. Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts? *No. Beyond the cumulative impact analyses in the 2006 and 2007 harvest specifications EA and the Groundfish Harvest Specifications EIS, no other additional pas or, present cumulative impact issues were identified. Reasonably foreseeable future impacts in this analysis include potential effects of global warming (EA Section 4.2). The combination of effects from the cumulative effects and this proposed action are not likely to result in significant effects for any of the environmental component analyzed and are therefore not significant.*

12. Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources? *No. This action will have no effect on districts, sites, highways, structures, or objects listed or eligible for listing in the National Register of Historic Places, nor cause loss or destruction of significant scientific, cultural, or historical resources. Because this action is in nearshore waters to 200 nm at sea, this consideration is not applicable to this action (EA Section 1.0).*

13. Can the proposed action be reasonably expected to result in the introduction or spread of a nonindigenous species? *No. This action poses no effect on the introduction or spread of nonindigenous species into the Bering Seas beyond those previously identified because it does not change fishing, processing, or shipping practices that may lead to the introduction of nonindigenous species.*

14. Will the proposed action likely establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration? *No. No decisions in principle about future considerations are part of this action because the criteria previously used to examine habitat conservation of the Bering Sea were applied to this action. Pursuant to NEPA for all future action, appropriate environmental analysis documents (EA or EIS) will be prepared to inform the decision makers of potential impacts to the human environment and to implement mitigation measures to avoid significant adverse impacts.*

15. Can the proposed action be reasonably expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment? *No. This action poses no known violation of Federal, State, or local laws or requirements for the protection of the environment. The proposed action would be conducted in a manner consistent, to the maximum extent practicable, with the enforceable provisions of the Alaska Coastal Management Program within the meaning of Section 30(c)(1) of the Coastal Zone Management Act of 1972, and its implementing regulations*

16. Can the proposed action be reasonably expected to result in adverse impacts, not otherwise identified and described above? *No. Beyond the analysis in the 2006 and 2007 harvest specifications EA and the Groundfish Harvest Specifications EIS (NMFS 2007a), no additional direct, indirect, or cumulative impacts have been identified that would accrue from this action.*

5.0 REGULATORY IMPACT REVIEW

5.1 Introduction

This Regulatory Impact Review (RIR) describes the costs and benefits of a suite of alternatives to the status quo to evaluate potential new fishery management measures to protect Essential Fish Habitat (EFH) in the EBS. The analysis will tier off of the 2005 EFH Environmental Impact Statement and will consider as alternatives, open and closed areas, and gear modifications. The purpose of the analysis is to consider practicable and precautionary management measures to reduce potential adverse effects of fishing on EFH and to support the continued productivity of managed fish species.

A benefit/cost framework is the appropriate way to evaluate the relative economic and socioeconomic merits of the alternatives under consideration in this Regulatory Impact Review (RIR). When performing a benefit/cost analysis, the principal objective is to derive informed conclusions about probable net effects of each alternative under consideration (e.g., net revenue impacts). However, in the present case, necessary empirical data (e.g., operating costs, capital investment, debt service, opportunity costs) are not available to the analysts, making a quantitative net benefit analysis impossible. Furthermore, empirical studies bearing on other important aspects of these alternative actions (e.g., non-use value, domestic and international seafood demand) are also unavailable, and time and resource constraints prevent their preparation for use in this analysis.

Nonetheless, the following RIR uses the best available information and quantitative data, combined with accepted economic theory and practice, to provide the fullest possible assessment (both quantitative and qualitative) of the potential economic benefits and presumptive costs attributable to each alternative action. Based upon this analysis, conclusions are offered concerning the likely economic and socioeconomic effects of each of the alternatives. This analytical approach is consistent with applicable policy and established practice for implementing Executive Order (EO) 12866.

5.2 What is a Regulatory Impact Review?

The preparation of an RIR is required under Presidential Executive Order (E.O.) 12866 (58 FR 51735: October 4, 1993). The requirements for all regulatory actions specified in E.O. 12866 are summarized in the following Statement from the E.O.:

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

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

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

5.3 Statutory Authority

Under the Magnuson-Stevens Act, the United States has exclusive fishery management authority over all marine fishery resources found within the Exclusive Economic Zone (EEZ), which extends between 3 nm and 200 nm from the baseline used to measure the territorial sea. The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the Regional Councils. In the Alaska Region, the Council has the responsibility for preparing Fishery Management Plans (FMPs) for the marine fisheries it finds that require conservation and management and for submitting their recommendations to the Secretary. Upon approval by the Secretary, the National Marine Fisheries Service (NMFS) is charged with carrying out the Federal mandates of the Department of Commerce with regard to marine and anadromous fish. The groundfish fisheries in the EEZ off Alaska are managed under the FMP for the Groundfish Fisheries of the Gulf of Alaska (GOA) and the FMP for the Groundfish Fisheries of the Bering Sea and Aleutian Island (BSAI). The crab fisheries in the EEZ off Alaska are managed under the FMP for the Crab Fisheries of the BSAI. The scallop fisheries in the EEZ off Alaska are managed under the FMP for the Scallop Fisheries off Alaska. The salmon fisheries in the EEZ off Alaska are managed under the FMP for Salmon Fisheries off Alaska. The halibut fishery is managed by the International Pacific Halibut Commission (IPHC), which was established by a Convention between the governments of Canada and the United States. The IPHC's mandate is research on and management of the stocks of Pacific halibut within the Convention waters of both nations.

Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of Federal laws and regulations. In addition to the Magnuson-Stevens Act, the most important of these are the Northern Pacific Halibut Act of 1982 (Halibut Act), the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), EO (EO 12866), the Regulatory Flexibility Act (RFA), the Migratory Bird Treaty Act of 1918, and EO 13186 on the Responsibilities of Federal Agencies to Protect Migratory Birds.

5.4 Purpose and Need for Action

The purpose of this analysis is to evaluate impacts of alternatives to further conserve fish habitat in the EBS. In February 2005, the Council took final action on the EFH EIS (NMFS 2005) to adopt a suite of measures to conserve EFH in the Gulf of Alaska (GOA) and Aleutian Islands (AI) from potential impacts due to fishing. Those measures primarily addressed the impacts of nonpelagic trawl gear. At the time of final action, the Council took no action to implement additional conservation measures in the EBS, as the analysis found such additional measures were neither required by law, nor necessary at that time. Further, the alternatives considered for Bering Sea habitat conservation required additional 'fine-tuning' before they could be considered as practicable measures. Alternatives to modify nonpelagic trawl gear had not been sufficiently well researched to understand the scale of likely beneficial effects on habitat. The alternatives for open areas had left out historically important and lucrative fishing grounds, and included rotating closures that were found to have questionable merit. So, to address these issues, the Council notified the public that it planned to take a more focused examination of potential measures to further conserve fish habitat, including EFH, in the EBS by initiating a separate analysis that would tier off of the EFH EIS. After several meetings deliberating on this issue, the Council decided to focus on reducing the effect of nonpelagic trawling. The reason for this focus is that nonpelagic trawling uses gear that fishes hard on the bottom, nonpelagic trawling had high long term effect indices (LEI) on habitat based on the EIS evaluation, the nonpelagic trawl fishery is widely distributed (i.e., a large footprint), and effort could potentially increase dramatically, pending future increases in total allowable catch (TAC) limits for flatfish species. This analysis provides an examination of a range of reasonable alternatives to conserve fish habitat in the EBS by reducing potential impacts of nonpelagic trawling.

Analysis beyond the EFH EIS is needed to consider measures for the conservation of fish habitat in the Bering Sea. New information on potential nonpelagic trawl gear modifications to protect bottom habitat has become available since the EFH EIS and allows for a gear modification alternative that could not have been considered in the EFH EIS. The Council wishes to protect fish habitat in support of commercial fisheries and subsistence activities in the EBS, ensuring consistency with national standard 8 of section 301 of the Magnuson-Stevens Fishery Conservation and Management Act. Thus, evaluation of additional measures, and possible implementation of them, provides a precautionary approach in light of incomplete knowledge of fish dependence upon habitat, and the effects of fisheries on that habitat. The problem statement adopted by the Council for this analysis is provided below:

Problem Statement: The Council intends to evaluate potential new fishery management measures to protect Essential Fish Habitat (EFH) in the Bering Sea. The analysis will tier off of the 2005 EFH Environmental Impact Statement and will consider as alternatives open and closed areas and gear modifications. The purpose of the analysis is to consider practicable and precautionary management measures to reduce potential adverse effects of nonpelagic trawl fishing[2] on EFH and to support the continued productivity of Council managed species. Any new management measures will be developed in consideration of local community use.

5.5 Alternatives Considered

A detailed presentation of the alternatives, including a thorough discussion of their development (e.g., background information on both the open/closed area, and gear modification approaches) appears in Section 2.1 of the EA (including Figures of areas). A discussion of alternatives considered for analysis, but rejected, is provided in Section 2.3 of the EA. Those carried forward for analysis include:

Alternative 1: Status quo. No additional measures would be taken to conserve benthic habitat.

Alternative 2: **Preferred Alternative--**Open area approach. This alternative would prohibit use of nonpelagic trawl gear outside of a designated 'open area.' Use of nonpelagic trawl gear would be prohibited in the northernmost shelf area and the deepwater basin area of the Bering Sea.

Suboption: A new open area approach is added that defines the northern boundary. The resulting "wedge", as described by the attached map, would move a portion of the northern boundary northward, between Nunivak and St. Matthew Islands to 61° N.

Alternative 3: Gear modifications. This alternative would require gear modifications for all nonpelagic trawl gear used in flatfish target fisheries. Specifically, this alternative would require discs on nonpelagic trawl sweeps to reduce seafloor contact and/or increase clearance between the sweep and substrate. A performance standard of at least 2.5 inches elevation of the sweep from the bottom would be required. This alternative is limited to the flatfish fisheries because testing of the modified gear has been limited to only the flatfish target and the effects on the ability to catch other target species with modified gear is unknown.

The options below could be selected in combination with any alternative(s) and more than one option can be chosen.

Option 1. **Preferred Option -** Close the area around St. Matthew Island to use of nonpelagic trawl gear. This area would be configured such that the area near St. Matthew Island is closed to conserve blue king crab habitat

Option 2. Close an area to nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Strait. This area would be configured such that the area around Nunivak Island and Etolin Strait is closed to conserve nearshore habitats, and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas.

[2] Staff added the term 'nonpelagic trawl' in the draft problem statement to make it clear to the public that the Council's intent with this analysis was to consider only alternatives to address impacts of nonpelagic trawl gear. See section 2.1 for detailed explanation of process of alternative development.

Option 3. **Preferred Option** - Close an area to use of nonpelagic trawl gear around Nunivak Island, with the southern border extending along the nearshore portion of Etolin Strait and Kuskokwim Bay. This area would be configured such that the area in southern Etolin Strait and Kuskokwim Bay is closed to conserve nearshore habitat and minimize potential interactions with community use and subsistence fisheries taking place in the nearshore areas. The boundaries of this closure area are the result of negotiations by representatives of the flatfish industry and coastal communities.

Option 4: **Preferred Option** - Close an area to use of nonpelagic trawl gear from the northern boundary line of the open area under Alternative 2, stretching from the boundary of the Russian EEZ around the southern end of St. Matthew Island and around the southern portion of Nunivak Island and across Kuskokwim Bay to Cape Newenham and designate it as the Northern Bering Sea Experimental Fishing Area. The Council requests the NMFS Alaska Fisheries Science Center design an adaptive management experiment in the closed northern area described under this option, to study the effects of nonpelagic trawl gear in previously untrawled areas. The study should include open and closed areas and appropriate monitoring to study fishing impacts on benthic communities and ecological proceses, particularly as these relate to juvenile C. opilio crab. The adaptive management experiment design will include review by the SSC. NMFS will provide the draft adaptive management experimental design to the Council for review within 18 months following the Federal Register publication of the final rule for this action.

Suboption: A new closure is added that defines the northern boundary. The resulting “wedge”, as described by Figure 2.2-8, would move a portion of the northern boundary northward between Nunivak and St. Matthew Islands to 61° N.

Option 5: **Preferred Option** - Close the area to use of nonpelagic trawl gear around St. Lawrence Island. This area would be configured such that the area around St. Lawrence Island is closed to nonpelagic gear to conserve blue king crab habitat and minimize potential interactions with community use and subsistence fisheries taking place in nearshore areas.

5.6 Description of the Fisheries

5.6.1 Existing Conditions in the Fishery

This section describes the conditions in the BSAI groundfish fishery under the current management regime. Because the status quo alternative would continue the current management structure, its retention is unlikely to result in substantial change in the fisheries. This section also provides much of the status quo baseline that is used to assess the expected effects of Amendment 80 alternatives under consideration. Beginning with a brief description of the current management regime, this section provides a description of the subject fisheries. A more detailed description of the H&G trawl CP sector is provided. Product markets and estimated historic first wholesale prices are described. Finally, a brief description of community dependence, and a description of the Western Alaska Community Development Quota program are provided.

5.6.1.1 Management of the Fisheries

The BSAI management area encompasses the U.S. EEZ of the EBS and that portion of the North Pacific Ocean adjacent to the Aleutian Islands west of 170º W. longitude. The northern boundary of the Bering Sea is the Bering Strait, defined as a straight line from Cape Prince of Whales to Cape Dezhneva, Russia.

The fishing year for the trawl fisheries under consideration in this action is divided, by regulation, into three parts: the ‘A’ season runs from January 20 through April 1; the ‘B’ season from April 1 through June 10; and finally, the ‘C’ season is open June 10 through November 1.

Both the trawl and non-trawl fisheries are prosecuted under a single TAC. The TAC specifications for the primary allocated species, and PSC specifications, are recommended by the Council at its December meeting, for the following two fishing years. The recommendations are based on Stock Assessment Fishery Evaluation reports prepared by Council BSAI Groundfish Plan Team. The Secretary, after receiving recommendations from the Council, determines up to 2 years of TACs and apportionments. A portion (4.3 percent to 15 percent) of the TAC limit for sablefish caught with trawl gear, arrowtooth flounder, BS Greenland turbot, and those species not allocated to the CDQ Program are placed in a reserve.

The reserve is used for (a) correction of operational problems is the fishing fleets, to promote full and efficient use of groundfish resources, (2) adjustments of species TACs according to changing conditions of stocks during fishing year, and (3) apportionments. While originally set at 7.5 percent, Congress increased the pollock CDQ allocation to 10 percent in 1998, as part of the American Fisheries Act. The percentage of other catch limits allocated to the CDQ Program (as CDQ reserves) is determined by: the BSAI Crab Rationalization Program (10 percent of crab species, except for Norton Sound red king crab, which is 7.5 percent (70 FR 10174, March 2, 2005); the BSAI FMP for all other groundfish and prohibited species (7.5 percent, except 20 percent for fixed gear sablefish); and, 50 CFR 679 for halibut (20 percent to 100 percent, depending on management area). The initial TAC (ITAC) for each species is the remainder of the TAC after the subtraction of these reserves.

Since 1994, the Atka mackerel quota has been split during the annual specifications into three separate area allocations, based on the most recent biomass estimates. The three areas are the Bering Sea/eastern Aleutian Islands (Bering Sea and Area 541), the central Aleutian Islands (area 542), and the western Aleutian Islands (Area 543). In 1999, Area 542 and Area 543 were further split into critical habitat and non-critical habitat areas, due to Endangered Species Act (ESA) Steller sea lion concerns. In addition, up to 2 percent of the Atka mackerel TAC in the eastern Aleutian Islands District/Bering Sea subarea may be allocated to vessels using jig gear in the areas noted above. In 2005, the Council recommended and NMFS approved allocating 1 percent to vessels using jig gear.

A Federal groundfish license is required for vessels participating in any Federal BSAI groundfish fishery, other than fixed gear sablefish (which is regulated through IFQs). The LLP limits the number, size, and specific operation of vessels that may be deployed in certain groundfish fisheries under the Council's jurisdiction. For a person to qualify for an LLP permit, the person must own a vessel that has documented harvests of groundfish during two periods, the general qualification period and the endorsement qualification period. In addition to the area/species endorsements, the LLP license is designated for use on either a catcher/processor, or catcher vessels, and for a specific vessel length category. LLP licenses may be transferred subject to the vessel designations and area/species endorsements.

Table 5.6-1 shows the number of LLP licenses issued for the BSAI by trawl sector. There are 64 trawl licenses designated as catcher/processors that are endorsed for the BSAI area. Twenty of these licenses are currently registered to AFA trawl CP vessels operating in the BSAI. The remaining 44 trawl CP licenses are either currently registered to H&G Trawl CP vessels that currently operate in the BSAI and/or GOA, or they are registered to other vessels, but are not being used in either area. Of the 44 H&G Trawl CP licenses, 22 also have Gulf of Alaska endorsements. There are 152 trawl licenses designated for catcher vessels that are endorsed for BSAI area. One hundred and two of these licenses are currently registered to AFA trawl catcher vessels, leaving 50 licenses that are registered to non-AFA trawl catcher vessels.

Table 5.6-1 BSAI trawl LLP licenses by trawl sector

Sector	BS only LLP	AI only LLP	BSAI LLP	Total License
AFA Trawl CP	1	0	19	20
H&G Trawl CP	6	1	37	44
Total Trawl CP Licenses	**7**	**1**	**56**	**64**
AFA Trawl CV	59	0	43	102
Non-AFA Trawl CV	44	2	4	50
Total Trawl CV Licenses	**103**	**2**	**47**	**152**

Source: NMFS Groundfish LLP database. Current as of July 13, 2005.

Inseason management credits both directed harvest and incidental harvest against the TAC for groundfish species, to ensure that they are not overharvested. The directed fishery for any groundfish species is closed when the directed fishing amount is harvested, reserving the remainder of the TAC for incidental catch in other groundfish fisheries. NOAA Fisheries allows vessels to retain incidental catch of groundfish species (if the TAC has not been reached) taken in other directed fisheries that are open, up to the maximum retainable amount (MRA). If the fishery is closed to directed fishing and the TAC is reached, NOAA Fisheries issues a prohibition on retention for that species, and all additional catch of that species must be discarded. If a fishery is closed to directed fishing for one of these species, the ABC has been taken, and the harvest is approaching the overfishing level, then NOAA Fisheries could close target fisheries that have the potential to incidentally harvest that species.

Pacific halibut, Pacific herring, Pacific salmon and steelhead, king crab, and Tanner crab are prohibited species and, as such, must be avoided while fishing for groundfish. Incidental catch of the prohibited species must be returned to the sea with a minimum of injury, except when their retention is authorized by other applicable law. PSC is apportioned between trawl and non-trawl fisheries. The halibut PSC limit for trawl gear is currently 3,675 mt. The PSC limits for *C. bairdi* and *C. opilio* crab are dependent upon the abundance of these species of crab, while the PSC limit for red king crab is dependent on the abundance and spawning biomass of red king crab.

All vessels participating in the groundfish fisheries are required to retain all catch of pollock and Pacific cod, when directed fishing for those species is open, regardless of gear type employed and target fishery. When directed fishing for an IR/IU species is prohibited, retention of that species is required only up to any maximum retainable amount in effect for that species. No discarding of whole fish of these species is allowed, either prior to, or subsequent to that species being brought on board the vessel, except as provided for in the regulations. At-sea discarding of any processed product, derived from any IR/IU species, is also prohibited, unless required by other regulations. The no action alternative also includes the revision of the BSAI pollock MRA accounting interval, which was implemented on June 2004. Under this revision, the enforcement of pollock MRAs in the BSAI was modified from ‘instantaneous’ enforcement (i.e., in compliance at anytime during a fishing trip), to enforcement at the time of offload.

All IR/IU species caught in the BSAI must be either: 1) processed at sea, subject to minimum product recovery rates, or 2) delivered in their entirety to onshore processing plants for which similar processing requirements are implemented by State regulations.

5.6.2 Description of BSAI Groundfish Fisheries

In the BSAI, the rock sole, flathead sole, and ‘other’ flatfish fisheries are almost exclusively prosecuted by catcher/processors using nonpelagic trawl gear. Although the fisheries are open to other vessel categories and gear types, very few rock sole, flathead sole, and/or ‘other’ flatfish are harvested by other types of vessels. Vessels participating in these fisheries generally fish for rock sole during the roe season, until the first seasonal halibut bycatch cap is reached. Generally, after the rock sole roe fishery closes, these vessels shifted to several different targets; notably Atka mackerel, yellowfin sole, and Pacific cod. Vessels with the proper licenses and endorsements may also go into the GOA to fish for rex sole.

The directed Atka mackerel fishery is a nonpelagic trawl fishery that occurs on the narrow portion of the continental shelf in the Eastern Bering Sea (EBS) and in the passes between the islands of the central and western Aleutians.

Thirty-five species of rockfish (genus *Sebastes* and *Sebatolobus*) occur in the BSAI, of which eight are commercially important at present. In recent years, the only BSAI rockfish species open for directed fishing has been the Pacific ocean perch complex, which includes Pacific ocean perch, sharpchin, northern, shortraker, and rougheye rockfish. In the BSAI, directed fishing for these species is mostly conducted by catcher/processors, using nonpelagic trawl gear, or by catcher vessels using hook and line gear.

Provided below are detailed descriptions of the fisheries targeting the primary species that would be affected under the proposed action. Generally, data are presented for each BSAI groundfish fishery for 1995 through 2006. Catch data, although limited, are reported for earlier years, in order to provide a more complete historical perspective on catch. Catch data for each fishery are provided by gear type.

The most recent descriptions of the BSAI groundfish fisheries are from the *Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions* (NPFMC 2005). Please see this document for further details on the groundfish fisheries in the BSAI.

5.6.2.1 Yellowfin Sole Fishery

The yellowfin sole is one of the most abundant flatfish species in the EBS and is the target of the largest flatfish fishery in the United States. The resource inhabits the EBS shelf and is considered one stock. Abundance in the Aleutian Islands region is negligible.

The directed fishery typically occurs from spring through December. Yellowfin sole have been caught with nonpelagic trawls on the Bering Sea shelf, since the fishery began in 1954. Yellowfin sole were overexploited by foreign fisheries between 1959 and 1962, when catches averaged 404,000 mt, annually. As a result of reduced stock abundance, catches declined to an annual average of 117,800 mt, from 1963 through 1971, and further declined to an annual average of 50,700 mt, from 1972 through 1977. The lower yield in this latter period was partially due to the discontinuation of the Soviet fishery. In the early 1980s, after the stock condition had improved, catches again increased, reaching a recent peak of over 227,000 mt in 1985. During the 1980s, there was also a major transition in the characteristics of the fishery. Yellowfin sole were traditionally taken exclusively by foreign fisheries and these fisheries continued to dominate through 1984. However, U.S. fisheries developed rapidly during the 1980s, in the form of joint ventures, and during the last half of the decade began to dominate and then take all of the catch, as the foreign fisheries were phased out of the EBS. Since 1990, only domestic harvesting and processing has occurred.

The 1997 catch of 181,389 mt was the largest since the fishery became completely domestic; then decreased to 101,201 mt in 1998. The 2006 catch totaled 97,954 mt. The yellowfin sole harvest in 2006 has been constrained by several closures due to the attainment of halibut PSC and TAC limits (April 20-May 20, June 8-July 19, June 19-July 19, and August 8-December 31). Table 5.6-2 provides total catch of yellowfin sole in the BSAI, by gear-type, from 1995 through 2006.

Table 5.6-2 Total catch of yellowfin Sole in the BSAI by Gear Type, in mt, 1995-2006.

Year	Trawl	Hook and Line	Pot	Total
1995	124,611	60	81	124,752
1996	129,254	148	256	129,658
1997	181,081	237	71	181,389
1998	100,783	260	111	101,154
1999	67,099	150	71	67,320
2000	83,491	288	70	83,849
2001	62,731	618	46	63,395
2002	72,391	570	38	72,999
2003	74,119	573	90	74,782
2004	67,565	596	77	68,238
2005	93,601	706	75	94,382
2006	97,454	454	46	97,954

Source: NMFS Weekly Production and Observer Reports.

Table 5.6-3 Number of vessels with retained catch (mt) of yellowfin sole for all sectors from 1995 to 2005.

Year	Sector	Number of Vessels	Retained tons	Percent of total
1995	Non-AFA Trawl CPs	30	46,558	60%
	AFA Trawl CPs	19	14,558	19%
	AFA CVs	42	10,159	13%
	All other sectors	55	6,841	9%
	Total	**146**	**78,117**	**100%**
1996	Non-AFA Trawl CPs	**28**	**48,520**	**61%**
	AFA Trawl CPs	19	21,687	27%
	AFA CVs	28	5,906	7%
	All other sectors	39	3,450	4%
	Non AFA Trawl CVs	3	[a]	[a]
	Total	**117**	**79,563**	**100%**
1997	Non-AFA Trawl CPs	27	90,135	71%
	AFA Trawl CPs	14	17,163	14%
	AFA CVs	**27**	**14,196**	**11%**
	All other sectors	33	5,865	5%
	Non AFA Trawl CVs	3	[a]	[a]
	Total	**104**	**127,359**	**100%**
1998	Non-AFA Trawl CPs	23	53,705	83%
	AFA Trawl CPs	19	10,379	16%
	AFA CVs	27	282	0%
	All other sectors	49	88	0%
	Total	**118**	**64,453**	**100%**
1999	Non-AFA Trawl CPs	23	35,711	84%
	AFA Trawl CPs	16	5,628	13%
	AFA CVs	18	1,209	3%
	All other sectors	25	5	0%
	Total	**82**	**42,552**	**100%**
2000	Non-AFA Trawl CPs	21	42,993	82%
	All other sectors	**25**	**5,583**	**11%**
	AFA Trawl CPs	14	2,334	5%
	AFA CVs	67	1,524	3%
	Total	**127**	**52,435**	**100%**
2001	Non-AFA Trawl CPs	22	43,580	97%
	AFA Trawl CPs	14	1,217	3%
	All other sectors	**23**	**18**	**0%**
	AFA CVs	41	0	0%
	Total	**100**	**44,814**	**100%**
2002	Non-AFA Trawl CPs	22	51,516	97%
	AFA Trawl CPs	15	1,341	3%
	All other sectors	**30**	**10**	**0%**
	AFA CVs	33	0	0%
	Total	**100**	**52,867**	**100%**
2003	Non-AFA Trawl CPs	22	54,306	95%
	AFA Trawl CPs	13	2,988	5%
	All other sectors	**40**	**8**	**0%**
	AFA CVs	59	0	0%
	Total	**134**	**57,303**	**100%**
2004	Non-AFA Trawl CPs	23	51,018	95%
	AFA Trawl CPs	15	2,535	5%
	All other sectors	34	138	0%
	AFA CVs	54	18	0%
	Total	**126**	**53,708**	**100%**
2005	Non-AFA Trawl CPs	22	67,685	93%
	AFA Trawl CPs	15	5,148	7%
	Non-AFA Trawl CVs	2	[a]	[a]
	All other sectors	34	110	0%
	AFA CVs	42	0	0%
	Total	**115**	**72,971**	**100%**

[a] Data were withheld to protect confidentiality
Source: Data summarized from 1995-2005 NMFS Weekly Production Reports and 1995-2005 ADFG groundfish fish tickets.

5.6.2.2 Rock Sole Fishery

Northern rock sole is distributed primarily on the EBS continental shelf and in much lesser amounts in the Aleutian Islands region. Rock sole are important as the target of a high value roe fishery, occurring in February and March, which accounts for the majority of the annual catch. Rock sole catches from 1989 through 2003, have averaged 49,480 mt, annually. The 2003 catch of 35,395 mt was only 32 percent of the ABC of 110,000 mt (80 percent of the TAC). The 2006 catch total is 36,435 mt. Thus, rock sole remain lightly harvested in the Bering Sea and Aleutian Islands. During the 2006 fishing season, rock sole harvesting was closed in the Bering Sea and Aleutian Islands, due to halibut bycatch restrictions on February 21, April 13, and August 8. Table 5.6-4 provides total catch of rock sole in the BSAI, by gear type, from 1995 through 2006.

Table 5.6-5 provides the number of vessels with retained catch, by sector, for 1995 through 2005.

Table 5.6-4 Total catch of rock sole in the BSAI by Gear Type, in mt, 1995-2006.

Year	Trawl	Hook and Line	Pot	Total
1995	54,982	46	-	55,028
1996	46,859	60	8	46,927
1997	67,526	36	2	67,564
1998	33,590	51	1	33,642
1999	40,449	60	2	40,511
2000	49,232	31	1	49,264
2001	29,222	31	2	29,255
2002	41,299	30	2	41,331
2003	36,113	36	7	36,156
2004	45,463	30	1	45,494
2005	37,313	56	1	37,370
2006	36,408	25	2	36,435

Source: NMFS Weekly Production and Observer Reports

Table 5.6-5 Number of vessels with retained catch (mt) of rock sole for all sectors from 1995 to 2005

Year	Sector	Number of Vessels	Retained tons	Percent of total
1995	Non-AFA Trawl CPs	32	12,564	87%
	AFA Trawl CPs	20	717	5%
	All other sectors	69	607	4%
	AFA CVs	47	487	3%
	Non AFA Trawl CVs	3	[a]	[a]
	Total	**171**	**14,375**	**100%**
1996	Non-AFA Trawl CPs	29	12,438	95%
	AFA Trawl CPs	19	406	3%
	All other sectors	62	110	1%
	AFA CVs	30	82	1%
	Total	**140**	**13,035**	**100%**
1997	Non-AFA Trawl CPs	28	19,421	89%
	AFA CVs	49	1,092	5%
	All other sectors	28	763	4%
	AFA Trawl CPs	19	482	2%
	Non AFA Trawl CVs	4	0	0%
	Total	**128**	**21,758**	**100%**
1998	Non-AFA Trawl CPs	23	9,336	95%
	AFA Trawl CPs	18	476	5%
	AFA CVs	46	8	0%
	All other sectors	20	0	0%
	Total	**107**	**9,820**	**100%**
1999	Non-AFA Trawl CPs	23	9,901	96%
	All other sectors	18	329	3%
	AFA Trawl CPs	15	39	0%
	AFA CVs	35	32	0%
	Total	**91**	**10,300**	**100%**
2000	Non-AFA Trawl CPs	22	10,509	88%
	All other sectors	23	1,260	11%
	AFA Trawl CPs	14	118	1%
	AFA CVs	80	90	1%
	Non AFA Trawl CVs	4	11	0%
	Total	**143**	**11,988**	**100%**
2001	Non-AFA Trawl CPs	22	13,128	99%
	AFA Trawl CPs	16	115	1%
	All other sectors	25	29	0%
	AFA CVs	70	2	0%
	Total	**133**	**13,274**	**100%**
2002	Non-AFA Trawl CPs	22	16,501	100%
	AFA Trawl CPs	16	26	0%
	AFA CVs	60	7	0%
	Non AFA Trawl CVs	4	4	0%
	Total	**102**	**16,537**	**100%**
2003	Non-AFA Trawl CPs	22	13,382	100%
	Non AFA Trawl CVs	8	23	0%
	AFA CVs	86	10	0%
	All other sectors	28	3	0%
	AFA Trawl CPs	13	3	0%
	Total	**157**	**13,421**	**100%**
2004	Non-AFA Trawl CPs	23	20,672	98%
	Non AFA Trawl CVs	7	1	0%
	AFA Trawl CPs	17	325	2%
	AFA CVs	88	160	1%
	Total	**135**	**21,157**	**100%**
2005	Non-AFA Trawl CPs	22	16,985	100%
	Non AFA Trawl CVs	2	[a]	[a]
	AFA Trawl CPs	15	23	0%
	AFA CVs	81	16	0%
	All other sectors	26	2	0%
	Total	**146**	**17,025**	100%

[a] Data were withheld to protect confidentiality

Source: Data summarized from 1995-2005 NMFS Weekly Production Reports and 1995-2005 ADFG groundfish fish tickets.

5.6.2.3 Flathead Sole Fishery

Hippoglossoides sp. (which include flathead sole and Bering flounder) are managed as a unit stock in the Bering Sea and Aleutian Islands, and were formerly a constituent of the "other flatfish complex." In June 1994, the Council requested that the Plan Team assign a separate ABC for flathead sole in the BSAI, rather than combining flathead sole with other flatfish, as in past assessments. This request was based on a change in the directed fishing standards to allow increased retention of flatfish.

The 2006 catch was 92 percent of the 2006 TAC of 19,500 mt. Although flathead sole receive a separate ABC and TAC, they are still managed in the same PSC classification as rock sole and 'other' flatfish, and receive the same apportionments and seasonal allowances of prohibited species. In recent years, the flathead sole fishery has been closed prior to attainment of the TAC, due to the bycatch of halibut. Substantial amounts of flathead sole are discarded in various EBS target fisheries. Table 5.6-6 depicts the annual total catch of flathead sole in the BSAI, from 1995 to 2006, by gear-type. Table 5.6-7 provides the number of vessels with retained catch of flathead sole in the BSAI, from 1995 through 2005.

Table 5.6-6 Total catch of flathead sole in the BSAI by Gear Type, in mt, 1995-2006.

Year	Trawl	Hook and Line	Pot	Total
1995	14,456	255	2	14,713
1996	17,065	272	7	17,344
1997	20,357	347	-	20,704
1998	23,970	415	-	24,385
1999	17,588	254	-	17,842
2000	19,687	295	1	19,983
2001	17,333	253	-	17,586
2002	14,764	344	-	15,108
2003	13,453	373	-	13,826
2004	14,465	498	1	14,964
2005	15,525	625	1	16,151
2006	17,339	531	1	17,871

Table 5.6-7 Number of vessels with retained catch (mt) of flathead sole for all sectors from 1995 to 2005.

Year	Sector	Number of vessels	Retained tons (mt)	Percent of total
1995	Non-AFA Trawl CPs	32	6,161	92%
	AFA Trawl CPs	20	241	4%
	AFA CVs	48	218	3%
	All other sectors	70	81	1%
	Non AFA Trawl CVs	3	[a]	[a]
	Total	**173**	**6,700**	**100%**
1996	Non-AFA Trawl CPs	29	8,641	96%
	AFA CVs	40	251	3%
	AFA Trawl CPs	19	57	1%
	All other sectors	37	10	0%
	Non AFA Trawl CVs	6	1	0%
	Total	**131**	**8,959**	**100%**

Year	Sector	Number of vessels	Retained tons (mt)	Percent of total
1997	Non-AFA Trawl CPs	28	10,103	94%
	AFA CVs	50	337	3%
	All other sectors	32	223	2%
	AFA Trawl CPs	19	70	1%
	Non AFA Trawl CVs	2	[a]	[a]
	Total	**131**	**10,733**	**100%**
1998	Non-AFA Trawl CPs	23	15,505	98%
	AFA Trawl CPs	19	247	2%
	All other sectors	59	59	0%
	AFA CVs	59	39	0%
	Non AFA Trawl CVs	6	0	0%
	Total	**166**	**15,850**	**100%**
1999	Non-AFA Trawl CPs	23	11,631	99%
	All other sectors	30	131	1%
	AFA Trawl CPs	15	22	0%
	AFA CVs	64	9	0%
	Total	**132**	**11,794**	**100%**
2000	Non-AFA Trawl CPs	20	12,037	94%
	All other sectors	28	737	6%
	Non AFA Trawl CVs	7	1	0%
	Total	**55**	**12,775**	**100%**
2001	Non-AFA Trawl CPs	22	12,135	100%
	All other sectors	36	30	0%
	AFA Trawl CPs	15	0	0%
	AFA CVs	79	0	0%
	Total	**152**	**12,165**	**100%**
2002	Non-AFA Trawl CPs	22	9,918	100%
	All other sectors	31	15	0%
	AFA Trawl CPs	15	10	0%
	AFA CVs	68	1	0%
	Non AFA Trawl CVs	7	0	0%
	Total	**143**	**9,944**	**100%**
2003	Non-AFA Trawl CPs	22	9,124	100%
	All other sectors	35	30	0%
	AFA CVs	91	9	0%
	Non AFA Trawl CVs	8	1	0%
	Total	**156**	**9,165**	**100%**
2004	Non-AFA Trawl CPs	23	10816.728	99%
	AFA Trawl CPs	17	0.1	0%
	AFA CVs	93	59.8	1%
	All other sectors	35	14.967	0%
	Total	**168**	**10891.6**	**100%**
2005	Non-AFA Trawl CPs	22	9963.886	98%
	Non-AFA Trawl CVs	3	[a]	[a]
	AFA Trawl CPs	15	8.532	0%
	AFA CVs	91	99.59	1%
	All other sectors	33	57.119	1%
	Total	**164**	**10129.13**	**100%**

[a] Data were withheld to protect confidentiality
Source: Data summarized from 1995-2005 NMFS Weekly Production Reports and 1995-2005 ADFG groundfish fish tickets.

5.6.2.4 Atka Mackerel Fishery

Atka mackerel became a reported species group in the BSAI Groundfish FMP in 1978. The patterns of the Atka mackerel fishery generally reflect the behavior of the species: (1) the fishery is highly localized and usually occurs in the same few locations; (2) the schooling semi-pelagic nature of the species makes it particularly susceptible to trawl gear, fished on the bottom; and (3) trawling occurs almost exclusively at depths less than 150 m. In the early 1970s, most Atka mackerel catches were made in the western Aleutian Islands (west of 180º W. longitude). In the late 1970s and through the 1980s, fishing effort moved eastward. A majority of landings occurred near Seguam and Amlia Islands. In 1984 and 1985, the majority of landings came from a single 1/2º latitude by 1º longitude block bounded by 52º 30’ N. and 53º N. latitude, and 173º W. longitude in Seguam Pass (73 percent in 1984, 52 percent in 1985).

Prior to 1992, ABCs for Atka mackerel were allocated to the entire Aleutian management district, with no additional spatial management. However, because of increases in the ABC, beginning in 1992, the Council recognized the need to disperse fishing effort throughout the range of the stock to minimize the likelihood of localized depletions. In 1993, an initial Atka mackerel TAC of 32,000 mt was caught by March 11, almost entirely south of Seguam Island (Seguam Bank). This initial TAC release represented the amount of Atka mackerel that the Council thought could be appropriately harvested in the eastern portion of the Aleutian Islands subarea (based on the assessment for 1993; Lowe 1992). As noted, there was no mechanism in place at the time to spatially allocate TACs in the Aleutians to minimize the likelihood of localized depletions. In mid-1993, however, Amendment 28 to the BSAI Groundfish FMP became effective, dividing the Aleutian Island subarea into three districts at 177° W. and 177° E. longitudes, for the purposes of spatially apportioning TACs. On August 11, 1993, an additional 32,000 mt of Atka mackerel TAC was released to the Central (27,000 mt) and Western (5,000 mt) districts. Since 1994, the BSAI Atka mackerel TAC has been allocated to the three regions, based on the average distribution of biomass estimated from the Aleutian Islands nonpelagic trawl surveys. Amendment 34 allocates up to 2 percent of the Atka mackerel TAC specified for the eastern BSAI to vessels using jig gear.

In June 1998, the Council passed a fishery regulatory amendment that proposed a four-year timetable to temporally and spatially disperse and reduce the level of Atka mackerel fishing within Steller sea lion critical habitat in the Aleutian Islands. Temporal dispersion was accomplished by dividing the BSAI Atka mackerel TAC into two equal seasonal allowances, an A-season beginning January 1 and ending April 15, and a B-season from September 1 to November 1. Spatial dispersion was accomplished through a planned 4-year reduction in the maximum percentage of each seasonal allowance that could be caught within critical habitat in the Central and Western Aleutian Islands. This was in addition to bans on trawling within 10 nm of all sea lion rookeries in the Aleutian district, and within 20 nm of the rookeries on Seguam and Agligadak Islands (in area 541), which were instituted in 1992. The goal of spatial dispersion was to reduce the proportion of each seasonal allowance caught within critical habitat to no more than 40 percent by the year 2002. No critical habitat allowance was established in the eastern subarea, because of the year-round 20 nm trawl exclusion zone around the Steller sea lion rookeries on Seguam and Agligadak Islands that minimized effort within critical habitat. The regulations implementing this four-year phased-in change to Atka mackerel fishery management became effective on 22 January 1999, and lasted only 3 years (through 2001). In 2002, new regulations affecting management of the Atka mackerel, pollock, and Pacific cod fisheries went into effect. Furthermore, all trawling was prohibited in critical habitat from 8 August 2000 through 30 November 2000, by the U. S. District Court for the Western District of Washington, because of violations of the Endangered Species Act (ESA).

As part of the plan to respond to the Court and comply with the ESA, NOAA Fisheries and the Council formulated new regulations for the management of Steller sea lion and groundfish fishery interactions that went into effect in 2002. The objectives of temporal and spatial fishery dispersion, cornerstones of the 1999 regulations, were retained. Season dates and allocations remained the same (A season: 50 percent of annual TAC from 20 January to 15 April; B season: 50 percent from 1 September to 1 November). However, the maximum seasonal catch percentage from critical habitat was raised from the goal of 40 percent in the 1999 regulations, to 60 percent. To compensate, effort within critical habitat in the Central (542) and Western (543) Aleutian fisheries was limited by allowing access to each subarea to only one-half of the fleet at a time. Vessels fishing for Atka mackerel are randomly assigned to one of two platoons; one starts fishing in area 542, while the other begins in 543. Vessels may not switch areas until the other platoon has caught its critical habitat allocation, assigned to that area. In the 2002 regulations, trawling for Atka mackerel was prohibited within 10 nm of all rookeries in areas 542 and 543; this was extended to 15 nm around Buldir Island, and 3 nm around all major Steller sea lion haulouts. Steller sea lion critical habitat east of 178°W in the Aleutian district, including all critical habitat in subarea 541 and a 1° longitude-wide portion of subarea 542, was closed to directed Atka mackerel fishing. Seasonal and spatial fishery dispersion for 2005 and 2006 are shown in Table 5.6-8.

Table 5.6-8 2005 and 2006 seasonal and spatial allowances, gear shares, and CDQ reserve of the BSAI Atka Mackerel TAC (amounts are in metric tons).

Subarea and component	2005 and 2006 TAC	CDQ Reserve	CDQ reserve HLA limit[3]	ITAC	Seasonal Allowance[1]			
					A season[2]		B season[2]	
					Total	HLA limit[3]	Total	HLA limit[3]
Western AI District (543)	20,000	1,500	900	18,500	9,250	5,550	9,250	5,550
Central AI District (542)	35,500	2,663	1,598	32,838	16,419	9,851	16,419	9,851
EAI (541)/BS subarea[4]	7,500	563	…………..	6,938	…………..	…………..	…………..	…………..
Jig (1%)[5]	…………..	…………..	…………..	69	…………..	…………..	…………..	…………..
Other gear (99%)	…………..	…………..	…………..	6,868	3,434	…………..	3,434	…………..
Total	**63,000**	**4,725**	**…………..**	**58,275**	**29,103**	…………..	**29,103**	…………..

[1]The seasonal allowances of Atka mackerel are 50% in the A season and 50% in the B season.

[2]The A season is January 1 (January 20 for trawl gear) to April 15 and the B season is September 1 to November 1.

[3]Harvest Limit Area (HLA) refers to the amount of each seasonal allowance that is available for fishing inside the HLA.
In 2005 and 2006, 60% of each seasonal allowance was available for fishing inside the HLA in the Western and Central Aleutian Districts.

[4]Eastern Aleutian District and the Bering Sea subarea.

[5]Regulations require that up to 2 percent of the Eastern Aleutian District and the Bering Sea subarea ITAC be allocated to jig gear.
The amount of this allocation is 1 percent. The jig gear allocation is not apportioned by season.

Table 5.6-9 provides the annual total catch of Atka mackerel in the BSAI, from 1995 through 2006, by gear-type. Table 5.6-10 provides the number of vessels and the annual total catch of Atka mackerel in the BSAI by trawl sector 1995 through 2005.

Figure 5.6-1 presents annual trawling harvest of Atka mackerel by Aleutian Islands subarea.

Table 5.6-9 Catch of Atka mackerel in the BSAI by gear type, in mt, 1995-2006.

Year	Trawl	Hook and Line	Pot	Total
1995	81,413	61	81	81,555
1996	103,853	36	54	103,943
1997	65,755	40	50	65,845
1998	55,768	90	15	55,873
1999	53,561	71	11	53,643
2000	42,293	138	9	42,440
2001	56,249	270	17	56,536
2002	41,945	43	53	42,041
2003	54,052	21	206	54,279
2004	54,814	36	105	54,955
2005	61,760	24	251	62,035
2006	61,452	10	364	61,826

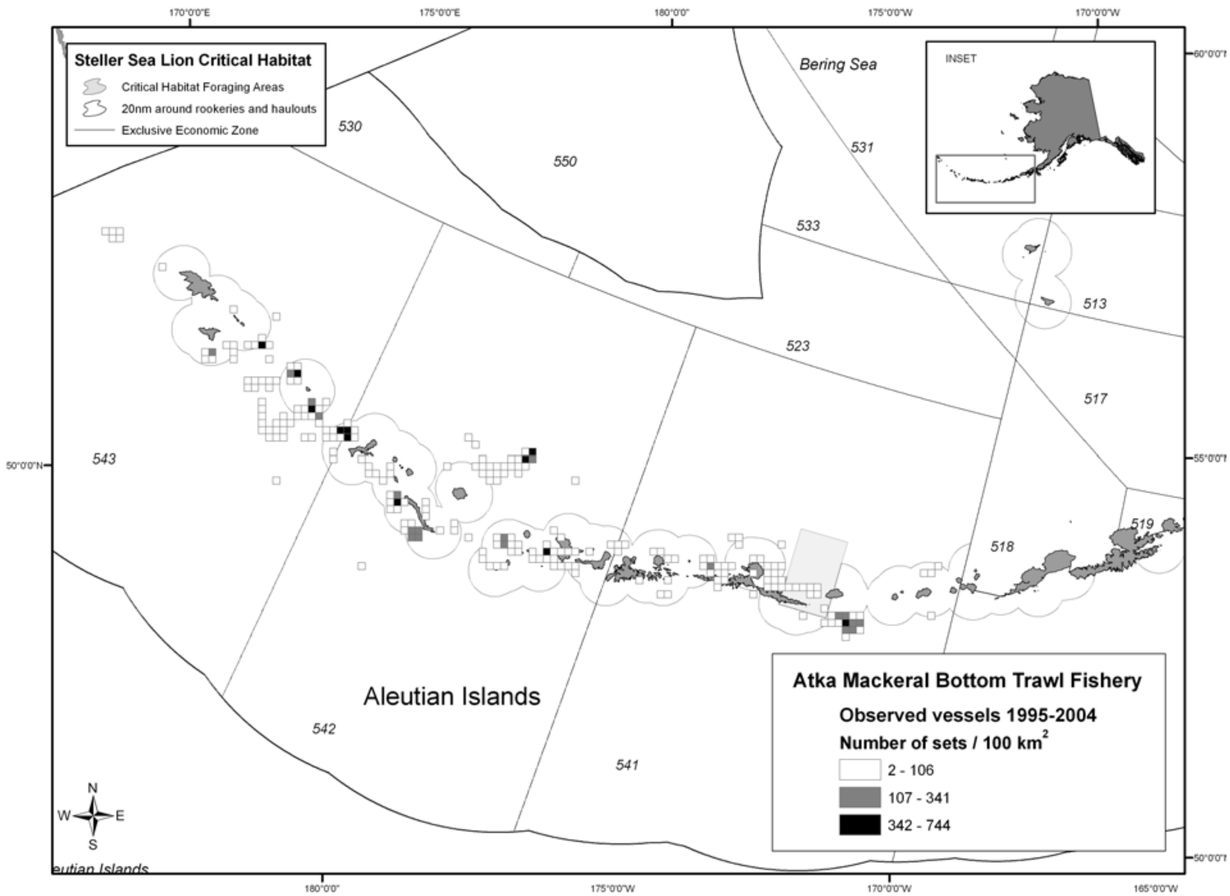
Source: NMFS Weekly Production and Observer Reports

Table 5.6-10 Number of vessels and retained catch (mt) of Atka mackerel in the BSAI by trawl sector from 1995 to 2005.

Year	Sectors	Number of vessels	Retained tons	Percent of total
1995	Non-AFA Trawl CPS	15	52,200	85%
	All other sectors	4	7,440	12%
	AFA Trawl CPs	8	1,824	3%
	AFA CVs	11	16	0%
	Total	**38**	**61,480**	**100%**
1996	Non-AFA Trawl CPS	18	77,627	92%
	All other sectors	20	5,503	7%
	AFA Trawl CPs	4	1,392	2%
	AFA CVs	18	13	0%
	Total	**60**	**84,535**	**100%**
1997	Non-AFA Trawl CPS	11	42,344	79%
	All other sectors	19	7,527	14%
	AFA Trawl CPs	4	3,869	7%
	AFA CVs	3	[a]	[a]
	Total	**37**	**53,741**	**100%**
1998	Non-AFA Trawl CPS	21	39,911	84%
	All other sectors	18	7,380	16%
	AFA CVs	26	0	0%
	Total	**65**	**47,292**	**100%**
1999	Non-AFA Trawl CPS	19	44,212	99%
	AFA Trawl CPs	10	438	1%
	All other sectors	9	1	0%
	AFA CVs	12	0	0%
	Total	**50**	**44,652**	**100%**
2000	Non-AFA Trawl CPS	16	36,424	100%
	All other sectors	8	3	0%
	Non AFA Trawl CVs	1	[a]	[a]
	Total	**25**	**36,426**	**100%**
2001	Non-AFA Trawl CPS	18	45,527	100%
	All other sectors	20	73	0%
	AFA CVs	27	16	0%
	Total	**65**	**45,616**	**100%**
2002	Non-AFA Trawl CPS	17	31,125	100%
	AFA CVs	47	78	0%
	All other sectors	9	2	0%
	Non AFA Trawl CVs	2	[a]	[a]
	Total	**75**	**31,205**	**100%**
2003	Non-AFA Trawl CPS	17	37,757	100%
	AFA CVs	72	86	0%
	AFA Trawl CPs	13	3	0%
	All other sectors	22	0	0%
	Non AFA Trawl CVs	6	0	0%
	Total	**130**	**37,848**	**100%**
2004	Non-AFA Trawl CPs	22	41,902	99%
	AFA CVs	76	216	1%
	Total	**98**	**42,118**	**100%**
2005	Non-AFA Trawl CPs	21	50,804	100%
	AFA CVs	71	190	0%
	Total	**92**	**50,994**	**100%**

[a] Data were withheld to protect confidentiality
Source: Data summarized from 1995-2005 NMFS Weekly Production Reports and 1995-2005 ADFG groundfish fish tickets.

Figure 5.6-1 Annual harvest of Atka mackerel inside and outside Steller Sea lion critical habitat by Aleutian Islands subarea (541, 542, and 543) from 1995 to 2004.



5.6.2.5 Pacific Ocean Perch Fishery

Pacific ocean perch (POP), and four other associated species of rockfish (northern rockfish; rougheye rockfish; shortraker rockfish; and sharpchin rockfish) were managed as the POP complex in the Bering Sea and Aleutian Islands subareas, from 1979 through 1990. In 1991, the Council separated POP from the other red rockfish, in order to provide protection from possible overfishing. Of the five species in the former POP complex, Pacific ocean perch has historically been the most abundant in this region, and has contributed most to the commercial rockfish catch. Since 2001, Pacific ocean perch in the BSAI have been assessed and managed as a single stock.

Pacific ocean perch were highly sought after by Japanese and Soviet fisheries and supported a major trawl fishery throughout the 1960s. However, apparently, these stocks were not productive enough to support such large removals, because catches declined throughout the 1960s and 1970s, reaching their lowest levels in the mid-1980s. With the gradual phase-out of the foreign fishery in the U.S. EEZ, a small joint-venture fishery developed, but was replaced by a domestic fishery by 1990. In 1990, the domestic fishery recorded the highest Pacific ocean perch removals since 1977.

Estimates of retained and discarded Pacific ocean perch from the fishery have been available since 1990. The EBS region generally shows a higher discard rate than in the Aleutian Islands region. For the period from 1990 to 2003, the Pacific ocean perch discard rate in the EBS averaged about 33 percent, and the 2003 discard rate was 52 percent. In contrast, the discard rate from 1990 to 2002 in the Aleutian Islands averaged about 15 percent, and the 2003 discard rate was 16 percent.

There has been little change in the distribution of observed Aleutian Islands POP catch from the foreign and joint venture fisheries (years 1977-1988) and the domestic fishery (years 1990-present) with respect to fishing depth and management area. Management Area 541 contributes the largest share of the observed catch in each fishery, with 46 percent and 41 percent in the foreign/joint venture and domestic fisheries, respectively. In contrast, Area 543 contributes the largest share of the catch in the 2002 fishery, due to the spatial allocation of harvest quotas. Although the catch by management area between the two time periods was similar, variations appeared to occur within each of these periods. For example, Area 543 contributed a large share of the catch in the late 1970s foreign fishery, as well as the domestic fishery from the mid-1990s to the present. In the late 1980s to the early 1990s, Area 541 contributed a large share of the catch, and prompted management changes to spatially allocate POP harvest. Note that the extent to which the patterns of observed catch can be used as a proxy for patterns in total catch is dependent upon the degree to which the observer sampling represents the true fishery. In particular, the proportion of total POP catch that was actually sampled by observers was very low in the foreign fishery, prior to 1984.

Table 5.6-11 provides annual total catch of BSAI POP from 1995 through 2006, by gear-type. Table 5.6-12 provides annual retained catch of BSAI POP, by sector, from 1995 through 2005, for all sectors.

Table 5.6-11 Total catch (mt) of Pacific ocean Perch in the BSAI, by gear-type, 1995-2006.

Year	Trawl	Hook and Line	Pot	Total
1995	11,492	17	1	11,510
1996	15,679	2	1	15,682
1997	13,465	-	-	13,465
1998	10,003	-	-	10,003
1999	12,260	-	-	12,260
2000	9,018	10	-	9,028
2001	8,807	5	-	8,812
2002	10,526	3	-	10,529
2003	13,914	2	1	13,917
2004	10,826	2	-	10,828
2005	10,420	2	-	10,422
2006	12,851	1	1	12,853

Source: NMFS Weekly Production and Observer Reports

Table 5.6-12 Number of vessels and annual retained catch (mt) of BSAI Pacific ocean Perch, all sectors, 1995 -2005.

Year	Sectors	Number of Vessels	Retained tons	Percent of total
1995	Non-AFA Trawl CPs	14	8,053	98%
	AFA Trawl CPs	17	198	2%
	AFA CVs	10	8	0%
	All other sectors	3	[a]	[a]
	Total	**44**	**8,259**	**100%**
1996	Non-AFA Trawl CPs	14	8,950	99%
	AFA Trawl CPs	14	122	1%
	AFA CVs	14	6	0%
	All other sectors	4	1	0%
	Total	**46**	**9,079**	**100%**
1997	Non-AFA Trawl CPs	10	10,325	100%
	AFA CVs	16	30	0%
	All other sectors	6	13	0%
	AFA Trawl CPs	14	0	0%
	Total	**46**	**10,368**	**100%**
1998	Non-AFA Trawl CPs	12	7,702	100%
	AFA Trawl CPs	7	1	0%
	AFA CVs	13	1	0%
	All other sectors	2	[a]	[a]
	Total	**34**	**7,703**	**100%**
1999	Non-AFA Trawl CPs	12	9,580	100%
	All other sectors	2	[a]	[a]
	Total	**14**	**9,580**	**100%**
2000	Non-AFA Trawl CPs	10	6,996	100%
	All other sectors	1	[a]	[a]
	Non AFA Trawl CVs	1	[a]	[a]
	Total	**12**	**6,996**	**100%**
2001	Non-AFA Trawl CPs	11	6,320	100%
	All other sectors	5	0	0%
	Total	**16**	**6,320**	**100%**
2002	Non-AFA Trawl CPs	11	8,249	100%
	Total	**11**	**8,249**	**100%**
2003	Non-AFA Trawl CPs	10	9,823	96%
	AFA Trawl CPs	2	[a]	[a]
	Total	**12**	**9,823**	**96%**
2004	Non-AFA Trawl CPs	12	8,166	100%
	AFA CVs	4	3	0%
	Total	**16**	**8,169**	**100%**
2005	Non-AFA Trawl CPs	12	7,338	100%
	Total	**12**	**7,338**	**100%**

[a] Data were withheld to protect confidentiality
Source: Data summarized from 1995-2005 NMFS Weekly Production Reports and 1995-2005 ADFG groundfish fish tickets.

5.6.2.6 BSAI Pacific Cod Fisheries

The only other groundfish target fishery that is affected by the proposed action is the Pacific cod fishery. Presently, the Pacific cod stock is exploited by a multiple-gear fishery, including trawl, longline, pot, and jig components. From 1980 through 2005, TAC averaged about 77 percent of ABC, and aggregate commercial catch averaged about 88 percent of TAC. In nine of these 26 years (35 percent), TAC equaled ABC exactly, and in 5 of these 26 years (19 percent), catch exceeded TAC (by an average of 4%). Changes in ABC over time are typically attributable to three factors: 1) changes in resource abundance, 2) changes in management strategy, and 3) changes in the stock assessment model. For example, from 1980 through 2005, six different assessment models were used, though the present model has remained unchanged since 1992 (except for the addition of a new fishery selectivity era, beginning in 2000). Historically, the great majority of the BSAI catch has come from the EBS area. Table 5.6-13 provides annual total catch of BSAI Pacific cod from 1995 through 2006, by gear- type.

Table 5.6-13 Total catch (mt) of Pacific Cod in the BSAI, by Gear-type, 1995-2006.

Year	Trawl	Hook and Line	Pot	Total
1995	121,530	103,199	20,299	245,028
1996	113,089	94,968	32,617	240,674
1997	111,212	124,406	22,047	257,665
1998	81,308	98,286	13,657	193,251
1999	67,190	79,021	16,150	162,361
2000	73,476	85,177	18,783	177,436
2001	50,752	96,945	16,507	164,204
2002	78,178	89,968	15,054	183,200
2003	78,576	94,325	21,960	194,861
2004	81,946	96,465	17,108	195,519
2005	72,237	115,752	17,038	205,027
2006	70,102	98,286	18,672	187,060

Source: NMFS website http://www.fakr.noaa.gov/sustainablefisheries/catchstats.htm.

Current regulations specify that the TAC of Pacific cod will be allocated according to gear-type as follows: the trawl fishery will be allocated 47 percent, the fixed gear (longline and pot) fishery will be allocated 51 percent, and the jig fishery will be allocated 2 percent; of the fixed gear allocation, the longline fishery will be allocated 80.3 percent (not counting catcher vessels less than 60 ft LOA), the pot fishery will be allocated 18.3 percent (not counting catcher vessels less than 60 ft LOA), and fixed-gear catcher vessels less than 60 ft LOA will be allocated 1.4 percent. Typically, as the harvest year progresses, it becomes apparent that one or more gear-type sectors will be unable to harvest their full allotment(s) by the end of the year. This is addressed by reallocating TAC between gear-types in September of each year. Most often, such reallocations shift TAC from the trawl, jig, and (sometimes) pot components of the fishery, to the longline catcher/processors. The longline catcher/processors typically receive 15,000 mt to 20,000 mt, per year, through such transfers.

5.6.3 Description of the Potentially Affected Trawl Sectors

5.6.3.1 Description of the Non-AFA Trawl Catcher/Processor Sector

The head and gut trawl catcher processor sector (H&G trawl CP) is the most diverse of the processing sectors in the BSAI, and the only sector that consistently targets a significant amount of flatfish. However, the flatfish market is characterized as having significant constraints. The rock sole market, for example, prefers females, with roe, over smaller males. Similarly, large yellowfin sole and flathead sole are preferred over smaller fish of the same species. There are few economic incentives to keep small fish, because they fill limited hold space with product that is largely unmarketable. In the "race for fish" regime, under which some of the H&G trawl CP sector operates, if a vessel tries to minimize discards by reducing throughput, and keeping and processing "less valuable" fish, its share of total catch may be reduced if others in the fleet do not follow suit. This is not an issue for vessels participating in the cooperatives established by Amendments 79 and 80 to the BSAI groundfish FMP. In addition, unlike larger catcher/processors and shore-plants, the H&G trawl CP vessels are generally constrained from process fish-meal. Because of size constraints (among other considerations), the H&G trawl CP sector have fewer options for processing lower value products and, therefore, are typically more likely to discard "less valuable" fish.

The H&G trawl CP fleet consists of a relatively wide variety of vessels that range from 103 ft to 295 ft in length. As would be expected, the smaller vessels are relatively less productive than the larger vessels. From 1995 through 2005, the smaller vessels generated approximately 13 percent of this sector's catch. However, the smaller vessels accounted for roughly 19 percent of the total discards in the sector. Vessels less than 125 ft discarded 46 percent of their catch, over the eleven year period, while vessels 125 ft discarded 30 percent. Industry sources indicate that the smaller vessels are unable to retain as many fish as larger vessels, because of limitations in hold size and processing space (Table 5.6-14).

Table 5.6-14 Fishing Activity in the H&G Trawl CP Sector 1995-2005, by Size Class

Length Class	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
	Number of Vessels										
< 125'	8	8	7	10	7	8	6	6	6	7	6
> 125'	24	21	18	16	16	16	16	16	16	16	16
Total	32	29	25	26	23	24	22	22	22	23	22
	Total Groundfish Catch (1,000 mt)										
< 125'	19.2	34.5	50.6	37.4	34.3	42.7	30	44	41	50	42
> 125'	284	293	303	234	234	251	240	241	230	250	259
Total	303	328	354	271	268	294	270	285	271	300	301
	Percent of HT-CP Total Groundfish Catch										
< 125'	6.3	10.5	14.3	13.8	12.8	14.5	11.2	15.5	15.1	16.8	13.9
> 125'	93.7	89.5	85.7	86.2	87.2	85.5	88.8	84.5	84.9	83.2	86.1
	Discards as a Percent of Total Groundfish Catch of Length Class										
< 125'	60.7	55.1	52	46.9	41.2	41	39.8	40.1	42.1	46.1	42.8
> 125'	39.4	36.3	34.1	27.1	32.1	29.3	24.2	28.6	28.3	29.9	18.3
	Discards as a Percent of HT-CP Total Discards										
< 125'	12.1	13.5	18.4	20.4	17.8	17.2	17.1	20.4	20.8	23.7	27.5
> 125'		87.9	86.5	81.6	79.6	82.2	82.9	79.6	79.2	76.3	72.5

Source: NPFMC Sector Profiles Database for data from 1995 to 2001 and COAR data for 2002-2005.

The following information on employment for the H&G Trawl CP sector is from the *Alaska Groundfish Fisheries Final Programmatic Supplemental Environmental Impact Statement* (NMFS 2004). The average crew size for an H&G Trawl CP vessel is about 34 persons, which is about one-third of the average aboard a surimi catcher/processor, and fewer than half of the average crew aboard a fillet catcher/processor. A typical crew might include a captain, a mate, two engineers (one each for the vessel and processing equipment), a cook/housekeeper, two to three crew members dedicated to the deck, a processing foreman and assistant, and about 25 processing workers. On some vessels, two or three crew members may split their time between processing and deck work. Any variation in crew size usually is the result of a change in the number of processing workers employed. An annual average of 1,022 FTE positions were generated by this vessel class during the 1992 through 2001 period, and estimated yearly payments to labor averaged $55 million.

5.6.3.2 History of the H&G Trawl CP Sector

The first US-flagged trawl catcher/processors were head and gut factory trawlers, and entered the fishery in 1980. [Paul MacGregor 2003, Mary Furuness 2003] These boats focused their effort primarily on Pacific cod, rockfish, sablefish, and flatfish. Pollock, while ubiquitous, were not generally targeted, because of their relatively low value.

A key development in the history of the factory trawler was the 1983 introduction and rapid acceptance of high-speed at-sea filleting machinery, such as the Baader 182, and other similar machinery manufactured by Toyo [Wulff 2003]. These machines made at-sea processing of pollock fillets, and subsequent processing into surimi, economically feasible [Wulff 2003]. Vessels that were large-enough, and met Coast Guard stability and loadline requirements, to install this machinery, were able to tap into the huge pollock resource in the Bering Sea. Other trawl CPs, typically smaller vessels without loadline certifications, were limited largely to head and gut, or frozen-in-the-round processing.

The 1987 Anti-Reflagging Act also contributed to the growth of the U.S. flagged trawl CP fleet. The Act prohibited vessels that were not originally constructed in the U.S. from being re-flagged as a U.S. vessel. There was, however, a three-year window in which vessels that were already under conversion/construction in foreign shipyards were allowed to enter [IAI 1994].

The coincidental timing of the introduction of the Baader 182 and the conversion provisions in the Anti-Reflagging Act led to a dramatic increase in the number of U.S. flagged trawl CPs operating in the EEZ off Alaska. In 1986, NMFS reported 12 active U.S. trawl CPs operating in the EEZ off Alaska. However, the number of U.S. trawl CPs doubled in 1987 (IAI, 1994), and by 1990, there were a total of 72 U.S. flagged trawl CPs operating in these waters [NPFMC 1995]. Although the exact number of H&G Trawl CP vessels was not explicitly tracked at the time, estimates developed in 1995, for the Groundfish and Crab License Limitation Program [NPFMC, 1995], indicated that there were a total of 23 H&G trawl CP vessels in 1988—12 of which fished only with trawl gear and 11 of which reported fishing with both trawl and non-trawl gear-types. The same source indicated that in 1990, a total of 33 vessels were H&G Trawl CP vessels, 17 of which had reported only using trawl gear.

During the early and mid-1990's, the Council process was primarily focused on allocation and rationalization issues. While these issues indirectly affected the H&G trawl CP sector, other sectors were affected in much more significant ways. However, an add-on to the License Limitation Program, in 1995, closed the Eastern Gulf of Alaska (EG) to trawling. While trawl catches in the EG were not large compared to non-trawl catches in the EG, or to trawl catches in other areas, the H&G trawl CP fleet was the primary participant–trawling for high value rockfish species. The closure limited the opportunities for the H&G trawl CP sector.

In the early 1990's, there was a marked increase in public awareness and dissatisfaction with the problems of incidental catch, prohibited species catch, and discards of both target species and of incidental catch species. In response to the growing perception of unnecessary waste in the fisheries, the Council, in 1994, initiated analysis to improve utilization and retention and to provide incentives to reduce incidental catches and discards of non-target species. The growing awareness and controversy led to a formulation of a National policy to reduce bycatch[3], which was included in the reauthorization of the Magnuson-Stevens Act in 1996.

The waste reduction initiatives resulted in the Council's 1996 approval of Improved Retention/Improved Utilization (IR/IU) for the BSAI (Amendment 49 to the BSAI Groundfish FMP). A similar program was approved for the GOA in 1997 (Amendment 49 to the GOA Groundfish FMP). The IR/IU measures for pollock and Pacific cod were implemented in 1998, for both the GOA and BSAI. They were initially directed primarily at the surimi and fillet trawl CPs, which already had very low (on the order of 2 percent) discard rates. After passage of the American Fisheries Act (AFA), vessels in these sectors installed fish-meal plants, and otherwise changed their fishing and processing methods to catch fewer unusable fish, and to more fully utilize those fish harvested. For the H&G trawl CP vessel, which are generally too small to be outfitted with fish-meal plants, the IR/IU regulations were more difficult to meet. However, one outcome of the measure has been the development of a more consistent market for headed and gutted pollock in Asia—these fish are partially thawed and further processed before entering global markets.

[3] The term "bycatch" was redefined in the reauthorization process. Prior to the 1996 MSA, bycatch was synonymous with incidental catch. Each term was, at the time, also distinct from "*discarded*" catch. The 1996 MSA action formally altered this by redefining bycatch to mean "*incidental catch that is discarded*".

In approving the IR/IU Amendments, the Council also approved IR/IU standards for flatfish, but recognized that the H&G trawl CP sector, which had discard rates is roughly 72% at the time, would be unable to meet the IR/IU standard in the near term. The Council, therefore, requested NOAA Fisheries to delay implementation of the flatfish portions of the regulations until 2003. The delay was intended to give the H&G trawl CP fleet time to alter their fishing methods and gear to avoid unwanted catch, and to develop markets for catches of flatfish that are unavoidable and that would otherwise be discarded.

Since 1997, the H&G trawl CP sector has improved their retention and utilization. Retention by this non-AFA trawl sector has been aided in recent years by unusually large size flatfish and a global decline in whitefish supply. In addition, the H&G trawl CP sector has made significant internal efforts, beginning with the formation of Groundfish Forum–an association of H&G trawl CP sector owners. During the period following passage of IR/IU, the H&G trawl CP fleet, led by Groundfish Forum, has taken steps to reduce their unwanted catch. Since 1997, for example, 100 percent of the vessels in the sector have participated in SeaState, an industry sponsored organization that tracks the fishing location of participants and provides reports of areas of high rates of incidental catch. The sector has also engaged in several experimental fisheries to test new and different gear configurations, in order to reduce bycatch. The sector has also tested methods to reduce halibut mortality, and broaden markets for groundfish that had previously gone unprocessed.

This level of cooperation can be considered quite remarkable, given that vessels in H&G trawl CP sector operate in an intensely competitive environment in which the actions of one vessel or one company can have significant negative effects on all of the other vessels and companies in the sector. Because of this highly competitive environment, operators are forced to fish as hard and fast as possible, before another company's activities, or the activities of the fleet as a whole, force a fishery closure.

The primary factor contributing to this environment is the regulated common property nature of the fishery resource itself. Under these management rules, when the season begins, each vessel must race to catch as much fish as possible, before the TAC or a PSC limit is reached and the fishery closes. If an individual vessel or company slows its activity, say, to avoid catches of unwanted fish, or areas of high concentrations of PSCs, they will very likely suffer a loss of revenue, particularly if other vessels or companies do not fish in equivalently conservative ways.

While the race-for-fish problem is endemic throughout a number of fisheries in the North Pacific for the H&G Trawl CP sector, it is only one of several factors that contribute to the aggressive fishing practices of the sector. In addition, the products produced by the H&G trawl CP sector are relatively few and the number of wholesale buyers in the market is quite limited. Further, the demand for these products is relatively small, and prices are very sensitive to fluctuations in quantity. [NPFMC, 2001]

Other sectors have also been plagued by the common property nature of the fisheries in the North Pacific. This was particularly true of the pollock industry. However, following adoption of IR/IU and several Inshore-Offshore management measures, the pollock fishery was rationalized, with approval of the AFA in 1998, by the U.S. Congress. The AFA created exclusive pollock allocations to AFA eligible vessels and allowed the formation of cooperatives in both offshore and inshore sectors. Non-AFA vessels that took pollock as incidental catch were prohibited from targeting pollock, and now operate year-round under MRAs for pollock—retained pollock may not exceed 20 percent of other retained groundfish, between consecutive offloads.

The AFA has also resulted in an additional burden on the H&G Trawl CP sector. Because of the combination of AFA and IR/IU regulations, the H&G Trawl CP sector is continually struggling to comply with pollock regulations. Under IR/IU provisions, a vessel operating in this sector **must** retain all pollock it catches. That is, unless their pollock catch exceeds 20 percent of the total retained non-pollock groundfish. At which point, they must discard all pollock in excess of that amount, just as long as they do not discard so much as to fall below the maximum retainable amount (MRA) 20 percent standard because, that would place them in violation of IR/IU.

In 2002, the Council recognized the difficulties with attaining the IR/IU flatfish retention requirements on the timeline originally adopted, and sustaining an economicaly viable fishery. In April 2002, public testimony provided by H&G trawl CP sector to the Council described that some vessels in that sector would be forced to exit flatfish and other fisheries, if a requirement to retain flatfish species was imposed. Existing technology did not permit H&G flatfish operators to consistently haul target species with low proportions of non-target catch, and adapt to the limited space available on some vessels to hold and process mixed species hauls.

While retention and utilization of flatfish by all sectors, including the H&G trawl CP sector, had improved between 1995 and 2000, the H&G trawl CP fleet felt that it still did not have the capability (e.g., markets and gear) to remain viable participants, once IR/IU was implemented (as scheduled) in 2003. The industry proposed that alternatives to full retention of flatfish be examined, and the Council added options to the ongoing analysis of processing limits under the AFA.

Based on the experience of the AFA-CPs, the H&G trawl CP sector has also expressed the general conclusion that their best hope of facilitating the reduction of discards and incidental catch is regulated reductions of discards and some form of dedicated access privileges. The sector has tried to negotiate a voluntary cooperative within the existing fishery regulations, albeit unsuccessfully. For a voluntary cooperative to be successful in providing secure fishing privileges under existing regulations, it may be necessary for every participant in the sector to participate in the co-op. The H&G trawl CP sector has been unable to gain 100 percent agreement.

5.6.3.3 Other Trawl Sectors

Other trawl sectors that are qualified to harvest flatfish in the EBS include the AFA Trawl CP and the AFA Trawl CV fleets. Although both fleets could potentially be affected by the proposed action to protect EBS fishery habitat, the weight and gross revenue from flatfish harvests in the EBS by both of the AFA Trawl fleet sectors are minor, relative to their baseline gross annual revenues. The revenue at risk analyses produced no revenue at risk from the proposed action for these fleet components over the 2003 through 2005 period examined.

A thorough description of the AFA Trawl sectors is provided in the EA/RIR/IRFA for Amendment 80 (http://www.fakr.noaa.gov/npfmc/current_issues/bycatch/AM80506noAPX.pdf).

5.6.4 Value of BSAI Groundfish Fisheries

Relative to first wholesale value, the H&G trawl CP sector is more diversified across fisheries than other sectors. Two primary fisheries have historically contributed relatively equal shares of the first wholesale value for the H&G trawl CP fleet. Of the allocated species in the proposed action, Atka mackerel at $42 million, and yellowfin sole at $81 million, were two of the largest contributors to sector gross revenue in 2005, contributing 19 percent and 33 percent, respectively, to first wholesale value (Table 5.6-15). Other fisheries that have historically contributed a significant share of the total first wholesale value for the head and gut fleet are Pacific cod, rock sole, flathead sole, and GOA groundfish.

Table 5.6-15 Wholesale product value (millions of dollars) by BSAI Species Group and all GOA groundfish for the H&G Trawl CP sector, 1995-2005.

Species Group	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Arrowtooth flounder	0.04	0.01	0.04	0.84	0.99	1.82	1.91	2.24	1.82	1.99	4.36
Atka mackerel	39.64	66.49	31.20	19.37	25.46	25.14	48.35	26.39	26.67	33.25	42.67
Flathead sole	4.53	11.27	9.23	16.03	15.10	17.93	14.64	11.90	10.73	17.69	18.72
Greenland turbot	4.85	0.96	1.04	0.93	2.15	2.21	0.85	0.78	0.71	0.26	0.17
Other flatfish	5.87	2.96	0.73	2.17	1.15	1.72	0.66	0.74	0.86	1.28	1.32
Other groundfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacific cod	9.60	5.35	8.14	7.29	17.65	17.99	14.61	21.64	25.45	37.06	33.19
Pollock	3.90	2.48	1.39	2.76	3.06	2.26	2.38	2.79	0.05	0.00	0.21
Rock sole	26.84	22.56	0.00	13.79	16.06	22.28	19.09	25.78	19.84	29.59	33.29
Rockfish	12.26	11.65	8.08	3.94	6.68	5.26	5.53	6.66	8.57	7.03	9.76
Sablefish	0.25	0.14	22.69	0.03	0.01	0.00	0.19	0.00	0.00	0.20	0.07
Yellowfin sole	34.25	32.07	57.07	35.98	25.85	35.39	37.13	42.26	49.57	51.51	80.94
GOA groundfish	26.06	28.02	17.04	17.32	22.75	25.67	17.86	20.75	24.16	17.78	26.58
Total	**168.07**	**183.98**	**156.66**	**120.44**	**136.90**	**157.67**	**163.21**	**161.92**	**168.41**	**197.64**	**251.28**

Source: NMFS, Alaska Fisheries Science Center Economic SAFE Report Data.

5.6.4.1 BSAI Groundfish Products and Secondary Processing Activity

This section describes primary and secondary products produced in the BSAI groundfish fisheries. The discussion provides an aggregated perspective and does not examine production on a sector-by-sector basis. This section is based mainly on information provided in the document, *Alaska Groundfish Fisheries Final Programmatic Supplemental Environmental Impact Statement* (NMFS 2004).

Primary Products

Groundfish harvested in the fisheries off Alaska are made into a wide range of primary, secondary, and ancillary products. In this analysis primary product is defined as the product form after the initial stage of processing.[4] By this definition, all products produced directly from raw fish are considered primary products. These products may be table-ready (i.e., final product), but more often they are reprocessed before they are sent to retail markets or foodservice establishments. Secondary processing is defined as any processing that occurs after the primary products have been transferred to a different facility. Secondary processing includes the production of kamaboko from surimi, and the production of breaded fish sticks from fillets.

Table 5.6-16 shows the various primary products by weight, made from three of the BSAI groundfish categories of interest in the subject action, during 1998 through 2003. A large percentage of flatfish are frozen whole, while a small percentage, primarily yellowfin sole, are made into kirimi, a steak-like product. Atka mackerel is primarily produced as a headed and gutted or whole product. Most flatfish, by volume, are also headed and gutted, in some instances with the roe left intact, when present. It should be noted that comparing products by weight can be misleading. For example, fillets are typically skinless and boneless product, so a 5 lb yellowfin sole might yield 1.25 lb of fillets. The price per pound for fillets is higher than for head-and-gut product, primarily because fillets require less secondary processing (i.e., engender more “value-added” by the initial processor).

[4] This definition of primary processing differs from definitions used by processors when they report production to NOAA Fisheries in Weekly Processor Reports. In weekly reports processors differentiate primary products, such as fillets or surimi, from ancillary products, such as roe and fish meal.

Table 5.6-16 Volume of Selected BSAI Groundfish Products, by Species and Product Type (1,000 mt), 1998–2005.

Species/Product	1998	1999	2000	2001	2002	2003	2004	2005
Flatfish								
Whole fish	31.35	9.64	11.88	7.75	13.1	10.2	12.02	20.6
Head and gut	37.81	36.44	42.32	35.16	45.84	48.82	54.93	60.72
Kirimi	6.3	4.21	6.37	6.15	2.86	3.68	1.81	1.62
Fillets	-	-	-	-	-	0	-	-
Other products	0.86	0.7	0.85	0.42	0.74	0.73	0.83	1.14
Atka mackerel								
Whole fish	4.87	10.1	2.92	4.81	3.27	7.13	5	0.89
Head and gut	21.9	22.18	22.49	26.66	18.53	20.72	24.75	32.74
Rockfish								
Whole fish	0.04	1.73	0.17	0.46	0.71	0.74	0.33	0.4
Head and gut	4.45	5.04	4.3	2.94	4.58	5.77	5	4.63
Other products	0.01	0.02	0.01	2.14	0	0.04	0.02	0.02

Source: NMFS

Overview of Secondary Processing Activities

During 1995-2003, there were no major secondary processors of these species operating in Alaska. Groundfish harvested in Alaska is most often exported as headed and gutted, although some is exported as whole frozen fish, for example. How much remain in the U.S. and how much is shipped abroad varies from year to year.

5.6.4.2 Product Flows and Markets for BSAI Flatfish and Rockfish Species

The H&G Trawl CP sector currently produces, almost exclusively, whole and head and gut products. Catch is typically processed quickly after it is brought on board, maintaining relatively high quality across the fleet. At times, however, quality may suffer, because of the race for fish, which could compel participants to bring catch on board more quickly than it can be optimally processed, simply in an effort to maintain share of the total catch. A large majority of the primary processed output of this fleet is shipped to Asia for reprocessing, while a small portion of the output remains in the U.S., going directly to domestic markets. Historically, much of the production that is Asia-bound has been shipped to Japan or Korea. In recent years, however, China has played a more prominent role in the reprocessing of groundfish from the H&G Trawl CP sector. In particular, a large portion of the flatfish, Atka mackerel, and AI POP harvested from the BSAI is shipped to China, where it is reprocessed into finished products and then exported to final consumer markets around the world. In addition, some of the various groundfish species are reprocessed in Thailand and Vietnam. After reprocessing, production from the fisheries reaches a variety of markets, including the U.S., Europe, Japan, and other Asian countries.

In addition to these generalities, some greater definition of markets for specific species and products is discernable. While the general pattern of production for the fleet is similar across all species and products, a few specific markets exist for particular products of the sector. In flatfish markets, the size (grade) of the fish is extremely important to the product flow. In general, there are four or five grades of flatfish, with each grade having a specific market. Smaller grades (S and M) are shipped directly to Japan where the product is used in lunch boxes. Larger grades (L, 2L, & 3L) are typically first shipped to China for reprocessing, before being shipped to the U.S. and European markets. A typical H&G Trawl CP vessel will often processed up to 10 species per trip (including incidental catch species), with four or five grades per species.

Other distinguishable markets have developed for rock sole with roe, Atka mackerel, and AI POP. The major market for rock sole with roe is Japan; most rock sole with roe is shipped frozen whole directly to Japan, where it is reprocessed. Most of this production remains in the Japanese consumer market. Rock sole without roe generally follows the same path as any other flatfish. Atka mackerel is more popular in Japan and Korea than elsewhere; most of the fleet's production is exported to Japan or Korea for secondary processing and consumption. Nearly all of the AI POP harvested in the BSAI is exported to China, where it is reprocessed and then shipped to Japan for final consumption.

While these production trends can be discerned, on the whole, it is difficult to assess the distribution of the sector's production among consumer markets, as much of the reprocessed fish enters the world whitefish market. As a consequence, predicting effects on consumer markets is difficult.

5.6.5 Community Information

5.6.5.1 Regulatory Context

Analysis of community engagement, dependency, and impacts is guided by National Standard 8, under the Magnuson-Stevens Act, along with associated guidelines. National Standard 8 states that:

> *Conservation and management measures shall, consistent with the conservation requirements of this [Magnuson-Stevens] Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities and (B) to the extent practicable, minimize adverse economic impacts on such communities (Sec. 301(a)(8)).*

The Magnuson-Stevens Act defines a 'fishing community' as "...a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and United States fish processors that are based in such community" (Sec. 3 [16]). NMFS further specifies in the National Standard guidelines that a fishing community is "...a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries dependent services and industries (for example, boatyards, ice suppliers, tackle shops)" (63 FR 24235, May 1, 1998). 'Sustained participation' is defined by NMFS as "...continued access to the fishery within the constraints of the condition of the resource" (63 FR 24235, May 1, 1998). Consistent with National Standard 8, this section identifies potentially affected regions and communities through characterization of community engagement with relevant aspects of the fishery, and characterizes the nature and magnitude of community dependence on the fishery. To provide a context for subsequent impact analysis, summary information on the relevant engaged and/or dependent communities is also provided.

Additional community or social impact analysis is also required under Executive Order 12898 on Environmental Justice. That analysis is found in Section 6.4 of this document.

5.6.5.2 Community Engagement and Dependence

Community engagement in a particular fishery is typically described through links to one or more fishery sectors, including catcher vessels, catcher/processor vessels, floating processors, motherships, and/or shore processors, as well as through a range of support service industry links, such as vessel repair and supply businesses, and the like. Dependence is normally described in terms of the relative importance of the specific fishery being considered to the overall fishery activities that take place within a region or community, as well as the relative role of fishery activities to the overall economic or social structure of a given region or community. Comparatively recent and detailed characterizations of patterns of community and regional engagement in, and dependency on, the North Pacific groundfish fishery have appeared in the *Alaska Groundfish Fisheries Final Programmatic Supplemental EIS* (NMFS 2004), *Sector and Regional Profiles of the North Pacific Groundfish Fishery* (Northern Economics and EDAW 2001), and in a technical paper (Downs 2003) supporting the *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005). This section will provide limited additional information specific to those aspects of the fishery potentially affected by the proposed management alternatives.

5.6.5.3 Community Engagement

As noted in sector discussions above, current fishing activity subject to change under the currently proposed management alternatives being analyzed in this document are exclusively concentrated in the H&G trawl CP sector. Therefore, the discussion in this section will concentrate on the ties of this sector to specific communities and regions through vessel homeporting and/or ownership links and location of vessel support service activities. Community ties to other sectors, such as catcher vessels, catcher/processors other than H&G trawl CPs, floating processors, motherships, and/or shore processors would not be materially affected by the proposed management alternatives.

A review of relevant data from the years 2003, 2004, and 2005, show a total of 28 unique H&G trawl CPs had at least some level of fishing effort in one or more of the areas potentially affected under the alternatives, options, or suboptions under consideration. Homeport information from vessel records is one way of looking at the ties of these specific vessels to particular communities, but is subject to a number of limitations described in more detail below.

Homeport information from vessel records for these 28 vessels is displayed in Table 5.6-17. This table further breaks out vessels that fished in one or more of the relevant areas, in only one or two of the base years (i.e., 2003-2005) in comparison to vessels that fished these areas in all three base years. As shown, over half of the participating vessels were homeported in Seattle, and over two-thirds of the vessels were homeported outside of the State of Alaska. Among Alaska communities, Dutch Harbor/Unalaska represent the homeport with the most consistent fishing effort, as measured by number of vessels, across all three base years, but Juneau, Anchorage, and Kodiak also show up as having some homeport activity, as well.

Table 5.6-17 H&G Trawl CP Homeport Data by Base Year Category

Homeport	Fished in 1 or 2 Base Years (2003, 2004, and/or 2005)		Fished All 3 Base Years (2003-2005)	
	Number of Vessels	Percent of Total Vessels	Number of Vessels	Percent of Total Vessels
Seattle, WA	16	57.1%	12	57.1%
Rockland, ME	3	10.7%	3	14.3%
Dutch Harbor, AK	3	10.7%	3	14.3%
Anchorage, AK	2	7.1%	0	0.0%
Kodiak, AK	2	7.1%	1	4.8%
Juneau, AK	2	7.1%	2	9.5%
Total Vessels	28	100.0%	21	100.0%

Table 5.6-18 provides homeport information on the relevant H&G trawl CP vessels broken out by vessel size class. This table shows while medium class vessels are relatively evenly distributed across the various homeport communities, fully three-quarters of the relevant larger vessels are homeported in Seattle alone.

Table 5.6-18 H&G Trawl CP Homeport Data by Vessel Size Class (Any Base Year)

Homeport	Medium Vessels (60-124.9 ft)		Large Vessels (125 ft +)	
	Number of Vessels	Percent of Total Vessels	Number of Vessels	Percent of Total Vessels
Seattle, WA	3	27.3%	13	76.5%
Rockland, ME	2	18.2%	1	5.9%
Dutch Harbor, AK	2	18.2%	1	5.9%
Anchorage, AK	2	18.2%	0	0.0%
Kodiak, AK	2	18.2%	0	0.0%
Juneau, AK	0	0.0%	2	11.8%
Total Vessels	11	100.0%	17	100.0%

Table 5.6-19 provides information on total revenue, by homeport (within the confines of data confidentiality constraints) for H&G trawl CP vessels for the Bering Sea and for the Bering Sea, Aleutian Islands, and Gulf of Alaska fisheries combined. Seattle is the only homeport that can be shown individually, as all other ports either have fewer than three vessels, or the locally based fleet is owned by fewer than three entities.

Table 5.6-19 H&G Trawl CP Revenue by Area and by Vessel Homeport

Homeport	Number of Vessels	Bering Sea Revenue, All 3 Base Years (2003-2005)		BS, AI, & GOA Revenue, All 3 Base Years (2003-2005)	
		Revenue	Percent of Revenue	Revenue	Percent of Revenue
Seattle	16	$213,321,250	59.4%	$351,744,050	63.8%
Other	12	$146,018,067	40.6%	$199,604,427	36.2%
Total	28	$359,339,317	100.0%	$551,348,477	100.0%

As mentioned above, however, homeport information from vessel records is of limited analytic utility. This is due to individuals completing vessel documentation with no guidelines on what to enter in the homeport field (e.g., community of residence of vessel owner, port of greatest activity for the vessel, port where vessel spends most off-season time, etc.) so that it is highly likely that homeport does not mean the same thing from vessel to vessel. Knowledge of the industry would indicate that Bering Sea fishing-related H&G trawl CP vessel port activity is even more concentrated in Seattle, and secondarily in Dutch Harbor/Unalaska, than homeport records alone would imply. It is common knowledge, for example, that multiple vessels owned and/or managed by a single entity that are listed as homeported in Seattle have for a number of years been based year-round out of Dutch Harbor/Unalaska, except for infrequent trips to Seattle when major maintenance or repairs are needed. These vessels alone outnumber the vessels listed as actually homeported in Dutch Harbor/Unalaska, such that homeporting records, taken at face value, would tend to understate the activity of these several vessels in Dutch Harbor/Unalaska and overstate their activity in Seattle. It is also common knowledge within the industry that the vessels listed as homeported on the U.S. east coast have operated out of Seattle rather than their listed homeport for a substantial number of years. Further, at least some of the vessels listed as homeported in other Alaska communities are at least as closely tied with Seattle as with those Alaska communities. In general, it is safe to say that port-related activity associated with the Bering Sea fishery pursuits of the relevant component of the H&G trawl CP fleet is highly concentrated in Seattle and Dutch Harbor/Unalaska.

Location of vessel ownership is also sometimes used to ascribe connections between a vessel(s) and a particular community(ies), with the reasoning that revenue flows (and therefore a range of direct and indirect economic and social activities) would tend to follow ownership patterns. Ownership relationships in this industry are often complex, and existing data do not allow a quantitative analysis based on this type of information. Qualitative knowledge of the industry in general and relevant vessels specifically, however, would indicate that ownership ties of the relevant portion of the H&G trawl CP fleet are more heavily concentrated in and around the Seattle area than homeport information may be taken to imply. Further, an ownership analysis of this fleet, undertaken for a simultaneously occurring Amendment 80 impact assessment, indicates that nearly all vessels potentially affected by these Bering Sea EFH alternatives have at least some ownership ties to the Pacific Northwest, and for many, the greater Seattle-metropolitan area (or, the U.S. Eastern seaboard in the case of three vessels).

In terms of engagement of support service sector businesses by the H&G trawl CP fleet when pursuing Bering Sea fisheries, no independent 'third-party' data, breaking out expenditures of this fleet, are readily accessible. According to a recent industry-sponsored expenditure survey of the H&G trawl CP sector (Northern Economics 2006), however, fleet outlays on landing taxes, as well as community sales, use, and hotel taxes within Alaska, are highly concentrated in Dutch Harbor/Unalaska. Further, from other discussions with industry, it appears that a very large proportion of product (perhaps 75 percent to 90 percent, depending on the operation) produced by the H&G trawl CP fleet from the Bering Sea, in general, and the area potentially affected by the proposed alternatives in particular, has in recent years been offloaded in Dutch Harbor/Unalaska. Some Bering Sea offloads to trampers do take place elsewhere, such as offloads of yellowfin sole at-anchor in calm waters around St. Paul (mostly to foreign flag trampers that then typically go to Dutch Harbor/Unalaska to clear customs). According to industry sources, the large majority (perhaps, 60 percent to 90 percent, again depending on the operation) of shipments occur via tramper, with the balance moving by container vessel. In addition to activity at the shipping enterprises themselves, offloading and shipment-related activity in Dutch Harbor/Unalaska require the use of locally based vessel pilots, company agents, and stevedores and related enterprises.

Dutch Harbor/Unalaska has also traditionally been the location for Bering Sea H&G trawl CP fleet refueling, re-supply (including groceries), crew changes, and other in-region support, as needed, (e.g., gear storage, logistical support, use of local cold storage capacity during peak seasons, etc.). In recent years, the overall season has lasted from late January through mid-to-late September, with frequent port calls common for given vessels during this time. A number of H&G trawl CP vessels, irrespective of homeport and/or owner's community, also spend the off-season in Dutch Harbor/Unalaska, leaving the community only for active fishing periods, or to return to the lower 48 States (e.g., Seattle) for major maintenance and repair needs. It is important to note that, while offloading does also occur near St. Paul, this activity does not take place in the community as it does in Dutch Harbor/Unalaska, nor does St. Paul provide substantial support services to the fleet outside of serving as a staging area for crew changes, with crew ferried out to (and back from) the H&G trawl CP in small boats (i.e., the larger vessels do not enter the harbor and tie up at community docks to transfer crew). St. Paul also sees at least some limited fuel and light supply sales, as well. Other communities along the western coast of mainland Alaska may also act as locations for crew changes in a manner similar to St. Paul, including Togiak and Platinum. None of these communities, however, provide support services to the fleet in the diverse ways, or on the order of magnitude, that is seen in Dutch Harbor/Unalaska.

In terms of the potential for other community engagement, once shipment of product from Dutch Harbor/Unalaska takes place, industry sources indicated that foreign flag trampers typically move product to China (for secondary processing and subsequent export to many points around the world, including elsewhere in Asia, Europe, and the United States), Japan (for reprocessing and consumption within that country), and Korea (for reprocessing and either consumption within the country, or subsequent export abroad). Domestic trampers typically move product along the west coast of North America into Canada and the United States. Container vessels typically move product to Asia, Europe, or Seattle. Domestic U.S. shipments, whether by tramper or container, typically consist of rex sole, destined for selected urban markets, and a range of soles and cod fish bound for east coast markets. Reportedly, less product currently ships directly to domestic ports from Dutch Harbor/Unalaska than in the past, but more product reaches the United States, after secondary processing in China, than was previously the case. With the de-emphasis on domestic secondary processing, community engagement with the fishery, outside of Alaska or Seattle, is perhaps less concentrated in specific locales than was previously the case, although overall domestic economic returns may, in fact, have increased during this time.

While Adak has grown in importance as a support port for the H&G trawl CP fleet in recent years, this support has been largely associated with the Aleutian Islands fishery activity, rather than Bering Sea area activity. Similarly, support activity for this fleet also occurs in Kodiak, but this activity is more closely associated with Gulf of Alaska fisheries, than Bering Sea fisheries affected by the proposed management alternatives.

In terms of ties between crew/employees and specific communities, earlier work indicates that for the H&G trawl CP sector as a whole, much of crew recruiting is done with greater Seattle as a point of hire, although it is not uncommon for newspaper advertisements for open positions to be placed in diverse urban markets throughout the Pacific Northwest and other urban centers such as Denver, Minneapolis, or Chicago. Individual employees are commonly drawn from several states along the west coast and in the Pacific Northwest area of the United States, as well as from areas outside the country, including Mexico, South America, Southeast Asia, and Russia. For those several vessels with CDQ agreements, the majority of these agreements commonly stipulate employment goals whereby a number of crew positions are targeted to be filled by Alaska CDQ community residents, but is not apparent in the available data how many of these hires have taken place on the vessels potentially affected by the various management alternatives under consideration here. As in a number of other sectors, vessel crew positions tend to be relatively stable employment. While no independent data are accessible to track these trends, interviews with industry suggest, in contrast to some other CP sectors, the turnover rate among processing crew is also relatively low. Industry representatives suggest that this phenomenon may be related to the relatively small crew sizes, a more varied catch, and the degree of expertise required to successfully process many different species of fish over the course of a season. Information is not available for the specific vessels potentially affected by the proposed alternatives, but it is assumed that they follow similar employment patterns, such that crew employment and income are not tightly concentrated in any particular community within or outside of the greater Seattle area.

5.6.5.4 Community Dependence

As noted in the community engagement discussion, most activity associated with the potentially affected Bering Sea H&G trawl CP fleet accrues to Seattle, Washington and Dutch Harbor/Unalaska, Alaska. Additionally, based on homeport information, some activity may accrue to Anchorage, Kodiak, and Juneau, Alaska, as well as to Rockland, Maine.

Anchorage, Kodiak, Juneau, and Rockland

Anchorage, Kodiak, and Juneau are relatively large and, especially by Alaska standards, relatively economically and socially diversified communities. Located on the mainland in south-central Alaska, Anchorage is the main urban center of the State, with 269,070 inhabitants, as of the 2000 census. Demographically diverse, about 10 percent of the population reported they were Alaska Native/Native American in whole or in part in that census. Anchorage is the State's center of commerce, with most of the State's important economic sectors represented, one way or another, in the community (i.e., as the regional headquarters of major business entities, if not the site of direct extractive activities). Anchorage is involved in a number of ways with the fishing industry, is home to an active fleet, and in 2000 was home to nearly a dozen processing entities, including small-scale niche processors. In 2000, 773 Anchorage residents held a combined total of 1,042 commercial fishing permits. Anchorage had 1,388 of its residents registered as crewmen. A total of 57 resident vessel owners fished Federal fisheries that year, with the fleet involved in most fisheries in and off Alaska (Sepez et al., 2005).

The City of Kodiak, located on Kodiak Island, about 250 miles southwest of Anchorage in the Gulf of Alaska, had 6,334 residents as of the 2000 census. Demographically diverse, about 13 percent of the population reported they were Alaska Native/Native American in whole or in part in that census. Kodiak's economy is largely tied to commercial fishing, although it is considerably more diversified than major fishing ports farther west in the Gulf, or on the Bering Sea coast. Kodiak is homeport to the largest fishing fleet in the State and is one of the major processing centers in the Alaska, with multiple large plants. There were 1,569 commercial fishing permits issued to residents of Kodiak in 2000, and a reported 1,263 licensed crew members residing in the community. There were 256 resident vessel owners participating in the Federal commercial fisheries that year (Sepez et al., 2005).

Juneau is located on Alaska's southeast mainland coast, facing Douglas Island, in the eastern Gulf of Alaska, approximately 575 miles southeast of Anchorage. As of the 2000 census, Juneau, the State's third largest city, had 30,711 inhabitants. Demographically diverse, about 17 percent of the population reported they were Alaska Native/Native American in whole or in part in that census. As the Alaska State capital, the public administration sector of the economy predominates, although tourism and commercial fishing are also locally important economic sectors. In addition to having a sizeable local fleet, Juneau was also home to a half-dozen processing plants in 2000. In that same year, 552 Juneau residents held 962 commercial fishing permits, and 466 of Juneau's residents were registered as crewmen. A total of 81 local vessel owners participated in a full range of Federal fisheries in 2000 (Sepez et al., 2005).

Rockland is located on Maine's southeast coast, just north of Owls Head, and approximately 70 miles east of Portland. As of the 2000 census, Rockland had 7,609 inhabitants, with little demographic diversity, as approximately 98 percent of the population reported themselves as white, non-Hispanic in that census. Rockland is officially designated a "micropolitan" area by the U.S. Bureau of the Census, acting as a service center for the surrounding rural population and offering amenities commonly found in more populated, urban centers. Once focused on shipbuilding, commercial fishing and lobstering, and granite quarrying, the economy of Rockland has more recently become dominated by the service industry and tourism.

For Anchorage, Kodiak, and Juneau, the two H&G trawl CP vessels homeported in each community that may be affected by the proposed management alternatives are not, themselves, a substantial portion of the fishery sector upon which these diversified communities are dependent. None of these communities participates in the fisheries as a Community Development Quota (CDQ) community. Further, as developed above, attributing a large portion of affected Bering Sea fisheries' activities to homeport locations likely overstates the relative importance of these specific communities. As a result, Anchorage, Kodiak, and Juneau, for the purposes of this specific analysis, will not be further considered as fishery-dependent communities with respect to the proposed management alternatives.

Similarly, Rockland, Maine will not be further analyzed as a potentially fishery-dependent community with respect to the portion of the Bering Sea H&G trawl CP fishery sector that may be affected by the proposed management actions. This is because the only apparent ties of the fishery to that community are ownership/homeport ties of three vessels that reportedly have spent the last several years away from this east coast community.

Dutch Harbor/Unalaska and Seattle

Dutch Harbor/Unalaska is located in the Aleutian Islands, approximately 800 miles southwest of Anchorage and 1,700 miles northwest of Seattle. Unalaska is the 11th largest city in Alaska, with 4,178 residents as of the 2000 census. Demographically diverse, about 9 percent of the population reported they were Alaska Native/Native American in whole or in part in that census. There is relatively little local economic diversification outside of the commercial fishing and closely related industries, but the community has prospered as the number one port in the country in terms of volume of catch landed annually since 1992, and as either the number one or number two port in the country in terms of annual value of catch landed since 1988. It is clear that, by any definition, contemporary Dutch Harbor/Unalaska is heavily dependent on the commercial fishing industry. The most current, comprehensive baseline commercial fishing community profile for Dutch Harbor/Unalaska was recently prepared for the North Pacific Research Board and the NPFMC (EDAW and Northern Economics 2005), although the earlier produced *Steller Sea Lion Protection Measures Final SEIS* (NMFS 2001) contains additional detailed information on fishing sector demographics.

Specifically, Dutch Harbor/Unalaska is in a unique position with respect to the Bering Sea and Aleutian Islands fisheries. It is the site of both the most intense direct and indirect fishery economic sector activity among all the communities in the region. While having a modest local fleet, more BSAI groundfish and crab are processed in the community than in any other port, and the support service sector is developed to a greater degree in Dutch Harbor/Unalaska than any other community on the Bering Sea. Dutch Harbor/Unalaska is a community whose economy is strongly tied to Bering Sea commercial fisheries in general, as well as the regional community most closely associated with the H&G trawl CP fleet in particular. As a result, Dutch Harbor/Unalaska is considered individually in the subsequent analysis of community impacts potentially resulting from the fishery management alternatives under consideration. Dutch Harbor/Unalaska is not a CDQ member community.

Seattle has a complex relationship to the fishery. Similar to a pattern described in recent NPFMC and NMFS groundfish fishery-related documents (e.g.,, the *Alaska Groundfish Fisheries Final Programmatic SEIS* [NMFS 2004], *Impacts of the American Fisheries Act* [NPFMC 2001], and the *Steller Sea Lion Protection Measures Final SEIS* [NMFS 2001]), what makes Seattle an analytic challenge, in terms of a community assessment directly related to the Bering Sea H&G trawl CP fishery, is its scale and diversity. As of the 2000 census, the population of the Seattle-Tacoma consolidated metropolitan statistical area was over 3.5 million residents, in an area much more demographically and economically complex and diversified than any Alaskan community.

Like its relationship to the North Pacific groundfish fishery in general, Seattle's relationship to the specific potentially affected fisheries is a paradox. When examined from a number of different perspectives, Seattle is arguably more involved in the Alaska groundfish fishery in general and the Bering Sea H&G trawl CP sector in particular, than any other community. One example is the large absolute number of "Seattle" jobs within the fishery compared to all other communities, whether counted in terms of current residence, community of origin, or community of original hire – setting aside where the jobs are actually performed. In this sense, Seattle is more engaged in the potentially affected fisheries than any other community. On the other hand, when examined from a comparative perspective, it could be argued that the fishery is less important or vital for Seattle than for the other communities considered. Using the same example, the ratio of the number of Alaska groundfish fishery-related jobs in greater Seattle, compared to the total number of jobs in the same area, is quite small in contrast with analogous ratios for the much smaller community of Dutch Harbor/Unalaska. In this sense, Seattle is less economically dependent on the fishery than perhaps a number of other communities, and certainly less economically dependent on the fishery at the community level than is Dutch Harbor/Unalaska, in particular. It is important to note, however, that the fishery itself, as measured in many ways, is dependent upon Seattle, even if Seattle, as a community, is not economically dependent upon the fishery (which is not to say that a number of the industry sectors based in Seattle are not economically dependent upon the fishery). Economic dependency is not the sole form such relationships may take. Most observers would agree that Seattle has (and seeks to pertetuate) a cultural and historical identity that clearly depends upon its traditional role in the commercial fisheries of the North Pacific and Bering Sea. Given these relationships and its high level of engagement in, if not economic dependency upon, the relevant fisheries, Seattle is considered individually in the subsequent analysis of community impacts potentially resulting from the fishery management alternatives under consideration.

5.6.5.5 Other Community Considerations

Other Community Considerations

During public testimony before the AP, the issue of the potential for gear conflict between H&G trawl CP vessels operating in proposed (and currently) open trawl areas near some small western Alaska communities and small fishing vessels, especially halibut vessels, operating from those communities was raised. This concern was brought forward by residents of the Etolin Strait/Kuskokwim Bay area. Information provided by industry would indicate that informal discussions over past perceived gear conflicts in this area have occurred, and an informal working understanding has been reached between industry and the local fishermen, whereby H&G trawl CP vessel operators voluntarily agree amongst themselves at present to confine their trawl activities south of certain limitation lines in this area. Public testimony would indicate that local groups want to shape Bering Sea EFH alternatives such that open trawl area boundaries would formally take into account spatial gear conflict avoidance measures, in addition to habitat conservation driven goals. For reasons related to their proximity to various alternative open and closed areas detailed in the analysis of alternatives discussion, this issue focuses on the western Alaska communities of Kipnuk, Chefornak, and Platinum. In addition, information on the nearby communities of Mekoryuk, Savoonga, Gambell, Goodnews Bay, Kwigillingok, Umkumuite, Nightmute, and Tununak is provided (Figure 5.6-2). All of these communities are predominantly and traditionally Yup'ik Eskimo communities.

Saint Lawrence Island

There currently is no nonpelagic trawl effort as far north as St. Lawrence Island. However, in 1997, a large vessel commercial crab fishery was introduced in the area. Subsistence crab harvests began declining and during 1983 commercial vessels reportedly disrupted subsistence seal hunting activities near St. Lawrence (ADF&G 1985). Subsequently, a regulation was adopted by the Alaska Board of Fisheries in 1984, to close waters to commercial crab fishing within ten miles of all inhabited islands within the St. Lawrence Island Section (St. Lawrence Island, Little Diomede and King Island) (Kohler and Soong, 2005). The intent of the regulations was to protect stocks targeted by local subsistence fishermen and reduce impacts on marine mammal subsistence harvests.

Villagers of Little Diomede and St. Lawrence Island have traded and sold winter caught blue king crab to residents of Nome and other villages for years. ADF&G does not have an accurate estimate of the magnitude of this trade. Remoteness of villages contributes to the lack of harvest records. Current regulations allow a commercial harvest and sale of king crab from near shore during winter (Kohler and Soong, 2005).

The area near St. Lawrence Island is part of the generalized winter (November through March) migration pattern of the Bowhead Whale. Areas to the north and west of St. Lawrence Island are used by the Alaska Eskimo whaling community for hunting and search activities (North Slope Borough, 2003).

Western Alaska Communities

Some western Alaska communities in the vicinity of the open area alternative and Options 2 & 3 in this analysis have utilized halibut, herring, salmon, marine mammals, and other marine resources as a portion of their subsistence catches throughout recorded history. The local economy of these communities is characterized as "a mixed, subsistence-based economy", referring to their use of local, wild resources obtained by hunting and fishing, supplemented with some cash income secured through primarily seasonal and intermittent wage employment, and combined with the commercial sale of halibut, salmon, herring, and furs, as well as cottage industries (Wolfe and Walker 1987). Mekoryuk, on Nunivak Island, has several residents with commercial halibut permits, and a halibut processing plant active in the community. Over 200 short tons of herring were harvested annually for subsistence use by communities in the Nelson and Nunivak Island districts and the Kuskokwim Bay area combined (ADF&G 1991). ADF&G does not have an accurate estimate of the magnitude of subsistence use in these areas. Remoteness of villages contributes to the lack of harvest records. Specific catch and locations of harvested marine mammals are not provided in this summary.

Additional information of the socioeconomic environment relative to this action is provided in Chapter 5 of this analysis. A detailed review of the management of groundfish fisheries is provided in the PSEIS (NMFS 2004a), and the environmental effects of the BSAI groundfish fisheries are explained in detail in the 2006 TAC specifications EIS (NMFS 2006).

Kipnuk is located on the west bank of the Kugkaktlik River in the Yukon-Kuskokwim Delta. It is 85 miles southwest of Bethel, a few miles inland from the Bering Sea, and about 490 miles west-southwest of Anchorage. In 2000, Kipnuk had a total of 644 residents, of whom 98 percent self-reported Alaska Native or Native American heritage in whole or in part. The economy of Kipnuk is based on a combination of commercial fishing, and subsistence fishing and hunting, with most employment opportunities being seasonal. In 2000, there was no processing plant in the community, nor were there any registered commercial landings. In that same year, 97 local residents held 135 commercial fishing permits, there were 82 registered crewmembers in the community, and there were seven local vessel owners operating in Federal fisheries.

Chefornak is located on the south bank of the Kinia River, near its mouth at Etolin Strait. It is 98 miles southwest of Bethel and 490 miles west-southwest of Anchorage. As of the 2000 census, there were 394 residents of Chefornak, of whom 98 percent reported they were Alaska Native or Native American in whole or in part. Commercial fishing is a mainstay of the local economy that otherwise offers relatively limited employment opportunities. Subsistence fishing and hunting are important to nearly all residents of the community. In 2000, there was one commercial fish processing plant in Chefornak. In that same year, 27 local residents held a total of 56 commercial fishing permits, there were 21 registered crew members in the community, and there were 8 vessel owners residing in the community who operated in

Federally-managed fisheries. Chefornak also participates in Bering Sea fisheries as a member of the Coastal Villages Region Fund CDQ group (Sepez et al. 2005).

Platinum is located on the south spit of Goodnews Bay, on the Bering Sea coast. It is 123 miles southwest of Bethel. In 2000, there were 41 residents in 17 households, of whom 93 percent reported they were Alaska Native or Native American in whole or in part. Commercial fishing is the base of economic activity in Platinum, with many residents using subsistence resources as a supplement to their cash incomes. In 2000, there was no fish processing plant in the community, nor were there any registered commercial landings. In that same year, 9 local residents held a total of 16 commercial fishing permits (10 herring permits and 6 salmon permits), and 7 permits were fished. There were also 7 registered crew members in the community, and 8 vessel owners with operations in Federal fisheries. Platinum also participates in Bering Sea fisheries as a member of the Coastal Villages Region Fund CDQ group (Sepez et al. 2005).

Mekoryuk is located on the mouth of Shoal Bay, on the north shore of Nunivak Island in the Bering Sea. It is about 30 miles off the coast, about 149 air miles west of Bethel and 553 air miles west of Anchorage. In 2000, there were 210 reported residents of Mekoryuk, of whom nearly 97 percent reported they were Alaska Native or Native American in whole or in part. Employment in the community is provided primarily by the school, city, Village Corporation, commercial fishing, construction, and service industries. A major employer is the Nuniwarmiut Reindeer and Seafood Products Company. Many families also earn income from Native crafts or trapping, and most are involved in subsistence and have fish camps. In 2000, a total of 113 commercial fishing permits were issued to residents of the community (86 of which were fished), and 50 residents were licensed crew members. A total of 51 permits were issued for commercial halibut fishing, 60 permits for herring, and one permit each for saltwater finfish and salmon fishing. Also in 2000, 37 residents owned vessels involved in Federal fisheries. No vessels delivered landings to Mekoryuk in 2000; however, a halibut plant subsequently began fish processing in the community. The plant is operated by Coastal Villages Region Fund, the CDQ group representing the community (Sepez et al. 2005).

Goodnews Bay is located in Goodnews Bay, a small inlet off Kuskokwim Bay in the Bering Sea. It is approximately 116 air miles south of Bethel and 400 miles west of Anchorage. In 2000, Goodnews Bay had 230 residents and 71 households, of which 94% reported being Alaska Native or Native American in whole or in part. The economy in Goodnews Bay is based primarily on subsistence hunting and fishing, and a significant number of residents also hold commercial fishing permits. The salmon and herring fisheries of Goodnews Bay are particularly important, with a total of 28 salmon permits and 23 herring permits held by residents of the community. In addition, one halibut permit was issued in 2000. In 2000, there were 9 vessels with operations in non-Federal fisheries, whose owners resided in the community, and 37 registered crew members. There are no dock facilities in the community, although locals use boats and skiffs extensively during the summer months. In 2000, there were also no commercial fish processors located in Goodnews Bay, and therefore, no registered landings. The community is part of the Coastal Villages Region Fund CDQ group (Sepez et al. 2005).

Savoonga is located on the northern coast of St. Lawrence Island in the Bering Sea, 164 miles west of Nome. It lies 39 miles southeast of Gambell. When the Alaska Native Claims Settlement Act (ANCSA) was passed in 1971, Gambell and Savoonga decided not to participate, and instead opted for title to the 1.136 million acres of land in the former St. Lawrence Island Reserve. The island is jointly owned by Savoonga and Gambell. In 2000, Savoonga had 643 residents, of which 96% reported being Alaska Native or Native American in whole or in part. The economy of Savoonga is largely based upon subsistence hunting (of marine mammals) and fishing, with some cash income. Eight residents hold commercial fishing permits, and Norton Sound Seafood Products operates in Savoonga. Reindeer harvests occur, but the herd is not managed. Fox are trapped as a secondary source of income, and residents are known for their quality ivory carvings (Alaska DCCED, 2007). Savoonga is part of the Norton Sound Economic Development Corporation CDQ group.

Gambell is located on the northwest cape of St. Lawrence Island, 200 miles southwest of Nome, in the Bering Sea. Gambell is 36 miles from the Chukotsk Peninsula, Siberia. In 2000, Gambell had 649 residents, of which 96% reported being Alaska Native or Native American in whole or in part. Like Savoonga, the economy in Gambell is largely based upon marine subsistence harvests: seal, walrus, fish, and bowhead and gray whales. Fox are trapped as a secondary source of cash income, and ivory carving provides income, as well. Some reindeer roam free on the island, but most harvesting occurs out of Savoonga. Ivory carving is a popular source of income (Alaska DCCED, 2007). Gambell is also part of the Norton Sound Economic Development Corporation CDQ group.

Kwigillingok is on the western shore of the Kuskokwim Bay on the Bering Sea, near the mouth of the Kuskokwim River. It is 77 miles southwest of Bethel and 388 miles west of Anchorage. In 2000, Kwigillinkok had 338 residents in 73 households, 98% of which recognized themselves as being Alaska Native or Native American in whole or in part. The economy in the community is dominated by commercial fishing, particularly the herring and salmon fisheries, and most residents also rely on subsistence hunting and fishing. In 2000, there were 14 resident vessel owners with operations in State-managed fisheries and 1 resident vessel owner involved in Federal fisheries. There were also 26 registered crew member, and 37 local residents who held a total of 53 commercial fishing permits (7 halibut; 20 herring; 26 salmon). In 2000, there were no commercial fish processors and, thus, no registered landings. The community is part of the Coastal Villages Region Fund CDQ group (Sepez et al. 2005).

Nightmute is located on Nelson Island in the Bering Sea, about 100 miles west of Bethel. In 2000, there were 208 residents in 47 households, with 95% of the population recognizing themselves as all or part Alaska Native or Native American. Commercial fishing is a major part of the economy in Nightmute, with the local school system being another major source of employment. Similar to the previous communities discussed, most Nightmute residents also supplement their incomes with subsistence hunting and fishing. In 2000, 15 vessel owners with operations in Federal fisheries resided in Nightmute, along with 3 vessel owners with operations in State-managed fisheries. In addition, there were 22 registered crew members in the community, and 31 residents held a total of 44 commercial fishing permits (20 halibut; 18 herring; 6 salmon). In 2000, there were no commercial fish processors and, thus, no registered landings. The community is part of the Coastal Villages Region Fund CDQ group (Sepez et al. 2005).

Tununak is also located on Nelson Island (northeast coast) on a small bay. The community is 115 miles northwest of Bethel and 519 miles northwest of Anchorage. In 2000, there were a total of 325 residents, of whom 97% recognized themselves as all or part Alaska Native or Native American. The Tununak economy centers around commercial fishing, school district employment, village council employment, and income generated from trapping and crafts. Subsistence is also a significant part of the community, including marine mammals and fish. In 2000, 78 commercial fishing permits were held by residents (41 halibut; 33 herring; 1 saltwater finfish; 3 salmon), and 23 residents were licensed crew members. Twenty-eight vessel owners participated in Federal fisheries; 2 vessel owners participated in the salmon fishery. No vessels delivered to Tununak in 2000, although a processor operates in the community. Coastal Villages Seafood, Inc, a subsidiary of the CDQ group, processes halibut and salmon. The community is part of the Coastal Villages Region Fund CDQ group (Sepez et al. 2005).

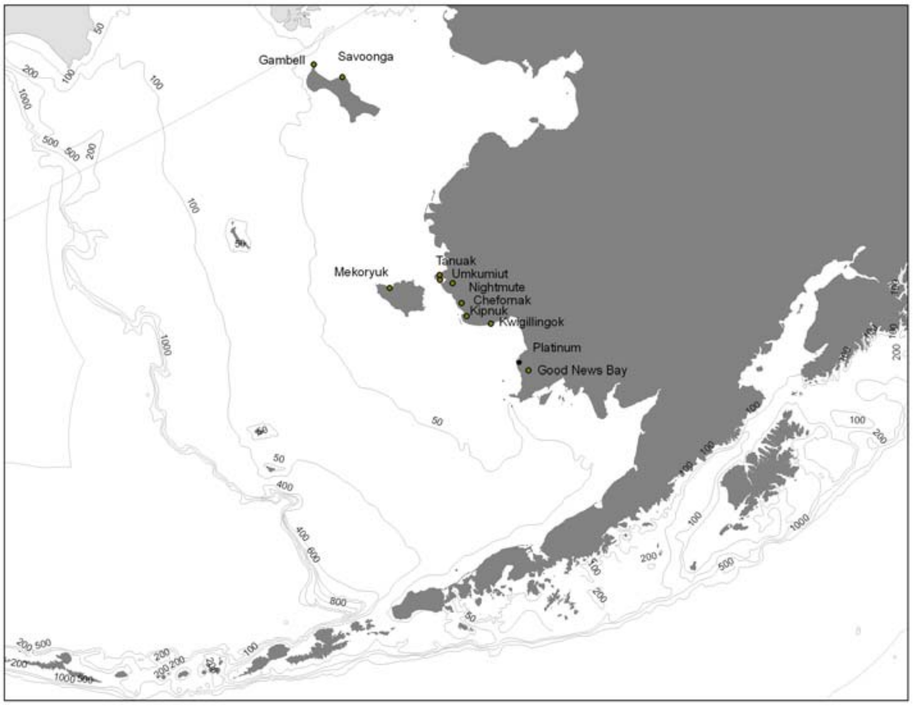


Figure 5.6-2. Location of 11 western communities of Kipnuk, Chefornak, and Platinum. In addition, information on the nearby communities of Mekoryuk, Savoonga, Gambell, Goodnews Bay, Kwigillingok, Umkumuite, Nightmute, and Tununak,

5.6.6 Description of the Western Alaska Community Development Quota (CDQ) Program

This section provides general information about the Western Alaska CDQ Program. More detailed information about the CDQ Program and CDQ groups may be found at: the NOAA Fisheries, Alaska Region web site at http://www.fakr.noaa.gov/cdq/default.htm, the Alaska Department of Commerce, Community and Economic Development web site at http://www.dced.state.ak.us/bsc/CDQ/cdqstats.htm, and the Bering Sea Fishermen's Association's web site http://www.cdqdb.org.

5.6.6.1 CDQ Program

The Community Development Quota (CDQ) Program was developed to redistribute some of the economic benefits from Bering Sea and Aleutian Islands (BSAI) fisheries to adjacent communities by allocating to them a portion of commercially important BSAI species as fixed shares, or quota, of groundfish, halibut, and crab. The program was designed to improve the social and economic conditions in western Alaska communities by facilitating their economic participation in BSAI fisheries. The large-scale commercial fisheries of the BSAI developed in the eastern BS without significant participation from rural western Alaska communities. These fisheries are capital intensive and require large investments in vessels, infrastructure, processing capacity, and specialized gear. Allocating fisheries resources to the CDQ Program provides opportunities for residents of communities associated with the program to participate in the BSAI fisheries.

In accordance with the Magnuson-Stevens Act, the CDQ Program is established in order:
(i) to provide eligible western Alaska villages with the opportunity to participate and invest in fisheries in the Bering Sea and Aleutian Islands Management Area;
(ii) to support economic development in western Alaska;
(iii) to alleviate poverty and provide economic and social benefits for residents of western Alaska; and

(iv) to achieve sustainable and diversified local economies in western Alaska.

5.6.6.2 CDQ Program allocations and benefits

The CDQ Program receives apportionments of the annual catch limits for a variety of commercially valuable species in the BSAI. These program allocations are in turn allocated among six different non-profit managing organizations representing different affiliations of communities (CDQ groups). There are 65 communities participating in the program. Approximately 27,000 people reside in CDQ communities. CDQ groups use the revenue derived from the harvest of their fisheries allocations as a basis for funding investments, for economic development activities, and for providing employment opportunities. Thus, the successful harvest of CDQ Program allocations is integral to achieving the goals of the program.

The percentage of each annual BSAI catch limit allocated to the CDQ Program varies by species. The 2006 CDQ allocations included approximately 188,000 mt of groundfish, about 2 million pounds of halibut, and approximately 5.7 million pounds of crab. Annual CDQ allocations provide a revenue stream for CDQ groups through various channels, including the direct catch and sale of some species, leasing quota to various harvesting partners, and income from a variety of investments. The six CDQ groups had total revenues in 2005 of approximately $134 million, primarily from pollock royalties. Since 1992, the CDQ groups have accumulated net assets worth approximately $369 million (as of 2005), including ownership of small local processing plants, catcher vessels, and catcher/processors that participate in the groundfish, crab, salmon, and halibut fisheries.

One of the most tangible direct benefits of the CDQ Program has been employment opportunities for western Alaska village residents. CDQ groups have had some successes in securing career track employment for many residents of qualifying communities, and have opened opportunities for non-CDQ Alaskan residents, as well. Jobs generated by the CDQ program included work aboard a wide range of fishing vessels, internships with the business partners or with government agencies, employment at processing plants, and administrative positions. In recent years, annual CDQ-related jobs have ranged from 1,339 people in 1999 to 2,025 in 2005. CDQ wages have ranged from $10.6 million in 1999, to $16.6 million in 2005. CDQ groups continue to explore the means to provide both continuing and additional employment opportunities for local residents.

5.6.6.3 CDQ Program management

The fishery resources allocated under the CDQ Program are under Federal jurisdiction, but the program was historically managed by both NMFS and the State of Alaska (State). The changes made to the Magnuson-Stevens Act in 2006 shifted most oversight responsibilities to an administrative panel comprised of the six CDQ groups. Prior to 2006, the State primarily was responsible for the day-to-day administration and oversight of the economic development aspects of the program, recommending quota allocations for each CDQ group, and the management of the CDQ crab fisheries. NMFS was, and remains, primarily responsible for groundfish and halibut CDQ fisheries management. The State of Alaska continues to manage the crab CDQ fisheries in conjunction with the management of other non-CDQ crab fisheries in the BSAI. The fisheries management regulations governing the CDQ fisheries are integrated into the regulations governing the non-CDQ fisheries for groundfish, halibut, and crab.

5.6.6.4 CDQ Communities and Groups

The CDQ Program communities are predominantly Alaska Native villages. The communities are typically remote, isolated settlements with few natural assets with which to develop and sustain a viable diversified economic base. Basic community and social infrastructure is often underdeveloped or lacking, and transportation and energy costs are high. Historically, economic opportunities have been few, unemployment rates have been chronically high, and these communities (and the region) have been economically depressed.

While the CDQ communities are located within 50 miles of the Bering Sea shoreline, and as such can be thought of as "bordering" very productive fishing grounds, they did not exploit this proximity as the BSAI groundfish fisheries developed. The development of the domestic groundfish fishing and processing sectors in these fisheries occurred relatively quickly, between 1976 and into the 1990s. However, the high initial capital investment, and the equally high economic risks, required to compete in these fisheries largely precluded small communities (with a few notable exceptions) from participating in them. The CDQ Program served to re-distribute wealth deriving from these fish stocks, ameliorating some of these circumstances by extending an opportunity to qualifying communities to directly benefit from the productive harvest and use of these publicly-owned resources.

Currently, 65 communities participate in the CDQ Program, based on eligibility criteria listed in both the Magnuson-Stevens Act and Federal regulation. The eligible communities have formed six non-profit corporations (CDQ groups) to manage and administer the CDQ allocations, investments, and economic development projects. The six CDQ groups are Aleutian Pribilof Island Community Development Association (APICDA), Bristol Bay Economic Development Corporation (BBEDC), Central Bering Sea Fishermen's Association (CBSFA), Coastal Villages Region Fund (CVRF), Norton Sound Economic Development Corporation (NSEDC), and Yukon Delta Fisheries Development Association (YDFDA).

5.6.6.5 CDQ Program Allocations, Harvest, and Value

Since 1992, the share of the ABC transferred to the CDQ Program has expanded several times, and now includes allocations of pollock, halibut, sablefish, crab, all of the remaining groundfish species (cod, Atka mackerel, flatfish, and rockfish), and prohibited species catch allowances (i.e., bycatch allowances of salmon, halibut, and crab needed to prosecute their target-species quotas). CDQ Program allocations vary by species. Congress increased the pollock CDQ allocation from 7.5 percent to 10 percent, in 1998, as part of the American Fisheries Act. The percentage of other catch limits allocated to the CDQ Program (as CDQ reserves) is determined by: the BSAI Crab Rationalization Program (10 percent of crab species, except for Norton Sound red king crab, which is 7.5 percent (70 FR 10174, March 2, 2005); the BSAI FMP for all other groundfish and prohibited species (7.5 percent, except 20 percent for fixed gear sablefish); and, 50 CFR 679 for halibut (20 percent to 100 percent, depending on management area).

Establishment of the annual groundfish CDQ reserves is an extension of the groundfish harvest specifications process. Once annual BSAI species categories and TAC amounts are established, an initial TAC amount of 85 percent of the aggregated BSAI TACs is calculated for all species, except pollock and fixed gear sablefish. The remaining 15 percent of annual TAC is equally split between the CDQ Program and a non-specified groundfish reserve. This is the basis for the annual 7.5 percent groundfish CDQ reserve, which is then apportioned back among the TAC categories in place for a given year, based on the proportion each TAC category contributes to the aggregate BSAI TAC limit. The BS and AI pollock TACs each contribute 10 percent to CDQ reserves, while the fixed gear sablefish TAC contributes 20 percent to a CDQ reserve. A parallel process is used to allocate 7.5 percent of each BSAI prohibited species catch limits to the CDQ Program as prohibited species quota (PSQ). Annual groundfish CDQ and PSQ allocations for 1998 to 2004 are available at the NOAA Fisheries web site cited in the introductory paragraph to Section 3.3.5. The process establishing PSQ reserves is similar.

Each CDQ group is eligible to receive a percentage allocation of each CDQ reserve and prohibited species quota (PSQ) reserve, as recommended by the State and approved by the NOAA Fisheries. The percentages can vary by CDQ group, management area, and species. Such percentages are reviewed and amended on a periodic basis. Under the current regulations, all groundfish (except for squid and "other species," as discussed in Section 3.4) and prohibited species caught by vessels fishing for a particular CDQ group accrues against that group's CDQ and PSQ allocations. Besides squid and "other species," none of the groundfish or prohibited species caught in the groundfish CDQ fisheries accrues against the non-CDQ apportionment of TAC or PSC limits. The CDQ groups must manage their catch to stay within each of their annual CDQ allocations, as they are prohibited from exceeding them. This may have a bearing on how successfully or aggressively CDQ groups prosecute some target species.

The 2004 CDQ allocations included approximately 187,000 metric tons of groundfish, over 2 million pounds of halibut, and approximately 3 million pounds of crab. CDQ allocations provide a revenue stream for CDQ groups in a variety of ways, including the direct catch and sale of quota, leasing quota to various harvesting partners, and income from investments that are funded by the proceeds of harvesting annual allocations. The six CDQ groups had total revenues in 2003 of approximately $87 million, primarily from pollock royalties. Since 1992, the CDQ groups have accumulated net assets worth approximately $231 million (as of 2003), including ownership of small local processing plants, catcher vessels, and catcher/processors that participate variously in the groundfish, crab, salmon, and/or halibut fisheries.

One of the most tangible direct benefits of the CDQ Program has been employment opportunities for western Alaska village residents. CDQ groups have had some successes in securing career track employment for residents of qualifying communities, and have opened opportunities for non-CDQ Alaskan residents, as well. Jobs generated by the CDQ Program included work aboard a wide range of fishing vessels, internships with the business partners or government agencies, employment at processing plants, and administrative positions. In recent years, annual CDQ-related employment has ranged from 1,339 people in 1999, to 2,080 in 2003. CDQ wages in those same years has ranged from $10.6 million to $11.9 million. CDQ groups continue to explore the means to provide both continuing and additional employment opportunities for local residents.

5.7 Analysis of the alternatives

This analysis of the alternatives begins with a treatment of impact categories not thought to be affected by the proposed alternatives. This is done to simplify and focus the discussion on those impact categories where impacts, either positive or negative, are likely. Finally, this section concludes with a summary of the analyses of the alternatives.

The analyses of the direct economic impact of the area closures on fleet sectors considered in the alternatives uses a “revenue at risk” approach. Revenue at risk is the amount of gross revenue estimated to be at risk for the fleet sector for each alternative or option as compared with the estimated total gross revenue generated by the fleet sector from all gear types, all retained species, and all areas off Alaska.

Under each alternative, the revenue at risk is that portion of total gross revenue that has been caught in an area proposed for closure under the Bering Sea Habitat Conservation measures. Revenue at risk can be mitigated, to a largely unknown extent, by relocating fishing effort from the proposed closed area to fishing grounds remaining open under the proposed habitat conservation measures. For the H&G trawl CP sector, baseline total gross revenue and gross revenue at risk are calculated by applying round weight equivalent first wholesale prices to retained round weight catch by species. Round weight equivalent first wholesale prices are estimated by NMFS from fleet reported product mix and values, by species. A similar revenue at risk analyses was conducted in the evaluation of EFH alternatives and is described in greater detail in the EFH EIS (NMFS, 2005).

The analyses of proposed gear modification impacts on the flatfish H&G Trawl CP fleet estimates expected additional gear, maintenance, and operational costs, where possible. These estimates were derived with assistance from gear manufactures that supply the H&G Trawl CP fleet sector, whenever possible.

5.7.1 Impact Categories Not Affected by the alternatives

5.7.1.1 AFA Trawl CP and CV Sectors

Other trawl sectors that are qualified to harvest flatfish in the EBS include the AFA trawl CP and the AFA trawl catcher vessel (CV) fleets. Although both fleets could potentially be affected by the proposed action to protect EBS fishery habitat, the volume and gross revenue from flatfish harvests in the EBS by both of the AFA Trawl fleet sectors is minor relative to their baseline first wholesale and ex-vessel gross annual revenues, produced in their main target fisheries for pollock and Pacific cod. The analyses of the alternatives for the proposed action produced no gross revenue at risk for these fleet components over the 2003 to 2005 period examined. This time period is used as it is the best available information that represents current consistent fishing practices.

5.7.1.2 CDQ Fisheries

Annual CDQ allocations include flatfish that are typically harvested under contract by vessels in the H&G trawl CP sector. The CDQ flatfish allocations are harvested in the same general area as the open access flatfish harvests. However, analyses of the alternatives for the Bering Sea Habitat Conservation action produced no gross revenue at risk for the CDQ harvest of flatfish over the 2003 to 2005 period examined.

5.7.1.3 Impacts on Other Fleet Components

Area closures proposed as part of the Bering Sea Habitat Conservation action under Alternative 2 and Optons 2-4 may effectively require the H&G trawl CP sector in the EBS to seek to mitigate first wholesale gross revenue placed at risk by transferring fishing effort from the closed area to the area remaining open. The transfer of fishing effort could potentially affect other fleet components fishing in the same area, such as the AFA trawl CP, AFA trawl CV, fixed gear CP, and fixed gear CV fleets, however, the analyses of the alternatives for the proposed action produced relatively small catch volumes and gross revenues at risk. Because of the small catch volumes and gross revenues at risk, any impacts on other fleet components from mitigation actions by the H&G trawl CP sector would likely be negligible.

5.7.2 Impacts of the alternatives

5.7.2.1 Alternative 1: Status Quo/No Action

Under the status quo, no additional measures would be taken to conserve benthic habitat in the Bering Sea at this time. There would be no changes to existing open fishing area and no gear modifications to nonpelagic flatfish trawl gear would be required. There would be no attributable revenue placed at risk, nor increased gear or operational costs under Alternative 1. Economic impacts would be associated with reduced pristine habitat for managed species, which may reduce fish populations and catches in the future. This outcome is uncertain at present and will depend upon the interplay of numerous, complex factors, over time (e.g., climate and oceanographic changes, technology advances, the world seafood market, global/national/regional macroeconomic forces).

5.7.2.2 Alternative 2: Open Area Approach and Northern Boundary Suboption

This alternative would prohibit trawling with nonpelagic trawl gear outside of a designated open area. Nonpelagic trawling would be thus prohibited in the northernmost shelf area and the deepwater basin area of the Bering Sea. Alternative 2 would close an area roughly 366,390 km^2, or 46.3% of the 791,731 km^2 of EBS benthic habitat currently open to nonpelagic trawling (shelf area to the 1,000 m depth contour) and all of the 160,938 km^2 EBS basin (depth >1,000 m). In addition, the suboption to Alternative 2 would move a portion of the northern boundary northward between Nunivak and St. Matthew Islands to 61° N.

Table 5.7-1 provides estimates of the revenue potentially placed at risk and the percent of baseline revenue potentially placed at risk under Alternative 2. From 2003 through 2005, first wholesale gross revenue at risk from the proposed area closure under Alternative 2 averaged $2.4 million, or 1.19% of status quo gross revenue. During the three years analyzed, Alternative 2 revenue at risk was lowest in 2005, at $1.25 million, or 0.77% of status quo gross revenue. The highest Alternative 2 revenue at risk, $3.53 million, or 1.81% of status quo gross revenue, occurred in 2004.

Flatfish and Pacific cod represented the largest proportions of first wholesale gross revenue at risk over the three-year period. Retained flatfish revenue at risk would have been $960,000 or 1.32% of the $72.72 million of status quo first wholesale gross revenue in 2003; $2.83 million or 3.37% of the $83.98 million status quo first wholesale gross revenue in 2004; and $2.22 million or 1.83% of the $121.33 million status quo first wholesale gross revenue in 2005. Pacific cod revenue at risk would have been $250,000 or 0.69% of the $35.91 million status quo first wholesale gross revenue in 2003; $570,000 or 1.23% of the $46.39 million status quo first wholesale gross revenue in 2004, and $190,000 or 0.72% of the $44.3 million status quo first wholesale gross revenue in 2005.

Given that the Alternative 2 open area encompasses more than 95% of current fishing area, the first wholesale gross revenue that would be placed at risk under the proposed action could likely be mitigated by additional fishing effort in the area remaining open to nonpelagic trawl. Such mitigation would not be expected to substantially increase operational costs, because a similar level of effort (number of tows) is expected to be needed to mitigate revenue at risk by relocating some tows within the area remaining open under this alternative. Presumably, some incremental increase in costs could acrue, because the closure may compel impacted operators to fish in ways and locations other than those they would have preferred, if unconstrained. These alternative areas must, by definition, be perceived as inferior, or one would observe these operators voluntarily fishing these areas/patterns under the status quo. The conclusion that these costs will not be substantial assumes that the distribution of fish stocks, and the resulting catch rates of target species and prohibited species, remains similar to presently observed distributions and rates within the open area.

The suboption to Alternative 2 would move a portion of the northern boundary of the open area northward to 61° N, between Nunivak and St. Matthew Islands. Analysis of the resulting “wedge-shaped” area did not reveal any nonpelagic trawl effort in this area during 2003 through 2005. Thus, the suboption does not affect the estimates of Alternative 2 revenue at risk. However, this northward boundary shift may serve to offset, to an unknown extent and for an unknown duration, adverse economic impacts on these fisheries that may occur from potential northward movement of groundfish stocks brought about by changing climactic conditions.

In terms of potential community impacts accruing from impacts to H&G trawl CP vessels homeported in the various communities, the level of revenue at risk as a percent of total combined revenues from all Bering Sea, Aleutian Islands, and Gulf of Alaska fisheries, by vessel, may be examined. Only two vessels had 5 percent or more of their respective revenue at risk, when evaluated for any year between 2003 and 2005 (inclusive) under Alternative 2. Both vessels had revenue at risk at this level only for 2004, both had revenues at risk less than 7 percent, and both were homeported in communities other than Seattle. A total of 15 vessels had revenue at risk of greater than or equal to 1 percent, but less than 5 percent, in any of the base years (3 in 2003 only [but one of these vessels had more than 5 percent revenue at risk in 2004], 2 in 2003 and 2004, 10 in 2004 only, and none in 2005). Of the vessels with revenue at risk greater than or equal to 1 percent, but less than 5 percent of their total fishing revenues, 8 were homeported in Seattle and 7 were homeported in other communities. Due to the combination of relatively low levels of dependency by these specific homeport communities outside of Seattle on this sector (as detailed in Section 5.6.5 of the RIR) and the low levels of revenue at risk, no significant community impacts related to vessel homeport activities are foreseen, nor are significant community impacts considered likely in Seattle, simply due to the relatively low levels of revenues placed at risk under this alternative.

In terms of potential community impacts accruing to Bering Sea regional communities through fleet related support service activities, H&G trawl CP vessel revenue at risk for the Bering Sea fisheries alone is likely more relevant than combined revenue at risk for Bering Sea, Aleutian Island, and Gulf of Alaska fisheries. Only 1 vessel had 10 percent or more of its Bering Sea revenue at risk for any year, 2003 through 2005 (this occurred in 2003 and revenue at risk was less than 11 percent). A total of 6 vessels had 5 percent or more, but less than 10 percent of Bering Sea revenue at risk for any year, 2003 through 2005, under Alternative 2 (1 in 2003 only, 1 in 2003 and 2004, 4 in 2004 only, and none in 2005). A total of 7 vessels had Bering Sea revenue at risk greater than or equal to 1 percent, but less than 5 percent, in any of the base years (1 in 2003 only [but this same vessel more than 5 percent revenue at risk in 2004], 6 in 2004 [one of which had more than 5 percent revenue at risk in 2003, and another of which had more than 10 percent revenue at risk in 2003], and none in 2005). Regional community support sector impacts, if any, would accrue almost exclusively to Dutch Harbor/Unalaska. While some individual vessel operations may experience a small, but noticeable impact on Bering Sea revenues if revenues at risk cannot be recouped or at least partially offset through a redirection of fishing effort, given the small overall proportion of Bering Sea revenue at risk on a fleet-wide or multi-sector basis, significant support service related impacts in Dutch Harbor/Unalaska are considered unlikely.

In addition to the evaluation of the effects on current fisheries, a designation of an open area could have future effects, depending on fish stock distribution and fishing effort distribution. Potential economic impacts from the open area alternative depend to some extent on how and where fish stocks and fishermen change their distributions in the future. If the fish distribution remains static, the impacts will be negligible. However, if a substantial portion of flatfish and cod stocks redistribute outside of the open area in the future – and assuming that other economically valuable fish stocks don't take their place – there could be some adverse economic impacts to this fleet if they were unable to catch the TACs.

Table 5.7-1 Total H&G Trawl CP status quo first wholesale gross revenue and first wholesale gross revenue at risk ($ millions) under Alternative 2 and Alternative 2 with Suboption

Year	Sector or Species	Status Quo Revenue	Revenue at Risk	%Revenue at Risk
2003	H&G Trawl CP	$161.72	$1.25	0.77%
2004	H&G Trawl CP	$195.51	$3.53	1.81%
2005	H&G Trawl CP	$247.96	$2.45	0.99%
	Average	$201.73	$2.40	1.19%
2003	Atka Mackerel	$21.87	$0.00	0.00%
	Flatfish	$72.72	$0.96	1.32%
	Pacific Cod	$35.91	$0.25	0.69%
	Pollock	$10.68	$0.03	0.32%
	Rockfish	$15.31	$0.00	0.01%
	Sablefish	$4.18	$0.00	0.00%
	Other	$1.06	$0.00	0.00%
2004	Atka Mackerel	$29.08	$0.00	0.00%
	Flatfish	$83.98	$2.83	3.37%
	Pacific Cod	$46.39	$0.57	1.23%
	Pollock	$14.36	$0.11	0.73%
	Rockfish	$17.14	$0.00	0.02%
	Sablefish	$4.03	$0.02	0.48%
	Other	$0.53	$0.00	0.00%
2005	Atka Mackerel	$36.52	$0.00	0.00%
	Flatfish	$121.33	$2.22	1.83%
	Pacific Cod	$44.30	$0.19	0.43%
	Pollock	$15.22	$0.04	0.27%
	Rockfish	$25.36	$0.00	0.00%
	Sablefish	$4.89	$0.00	0.00%
	Other	$0.34	$0.00	0.00%

Source: NMFS, Alaska Region Catch in Areas Database

In February, the Advisory Panel requested that the analysis consider a scenario whereby a substantial portion of the fish biomass moved north, out of the proposed open area. Commercial groundfish species most likely to move into this area include rock sole, arrowtooth flounder, flathead sole, and Pacific cod. Because the current TAC for rock sole, arrowtooth flounder, and flathead sole are so much lower than the ABC, one would conclude that catches for these species under an open area approach could still be much greater than now. For reference, the 2007 catch specifications (mt) for these species were rock sole: ABC=198,000 and TAC=55,000; arrowtooth flounder: ABC =158,000 and TAC=20,000; flathead sole: ABC=79,200 and TAC=30,000. For Pacific cod, where TAC is set at ABC (176,000 mt, minus an AI State-water apportionment), only 2.3% of the TAC is allocated to AFA trawl catcher/processors, and 13.4 % of the TAC is allocated to non-AFA trawl catcher/processors. The remaining cod is allocated to non-trawl sectors, which would not be impacted under an open area approach, and to the trawl catcher vessel sectors (22.1% of TAC), which would be expected to only experience minimal impacts under the open area alternative, given the distance to processing plants in Dutch Harbor to which they deliver raw catch.

Several scenarios were examined to assess potential economic effects of Alternative 2, if flatfish biomass moved northward in the future. Should the cold pool south of St. Lawrence disappear entirely, then new habitat will become available for flatfish species to utilize (as discussed in Chapter 4.1.3). The utilization of this habitat by flatfish species could range from a simple redistribution of the stock (such that there was the same biomass, but at lower densities) to an increasing stock size, as recruits settle into the new available habitat. If we assume habitat quantity is a factor determining fish stock abundance, the second possibility may be more likely, over the long term. Table 5.7.2 shows the results of simulations under both possibilities, using simulations whereby 10% or 30% of the stock is in the northern area. The 30% figure was used as a maximum, as this approximated the proportion of the available area south of St Lawrence Island (and north of the Alternative 2 boundary) relative to the Alternative 2 open area.

The results of these simple simulations illustrate that there may be little or no effect on TACs, even if a substantial portion of the stock resides outside of the open area boundaries. Because TAC specifications for flatfish species are low, the TACs would not be significantly affected by Alternative 2, despite lower biomass and ABCs within the open area, assuming the fish stocks simply redistributed (Scenarios 1 and 2). In the most extreme scenario (Scenario 2), whereby 30% of the biomass moves out of the open area, only the yellowfin sole TAC would need to be reduced slightly (by 5,986 mt). None of the other flatfish TACs would have to be reduced. Thus, under the most extreme scenario, the impacts to the flatfish fisheries would be a 3.5% reduction in the combined flatfish TACs.

If flatfish stock biomass increased as a result of newly available habitat, the fleet would encounter virtually the same biomass density within the open area as under the existing conditions, even if 30% of the stock was found in the northern area (Scenarios 3 and 4). The results of these scenarios should be interpreted with caution, as there are many assumptions built into these speculations. For example, these scenarios assume that halibut bycatch rates would not increase, as halibut is also a flatfish species and could be expected to use the newly available northern habitats. Halibut prohibited species caps have constrained the flatfish fisheries in the recent past such that they have not always harvested all of the available TAC. If halibut bycatch levels increase within the remaining open area, the ability of the fleet to harvest even present levels of TAC, and to earn present levels of revenue, could be reduced. It is also possible that under an increased biomass scenario, the fleet may not benefit from larger TACs if halibut bycatch remains at present levels or increases. Thus, while movement of biomass outside of the open area is not expected to limit TACs, it is entirely possible that full harvest of TACs may not be possible if halibut bycatch rates increase or, in some cases, even if they remain constant within the open area defined by Alternative 2.

While the results of the scenarios show that there may be little effect on TACs, there could be effects on operational costs associated with catching the TAC. This is because these scenarios assume that CPUE remains at present levels within the open area defined by Alternative 2, even if biomass moves northward. If, however, the northward movement of biomass results in fish aggregations moving outside of the open area, CPUE could be reduced within the open area. In the case of spawning aggregations moving out of the open area, there could also be an effect on the revenue earned per ton of retained catch, if that catch has either poor roe quality or no roe (e.g., more males and immature females). The rock sole fishery would be most likely to be affected by such an event, as it derives much of its value from a roe-bearing rock sole product. If CPUE declines, greater effort would be needed to harvest the available TAC. Greater effort would result in greater cost of production relative to revenue earned. All else equal, net revenue could be reduced from cost effects alone. A loss of roe value would exacerbate this speculative situation by reducing revenue per ton. Further, if halibut bycatch per trawl tow remains relatively constant, a drop in tonnage of target species caught per tow (reduced CPUE) would increase the halibut bycatch rate and could affect the ability of the fleet to harvest all of the available TAC, prior to a PSC closure. Thus, the northward movement of biomass, if it occurs, could have effects on halibut PSC constraints, CPUE, cost of production, and revenue within the affected H&G fleet. The extent to which any or all of these factors may come into play is, however, highly speculative. As such, these potential effects are discussed here only to illustrate the issues surrounding potential northward migration of biomass.

Table 5.7-2. Scenarios to evaluate effects of fish redistribution to northern Bering Sea under the Alternative 2 open area approach *

STATUS QUO - 2007					
Species	**Total exploitable biomass**	**Exploitable biomass in 'open area'**	**OFL**	**ABC**	**TAC**
Yellowfin sole	2,000,000	2,000,000	144,000	121,000	90,686
Rock sole	1,670,000	1,670,000	150,000	126,000	41,500
Flathead sole	875,000	875,000	71,800	59,800	19,500
Arrowtooth flounder	1,280,000	1,280,000	166,000	136,000	12,000
Alaska plaice	1,340,000	1,340,000	237,000	188,000	8,000
					171,686

Scenario 1. A 10% biomass shift into northern area, assuming NO additional biomass due to habitat becoming available.					
Yellowfin sole	2,000,000	1,800,000	129,600	108,900	90,686
Rock sole	1,670,000	1,503,000	135,000	113,400	41,500
Flathead sole	875,000	787,500	64,620	53,820	19,500
Arrowtooth flounder	1,280,000	1,152,000	149,400	122,400	12,000
Alaska plaice	1,340,000	1,206,000	213,300	169,200	8,000
					171,686

Scenario 2. A 30% biomass shift into northern area, assuming NO additional biomass due to habitat becoming available.					
Yellowfin sole	2,000,000	1,400,000	100,800	84,700	84,700
Rock sole	1,670,000	1,169,000	105,000	88,200	41,500
Flathead sole	875,000	612,500	50,260	41,860	19,500
Arrowtooth flounder	1,280,000	896,000	116,200	95,200	12,000
Alaska plaice	1,340,000	938,000	165,900	131,600	8,000
					165,700

Scenario 3. A 10% biomass shift into northern area, assuming additional biomass due to habitat becoming available.					
Yellowfin sole	2,200,000	2,000,000	158,400	133,100	90,686
Rock sole	1,837,000	1,670,000	165,000	138,600	41,500
Flathead sole	962,500	875,000	78,980	65,780	19,500
Arrowtooth flounder	1,408,000	1,280,000	182,600	149,600	12,000
Alaska plaice	1,474,000	1,340,000	260,700	206,800	8,000
					171,686

Scenario 4. A 30% biomass shift into northern area, assuming additional biomass due to habitat becoming available.					
Yellowfin sole	2,600,000	2,000,000	187,200	157,300	90,686
Rock sole	2,171,000	1,670,000	195,000	163,800	41,500
Flathead sole	1,137,500	875,000	93,340	77,740	19,500
Arrowtooth flounder	1,664,000	1,280,000	215,800	176,800	12,000
Alaska plaice	1,742,000	1,340,000	308,100	244,400	8,000
					171,686

*** There are many assumptions. For example, catch specifications would be caculated only for the open area, TACs will remain at current low levels unless constrained by ABC, and halibut biomass redistributes the same as the other flatfish species, so that halibut PSC bycatch rates remain unchanged. Input values from SAFE and final specifications.**

5.7.2.3 Alternative 3: Gear Modification Approach

This alternative would require gear modifications for all nonpelagic trawl gear used in flatfish target fisheries. Specifically, this alternative would require disks on nonpelagic trawl sweeps to reduce seafloor contact and/or increase clearance between the sweep and substrate. A performance standard of at least 2.5 inches elevation of the sweep from the bottom would be required. This will require an elevating device tall enough to ensure the clearance can be achieved in a variety of substrates, including sand and mud. The performance testing of the elevating devices has determined that a this time, a device at least 8 inches in diameter would meet the 2.5 inches of clearance in various substrates. NMFS is currently working with the US Coast Guard and NOAA Office of Law Enforcement to develop procedures that would be necessary to enforce this provision, including gear inspection on the vessels and manufacturers' commitment to construct the gear in a manner that would meet the performance standard. See Section 5.9 and Appendix D for further information.

In side-by-side field studies, conducted by NMFS, the catch of target flatfish species with unmodified gear was not significantly different than the catch of the modified gear equipped with 6 to 8 inch diameter disks that elevated the sweeps 2.5 inches off the seabed between disks. Gear modification resulted in a decrease of the trawl sweeps contact with seabed by about 90% and was effective in reducing trawl sweep impact effects to basketstars and sea whips (Dr. Craig Rose, pers. com. 1/3/2007. Also, see Appendix A). Because the field studies showed that target flatfish species catch using the modified gear was not significantly diminished, there is no first wholesale gross revenue at risk due to the proposed gear modification.

The proposed gear modifications will likely result in additional equipment costs for vessels to comply with the addition of disks to the trawl sweeps, and on some vessels the requirement may result in modification to operations and/or the cost of additional deck equipment. The net additional cost for a combination rope (Randers) option is the cost of installed bobbins (lifting devices). The bobbins are 8 inches in diameter, and are attached on each side with a plate washer, 5 inch disk, and 1/2 inch rope (see Figure 5.7-1). H&G Trawl CP vessels reportedly replace their trawl sweeps about once a year and may have two to three sets of sweeps on board the vessel as replacement gear. Vessels using this gear may use 100 fathoms or 200 fathoms sweeps on each side of the net. An approximate upper bound additional cost estimate would be 3 times the difference between the cost of the status quo sweeps and the cost of the sweeps with the bobbins installed. Gear manufacturers estimate this cost at just under $4,000 per vessel, or about 33% more than the sweep alone.

Vessels that put their sweeps on the main winches (i.e., do not have net reels) typically use much shorter bare wire sweeps. Gear manufacturers indicate a 40 fathom assembly on each side of the net would be needed for these vessels. The additional cost here is the cost of 8 inch disks and swaging stoppers onto the wire. Estimates of the cost of these modifications are just under $500 per side ($1000 per pair), an increase of about 45% over the cost of the bare wire sweeps alone.

Mudgear sweeps are made up of rubber disks, commonly 3 inches in diameter, strung over steel cables. To comply with the proposed gear modification, mudgear sweeps would have to be retrofitted by replacing several of the 3 inch disks with larger disks at both ends and at 2 points in the middle span, dividing the 90 ft sweeps into 30 ft sections. The cost difference for the addition of these larger disks is negligible as compared to the cost of a regular 90 ft mudgear sweep, which is estimated to be approximately $1,100 for a 90 ft sweep.

Figure 5.7-1 Combination Rope Trawl Sweep Bobbin Installation

Photo courtesy of Dr. Craig Rose, NMFS, Alaska Fisheries Science Center.

Most of the vessels in the H&G Trawl CP sector are equipped with both main deck winches and a net reel. The trawl sweeps can be wound on the net reel during trawl net retrieval. However, some vessels do not have net reels, and currently wind their trawl sweeps onto the main deck winches. The proposed gear modification of adding rubber disks to the trawl sweeps may create difficulty in passing the trawl sweep disk through the level wind on the deck winches and/or may exceed the holding capacity of the drum on the main deck winches. On these vessels, it may be necessary for the vessel to modify the main trawl winch level-winds to allow passage of the disks. The cost to modify trawl winches will depend upon the individual vessel making the modifications, and cannot be predicted at this time. Initial indications are that vessels lacking net reels will likely be able to modify the level wind on their main trawl winches to accommodate the bobbins and that installation of net reels will not likely be necessary.

5.7.2.4 Impact of the area closure options applying to all nonpelagic trawling

The potential economic impacts of the five options, available under any of the three alternatives are discussed in this section. Note that the options could be selected in combination (i.e., more than one option can be chosen). As such, the impacts of the closure options selected (1, 2, 3, and 5) **may** be additive, **with the following caveats**. Option 3 is an expansion of Option 2. Thus, it would not be appropriate to add the effects of Options 1, 2, and 3, as that would double count the affects of Option 2. Similarly, Option 4 encompasses the area identified in each of Option 1, 2, and 3. Thus, the effect of

Option 4 cannot be considered additively with Options 1, 2, and/or 3, as doing so would double count the revenue at risk for Options 1, 2 and/or 3. In the analysis presented below, the potential revenue at risk for Options 1, 2, 3, and 4 are presented separately. In addition, the potential combined effects of Options 1 and 2; and Options 1 and 3, are shown. Note that, in terms of revenue at tisk, Option 4 is identical to the combination of Options 1 and 3. The area associated with Option 5 had no nonpelagic trawl effort and, thus, no revenue at risk, during the analytical time period.

Option 1 would close the area around St. Matthew Island to all nonpelagic trawl gear, to conserve blue king crab habitat. There has historically been some amount of trawl effort, targeting Pacific cod, just to the north of St. Matthew Island. Maps of fishing effort, by Fritz et al. (1998), indicate that a strip immediately north of St. Matthew Island has been an area with very high CPUEs for Pacific cod. There may be economic benefits of Option 1 to crab fishermen associated with reduced impacts on crab; however, these effects are likely to be minor given that blue king crab bycatch is considered low in this area (NMFS data review by crab plan team) and the area to the north does not seem as important to blue king crab as compared with the area to the south and areas within State waters.

Table 5.7-3 provides estimates of the revenue potentially placed at risk, and the percent of baseline revenue potentially placed at risk under Option 1. Average revenue at risk from 2003 through 2005 is estimated to be $310,000, or 0.15% of the status quo average revenue of $201.73 million. Revenue at risk during the analysis period was highest in 2004, with $680,000, or 0.35% of the 2004 status quo revenue of $195.51 million. The low would have occurred in 2005 with $50,000, or 0.02% of the 2005 status quo revenue of $247.96 million. The majority of this revenue at risk was derived from Pacific cod, with flatfish and pollock making up the remainder. Pacific cod revenue at risk would have been $160,000, or 0.43% of the $35.91 million status quo first wholesale gross revenue in 2003; $470,000, or 1.02% of the $46.39 million status quo first wholesale gross revenue in 2004; and $40,000, or 0.08% of the $44.3 million status quo first wholesale gross revenue in 2005.

Option 2 would close an area to all nonpelagic trawl gear around Nunivak Island with the southern border extending along the nearshore portion of Etolin Strait, to conserve nearshore habitats and minimize potential interactions with community use and subsistence fisheries. The area south of Nunivak Island and Etolin Strait has seen increasing effort by vessels targeting yellowfin and rock sole in recent years.

Table 5.7-3 provides estimates of the revenue potentially placed at risk and the percent of baseline revenue potentially placed at risk under Options 2 and 3. Option 2 average revenue at risk from 2003 through 2005 is estimated to be $830,000, or 0.41% of the status quo average revenue of $201.73 million. Revenue at risk during the analysis period is estimated to be highest in 2004, with $1.87 million, or 0.95% of the 2004 status quo revenue of $195.51 million. The low would have occurred in 2005, with $60,000, or 0.02% of the 2005 status quo revenue of $247.96 million.

The majority of this revenue at risk under Option 2 is derived from flatfish. Flatfish revenue at risk would have been $570,000, or 0.78% of the $72.72 million status quo first wholesale gross revenue in 2003, $1.86 million, or 2.21% of the $83.98 million status quo first wholesale gross revenue in 2004, and $60,000, or 0.05% of the $121.33 million status quo first wholesale gross revenue in 2005.

Table 5.7-3 Total H&G Trawl CP status quo first wholesale gross revenue and first wholesale gross revenue at risk ($millions) under Options 1, 2, or 3.

Year	Sector or Species Group	Status Quo Revenue	Option 1		Option 2		Option 3	
			Revenue at Risk	%Revenue at Risk	Revenue at Risk	%Revenue at Risk	Revenue at Risk	%Revenue at Risk
2003	H&G Trawl CP	$161.72	$0.21	0.13%	$0.57	0.35%	$1.03	0.64%
2004	H&G Trawl CP	$195.51	$0.68	0.35%	$1.87	0.95%	$2.99	1.53%
2005	H&G Trawl CP	$247.96	$0.05	0.02%	$0.06	0.02%	$1.00	0.40%
	Average	$201.73	$0.31	0.15%	$0.83	0.41%	$1.67	0.83%
2003	Atka Mackerel	$21.87	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
	Flatfish	$72.72	$0.04	0.05%	$0.57	0.78%	$1.02	1.40%
	Pacific Cod	$35.91	$0.16	0.43%	$0.00	0.00%	$0.00	0.01%
	Pollock	$10.68	$0.02	0.16%	$0.00	0.01%	$0.00	0.02%
	Rockfish	$15.31	$0.00	0.01%	$0.00	0.00%	$0.00	0.00%
	Sablefish	$4.18	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
	Other	$1.06	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
2004	Atka Mackerel	$29.08	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
	Flatfish	$83.98	$0.12	0.14%	$1.86	2.21%	$2.98	3.55%
	Pacific Cod	$46.39	$0.47	1.02%	$0.01	0.01%	$0.01	0.02%
	Pollock	$14.36	$0.08	0.58%	$0.00	0.03%	$0.01	0.05%
	Rockfish	$17.14	$0.00	0.01%	$0.00	0.00%	$0.00	0.00%
	Sablefish	$4.03	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
	Other	$0.53	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
2005	Atka Mackerel	$36.52	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
	Flatfish	$121.33	$0.01	0.01%	$0.06	0.05%	$0.99	0.81%
	Pacific Cod	$44.30	$0.04	0.08%	$0.00	0.00%	$0.01	0.01%
	Pollock	$15.22	$0.00	0.02%	$0.00	0.00%	$0.01	0.04%
	Rockfish	$25.36	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
	Sablefish	$4.89	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%
	Other	$0.34	$0.00	0.00%	$0.00	0.00%	$0.00	0.00%

Source: NMFS, Alaska Region Catch in Areas Database

Option 3 would close an area to all nonpelagic trawling around Nunivak Island, with the southern border extending along the nearshore portion of Etolin Strait and Kuskokwim Bay to conserve nearshore habitat and minimize potential interactions with community use and subsistence fisheries. Average revenue at risk from 2003 through 2005 is estimated to be $1.67 million, or 0.83% of the status quo average revenue of $201.73 million. Revenue at risk during the analysis period is estimated to be highest in 2004, with $2.99 million, or 1.53% of the 2004 status quo revenue of $195.51 million. The low would have occurred in 2005, with $1.0 million, or 0.4% of the 2005 status quo revenue of $247.96 million.

The majority of this revenue at risk under Option 3 is derived from flatfish. Flatfish revenue at risk would have been $1.02 million, or 1.4% of the $72.72 million status quo first wholesale gross revenue in 2003, $2.98 million, or 3.55% of the $83.98 million status quo first wholesale gross revenue in 2004, and $990,000, or 0.81% of the $121.33 million status quo first wholesale gross revenue in 2005. On average, these potential revenue at risk impacts appear relatively minor. However, based on public testimony before the Council, this is an important area to the fleet because according to the fleet the catch rates for yellowfin sole can be high while encountering low halibut bycatch rates.

As discussed previously, it is possible that several different combinations of alternatives and options could be chosen. The combined effects of Options 1 and 2, and Options 1 and 3 (Option 2 is a subset of Option 3) are presented in Table 5.7-4. Average revenue at risk from 2003 through 2005, for the combination of Option 1 and Option 2, is estimated to be $1.14 million, or 0.57% of the status quo average revenue of $201.73 million. Revenue at risk during the analysis period is estimated to be highest in 2004, with $2.54 million, or 1.3% of the 2004 status quo revenue of $195.51 million. The low would have occurred in 2005, with $110,000, or 0.04% of the 2005 status quo revenue of $247.96 million. The majority of this revenue at risk is derived from flatfish. Flatfish revenue at risk would have been $600,000, or 0.83% of the $72.72 million status quo first wholesale gross revenue in 2003; $1.98 million, or 2.35% of the $83.98 million status quo first wholesale gross revenue in 2004; and $70,000, or 0.051% of the $121.33 million status quo first wholesale gross revenue in 2005.

Table 5.7-4 Total H&G Trawl CP status quo first wholesale gross revenue and first wholesale gross revenue at risk ($ millions) under Combined Options 1 and 2; and Combined Options 1 and 3 *.

Year	Sector or Species Group	Status Quo Revenue	Option 1 + Option 2		Option 1 + Option 3*	
			Revenue at Risk	%Revenue at Risk	Revenue at Risk	%Revenue at Risk
2003	H&G Trawl CP	$161.72	$0.78	0.48%	$1.24	0.76%
2004	H&G Trawl CP	$195.51	$2.54	1.30%	$3.67	1.88%
2005	H&G Trawl CP	$247.96	$0.11	0.04%	$1.04	0.42%
	Average	$201.73	$1.14	0.57%	$1.98	0.98%
2003	Atka Mackerel	$21.87	$0.00	0.00%	$0.00	0.00%
	Flatfish	$72.72	$0.60	0.83%	$1.06	1.45%
	Pacific Cod	$35.91	$0.16	0.43%	$0.16	0.44%
	Pollock	$10.68	$0.02	0.17%	$0.02	0.18%
	Rockfish	$15.31	$0.00	0.01%	$0.00	0.01%
	Sablefish	$4.18	$0.00	0.00%	$0.00	0.00%
	Other	$1.06	$0.00	0.00%	$0.00	0.00%
2004	Atka Mackerel	$29.08	$0.00	0.00%	$0.00	0.00%
	Flatfish	$83.98	$1.98	2.35%	$3.10	3.69%
	Pacific Cod	$46.39	$0.48	1.03%	$0.48	1.04%
	Pollock	$14.36	$0.09	0.61%	$0.09	0.64%
	Rockfish	$17.14	$0.00	0.01%	$0.00	0.01%
	Sablefish	$4.03	$0.00	0.00%	$0.00	0.00%
	Other	$0.53	$0.00	0.00%	$0.00	0.00%
2005	Atka Mackerel	$36.52	$0.00	0.00%	$0.00	0.00%
	Flatfish	$121.33	$0.07	0.05%	$0.99	0.82%
	Pacific Cod	$44.30	$0.04	0.08%	$0.04	0.09%
	Pollock	$15.22	$0.00	0.03%	$0.01	0.06%
	Rockfish	$25.36	$0.00	0.00%	$0.00	0.00%
	Sablefish	$4.89	$0.00	0.00%	$0.00	0.00%
	Other	$0.34	$0.00	0.00%	$0.00	0.00%

* Option 1 plus Option 3 = Option 4 Revenue at Risk.
Source: NMFS, Alaska Region Catch in Areas Database

Average revenue at risk from 2003 through 2005, for the combination of Option 1 and Option 3 (equivalent to Option 4, which includes these areas and unfished area to the North) is estimated to be $1.98 million, or 0.98% of the status quo average revenue of $201.73 million. Revenue at risk during the analysis period is estimated to be highest in 2004, with $3.67 million, or 1.88% of the 2004 status quo revenue of $195.51 million. The low would have occurred in 2005, with $1.04 million, or 0.42% of the 2005 status quo revenue of $247.96 million. The majority of this revenue at risk is derived from flatfish.

Flatfish revenue at risk would have been $1.06 million, or 1.45% of the $72.72 million status quo first wholesale gross revenue in 2003; $3.1 million, or 3.69% of the $83.98 million status quo first wholesale gross revenue in 2004; and $990,000, or 0.82% of the $121.33 million status quo first wholesale gross revenue in 2005.

Option 4 would establish a Northern Bering Sea Experimental Fishing Area that would be entirely closed to fishing with all nonpelagic trawl gear, at least until an adaptive management experiment design was developed and approved. The option would close roughly 188,157 km^2 of EBS shelf (shelf area to 1,000 m depth) or 23.8% of the 791,731 km^2 of EBS benthic habitat currently open to nonpelagic trawling (shelf area to the 1,000 m depth contour).

The suboption to Option 4 would move a portion of the northern boundary of the open area southward, between Nunivak and St. Matthew Islands. This is essentially the reverse of the suboption treated under Alternative 2. Thus, the suboptions are mutually exclusive. Analysis of this "wedge-shaped" area has not revealed any nonpelagic trawl effort during the period 2003 through 2005. Thus, the suboption does not affect the estimates of Option 4 revenue at risk.

Option 5 would close the area to all nonpelagic trawl gear around St. Lawrence Island, to conserve blue king crab habitat and minimize potential interactions with community use and subsistence fisheries. Because there is currently no nonpelagic trawl effort as far north as St. Lawrence Island, there are no economic impacts to the trawl fleet, given the current and historic distribution of target species. Potential future effects of a change in fish distribution were discussed under Alternative 2, although the impacts of Option 5 would be substantially smaller, based on total area closed.

It is possible that Alternative 2 could be combined with Option 4. Doing so combines the open areas approach with the Northern Beirng Sea Research Area closure. The suboption could either be attached to the open area or the research area. The potential benefits of adding Option 4 to Alternative 2 likely would be in the form of improved or enhanced fisheries management that comes about via knowlege gained from scientific research that is conducted in the research area. These benefits would be in addition to the benefits associated with benthic habitat protection that Alternative 2 would provide. Since it is not clear, at present, what the research would entail, it is not possible to further evaluate these potential benefits at this time.

It is important to understand that the revenue at risk of a combined Alternative 2 and Option 4 is simply the revenue at risk of Alternative 2. This is because the boundaries of the open area of Alternative 2 would close the areas defined by Options 1, 2, 3, and 4. Alternative 2 also includes additional areas not included in these options. In other words, perfunctorily adding the revenue at risk from Alternative 2 and Option 4 together would double count the revenue at risk of the options, because Alternative 2 already closes those areas. Thus, the revenue at risk estimation for a combined Alternative 2 and Option 4 is equivalent to that of Alternative 2.

5.7.3 Subsistence Use Benefits

Alternatives 2 and the closure Options may enhance subsistence use of local fishery resources. Appendix D contains maps of subsistence use areas, provided by Ceñaliulriit Coastal Resource Service Area. The maps show that the areas around Nunivak Island and in Etolin Strait are currently used as fish, shellfish, and marine mammal subsistence harvest areas. Closure of these areas to nonpelagic trawl fishing may enhance subsistence harvesting activities by reducing benthic habitat impacts, reducing fish removals, and reducing interactions between commercial trawling operations and local subsistence harvesters. The options that close these areas (Option 2 and Option 3) may create benefits to subsistence users in these areas. Alternative 2 also would close these areas and would be expected to create similar benefits for subsistence users in those areas. Additionally, Alternative 2 would close the area around St. Matthew Island that is contained in Option 1, as well as additional area to the North. Option 4 would close an area similar to Alternative 2, and Option 5 adds a closure around St. Lawrence Island. Each of these potential actions could create subsistence benefits, however, quantifiable estimates of subsistence harvest in these areas and information on how such harvests may be affected by the proposed action is not presently available.

5.7.4 Passive Use and Productivity Benefits of the Alternatives

The alternatives discussed in this analysis address concerns that nonpelagic trawling activity may be adversely modifying habitat faster than the habitat can renew itself. The alternatives are premised on the idea that society can consume the habitat and enjoy its ecological services (including fish production) now, or that it can defer that consumption and enjoy those services in the future. This tradeoff between present and future consumption of benthic habitat reflects the underlying investment nature of the problem the alternatives seek to address. The overarching economic options are to (a) continue (perhaps even increase) current consumption of habitat services, with consequent increased costs and reduced benefits, or (b) invest in long-term resource productivity by deferring consumption of these assets until some future time. The expectation, not yet confirmed, for the alternatives to the status quo is that by reducing the rate of exploitation of benthic habitat (i.e., net benefits from fishing) in the short term, society will have invested in sustaining (perhaps even enhancing) habitat and will enjoy larger net benefits over the longer term. The benefits associated with the fishing impact minimization measures include: 1) passive-use (or non-use) benefits, and 2) use benefits (including non-consumptive use benefits, consumptive use benefits, non-market benefits, and market benefits) and ecological productivity benefits.

It can be demonstrated that society places economic value on relatively unique environmental assets, whether or not those assets are ever directly exploited. For example, society places real and potentially measurable economic value on simply knowing that a rare or endangered species of animal or plant is protected in the natural environment. The term ‘value’ is used, in the present context, as it would be in a cost-benefit analysis (i.e., what would people be willing to give up to preserve and/or enhance the asset being assessed?). Because no market, in the traditional economic sense, exists within which benthic habitat (at least in waters of the EEZ off Alaska) is bought, sold, or traded, there is no institutional mechanism wherein a market clearing price may be observed. Such a market clearing price would typically be used to estimate a consumer’s willingness-to-pay to obtain the goods or services being traded. Nonetheless, benthic habitat does have economic value, as demonstrated by the current public debate over its preservation and enhancement. Among those holding these values, there is no expectation of directly “using” this asset in the normal sense of that term. Whether referred to as passive-use, non-use, or existence value, the underlying premise is that individuals derive real and measurable utility (i.e., benefit) from the knowledge that relatively unique natural assets remain in a comparatively undisturbed state.

With respect to benthic habitat, the values at stake are what economists refer to as marginal values; that is, the values are associated with changes in the characteristics of habitat, not in the presence or absence of the habitat itself. Any region will have a wide range of characteristics. These may include the relative proportions of different sea bed types, locations of corals or other living structures, water temperature, salinity, distribution of vegetation, and so on. Fishing activity may change the nature, productivity, and value of the habitat by altering these characteristics in different ways. For example, unrestricted use of a bottom tending gear type may totally eliminate corals and alter the relative proportions of vegetation types, but leave salinity unchanged. The passive use values that society places on different regions of habitat will depend on these characteristics and can be expected to change as various combinations of characteristics of a particular region change.

While it is not possible at this time to provide an empirical estimate of the social value attributable to protection of fish habitat in the EEZ off Alaska, it is implicit in the fishing impact minimization measures that each of the alternatives to the status quo (i.e., Alternative 1) would be expected to yield an incremental social benefit over the baseline condition. That is, it is assumed that each of the alternatives, and the options to the alternatives, yields some additional protection for benthic habitat from fishing gear impacts, compared to retention of the status quo.

In addition to these passive-use benefits, there may be benefits resulting from increased productivity of fish populations as a result of habitat conservation actions. As discussed in the EFH EIS (NMFS 2006), current knowledge permits only a highly conditional evaluation of the effects of fishing on general classes of habitat features and allows only broad connections to be drawn between these features and the life history processes of some managed species. The level of effects on the stocks or potential yields of these species cannot be estimated with current knowledge. An expectation of substantial recoveries, directly attributable to implementation of measures to minimize the effects of fishing on benthic habitat, would require the presence of a species with a clear habitat limitation and consequent poor stock condition. Alaska fisheries include no such clear cases. Therefore, no quantifiable or even qualitative measure of sustained or increased yield in production or biomass of FMP species is available for this analysis. That is, based upon currently available scientific data and understanding of these fishery and habitat resources, it is not possible to empirically measure specific economic benefits linked to the biological or ecological changes attributable to the alternatives considered.

5.8 Summary of the Analysis of Alternatives

Table 5.8-1 provides a summary of the 2003 through 2005 average revenue at risk and percent of status quo revenue that the revenue at risk represents for Alternative 2, and for the five options.

5.8-1 Summary of 2003-2005 Average Revenue at Risk ($ millions) and Percent Revenue at Risk for the H&G CP fleet.

Alternative or Option	Average Revenue at Risk	% Revenue at Risk
Alternative 2	$2.40	1.19%
Option 1	$0.31	0.15%
Option 2	$0.83	0.41%
Option 3	$1.67	0.83%
Option 4	$1.98	0.98%
Options 1+2	$1.14	0.57%
Options 1+3	$1.98	0.98%
Option 5	$0.00	0.00%

The largest potential effect on revenue at risk would be from Alternative 2, which would place at risk an average of approximately $2.4 million, or 1.19 % of the status quo revenue. Alternative 2 includes the closed area contained in Option 1, Option 2, and Option 3 (Option 2 is a subset of Option 3) Option 4, which includes the area contained in options 1, 3, and 5, as well as additional unfished area, would place at risk an average of approximately $1.98 million, or 1.19 % of the status quo revenue. In terms of revenue at risk, the effect of Option 4 is equivalent to the effect of combining Options 1 and 3. Option 3 alone would place at risk an average of approximately $1.67 million or 0.83 % of the status quo revenue. The combination of Option 1 and Option 2 would place at risk an average of approximately $1.14 million or 0.57 % of the status quo revenue. Option 2 alone would place at risk an average of approximately $830,000 or 0.41% of the status quo revenue. Option 1 alone would place at risk an average of approximately $310,000 or 0.15% of the status quo revenue. Finally, Option 5 defines a closure in an unfished area and, thus, would have no impact on revenue at risk, as calculated in the present model.

The gear modifications required in Alternative 3 would likely impose additional costs on vessel operators of between $1,000 and $4,000, per vessel, annually. However, some vessels do not have net reels and may need to modify level-wind equipment on their main trawl winches to accommodate the new sweep gear. However, gear manufacturers are working with industry to accommodate the new sweep and it is expected that the bobbin equipped sweeps can be wound on the main trawl winch such that net reel installation are not likely to be required.

The quantitative analysis of potential impacts on fleet revenue indicates that, based on the best available information, any one of the proposed actions or feasible combinations of alternatives and options does not appear to have the potential to produce an annual effect on the economy of $100 million or more, or "adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or tribal governments or communities." The proposed action would not be expected to meet or exceed the threshold for a "significant" action (as that term is defined in E.O. 12866), although this determination is reserved for the Secretary of Commerce.

5.9 Monitoring and enforcement

The EFH protection measures, discussed in the three alternatives and five options, will be implemented in a large and remote area (the EBS from the Aleutians north to the Bering Straits) with only a few, relatively small, population centers. The north-south distance between Cape Prince of Wales on the Bering Straits and Unimak Pass in the Aleutians (approximately the north-south distance covered by the open area under Alternative 2) is over 800 miles. Logistical support for enforcement efforts is limited in this region.

The ability to enforce spatial boundaries considered in this action will depend on a clear definition of the areas open and closed to fishing with nonpelagic trawl gear, on the ability of NOAA OLE and USCG to determine vessel location, whether or not a vessel has been using nonpelagic trawl gear, and then to tie gear use to a specific location. Enforcement of the gear modification standards will depend on the type of program developed for implementation of the standards and the involvement of enforcement personnel and industry in assuring the standards are met.

Nonpelagic trawl gear has the definition given in 50 CFR 679.2, (i.e., trawl gear that does not meet the specifications used in the section to define pelagic trawl gear). This is a standard based on the construction of the gear, and not on the way it is used. This will contribute to the enforceability of the regulation. While the area boundaries in the alternatives and options are often complex, they are composed of straight-line segments, which should contribute to enforceability

Given the large size and remoteness of the area covered, and the limited enforcement infrastructure available, determination of vessel location will depend crucially on VMS reports. Information from VMS can be used to identify where vessels are operating, to organize patrols so as to increase the number of fishing vessels visually examined, or to focus examination of vessels of greatest concern (because of past records of fishing violations, or because of the location of fishing activity), and as evidence in prosecutions. VMS is currently required for any vessel which operates in the AI, and for all vessels that fish for Pacific cod, pollock, or Atka mackerel. Thus, a large proportion of the vessels using nonpelagic trawl gear in the EBS are expected to have and may be operating VMS units in the EBS because of existing regulations. Anecdotal evidence suggests that vessels with VMS typically do not turn it on and off during the year; therefore, it is likely that current VMS coverage is extensive for vessels operating in the EBS.

Of the 112 nonpelagic trawl vessels operating in the Bering Sea in 2006, only 14 vessels did not have VMS (NMFS Restricted Access Division, NOAA OLE VMS program, and NMFS Inseason Management data). If VMS is required for monitoring and enforcement of closure areas under this action, these 14 vessels would need to purchase, install, maintain, and operate VMS units to continue nonpelagic trawling in the Bering Sea subarea. In addition, nonpelagic trawl vessels that currently have VMS, but do not operate it in the EBS, would be required to do so, incurring the cost of transmission.

Closure areas currently in the Bering Sea, such as the Pribilof Island Area Habitat Conservation Zone and the Red King Crab Savings Area, are monitored by USCG aerial and vessel patrols, and VMS data. The NOAA OLE monitors vessel location in the Bering Sea by VMS. If closure areas were adopted under this action, a requirement for VMS on all nonpelagic trawl vessels would allow the NOAA OLE and the USCG to efficiently use their current resources to monitor area compliance with minimal additional cost to the agencies. Considering the large boundary represented by the open area approach in Alternative 2, and the remote locations of the closures under Options 1 through 5, tracking compliance with aerial and vessel patrols would be minimally effective without a large increase in patrol resources.

Alternative 3 requires vessels with nonpelagic trawl gear to fish with sweeps at least 2.5 inches from the bottom. Trawl sweeps will require special modifications to accomplish this. These modifications will be described in regulations. While the 2.5 inches distance from the ocean floor will be impossible to monitor, it will be possible to monitor compliance with gear standards specified in regulations. The more carefully these modifications are specified in regulations, the easier it will be to monitor compliance in port or during boardings. The key component will be the attachment of disks or bobbins to the trawl sweeps to elevate the sweeps above the seafloor by the required amount. Regulations will have to specify the sweep height and the distances separating the elevating devices to ensure they effectively raise the sweep.

Much can be inferred about whether a vessel is actively fishing, and the type of gear being used, when a VMS track is examined by an analyst knowledgeable about the vessel, and the fisheries that are open when the track is observed. This information can be useful for targeting vessels for more detailed observation. This observation, a physical inspection, may be carried out during deployment or retrieval of the gear. If the vessel is only carrying nonpelagic trawl gear, inspection may not be necessary during actual deployment and retrieval activities, but may be sufficient if it is done at a time when there was no possibility of a gear change prior to or after fishing activity. Inspection may be done during USCG boardings, or by an observer on the vessel. These observations would be limited to either the presence or absence of the modified trawl sweeps. USCG personnel, during voluntary safety inspections, also may be able to note the presence of the modified sweeps if the trawl gear is not installed on the net reels. Aerial patrols would not be able to confirm the presence of modified sweep gear. The USCG does not have inspection capabilities in the northern Bering Sea or within some State waters.

Because personnel from the North Pacific Groundfish Observer Program, NOAA OLE, and USCG will be unable to measure all the components of a modified sweep to determine compliance, documentation showing the gear meets the standards should be considered. To ensure the gear meets the standards, one or both types of documents could be required:

- a manufacturer's warranty on the construction of the sweep and /or
- proof of industry inspection of the sweep to ensure the standards are met, if the sweep is more than one year old.

The inspection time period may need further consideration depending on the wear of the sweeps. Typically, unmodified sweeps are replaced annually. These paperwork requirements would add to the cost of the sweeps, but provide a means of ensuring the sweep meets the standard at time of manufacture and at time of inspection. This type of program needs to be further explored with the Coast Guard safety program to determine if it is feasible for implementation of Alternative 3.

Elevation devices may be spot checked by enforcement staff when they are newly installed, or at dockside before fishing operations begin. However, ongoing fishing activity will impose wear and tear on the devices, and as time passes, they may cease to perform their function. Some may be lost, others may change their spacing along the sweep, still others may be worn down to a smaller diameter. Thus, effective enforcement may require agency personnel monitoring for the presence of devices and reviewing documentation of a manufacturer's warranty and industry inspection program.

On nonpelagic trawl vessels, the requirements may call for as many as 35 sweeps or bobbins on each of the trawl's two sweeps. Thus, a complete physical inspection of the gear could require an examination of the diameters of 70 elevating devices and the spaces between them. The manufacture of the elevating devices and their installation could reduce the time required for inspection, and make inspection easier from a distance. Distances along sweeps can be marked with tape or paint to make it easier to determine the spacing of elevating devices, or distances can be marked along the decks of trawlers. Specifications for elevating devices can require markings built into the devices to provide measures of wear and make it easier to identify devices which no longer have a sufficient diameter to elevate the sweep 2.5 inches above the bottom. Marking the sweep or deck, and having wear indicators on the elevating devices would reduce the inspection effort to determine compliance with the modified sweep standards.

6.0 FINAL REGULATORY FLEXIBILITY ANALYSIS (FRFA)

6.1 The Purpose of an FRFA

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

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

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

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

6.2 What is Required in a FRFA?

Under the RFA (5 U.S.C. 604(a)), each FRFA is required to contain the following:

(1) a succinct statement of the need for, and objectives of, the rule;

(2) a summary of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a summary of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments;

(3) a description of and an estimate of the number of small entities to which the rule will apply or an explanation of why no such estimate is available;

(4) a description of the projected reporting, recordkeeping and other compliance requirements of the rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record; and

(5) a description of the steps the agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.

6.2.1 Reasons for Considering this Action

The purpose of this analysis is to evaluate impacts of alternatives to further conserve fish habitat in the EBS. In February 2005, the Council took final action on the EFH EIS (NMFS 2005) to adopt a suite of measures to conserve EFH in the GOA and AI from potential impacts due to fishing. At the time of final action, the Council took no action to implement additional conservation measures in the EBS, as the analysis found such additional measures were neither required by law, nor necessary. Further, the alternatives considered for Bering Sea habitat conservation required additional 'fine-tuning' before they could be considered as practicable measures. Alternatives to modify gear had not been researched sufficiently to understand the effects on habitat. The alternatives for the open areas had left out historically important and lucrative fishing grounds, and included rotating closures that were found to have questionable merit. To address these issues, the Council notified the public that it planned to take a more focused examination of potential measures to further conserve fish habitat, including EFH, in the EBS by initiating a separate analysis that would tier off of the EFH EIS. This analysis provides an examination of a range of reasonable alternatives to conserve fish habitat in the EBS.

The need for this analysis is the recognition that uncertainty exists in the conservation of fish habitat. Thus, evaluation of additional measures, and possible implementation of them, provides a precautionary approach to deal with uncertainty in our knowledge of fish dependence upon certain habitats, and the effects of fisheries on that habitat.

6.3 Objectives and Legal Basis of the Proposed Rule

6.3.1 Objectives of the Rule

The objective of this regulatory amendment is to implement new practicable and precautionary fishery management measures to reduce adverse effects of fishing on Essential Fish Habitat (EFH) in the Bering Sea and to support the continued productivity of managed fish species.

6.3.2 Legal Basis of the Rule

Under the Magnuson-Stevens Act, the United States has exclusive fishery management authority over all marine fishery resources found within the Exclusive Economic Zone (EEZ), which extends between 3 and 200 nautical miles from the baseline used to measure the territorial sea. The management of these marine resources is vested in the Secretary of Commerce (Secretary) and in the Regional Fishery Management Councils. In the Alaska Region, the Council has the responsibility for preparing FMPs for the marine fisheries that require conservation and management and for submitting their recommendations to the Secretary. Upon approval by the Secretary, NMFS is charged with carrying out the federal mandates of the Department of Commerce with regard to marine and anadromous fish. The groundfish fisheries in the EEZ off Alaska are managed under the FMP for the Groundfish Fisheries of the GOA and the FMP for the Groundfish Fisheries of the BSAI.

Actions taken to amend FMPs or implement other regulations governing these fisheries must meet the requirements of Federal laws and regulations. In addition to the Magnuson-Stevens Act, the most relevant of these are the Halibut Act, the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), Executive Order 12866 on Regulatory Planning and Review, the Regulatory Flexibility Act (RFA), the Migratory Bird Treaty Act of 1918, and Executive Order 13186 on the Responsibilities of Federal Agencies to Protect Migratory Birds.

6.3.3 Public Comment

The proposed rule for Amendment 89 was published in the Federal Register on March 7, 2008 (73 FR 12357). An Initial Regulatory Flexibility Analysis (IRFA) was prepared for the propose rule and described in the classification section of the preamble to the proposed rule. The public comment period ended on April 21, 2008. No comments were received on the IRFA. No changes were made in the final rule from the proposed rule.

6.4 Description and Number of Small Entities to which the Rule Applies

6.4.1 Definition of a Small Entity

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

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

The SBA has established size criteria for all major industry sectors in the U.S. including fish harvesting entities, for-hire entities, fish processing businesses, and fish dealers. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $4.0 million for all its affiliated operations worldwide. A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. Finally, a wholesale business servicing the fishing industry (fish dealer) is a small businesses if it employs 100 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide.

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

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

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

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

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

6.4.2 Estimated Number of Small Entities to which the Rule Applies

Fishing vessels, both catcher vessels and catcher/processors, are considered small, for RFA purposes, if their gross receipts, from all their economic activities combined, as well as those of any and all their affiliates anywhere in the world, (including fishing in federally-managed non-groundfish fisheries, and in Alaska-managed fisheries), are less than or equal to $4.0 million annually. Further, fishing vessels were considered to be large if they were affiliated with an AFA fishing cooperative in 2004. The members of these cooperatives had combined revenues that exceeded the $4.0 million threshold.

The entities that would be directly regulated by the alternatives are those vessels that fish for groundfish with nonpelagic trawl gear in the EBS off Alaska. The non-AFA trawl CP (i.e., H&G Trawl CP) sector vessels are the primary participants in the BSAI, yellowfin sole, BSAI rock sole and BSAI flathead sole fisheries affected by the proposed action. From 2000 through 2003, they accounted for 92.8 percent of the total yellowfin sole that was retained, 96.9 percent of the retained rock sole, and 98.1 percent of the flathead sole retained. The other catcher/processors harvesting these species in the area affected by the proposed action are members of the AFA. During the 2004 fishing year, 3 AFA CPs owned by two companies participated in the directed fishery for yellowfin sole (PCC 2005). In November 2004, Congress passed the Fiscal Year 2005 Appropriations Act, which contained a BSAI Catcher Processor Capacity Reduction Program. That program precludes any catcher/processors, other than the 26 non-AFA trawl CPs, and the AFA trawl CPs, from directed fishing for BSAI yellowfin sole, BSAI Atka mackerel, BSAI rock sole, BSAI flathead sole, or AI Pacific ocean perch. Trawl catcher vessels rarely target these species. AFA trawl CVs may harvest up to 6.47 percent of the yellowfin sole ITAC (including yellowfin sole incidental catch in other fisheries), 3.41 percent of the rock sole ITAC, 5.05 percent of the flathead sole ITAC, less than 1 percent of the Atka mackerel ITACs, and less than 1 percent of the AI Pacific ocean perch ITACs. Given these small harvest limits, it is unlikely they can participate in these directed fisheries, with the possible exception of the yellowfin sole fishery. Other catcher vessels have traditionally not harvested these species in the BSAI.

The only potentially significant impacts of the proposed alternatives are on the non-AFA trawl CP (i.e. the H&G Trawl CP) fleet operating in the EBS. It is important to note that in many vessels in this fleet are owned by several companies. As such, this analysis of large and small entities is conducted at a company level and not at an individual vessel level.

Section 5.6 of the RIR provides a description of these fisheries and estimates the numbers of unique vessels that presently participate. As shown in, Table 5.6-12, approximately 22 to 24 vessels have participated in the H&G Trawl CP fishery off Alaska in recent years. Based on analysis of total annual gross revenues, two of the H&G Trawl CP vessels should be classified as small entities. The two AFA trawl CP companies that harvested yellowfin sole in 2004, are considered large entities as are all AFA entities eligible to fish in the affected fisheries, but choose not to do so at present. All CDQ groups and their associated communities are considered small entities, according to RFA guidelines, and are directly regulated by this action in that harvest of their allocation of BSAI species occurs within the areas defined by this action.

6.5 Description of the Projected Reporting, Recordkeeping and Other Compliance Requirements of the Rule

The alternatives being considered would not directly mandate additional reporting or recordkeeping within the context of the Regulatory Flexibility Act.

6.6 Identification of Relevant Federal Rules that may Duplicate, Overlap or Conflict with the Rule

This analysis did not identify any Federal rules that duplicate, overlap, or conflict with the rule.

6.7 Description of Significant Alternatives to the Rule

An FRFA must consider all significant alternatives to the proposed action that accomplish the stated objectives of the action, consistent with applicable statutes, and simultaneously minimize any significant economic impacts of the rule on small entities. “Significant alternatives” are those with potentially lesser impacts on small entities as a whole. The kinds of alternatives that are possible will vary, based on the particular regulatory objective and the characteristics of the regulated industry. However, section 603(c) of the RFA gives agencies some alternatives that they must consider at a minimum:

1. Establishment of different compliance or reporting requirements for small entities or timetables that take into account the resources available to small entities.

2. Clarification, consolidation, or simplification of compliance and reporting requirements for small entities.
3. Use of performance rather than design standards.
4. Exemption for certain or all small entities from coverage of the rule, in whole or in part.

The alternatives accepted by the Council for consideration in this EA/RIR/FRFA are described in detail in Section 2 of the EA and are briefly described in Section 5.5 of the RIR. The RIR for this action analyzes potential economic impacts of the suite of available alternatives.

At present, the suite of alternatives and options before the Council contain explicit provisions in regard to mitigating potential adverse economic effects on directly regulated entities, the vast majority of which are large entities. The preferred alternatives and options reflect the least burdensome of management structures in terms of directly regulated small entities available, while fully achieving the conservation and management purposes articulated by the Council (consistent with applicable statutes).

7.0 CONSISTENCY WITH OTHER APPLICABLE LAWS OR POLICIES

7.1 Consistency with the Magnuson-Stevens Act

7.1.1 National Standards

Below are the 10 National Standards as contained in the Magnuson-Stevens Act (Act), and a brief discussion of the consistency of the proposed alternatives with those National Standards, where applicable.

<u>National Standard 1 - Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery</u>

The proposed action would close a portion of the BS yellowfin sole, rock sole, and flathead sole fishing grounds to nonpelagic trawl fishing and/or impose gear modifications on the nonpelagic trawl fishery to reduce impacts of fishing on BS fish habitat. BSAI yellowfin sole, rock sole, and flathead sole are not currently in danger of overfishing and are considered stable. In terms of achieving 'optimum yield' from the fishery, the Act defines 'optimum', with respect to yield from the fishery, as the amount of fish which:

(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;

(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduce by any relevant economic, social, or ecological factor; and,

(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overall benefits to the Nation may be affected by the proposed action, though our ability to quantify those effects is quite limited. Overall net benefits to the Nation would not be expected to change to an identifiable degree between the alternatives under consideration.

<u>National Standard 2 - Conservation and management measures shall be based upon the best scientific information available.</u>

Information in this analysis represents the most current, comprehensive set of information available to the Council, recognizing that some information (such as operational costs) is unavailable. Information previously developed on the BSAI trawl fisheries, as well as the most recent information available, has been incorporated into this analysis. It represents the best scientific information available.

National Standard 3- To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The annual TAC is set for BSAI yellowfin sole, rock sole and flathead sole according to the Council and NMFS's harvest specification process. Atka mackerel TACs are set currently set for the Eastern Aleutian Islands/Bering Sea, Central Aleutian Islands, and Western Aleutian Islands. Pacific ocean perch TACs are set for the Bering Sea, Eastern Aleutian Islands, Central Aleutian Islands, and Western Aleutian Islands areas. NMFS conducts the stock assessments for these species and makes allowable biological catch recommendations to the Council. The Council sets the TAC for these species based on the most recent stock assessment and survey information. These BSAI stocks will continue to be managed as a single stock under the alternatives for establishing Bering Sea Habitat Conservation measures.

National Standard 4 - Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fishermen, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Nothing in the alternatives considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and states of the Pacific Northwest, participate in the major sectors affected by these allocations. No discriminations made among fishermen based on residency or any other criteria.

National Standard 5 - Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.

The wording of this standard was changed in the recent Magnuson-Stevens Act authorization, to consider rather than promote efficiency. Efficiency in the context of this change refers to economic efficiency, and the reason for the change, essentially, is to de-emphasize to some degree the importance of economics relative to other considerations (Senate Report of the Committee on Commerce, Science, and Transportation on S. 39, the Sustainable Fisheries Act, 1996). The analysis presents information relative to these perspectives and provides information on the economic risks associated with the closure of fishing grounds to nonpelagic trawling, the potential for increase in costs associated with proposed gear modifications and the economic impacts to communities.

National Standard 6 - Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

All of the alternatives under consideration in the proposed action appear to be consistent with this standard.

National Standard 7 - Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

All of the alternatives under consideration appear to be consistent with this standard.

National Standard 8 - Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

Many of the coastal communities in Alaska and the Pacific Northwest participate in the Bering Sea groundfish fisheries in one way or another, as homeport to participating vessels, the location of processing activity, the location of support businesses, the home of employees in the various sectors, or as the base of ownership or operations of various participating entities, among others. As noted elsewhere in this analysis, however, the sector that will be exclusively or nearly exclusively directly affected by the different management alternatives is the H&G trawl CP sector. As detailed in Section 5.6.5 of the RIR, the vessels in this sector that have recently fished in the areas potentially affected by one or more of the alternatives, and the related activities of those vessels while working in the Bering Sea, are closely associated with two communities: Seattle, Washington, and Dutch Harbor/Unalaska, Alaska. A summary of the level of fishery engagement and dependence in these communities is provided in Section 5.6.5 of the RIR, and references for detailed profiles of these communities are also provided in that section. Other affected vessels in this fleet have at least some association with the communities of Anchorage, Kodiak, and Juneau, Alaska, and Rockland, Maine. A summary of relevant fishery engagement and dependency for these communities is provided in Section 5.6.5 of the RIR as well, with none of these four communities being considered substantially dependent on the incremental contributions of the two or less vessels associated with each.

An analysis of the alternatives being considered for EFH in the Bering Sea suggests that while impacts may be noticeable at the individual operation level for at least a few vessels, the impacts at the community level for any of the involved fishing communities would be well under the level of significance. The sustained participation of these fishing communities is not put at risk by any of the alternatives being considered. Economic impacts to participating communities would not likely be noticeable at the community level, so consideration of efforts directed at a further minimization of adverse economic impacts to any given community is not relevant.

It should be noted also that positive or negative indirect effects of the alternatives may be experienced in the western Alaska communities of Kipnik and Chefornak due to the exacerbation or elimination of potential gear conflicts between the directly affected (non-local) H&G trawl CP fleet and local, small scale fishing operations. Whether or not these impacts would occur is a function of many variables as discussed in the analysis of alternatives section in the RIR. Under existing conditions gear conflicts are being avoided through informal industry-community agreements in the absence of formal management direction.

National Standard 9 -Conservation and management measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

All of the alternatives under consideration in the proposed action appear to be consistent with this standard.

National Standard 10 - Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The alternatives under consideration appear to be consistent with this standard. None of the alternatives or options proposed to modify the fishing grounds or gear of the non-AFA Trawl CP sector fleet would change safety requirements for fishing vessels.

7.1.2 Section 303(a)(9) – Fisheries Impact Statement

Section 303(a)(9) of the Magnuson-Stevens Act requires that any plan or amendment include a fishery impact statement which shall assess and describe the likely effects, if any, of the conservation and management measures on a) participants in the fisheries and fishing communities affected by the plan or amendment; and b) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants taking into account potential impacts on the participants in the fisheries, as well as participants in adjacent fisheries.

The alternative actions considered in this analysis are described in Section 2.2 of the EA. The impacts of these actions on participants in the fisheries and fishing communities are the topic of Sections 5.0 and 6.0 of the RIR/IRFA.

7.1.2.1 Fishery Participants

The proposed actions directly impact the participants in the BSAI flatfish fisheries, the CDQ groups, and CDQ communities. Participants in the non-AFA Trawl CP sector have traditionally harvested the majority of the BSAI species impacted under this action. During the more recent years, the participants in that sector have harvested over 90 percent of each of those species. Vessels in the non-AFA Trawl CP sector have also traditionally contracted to harvest the CDQ allocations of these species. Summaries of the sectors can be found in Section 5.6.6 of this document.

Although there are 43 License Limitation Program (LLP) licenses for vessels in the non-AFA Trawl CP sector, 22 to 26 vessels have been active in the BS flatfish fisheries in recent years. Seventeen of the vessels appear to operate out of Seattle, 6 vessels out of other Washington communities, and 3 vessels out of Maine. Several of the companies own and operate more than one vessel. Data that are currently available do not allow the analysts to exactly define ownership in this fleet. However, information produced in Amendment 79 (NPFMC, 2003) indicates that companies own between 1 and 5 of the qualified vessels.

The vessels range in length from 103' length over all (LOA) to 295' LOA. The largest vessels are reported to harvest and retain more fish than smaller vessels, on average. Portions of the BS flatfish TACs may be harvested by the AFA catcher processors, AFA catcher vessels, or other trawl catcher vessels. During 2004, 3 AFA CPs harvested yellowfin sole as a directed fishery. A small number of AFA catcher vessels have also participated in harvesting yellowfin sole during the spring fishery. However, the analyses showed no revenue at risk in fleet sectors other than the H&G Trawl CP sector. Members of the AFA fleets generally do not participate in directed fishing for other species targeted by the non-AFA Trawl CP fleet. The number of Non-AFA catcher vessels that participate in these fisheries is also very limited.

7.1.2.2 Fishing Communities

The fishing communities that are expected to be potentially directly impacted by the proposed action are those communities where the H&G trawl CP vessels engaged in fishing in areas considered for closure, serve as homeports to the H& G trawl CP vessels, offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. The Non-AFA H&G Trawl CP fleet, the only fleet directly affected by the proposed action, is primarily associated with the greater Seattle, Washington, area in terms of vessel homeporting and location of ownership, as well as the location for major maintenance and repair work. Dutch Harbor/Unalaska, Alaska, is the homeport for a few of the relevant vessels, but serves the entire fleet as the primary offloading, supply, and service center while the fleet is working in the Bering Sea, and it is the location where a range of other associated activities, such as crew changes, limited vessel maintenance and repair, and refueling take place. A number of other communities appear as homeports in the records of H&G trawl CPs potentially affected by the proposed action, as measured in areas of fishing effort over the period 2003-2005, such as Kodiak, Anchorage, and Juneau, Alaska, and Rockland, Maine, but these communities are not expected to be materially affected by the proposed action for reasons detailed in Section 5.6.5 of the RIR.

Information on the residence of the vessel crew and processing crew that work aboard the potentially affected vessels is not readily available. It is known, however, that in general companies operating vessels in the North Pacific H&G trawl CP sector tend to recruit crew from many locations, including Seattle, the Pacific Northwest and urban centers elsewhere in the west and mid-west. Workers are also drawn from a number of foreign countries, such that location of residence is not tightly concentrated in Seattle, or one or even a few communities outside of the Seattle area. For the majority of vessels with agreements with CDQ groups, a typical term of those agreements is some degree of targeted hire from CDQ group communities in western Alaska, but the actual number of hires from those communities on the specific vessels potentially affected by the proposed action is not apparent in the available data.

Additional summary information on the fishing communities mentioned above may be found in Section 5.6.5 of the RIR. Detailed information on the range of fishing communities relevant to the proposed action may be found in a number of recently produced documents, including the *Alaska Groundfish Fisheries Final Programmatic Supplemental EIS* (NMFS 2004), *Sector and Regional Profiles of the North Pacific Groundfish Fishery* (Northern Economics and EDAW 2001), and in a technical paper (Downs 2003) supporting the *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005) as well as that EIS itself. These sources also include specific characterizations of the degree of individual community and regional engagement in, and dependency upon, the North Pacific groundfish fishery.

Positive or negative indirect effects of the alternatives may be experienced in the western Alaska communities due to the exacerbation or elimination of potential gear conflicts between the directly affected (non-local) H&G trawl CP fleet and local, small scale fishing operations. Whether or not these impacts would occur is a function of many variables as discussed in the analysis of alternatives section in the RIR. It is important to note, however, that under existing conditions gear conflicts are being avoided through informal industry-community agreements in the absence of formal management direction.

7.1.2.3 Participants in Fisheries in Adjacent Areas

Neither the proposed action nor alternatives considered would significantly affect participants in the fisheries conducted in adjacent areas under the authority of another Council.

7.2 Executive Order 12898 Environmental Justice

E.O. 12898 focuses on environmental justice in relation to minority populations and low-income populations. The EPA defines environmental justice (EJ) as the "fair treatment for people of all races, cultures, and incomes, regarding the development of environmental laws, regulations, and policies." This order (Environmental Justice, 59 FR 7629) requires each Federal agency to achieve environmental justice by addressing "disproportionately high and adverse human health and environmental effects on minority populations and low-income populations."

The EPA responded to this order by developing an Environmental Justice Strategy focusing the agency's efforts in addressing these concerns. In order to determine whether environmental justice concerns exist, the demographics of the affected area should be examined to determine whether minority populations and low-income populations are present, and if so, a determination must be made as to whether implementation of the alternatives may cause disproportionately high and adverse human health or environmental effects on these populations.

As developed in Section 5.6.5 of the RIR, the only sector of the fishing industry likely to be directly affected under any of the alternatives is the H&G trawl CP fleet. Also as developed in that section, Dutch Harbor/Unalaska, Alaska, and Seattle, Washington, are the only communities substantially connected to that fleet. These communities engage in and/or dependent on the H&G trawl fleet and its activities in the relevant areas of the Bering Sea; therefore, these communities may also be affected by the proposed alternatives. Detailed demographic and economic information for these two communities, and the relationship of specific populations within these communities to specific fishery sectors may be found in several recently produced documents, including the *Alaska Groundfish Fisheries Final Programmatic Supplemental EIS* (NMFS 2004), *Sector and Regional Profiles of the North Pacific Groundfish Fishery* (Northern Economics and EDAW 2001), *Steller Sea Lion Protection Measures Final SEIS* (NMFS 2001), and in a technical paper (Downs 2003) supporting the *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005) as well as in that EIS itself. A comprehensive recent profile focusing specifically on Dutch Harbor/Unalaska may also be found in *Comprehensive Baseline Commercial Fishing Community Profiles: Unalaska, Akutan, King Cove, and Kodiak, Alaska* prepared for the North Pacific Research Board and the NPFMC (EDAW and Northern Economics 2005). These documents indicate that there is significant minority population engagement in a number of fishery sectors in these communities, particularly in the processing sector, both in terms of the shoreside sector as well as aboard catcher processors associated with the communities, although third-party quantitative information is largely lacking for a demographic analysis of the catcher processor sector in general or the H&G trawl catcher processor fleet in particular. Analysis of the proposed alternatives, however, would indicate that the amount of revenue at risk is less than significant at the fleet level and at the community level for the directly engaged communities. As a result, significant impacts would not occur in general, nor would high and adverse impacts disproportionately accrue to minority populations or low-income populations in this industry sector or either of the two primarily associated communities.

Members of the 65 Western Alaskan communities associated with the six CDQ groups could theoretically be affected by the proposed alternatives, and these communities have largely Alaska Native populations and limited local economic opportunities in general. The revenue at risk analyses, however, found no revenue from CDQ harvests relevant to the proposed action was at risk during the analytic base years (2003-2005), such that it is unlikely that any impacts would disproportionately accrue to CDQ community populations.

Indirect effects of the alternatives may be experienced in the western Alaska communities of Kipnik and Chefornak. Ninety-eight percent of the residents of these communities reported they are at least partly Alaska Native/Native American during the 2000 census. As summarized in Section 5.6.5 of the RIR, these communities are substantially dependent on commercial and subsistence fishing. Information on low-income status in these communities, along with comparative information from Dutch Harbor/Unalaska (as the most directly engaged relevant Alaska fishing community) and Anchorage (as a comparative reference as the urban demographic and economic center of the state) are presented in **Table 7.2-1** As shown in this table, there are several income and employment indicators that suggest that both Kipnuk and Chefornak have relatively low-income populations.

Table 7.2-1 Selected 2000 Census Income and Employment Indicators, Kipnuk, Chefornak, Dutch Harbor/Unalaska and Anchorage, Alaska

Demographic Indicator	Kipnuk	Chefornak	Dutch Harbor	Anchorage
Percent Below Poverty	20.9%	25.1%	12.5%	7.4%
Per Capita Income	$8,589	$8,474	$24,676	$25,287
Unemployment Rate	20.2%	7.9%	11.1%	4.7%
Age 16 or older by not in Labor Force	40.4%	33.7%	16.8%	25.6%

Source: Sepez et al. 2005.

Positive or negative indirect effects to Kipnuk and Chefornak would depend on whether the alternatives exacerbates or eliminates potential gear conflicts between the directly affected (non-local) H&G trawl CP fleet and local, small scale fishing operations. Whether or not these impacts would occur is a function of many variables as discussed in the analysis of alternatives section in the RIR. It is important to note, however, that under existing conditions gear conflicts are being avoided through informal industry-community agreements in the absence of formal management direction.

7.3 Management Policy of the BSAI Groundfish FMP

The alternatives discussed in this action accord with the management policy of the BSAI Groundfish FMP. The Council's management policy includes objectives that aims to "minimize to the extent practicable the adverse effects of fishing on EFH," (NMFS 2005). By closing portions of the flatfish habitat in the BS to nonpelagic trawl and/or requiring gear modifications to nonpelagic trawl gear to reduce impacts on habitat the Council is consistent with its management policy.

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Appendix A: Locations of proposed Alteranatives and Options

Table A-1. Name, location, and area of proposed Alternatives within the Eastern Bering Sea. Note that the open area would be defined as two closure areas one to the north and one to the west.

Name of Alternative by Area	Latitude	Longitude	Management	Area
Alternative 2 North	58 33' 6.01" N	161 46' 31.28" W	Nonpelagic trawl closure	291,986 km^2 85,130 nm
	58 33' 6.02" N	162 33' 34.17" W		
	58 36' 33.62" N	162 34' 10.74" W		
	58 39' 18.69" N	162 34' 17.90" W		
	58 41' 42.95" N	162 34' 10.61" W		
	58 44' 27.38" N	162 33' 42.86" W		
	58 46' 17.91" N	162 33' 12.68" W		
	58 48' 17.62" N	162 32' 29.34" W		
	58 50' 30.77" N	162 31' 25.04" W		
	58 51' 59.36" N	162 30' 34.97" W		
	59 20' 0.00" N	163 16' 00.00" W		
	59 34' 15.00 N	164 11'00.00" W		
	59 41' 80.00" N	164 42' 00.00" W		
	59 42' 6.00" N	165 0' 00.00" W		
	59 37' 22.48" N	165 1' 25.42" W		
	59 24' 34.49" N	167 40' 11.17" W		
	59 49' 13.02" N	167 59' 59.33" W		
	60 45' 41.72" N	168 0' 0.37" W		
	59 42' 21.90" N	174 0' 30.14" W		
	60 10' 7.30" N	174 25' 1.54" W		
	60 54' 6.09" N	1741' 14.37" W		
	62 6' 25.17" N	176 13' 59.78" W		
	65 30' 0.27" N	168 58' 31.13" W		
	65 30' 0.63" N	168 58' 30.31" W		
	65 37' 30.63" N	168 58' 30.29" W		
	65 37' 21.83" N	168 6' 58.12" W		
Alternative 2 West	54 59' 59.64" N	172 6' 21.23" E	Nonpelagic trawl closure	167,421 km^2 48,812 nm^2
	56 16' 56.08" N	173 59' 40.77" E		
	60 16' 31.39" N	179 32' 21.65" W		
	58 15' 1.29" N	177 51' 38.69" W		
	58 15' 1.50" N	175 0' 2.70" W		
	58 38' 42.35" N	175 0' 2.73" W		
	57 50' 24.00" N	174 12' 2.67" W		
	57 50' 23.99" N	17433' 38.67" W		
	56 50' 6.12" N	173 59' 58.57" W		
	55 42' 0.10" N	169 14' 2.75" W		
	54 6' 0.13" N	168 0' 2.40" W		
	53 18' 16.77" N	169 59' 59.61" W		
	54 59' 59.64" N	169 59' 59.61" W		
	54 59' 59.64" N	170 0' 0.00" W		
	54 59' 59.64" N	1700' 0.00" W		
	55 36' 48.59" N	175 49' 8.40" W		
	55 37' 31.09" N	175 49' 24.93" W		
	55 42' 10.80" N	175 53' 34.82" W		
	55 54' 53.27" N	176 3' 41.38" W		
	56 31' 28.92" N	176 23' 36.25" W		
	56 45' 12.96" N	176 27' 47.51" W		
	57 11' 14.64" N	176 32' 32.27" W		
	57 30' 23.04" N	176 32' 10.30" W		

	57 41' 2.63" N 57 49' 45.12" N 57 58' 14.87" N 585' 55.32" N 58 15' 17.65" N 58 23' 40.56" N 58 33' 49.68" N 58 52' 4.80" N 59 0' 56.15" N 59 13' 18.84" N 5926' 5.28" N 59 26' 5.28" N 59 35' 26.57" N 59 44' 12.11" N 59 52' 43.71" N 60 0' 43.92" N 60 11' 39.12" N	177 0' 0.00" W 177 18' 50.77" W 177 35' 13.94" W 177 48' 35.28" W 178 3' 18.36" W 178 15' 8.30" W 178 27' 59.04" W 178 47' 27.22" W 17857' 30.97" W 179 9' 52.93" W 17920' 40.57" W 179 20' 40.57" W 17927' 23.76" W 179 32' 49.58" W 17937' 40.79" W 179 42' 5.76" W 179 46' 49.10" W		
Alternative 2 SubOption 1 North	58 33' 1.82" N 58 33' 1.80" N 58 33' 0.76" N 58 33' 0.00" N 58 33' 0.90" N 58 33' 3.27" N 58 33' 15.00" N 58 35' 19.92" N 58 37' 30.24" N 58 39' 12.67" N 58 41' 36.93" N 58 44' 21.36" N 58 46' 11.89" N 5848' 35.25" N 58 50' 34.68" N 58 51' 59.33" N 59 20' 0.00" N 59 34' 15.00 N 59 41' 80.00" N 59 42' 6.00" N 59 37' 23.39" N 59 24' 27.80" N 59 49' 9.08" N 59 49' 9.09" N 61 0' 3.52" N 61 0' 0.00" N 60 13' 59.56" N 59 42' 15.81" N 60 10' 1.31" N 6054' 0.09" N 62 6' 19.18" N 62 6' 18.96" N 62 6' 19.08" N 65 29' 54.52" N 65 37' 24.52" N 65 37' 15.64" N	161 46' 21.13" W 161 46' 21.14" W 16146' 21.03" W 161 46' 19.52" W 162 33' 40.98" W 162 33' 42.78" W 162 33' 44.51" W 162 34' 9.72" W 162 34' 19.48" W 162 34' 19.73" W 162 34' 12.44" W 162 33' 44.70" W 162 33' 14.52" W 162 32' 19.78" W 162 31' 22.14" W 162 30' 37.47" W 163 16' 00.00" W 164 11'00.00" W 164 42' 00.00" W 165 0' 00.00" W 165 1' 27.31" W 167 40' 13.02" W 168 0' 0.00" W 168 0' 0.01" W 167 59' 49.35" W 170 59' 56.40" W 170 59' 57.88" W 174 0' 29.95" W 174 25' 0.66" W 174 1' 13.56" W 176 13' 58.50" W 176 13' 58.91" W 176 13' 59.13" W 168 58' 31.19" W 168 58' 31.17" W 168 6' 50.49" W	Nonpelagic trawl closure	283,070 km^2 82,530 nm^{22}
Alternative 2 SubOption 1 West	54 59' 59.64" N 56 16' 56.08" N 60 16' 31.39" N 58 15' 1.29" N 58 15' 1.50" N	172 6' 21.23" E 173 59' 40.77" E 179 32' 21.65" W 177 51' 38.69" W 175 0' 2.70" W	Nonpelagic trawl closure	167,421 km^2 48,812 nm^2

	58 38' 42.35" N 57 50' 24.00" N 57 50' 23.99" N 56 50' 6.12" N 55 42' 0.10" N 54 6' 0.13" N 53 18' 16.77" N 54 59' 59.64" N 54 59' 59.64" N 54 59' 59.64" N 55 36' 48.59" N 55 37' 31.09" N 55 42' 10.80" N 55 54' 53.27" N 56 31' 28.92" N 56 45' 12.96" N 57 11' 14.64" N 57 30' 23.04" N 57 41' 2.63" N 57 49' 45.12" N 57 58' 14.87" N 585' 55.32" N 58 15' 17.65" N 58 23' 40.56" N 58 33' 49.68" N 58 52' 4.80" N 59 0' 56.15" N 59 13' 18.84" N 5926' 5.28" N 59 26' 5.28" N 59 35' 26.57" N 59 44' 12.11" N 59 52' 43.71" N 60 0' 43.92" N 60 11' 39.12" N	175 0' 2.73" W 174 12' 2.67" W 17433' 38.67" W 173 59' 58.57" W 169 14' 2.75" W 168 0' 2.40" W 169 59' 59.61" W 169 59' 59.61" W 170 0' 0.00" W 1700' 0.00" W 175 49' 8.40" W 175 49' 24.93" W 175 53' 34.82" W 176 3' 41.38" W 176 23' 36.25" W 176 27' 47.51" W 176 32' 32.27" W 176 32' 10.30" W 177 0' 0.00" W 177 18' 50.77" W 177 35' 13.94" W 177 48' 35.28" W 178 3' 18.36" W 178 15' 8.30" W 178 27' 59.04" W 178 47' 27.22" W 17857' 30.97" W 179 9' 52.93" W 17920' 40.57" W 179 20' 40.57" W 17927' 23.76" W 179 32' 49.58" W 17937' 40.79" W 179 42' 5.76" W 179 46' 49.10" W		

Table A-2. Name, location, and area of proposed Options within the Eastern Bering Sea

Name of Option by Area	Latitude	Longitude	Management	Area
Option 1 St. Matthew	60 54’ 0.00” N 60 3’ 31.20” N 59 42’ 15.81”N 60 9’ 58.56” N 60 54’ 0.00” N	172 0’0.00” W 171 59’55.21” W 174 0’29.94” W 174 24’58.86” W 174 1’14.17” W	Nonpelagic trawl closure	13,763 km^2 4,013 nm^2
Option 2 Nunivak	59 47' 44.72" N 59 41' 80.00" N 59 42' 6.00" N 59 37' 23.19" N 59 24' 28.42" N 59 49' 2.38" N 59 49' 3.80" N 60 45' 32.86" N 60 45' 32.86" N 60 45' 28.78" N	163 49' 56.19" W 164 42' 00.00" W 165 0' 00.00" WW 165 1' 27.16" W 167 40' 13.29" W 168 0' 0.00" W 168 0' 1.15" W 168 0' 0.93" W 168 0' 0.00" W 165 1' 47.14" W	Nonpelagic trawl closure	21,141 km^2 6,163 nm^2

Option 3 Nunivak Island and Kuskokwim Bay	58 38' 41.46" N 58 38' 21.03" N 58 38' 21.65" N 58 51' 57.97" N 59 20' 0.00" N 59 34' 15.00 N 59 41' 80.00" N 59 42' 6.00" N 59 37' 23.23" N 59 24' 28.42" N 59 49' 7.91" N 60 45' 33.07" N 60 45' 32.24" N	162 9' 58.64" W 162 10' 30.47" W 162 34' 18.27" W 162 30' 34.10" W 163 16' 00.00" W 164 11'00.00" W 164 42' 00.00" W 165 0' 00.00" W 165 1' 27.16" W 167 40' 12.12" W 167 59' 59.11" W 167 59' 58.71" W 1651' 32.67" W	Nonpelagic trawl closure	33,537 km^2 9,778 nm^2
Option 4	58 33' 6.01" N 58 33' 6.02" N 58 36' 33.62" N 58 39' 18.69" N 58 41' 42.95" N 58 44' 27.38" N 58 46' 17.91" N 58 48' 17.62" N 58 50' 30.77" N 58 51' 59.36" N 59 20' 0.00" N 59 34' 15.00 N 59 41' 80.00" N 59 42' 6.00" N 59 37' 22.48" N 59 24' 34.49" N 59 49' 13.02" N 60 45' 41.72" N 59 42' 21.90" N 60 10' 7.30" N 60 54' 6.09" N 62 6' 25.17" N 65 30' 0.27" N 65 30' 0.63" N 65 37' 30.63" N 65 37' 21.83" N	161 46' 31.28" W 162 33' 34.17" W 162 34' 10.74" W 162 34' 17.90" W 162 34' 10.61" W 162 33' 42.86" W 162 33' 12.68" W 162 32' 29.34" W 162 31' 25.04" W 162 30' 34.97" W 163 16' 00.00" W 164 11'00.00" W 164 42' 00.00" W 165 0' 00.00" W 165 1' 25.42" W 167 40' 11.17" W 167 59' 59.33" W 168 0' 0.37" W 174 0' 30.14" W 174 25' 1.54" W 1741' 14.37" W 176 13' 59.78" W 168 58' 31.13" W 168 58' 30.31" W 168 58' 30.29" W 168 6' 58.12" W	Nonpelagic trawl closure	291,986 km^2 85,130 nm^2
Option 4 Suboption	58 33' 1.82" N 58 33' 1.80" N 58 33' 0.76" N 58 33' 0.00" N 58 33' 0.90" N 58 33' 3.27" N 58 33' 15.00" N 58 35' 19.92" N 58 37' 30.24" N 58 39' 12.67" N 58 41' 36.93" N 58 44' 21.36" N 58 46' 11.89" N 5848' 35.25" N 58 50' 34.68" N 58 51' 59.33" N 59 20' 0.00" N 59 34' 15.00 N 59 41' 80.00" N	161 46' 21.13" W 161 46' 21.14" W 16146' 21.03" W 161 46' 19.52" W 162 33' 40.98" W 162 33' 42.78" W 162 33' 44.51" W 162 34' 9.72" W 162 34' 19.48" W 162 34' 19.73" W 162 34' 12.44" W 162 33' 44.70" W 162 33' 14.52" W 162 32' 19.78" W 162 31' 22.14" W 162 30' 37.47" W 163 16' 00.00" W 164 11'00.00" W 164 42' 00.00" W	Nonpelagic trawl closure	283,070 km^2 82,530 nm^2

	59 42' 6.00" N 59 37' 23.39" N 59 24' 27.80" N 59 49' 9.08" N 59 49' 9.09" N 61 0' 3.52" N 61 0' 0.00" N 60 13' 59.56" N 59 42' 15.81" N 60 10' 1.31" N 6054' 0.09" N 62 6' 19.18" N 62 6' 18.96" N 62 6' 19.08" N 65 29' 54.52" N 65 37' 24.52" N 65 37' 15.64" N	165 0' 00.00" W 165 1' 27.31" W 167 40' 13.02" W 168 0' 0.00" W 168 0' 0.01" W 167 59' 49.35" W 170 59' 56.40" W 170 59' 57.88" W 174 0' 29.95" W 174 25' 0.66" W 174 1' 13.56" W 176 13' 58.50" W 176 13' 58.91" W 176 13' 59.13" W 168 58' 31.19" W 168 58' 31.17" W 168 6' 50.49" W		
Option 5 St Lawrence	64 0' 0.00" N 62 42' 0.00" N 62 42' 0.00" N 63 57' 1.83" N 640' 0.30" N	168 24' 0.00" W 168 24' 0.00" W 172 24' 0.00" W 172 24' 0.00" W 172 17' 25.07" W	Nonpelagic trawl closure	24,189 km^2 7,052 nm^2

Appendix B: Summary of Current Gear Research

Development and evaluation of trawl groundgear modifications to reduce damage to living structure in soft bottom areas. (Preliminary Results)

Craig S. Rose – Alaska Fisheries Science Center, NMFS

Summary – Simple modifications to trawl sweeps (Figure 1) were tested for their effectiveness at reducing effects on sessile seafloor animals on unconsolidated (sand – mud) substrates. The modifications support most of the sweeps 2 – 4 inches above the substrate, allowing space for animals to pass beneath. These were effective in reducing effects to basketstars and sea whips and did not substantially reduce catches of target flatfish until the space was increased to 4 inches.

Introduction

Scientists from the RACE Division's Conservation Engineering project have been working with the fishing industry to modify groundfish trawls to reduce their effects on the seafloor environment. We have initially focusing on areas with soft-bottom (sand – mud) substrates where most groundfish fishing occurs. In those areas, the seafloor features considered most likely to be both significant habitat elements and be vulnerable to fishing are the sessile invertebrates, such as anemones, ascidians, sponge and basketstars. Because they have relatively low profiles and flexible bodies, trawl modifications that create more space between the trawl and the seafloor are being evaluated as a way to reduce damage to these animals.

Do changes to trawl sweeps that reduce seafloor contact affect the degree of damage to structure-forming invertebrates?

From May 23 - June 7, RACE scientists compared the effects of conventional and modified sweeps (herding cables ahead of the trawl net) the on sessile invertebrates at four study sites on the EBS shelf (Figure 2). We selected sites with high abundances of such animals as well as a variety of the most common types. A site about 60 nautical miles west of St. Paul Island (A) was dominated by sea whips and basketstars. Sites 45 nm east of St. Paul (B) and 100 nm west of Cape Newenham (C) had mostly ascidians (*Halocynthia*, *Boltenia* and *Styela*). Finally, sponge dominated the sessile seafloor fauna at a site 60 nm NNE of Port Moller (D).

At each site, experimental trawling created parallel tracks of four types of modified sweeps and two types of conventional sweeps. Conventional sweeps had the same diameter throughout, of either 2-inch diameter combination rope (rope including interwoven steel and fiber element, with the softer fiber on the outside) or 3-inch disks strung over steel cable, causing more continuous seafloor contact (Figure 3). Modified sweeps had clusters of cluster of 6 inch, 8 inch or 10 inch diameter disks secured at 30-ft (9.1 m) intervals, lifting the sweep cables above the seafloor. Modification included all diameters of disk clusters on combination rope and 8-inch clusters on disk and cable sweeps. Three sets of two trawl tows each were made in opposite directions on parallel tracks, each with two types of sweeps, resulting in 12 parallel sweep tracks. The exception to this was Site C, where time limitations restricted towing to a single trawl track with only bare combination rope and combination wire with 8-inch disk cluster sweeps.

A seafloor sled (Figure 4) with both sonar and video sensors was then towed across the parallel trawl tracks at several points to compare the condition of seafloor animals in areas affected by these different gears and in control areas between tracks. An acoustic camera (DIDSON) provided an image of seafloor terrain on which trawl marks could be consistently identified, making it possible to discern which part of which trawl track the sled was in or whether it was between tracks. A video camera with strobed lights was then used to assess the condition and abundance of seafloor invertebrates associated with each area.

The imagery from these sensors was analyzed to estimate the relative effects of the alternative sweep designs on the principal structure-forming invertebrates at each site. Counts and condition evaluations were made for each crossing of a sweep track as well as for a swath of equal length from the seafloor on the other side of the adjacent door track, an area outside of the swath of the trawl system. Examples of the video from each site, including unaffected seafloor and those affected by conventional (combination rope) and modified (8-inch clusters on combination rope) gears, can be viewed at: http://www.afsc.noaa.gov/RACE/midwater/seafloor_videos.htm.

At this time, we have only completed analysis on the basketstars and sea whips from Site A. These are the two animals with the most vertical structure and have the clearest effects from sweep contact of all of the animals studied. Basketstars react to disturbance by curling their legs into a tight cluster. In their normal posture, they have upper legs spread to filter the water and lower legs braced against the substrate. Disturbance classes included 1) normal posture with all legs extended, 2) an intermediate level of disturbance where bracing legs are out, but filtering legs withdrawn 3) animals with all legs drawn in and 4) parts of basketstars (legs) lying separately on the seafloor. The proportions of these classes associated with each sweep type and the control areas are presented in Figure 5. The pattern is consistent with a reduction of effects from the conventional combination sweeps to those with larger disk cluster (more space beneath sweep), though the change is clearer when only the more severe effects are considered (25% vs. 40% damaged) than when the intermediate effects are included (41% vs. 46% damaged). Both types of rubber-over-cable footropes had larger effect rates than those with combination rope (roughly 65 –55% damaged for more severe and with intermediate included) and there was little difference when due to adding the larger disks. Notice that some of the animals in the control areas were not in the normal posture as basketstars do sometimes retract arms to retrieve collected food.

Sea whips were classified into 3 groups: 1) normal (vertical) posture, 2) laying flat on the substrate and 3) broken or otherwise visibly damaged. Some bare sea whip rods were also present, but these were not counted, as they were clearly remnants of animals that were dead long before the experimental trawling. While the proportion of normal postures was much higher for sea whips than for basketstars, the pattern of effects was similar (Figure 6). The conventional sweeps of both kinds showed 16-17% damage, while the reduction of that rate was approximately proportional to disk cluster diameter for the modified sweeps. Smallest effects were seem for the combination rope with 8 and 10 inch disk clusters with only 8-9% affected. The vast majority of affected sea whips were flattened on the seafloor with no apparent damage. Research by Malecha and Stone (in a poster by these AFSC Auke Bay scientists at: http://www.afsc.noaa.gov/ABL/MarFish/pdfs/Whip_Poster.pdf) indicates that some of these are capable of righting themselves, though they are more vulnerable to some forms of predation while down.

Analysis for the sponge encountered at Site D should be completed for the NPFMC December meeting. Because damage of these amorphous animals is difficult to classify, the analysis is based on size composition of the sponge colonies, detecting breakage.

The purpose of this study was to test for a reduction in the effects of trawl sweeps on sessile invertebrates when the sweeps are elevated off of the seafloor. Even though all sites have not been analyzed and the effects seen are not directly interpretable as mortalities, the results to date show a consistent pattern of reduced effects with the space created below the sweeps. Differences between the 8-inch and 10-inch modifications were minimal, perhaps indicating that further height would not further reduce effects.

Do changes to trawl sweeps that reduce seafloor contact affect the capture of flatfish?

From September 6 – 23, AFSC scientists conducted experiments aboard the F/V Cape Horn to determine whether modifications to raise 97% of the trawl sweeps inches above the seafloor affect how well they herd fish into the trawl. The Cape Horn is the only vessel in the Alaska groundfish fleet that uses a twin trawl, two matched trawl systems fished side-by-side (Figure 7). This allowed catches from identical trawls, except for the sweep modifications, to be compared to determine how the modifications affected catch rates.

Clusters of disks (6 inch, 8 inch and 10 inch diameters) were placed at 30 ft intervals along 300 ft-long, combination-rope sweeps (2 inch diameter), which were fished ahead of one trawl, while sweeps without the disks were fished ahead of that trawl's twin. The catches were processed separately, with the primary commercial species sorted and then weighed on a motion-compensated flow scale. Thus the catch for each of these species from each net was directly measured instead of being estimated from the total catch weight and a sample of the species composition. Length samples of each species were taken to test for any selectivity by size.

Initial analyses (Figure 8) indicated that:

1) Using the 6 and 8-inch disks did not significantly change flatfish catch rates.
2) Ten inch disks reduced flatfish catch rates 5-10%.
3) Roundfish catches, while more variable, tended to increase with the disks.

Discussion –

The tested modifications were effective at reducing the effects of trawl sweeps on sessile seafloor animals that are considered the most vulnerable habitat feature in the sand – mud habitats of the EBS shelf. The 8-inch disk clusters, creating up to 3 inches of opening under the sweeps, seems the best configuration; having no greater effects than the 10-inch disk clusters with no significant loss of target catch.

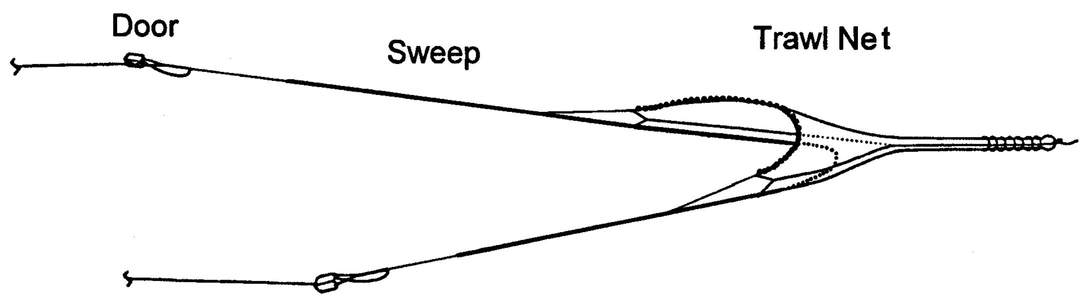


Figure 1 – Relative positions of doors, sweeps and trawl in an otter trawl system. Length of sweep varies with target species and seafloor. For most Bering Sea sole trawls sweeps are so long (up to 1500 ft) that they sweep 90% of the area covered between the doors.

Figure 2 – Seafloor camera/sonar sled.

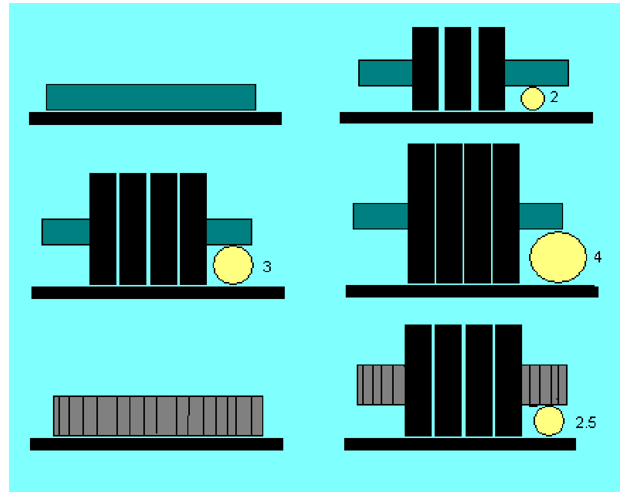


Figure 3. Sweep modifications tested for reduction of effects on sessile animals.

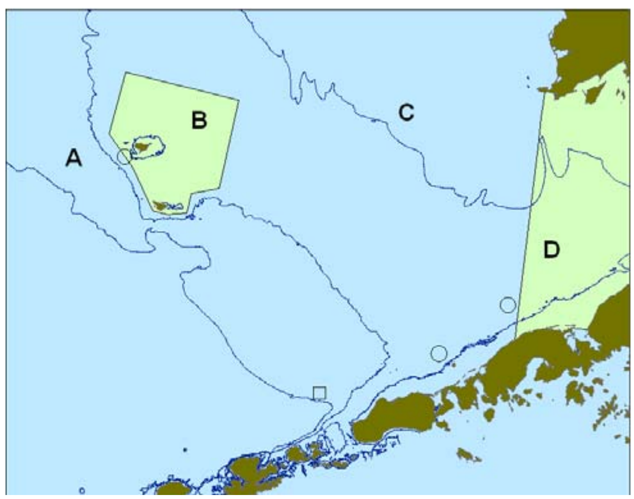


Figure 4 – Sites of studies of sweep modifications to reduce trawl effects on sessile animals

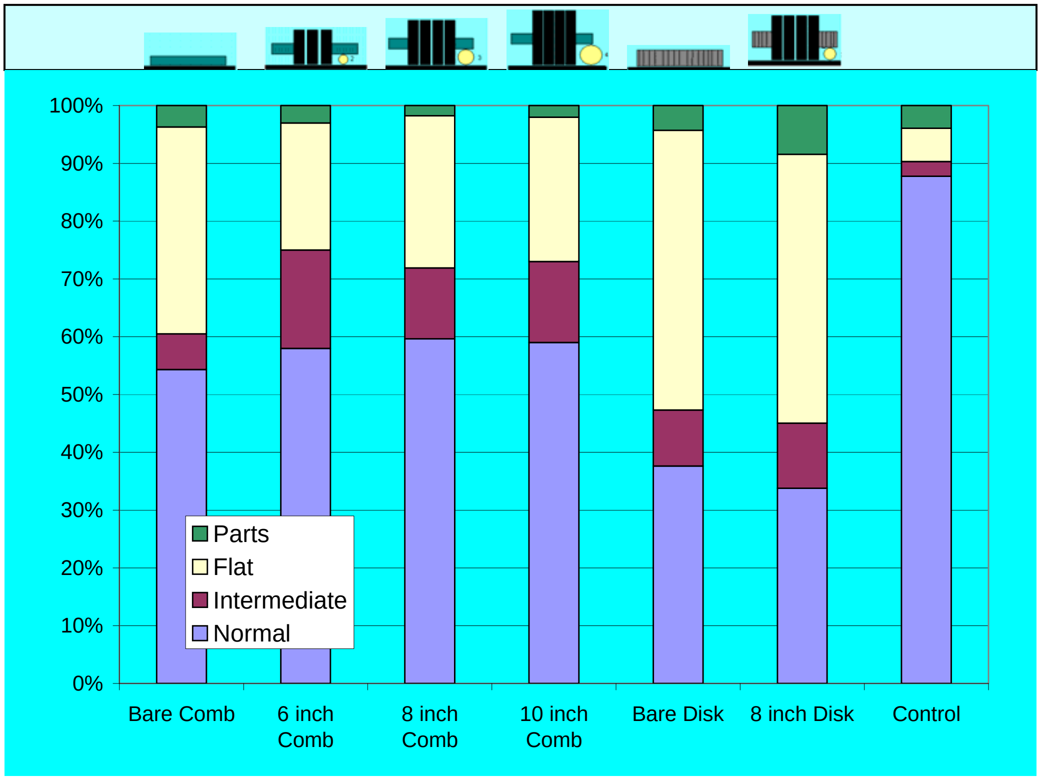


Figure 5 – Percent of basketstars in different condition categories after exposure to trawl sweep modifications.

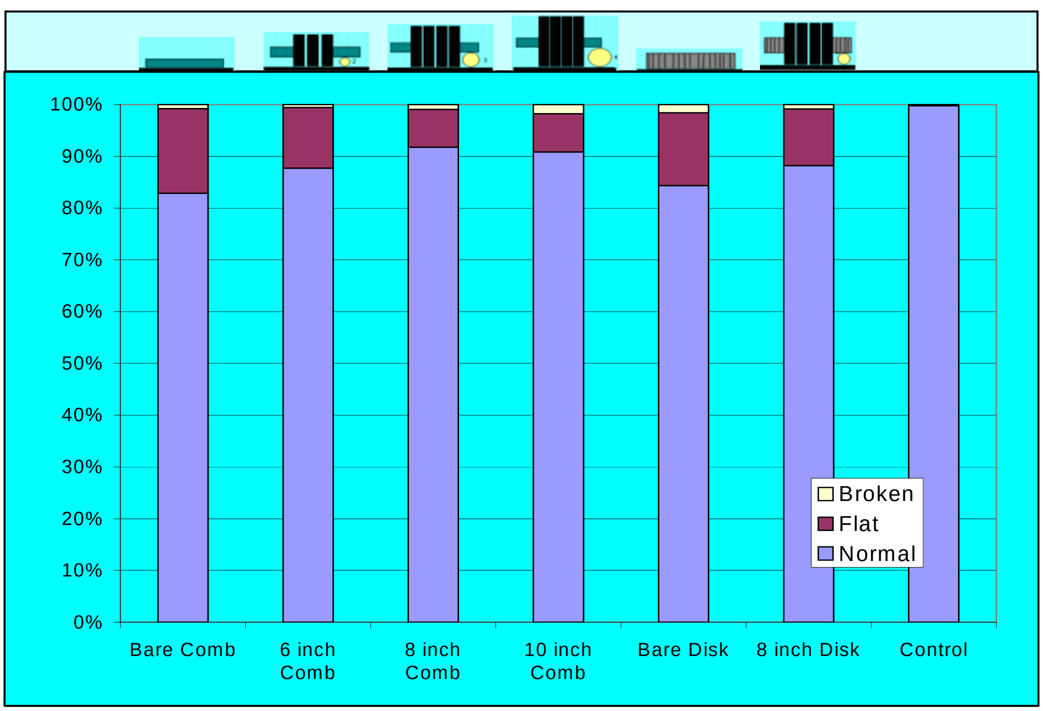


Figure 6 – Percent of sea whips in different condition categories after exposure to trawl sweep modifications.

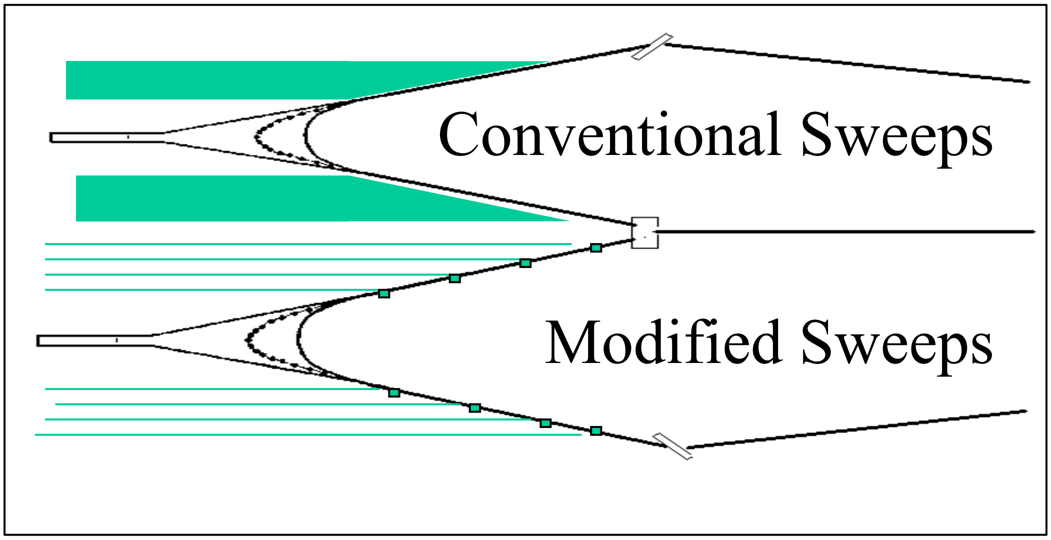


Figure 7 – Schematic of a twin trawl system, showing the concept of reducing bottom contact area of sweeps by limiting contact to disk clusters.

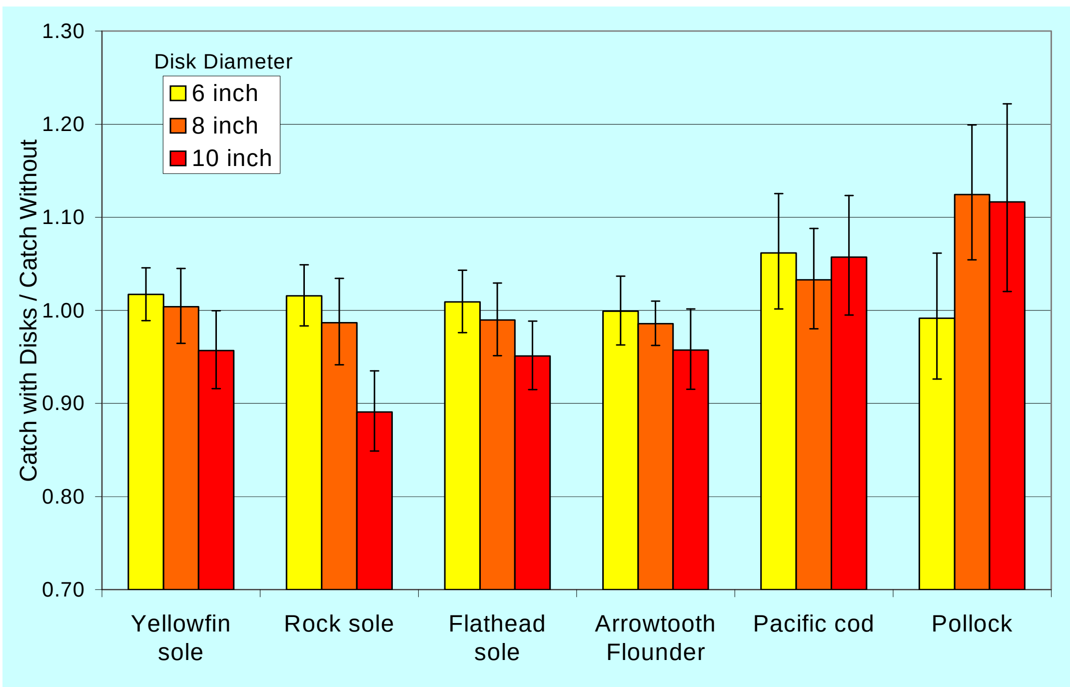


Figure 8 – Preliminary analysis of the proportional change in catch rates when trawl sweeps had disk clusters (6, 8 and 10 inch diameters) installed at 30 ft intervals.

APPENDIX C: Descriptions of essential fish habitat (EFH)

Table 1. Summary of species descriptions of Essential Fish Habitat for the Groundfish Resources of the BSAI Region[1]. The full set of descriptions is available in the EFH EIS Appendix D pp. D-49-D-73).

BSAI Species	Eggs	Larvae	EarlyJuvenile	Late Juvenile	Adult
Walleye pollock	1	1	x	**1**	**1**
Pacific cod	x	1	x	**1**	**1**
Yellowfin sole	x	x	x	**1**	**1**
Greenland turbot	1	1	x	**1**	**1**
Arrowtooth flounder	x	x	x	**1**	**1**
Rock sole	x	1	x	**1**	**1**
Alaska plaice	1	x	x	**1**	**1**
Rex sole	x	x	x	**1**	**1**
Dover sole	x	x	x	1	1
Flathead sole	1	1	x	**1**	**1**
Sablefish	x	**1**	x	**1**	**1**
Pacific ocean perch	x	**1**	x	**1**	**1**
Shortraker/rougheye rockfish	x	**1**	x	x	**1**
Northern rockfish	x	1	x	x	1
Thornyhead rockfish	x	**1**	x	**1**	**1**
Yelloweye rockfish	x	1	x	1	1
Dusky rockfish	x	1	x	x	1
Atka mackerel	x	1	x	x	1
Skates	x	x	x	x	**1**
Sculpins	x	x	x	**1**	**1**
Sharks	x	x	x	x	x
Forage fish complex	x	x	x	x	x
Squid	x	x	x	**1**	**1**
Octopus	x	x	x	x	x

x - No information available.

[1] **Bold text denotes those species and life stages where their General Distribution extends northward of 58°N Latitude. This importance is highlighted to indicate that commercial quantities of these species may exist in absence of systematic research survey.

<u>**EFH Description for BSAI Yellowfin Sole**</u>

Eggs—No EFH Description Determined
Scientific information notes the rare occurrence of yellowfin sole eggs in the BSAI.

Larvae—No EFH Description Determined
Scientific information notes the rare occurrence of larval yellowfin sole in the BSAI.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile yellowfin sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand, as depicted in Figure D-82.

Adults
EFH for adult yellowfin sole is the general distribution area for this life stage, located in the lower portion of the water column within nearshore bays and along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting mainly of sand, as depicted in Figure D-82.

<u>EFH Description for BSAI Alaska Plaice</u>

Eggs
EFH for Alaska plaice eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m) and upper slope (200 to 500 m) throughout the BSAI in the spring, as depicted in Figure D-89.

Larvae—No EFH Description Determined
Scientific information notes the rare occurrence of larval Alaska plaice in the BSAI.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile Alaska plaice is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud, as depicted in Figure D-90.

Adults
EFH for adult Alaska plaice is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are softer substrates consisting of sand and mud, as depicted in Figure D-90.

<u>EFH Description for BSAI Pacific Cod</u>

Eggs—No EFH Description Determined
Scientific information notes the rare occurrence of Pacific cod eggs in the BSAI.

Larvae
EFH for larval Pacific cod is the general distribution area for this life stage, located in epipelagic waters along the entire shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the BSAI, as depicted in Figure D-80.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile Pacific cod is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m)

shelf throughout the BSAI wherever there are soft substrates consisting of sand, mud, sandy mud, and muddy sand, as depicted in Figure D-81.

Adults
EFH for adult Pacific cod is the general distribution area for this life stage, located in the lower portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI wherever there are soft substrates consisting of sand, mud, sandy mud, muddy sand, and gravel, as depicted in Figure D-81.

EFH Description for BSAI Walleye Pollock

Eggs
EFH for walleye pollock eggs is the general distribution area for this life stage, located in pelagic waters along the entire shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the BSAI, as depicted in Figure D-77.

Larvae
EFH for larval walleye pollock is the general distribution area for this life stage, located in epipelagic waters along the entire shelf (0 to 200 m), upper slope (200 to 500 m), and intermediate slope (500 to 1,000 m) throughout the BSAI, as depicted in Figure D-78.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile walleye pollock is the general distribution area for this life stage, located in the lower and middle portion of the water column along the inner (0 to 50 m), middle (50 to 100 m), and outer (100 to 200 m) shelf throughout the BSAI, as depicted in Figure D-79. No known preference for substrates exist.

Adults
EFH for adult walleye pollock is the general distribution area for this life stage, located in the lower and middle portion of the water column along the entire shelf (0 to 200 m) and slope (200 to 1,000 m) throughout the BSAI, as depicted in Figure D-79. No known preference for substrates exist.

EFH Description for BSAI Blue King Crab

Eggs
Essential fish habitat of the blue king crab eggs is inferred from the general distribution of egg-bearing female crab (see also Adults).
Larvae—No EFH Description Determined
Insufficient information is available.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile blue king crab is the general distribution area for this life stage, located in bottom habitats along the nearshore where there are rocky areas with shell hash and the inner (0 to 50), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting of rock, cobble, and gravel, as depicted in Figure D-151.

Adults
EFH for adult blue king crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting of sand and mud adjacent to rockier areas and areas of shell hash, as depicted in Figure D-151.

EFH Description for BSAI Snow Crab

Eggs
Essential fish habitat of snow crab eggs is inferred form the general distribution of egg-bearing female crab (see also Adults).

Larvae—No EFH Description Determined
Insufficient information is available.

Early Juveniles—No EFH Description Determined
Insufficient information is available.

Late Juveniles
EFH for late juvenile snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting mainly of mud, as depicted in Figure D-154.

Adults
EFH for adult snow crab is the general distribution area for this life stage, located in bottom habitats along the inner (0 to 50 m), middle (50 to 100 m), and outer shelf (100 to 200 m) throughout the BSAI wherever there are substrates consisting mainly of mud, as depicted in Figure D-154.

APPENDIX D Bering Sea Habitat Conservation Gear Modification Implementation

<u>Bering Sea Habitat Conservation Gear Modification Implementation</u>
Prepared by Melanie Brown, NMFS Alaska Region (AKR) Sustainable Fisheries Division (SF), May 9, 2007 (Updated based on meeting and discussions with NOAA Office of Law Enforcement (OLE), US Coast Guard (USCG), and NOAA General Counsel Enforcement April 2007, and with members of the Head and Gut Workgroup and AFSC on May 8, 2007.)

Background

This document describes a potential implementation program for gear modification under the Bering Sea Habitat Conservation action being considered by the North Pacific Fishery Management Council (Council). Alternative 3 of the Council's December 2006 motion for this proposed action states that gear modifications would be required for all flatfish fishing in the Bering Sea. Discs or other elevating device (e.g., bobbins) would be required to be installed on the sweeps to reduce seafloor contact and/or increase clearance between the gear and the substrate (Fig. 2). A performance standard would require the sweep to be elevated at least 2.5 inches from a flat surface adjacent to the elevating device. Spacing of the elevating devices installed on the sweeps would be within an interval of 25 to 35 ft based on the most recent research, but this spacing may increase based on new research results available in mid May 2007.

While not part of the trawl net, sweeps are part of the trawl system used to herd fish into the trawl. In a typical flatfish trawl, sweeps extend from the aft end of the door bridles back to the forward end of the wing extensions (Figure 1). On vessels using 200 fathoms of sweeps, which is likely the maximum amount of sweep used for flatfish fishing, more than 35 elevating devices on each side of the trawl would need to be installed to meet the 25 to 35 ft spacing requirement. This totals to approximately 70 elevating devices and spaces that may need to be checked to determine if the performance standards are being met. Practically, the sweeps are much too long to be completely stretched across a vessel deck. A detailed, onboard inspection would require examining the sweep by sections while stacking the remainder, putting it onto another net reel (if available), or while the net is being set or hauled. On most trawl vessels, when the trawl is onboard the vessel, the trawl net is wound onto the net reel on top of the sweeps. It may be more practicable to determine if the sweep meets the standards during construction. Sweeps may be constructed by the fishers using sections provided by the manufacturer. Spare sections and parts are usually carried on the vessel.

A few flatfish catcher processor vessels in Alaska do not have net reels and wind the sweeps onto the main deck winches over the top of the trawl main wire (Jeff June, personal communication, January 9, 2007). The Fishing Company of Alaska boats and the F/V Seafisher currently are the only flatfish trawl vessels without net reels, and those boats are among the largest in the trawl non-AFA catcher-processor fleet (H&G fleet). All other vessels in this fleet have net reels including the smallest ones. For these vessels, the net has to be deployed or stacked onto the deck to access the sweeps.

To establish a requirement for modified trawl sweeps for the directed flatfish fishery in the Bering Sea, gear performance standards and prohibitions against flatfish fishing without modified gear must be stated in the regulations. NMFS would need to establish a method of ensuring that vessel owners and operators comply with the gear requirements. The program should ensure the gear is properly constructed, used, and maintained. Manufacturers, fishers, and personnel from the Alaska Fisheries Science Center (AFSC), NOAA OLE, North Pacific Groundfish Observer Program (NPGOP), SF and USCG would need to develop and implement the program. This requirement may apply to approximately 207 vessels based on the number of license limitation program permits with BS trawl endorsements issued in 2007. Not all of those 207 vessels currently fish for flatfish, and the expected number of vessels that would be affected by this proposed regulation is approximately 30.

Potential Regulation Changes:

Several regulations in 50 CFR part 679 would need to be revised to implement a modified trawl sweep requirement. The requirements would apply to all federally permitted vessels in reporting areas of the Bering Sea subarea and adjacent State of Alaska waters.

1. New definitions under § 679.2 should be added for a nonpelagic trawl sweeps and other trawl components and for directed fishing for flatfish for purposes of the gear modification requirement. The flatfish fishing definition includes any closures that may be implemented under Alternative 2 and options 1-5. The definition for federally permitted vessels should be revised to include modified trawl gear for flatfish fishing in the Bering Sea.

§ 679.2 Definitions

* * * *

Bridles means the lines connecting the trawl sweeps to the net or the doors on a nonpelagic trawl.

* * * *

Directed Fishing for Flatfish means for purposes of nonpelagic trawl restrictions under § 679.22 (X) and gear modification requirements under §§ 679.7(c)(3) and 679.24(f), fishing with nonpelagic trawl gear during any weekly reporting period that results in a retained aggregate amount of yellowfin sole, rock sole, Greenland turbot, arrowtooth flounder, flathead sole, Alaska plaice, and other flatfish that is greater than the retained amount of any other fishery category defined under § 679.21(e)(3)(iv).

* * *

Federally permitted vessel means a vessel that is named on either a Federal fisheries permit issued pursuant to § 679.4(b) or on a Federal crab vessel permit issued pursuant to § 680.4(k) of this chapter. Federally permitted vessels must conform to regulatory requirements for purposes of fishing restrictions in habitat conservation areas, habitat conservation zones, and habitat protection areas; for purposes of anchoring prohibitions in habitat protection areas**; for purposes of modified gear requirements for the BS directed flatfish fishery,** and for purposes of VMS requirements.

Sweeps means the lines connecting the door bridles to the net bridles and wing extensions on nonpelagic trawl gear.

* * * * *

2. A new paragraph (s) in § 679.5 may be needed to require the fishers to provide documentation that the trawl sweeps meet the performance standards. Possible types of documentation include a manufacturer's warranty and proof of inspection. This would require Paperwork Reduction Act approval.

3. A new subparagraph (3) also would be added to § 679.7(c) to prohibit directed fishing for BS flatfish without sweeps that meets the standards specified at § 679.24(f).

§ 679.7 Prohibitions

* * * * *

§ 679.7(c)(3) Conduct directed fishing for flatfish as defined in § 679.2 with a federally permitted vessel in any reporting area and adjacent State of Alaska waters of the Bering Sea as described in Figure 1 to this part without meeting the requirements for the nonpelagic trawl sweeps specified in § 679.24(f).

* * * * *

4. To establish standards and requirements for the use of modified nonpelagic trawl sweeps, add paragraph (f) to § 679.24 Gear Limitations.

§ 679.24 Gear Limitations

* * * * *

§ 679.24(f) Nonpelagic trawl sweeps for directed flatfish fishing in reporting areas and adjacent State waters of the BS with federally permitted vessels, as described in Figure 1 to this part.

(1) Vessel owner or operators using nonpelagic trawl gear for directed fishing for flatfish must have elevating discs, bobbins or similar devices installed on the sweeps that raise the sweeps at least 2.5 inches (6.35 cm), as measured adjacent to the device when resting on a hard, flat surface, regardless of device orientation. Elevating devices must be secured along the entire length of the sweeps at the spacing specified under subparagraph (2). The largest cross-section of the sweeps between elevating devices shall not be greater than at the nearest measurement location. Wider cross-sections resulting from doubling the line back for section terminations and devices required to connect sections are exempt from this requirement.

(2) The distance between elevating devices on the sweep must be between 25 ft (7.62 m) and 35 ft (10.67 m), unless the Regional Administrator specifies an alternative spacing that is at least as effective at elevating the sweep and minimizing contact with the sea floor.

The Regional Administrator option in paragraph (2) may not be acceptable due to Administrative Procedure Act concerns. If that is the case, this requirement would be written as one spacing in combination with paragraph (1). Dr. Craig Rose is researching effective spacing distance and may have results by mid May 2007 that could be used for the final action in June. The goal is to increase the distance as long as the increased spacing results in sufficient clearance in order to achieve the benefits attained in Dr. Rose's sweep modification studies. If the increased spacing is effective at providing sufficient clearance, the benthic protection should be increased due to further reduction in seafloor contact. Increasing the spacing also would reduce costs. Increase spacing may require more diligence to ensure the elevating devices are in good repair and properly spaced because of less overall support to raise the sweep.

Implementation Program:

Responses to questions regarding gear standard programs were received from three of the five other NMFS regions. Each region responding has some form of gear standard that must be met. Program implementation essentially is through performance standards in the regulations and ensuring compliance through inspections. No pre-approval or certification programs were used. Fishers improved compliance with the standards in a year or two after implementation, especially after one or more citations were issued for failure to comply. It appears that this model (like the seabird avoidance gear model in Alaska) is likely the most effective and less resource intensive for the agency than a pre-approval or certification program conducted by the agency.

The implementation of a modified trawl sweep program will involve manufacturers, fishers and NMFS, NPGOP, USCG, and OLE personnel. The fishers will be responsible to ensure their sweep meets the standards, and this may be randomly checked by several methods. Agency enforcement activities will focus on complying with the prohibition regarding flatfish fishing with a modified trawl sweep. An at-sea observer may observe the deployment or retrieval of the net to determine the presence or absence of the modified sweep. The OLE would be notified if the sweep may not meet the standard or if no modified gear is detected. OLE may follow-up with a more intensive dockside inspection. The USCG may conduct at sea inspections to determine if a modified sweep is present or absent. The details of the types of inspections and the procedures to be used by each organization will need to be developed and personnel trained before implementation of the gear modification requirement.

Determining compliance with the standards will be difficult once the sweeps are installed on the vessels. The USCG has suggested that a manufacturer's warranty and industry inspection of used sweeps may be an option for fishers to prove the sweep was constructed to meet the standards and that used sweeps are continuing to meet the standards. This would be a program similar to one used for safety gear on vessels, such as life rafts. An industry representative with Dantrawl, Inc. indicated that providing a manufacturer's warranty would be no problem. It is not clear if this would be equally effective for sweeps assembled by the manufacturer and for sweeps assembled by crew. OLE is concerned that this may not be feasible because of the resources needed to approve the industry to perform gear approvals and inspections. Further research with USCG is needed to determine how they administer this program, including their regulations for this provision.

It is likely that many fishers will purchase the sweep components and do the assembly, including installation of elevating devices. The gear also is likely to receive wear during use, requiring at-sea repairs to elevating devices and potential replacement of sweep sections. It is possible that used sweeps may not meet the performance standards. Approval at the beginning of the fishing season may not be sufficient to determine compliance with the standards throughout the year, and an additional check may be needed to assure continued compliance.

The following are steps and considerations that need to be addressed to design the implementation program.

1. Work with manufacturers to construct sweeps that meet the standards.
    a. Contact all known manufacturers of flatfish trawl sweeps. (Completed by John Gauvin 3/07)
    b. Meeting with industry, NMFS NPGOP, AFSC, OLE, USCG, and SF to review standards and determine if any difficulties or issues need to be resolved. Discuss methods to ensure sweep components are manufactured in a way to visually determine compliance. Need to determine if elevating devices are properly spaced on the sweeps and if the elevating device can give the required 2.5 inches clearance of the sweep from the bottom. (Meeting held at Dantrawl on 3/14/07, notes from the meeting below.)
    c. How can the industry be more involved in ensuring performance standards are met?
        i. Is it possible to warranty sweeps that are provided in components with instructions for assembly that would meet the performance standards?
        ii. Can an industry based inspection program be used to ensure performance standards are met for used sweeps?

2. Provide training to fishers to ensure they are obtaining and maintaining sweeps to meet the standard. Could AFSC do this or could a contract be used?

3. Work with NPGOP, OLE, NMFS SF, and USCG on implementation of program
    a. Where can each organization participate in checking compliance?
        i. Observers could focus on whether the modified sweep is being used or not for flatfish fishing. Observers may watch sweep during retrieval or deployment to see if elevating devices are present and appear to be in the right location. Use spot checks. May be accomplished by either markings on the sweeps or markings on the deck of the vessel.
        ii. OLE staff check the presence of modified sweeps on board during dock side inspection. Compare presence of modified gear with catch and fishing location. If notified of potential problems, inspection may be more intensive to determine if standards are met.

iii. NMFS SF staff work with manufacturers to build sweeps to standards. NMFS SF staff may also check for presence of modified sweep during scale inspections on vessels.
iv. USCG performs onboard inspections to check for presence of modified sweeps. This is not likely to occur during voluntary safety inspections because the trawl net is usually on the net reel, covering the sweeps.
v. All agencies personnel may review vessel records to determine if manufacturer's warranty and inspection requirements are met for the modified sweeps.

b. Need to address enforcement concerns and develop inspection protocol:
    i. What happens if the vessel is fishing, and it is discovered that the sweep doesn't meet the standard for a variety of reasons? Is one missing elevating device as bad as several? If elevating device spacing is not consistently meeting the standard, is that a problem? When would a vessel be required to stop fishing?
    ii. OLE, NPGOP, USCG, and NMFS SF will need to work with the fishing industry to develop workable standards to effectively and reasonably enforce the gear modification requirements, taking into account wear and tear of the sweeps. Field criteria could be developed to establish when a violation may occur.

Results of the 3/14/07 Meeting with NMFS, USCG and Industry Regarding Modified Trawl Sweeps

A meeting sponsored by the Head and Gut Workgroup was held at Dantrawl, Inc. in Seattle on March 14, 2007, to discuss the potential sweep modification requirement for the flatfish fishery. The meeting was attended by personnel from two flatfish trawl sweep manufacturers (all 4 sweep manufacturers that currently make flatfish nets for the Bering Sea fleet were invited by John Gauvin), fishing industry representatives, AFSC research and NPGOP staff, USCG, OLE, and NMFS SF. John Gauvin of Gauvin and Associates organized the meeting.

Attendees	**Affiliation**
Craig Rose	AFSC
Carwyn Hammond	AFSC
Jennifer Ferdinand	AFSC NPGOP
JR Osuga	Cascade Fishing
Tim Meintz	Cascade Fishing
Todd Loomis (by phone)	Cascade Fishing
Phil Dang	Cascade Fishing
Paul Pedersen	Dantrawl Inc
Elias Olafsso	Dantrawl Inc
Lori Swanson	Groundfish Forum
John Gauvin	Head and Gut Workgroup
Melanie Brown	NMFS SF AKR
Koji Tamura	Nets
Steve Patterson	Nets
John Adams	Nets
Michael Killary	NOAA OLE
Mitch Hull	Ocean Peace
Jody Nummer	USCG

Below are the issues identified regarding the construction of a sweep that would meet the proposed standards for spacing and elevation.

1. Can the sweep be marked so that one could easily see if the elevating devices are spaced as required?

The participants determined that it would be possible to mark the sweep with paint or tape at the appropriate intervals. There are concerns that tape or paint may wear. It also may be possible to insert a chain between sweep components where an elevating device should be installed so that the absence of the device could be easily detected. This could reasonably be done every 90 ft, since sweeps are often manufactured in 90 ft sections. Mandating chain every 30 or 45 ft is not reasonable as it would double or triple the amount of hardware (thimbles, hammerlocks, swedging sleeves, etc) and increase the amount of wire needed due to increased splices or swedges.

Another potential method for checking the spacing of the elevating devices is to mark the vessel deck, trawl alley or trawl way fence where the sweep is brought back onto the vessel. This method may work better for larger vessels without an aft reel and would reduce concerns for the markings possibly wearing off the sweeps after use.

2. Can the elevating devices be manufactured so one could easily see if they have worn to the point of not providing the elevation necessary to meet the standards?

The participants determined that the bobbins used on the combination sweep line could be notched such that it would indicate if wear has made the device not meet the standard. On cookie sweeps, the discs could have 3 evenly spaced holes drilled into them so that reaching the holes through wear would show that the discs no longer provide the necessary elevation to meet the standard.

The goal is to provide the crew, observers, OLE, USCG, and possible industry inspectors a quick visual method to determine if an elevating device is not meeting the standard and may need replacing.

3. Should any distance from the footrope be exempt from the need for elevating devices?

The original proposal for the gear modification would have provided an exemption from having elevating devices for the section of the lines within 25 fathoms of the footrope.

The participants reviewed the construction of the trawl, including the attachment of the doors and net to the sweeps by the use of bridles. The bridles are likely to be plain steel cable, except for the bottom bridles on the net, which may have a protective covering. Bridles connecting the net to the sweeps may be from 15 to 60 fathoms long (Elias Olafsso, Dantrawl, Inc.). Bbecause the bridles are a small portion of the entire trawl which has contact with the bottom, and the fishers may need to use different size bridles, it would be more practical and still effective to limit the requirements for the elevating devices to only the sweep components of the trawl. Therefore, bridles should be exempt from the portion of the gear where elevating devices are required. The elevating devices would be required on the sweep spanning from the point where the bridles come together between the trawl doors and the net.
.

4. Can the modified sweep fit on the reels and can it be wound level?

The participants were concerned that some vessels may not have the reel capacity to handle modified sweeps because their current trawl system takes up nearly all the room on their net reel. Also, for vessels without net reels, problems may occur with the elevating devices getting hung up on the level wind device on their main winches as the sweep is wound on the main winches. The flatfish fleet is working with gear manufacturers and Dr. Craig Rose to evaluate the amount of additional space the modified discs take on net reels that are already close to capacity. For vessels with net reels that may not have sufficient space, one remedy would be to cut back on the amount of sweep used by the vessel. This would be expected to reduce the vessel's area swept per tow relative to prior to the sweep modification and could reduce catch rates proportional to the reduction in sweep used. Alternatively, vessels could install larger net reels or work with gear manufacturers to find bobbins or discs that achieve the standards of the regulation while taking up relatively less space on the net reel.

For vessels without net reels, vessel owners are working with Dr. Rose and trawl system engineers to come up with elevating devices that slip through the level wind devices on trawl winches without damaging the discs or level winds. Preliminary work in this area indicates that elevating devices can be used on vessels without net reels. If further evaluation indicates otherwise, vessels without net reels would have to install sweep winches to handle the modified sweeps.

Vessel owners also are concerned that the elevating devices could cause the sweeps to wind unevenly on the net reel, resulting in an uneven circumference on the reel. This causes one side of the net (the side wrapping around the larger circumference) to come in faster than the other side. This can result in damage to the gear if the net or its components experience uneven stress during haulback or while on the net reel. Some vessels may also be at capacity with their net reels, and adding the elevating devices may exceed what can be held on the reel. The current research on increasing the elevating devices spacing may mitigate this concern. Additional issues, such as attachment of the sweep are being identified and work is in progress to resolve.

These issues are being tested now on a several vessels to determine the nature of any problems and potential solutions. In addition, the modified gear has been tested only under experimental conditions for approximately two weeks. It would be advantageous to do further testing of the modified sweeps under conditions similar to commercial fishing for a longer period of time. This would allow an understanding of the wear and maintenance of the modified sweep and its practical use under normal commercial fishing operations. The Council will be updated on the progress at the June meeting.

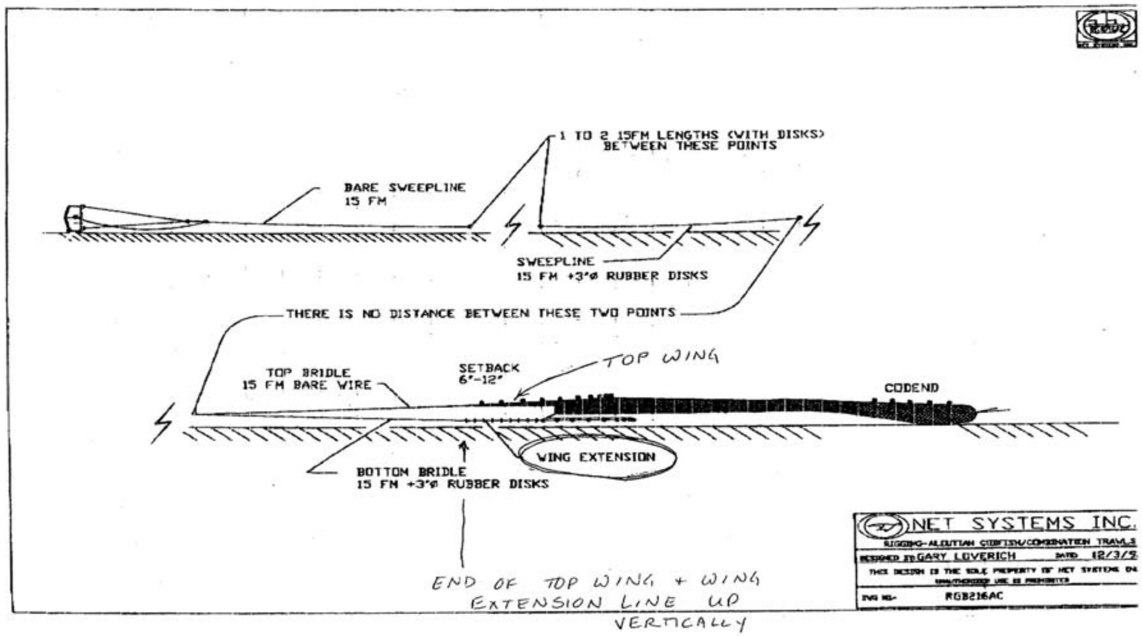
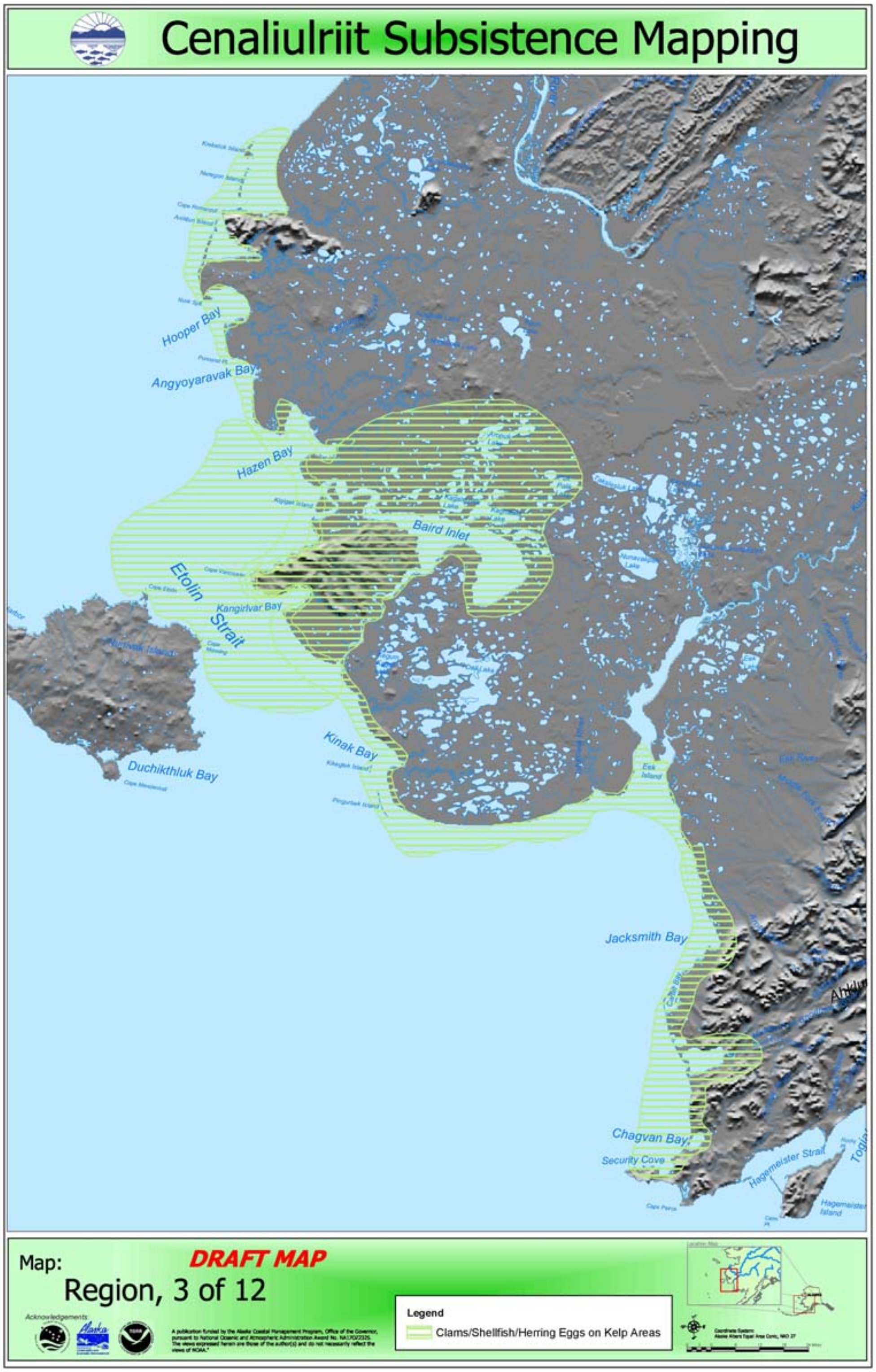
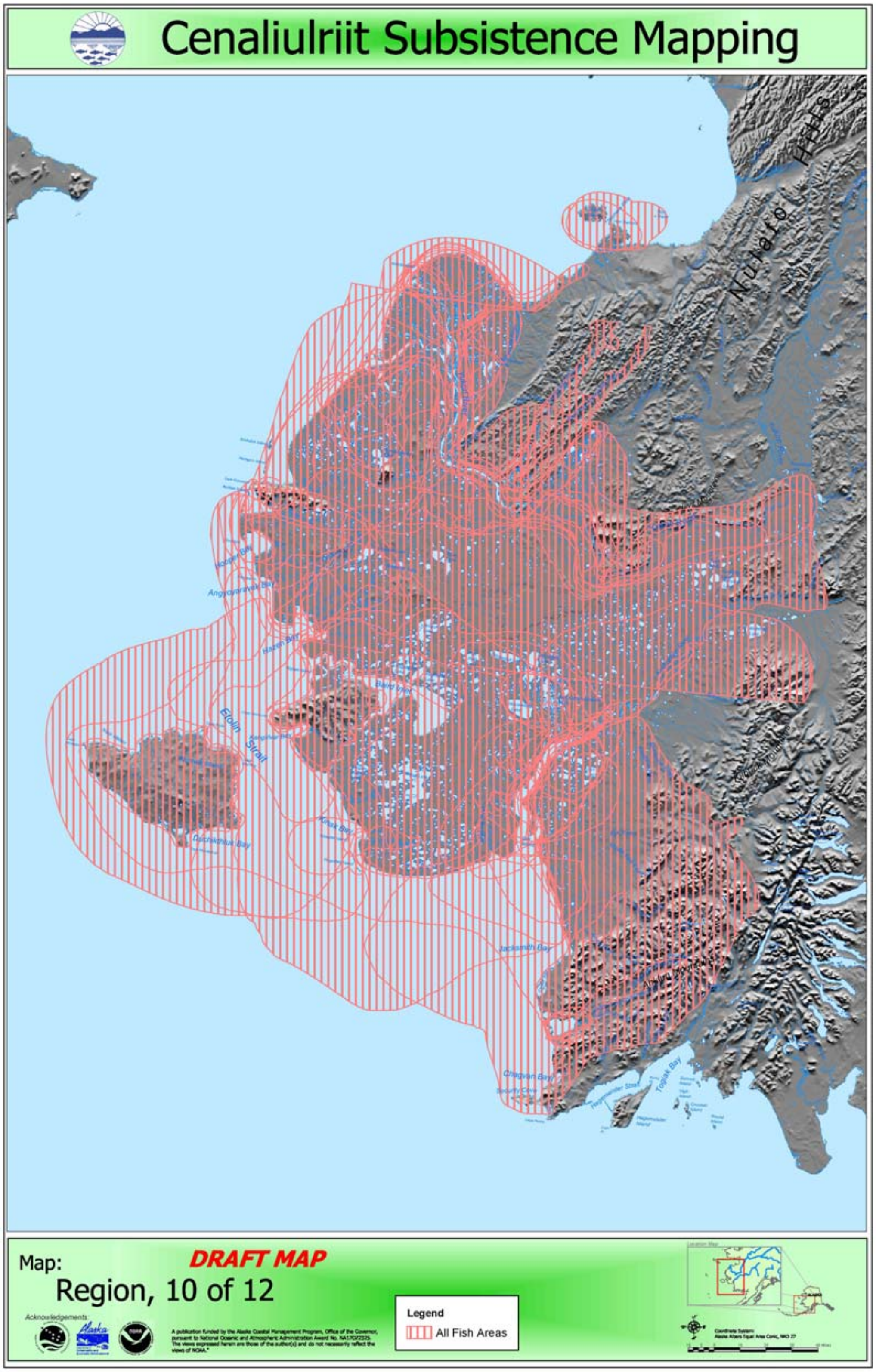


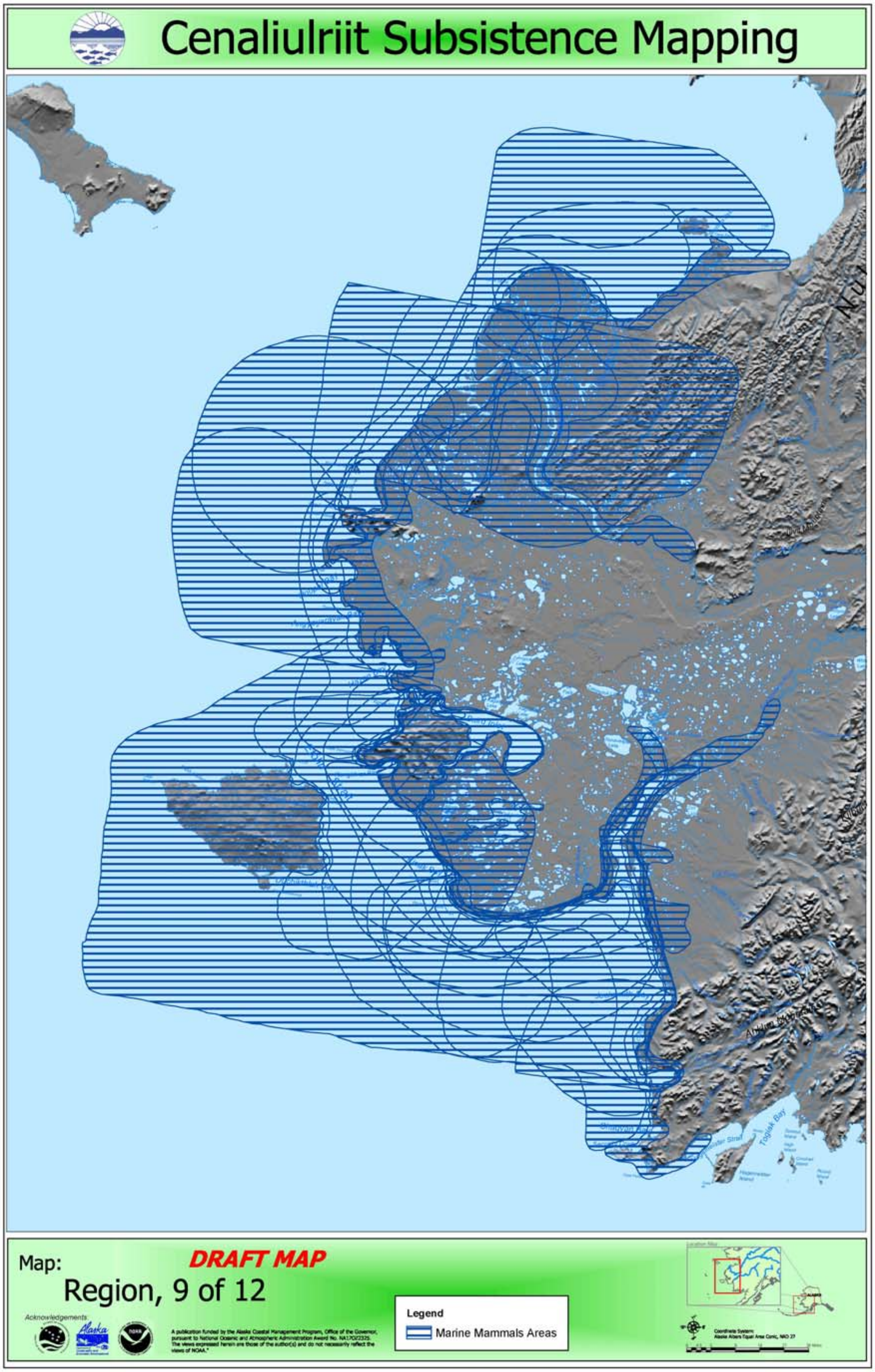
Fig. 1 Nonpelagic Trawl (Source: Use by permission from Steve Patterson, NET Systems, Inc. March 21, 2007)

Figure 2. Example of an elevating device. Bobbin on combination line sweep. (Source: Dantrawl, Inc. March 2007)

APPENDIX E: SUBSISTENCE USE MAPS PROVIDED BY CEÑALIULRIIT COASTAL RESOURCE SERVICE AREA




Cenaliulriit Subsistence Mapping
Nulato Hills
Etolin Strait
Map:
DRAFT MAP
Region, 10 of 12
Legend
All Fish Areas



Cenaliulriit Subsistence Mapping
Map:
DRAFT MAP
Region, 9 of 12
Legend
Marine Mammals Areas

Appendix F Summary of historical data on distribution of female blue king crabs in the St. Matthew Island area

As summarized by Pengilly, D.P. 2004. Project I: Regional Bering Sea Crab Research Program Support. Final Comprehensive Performance Report, Bering Sea Crab Research, NOAA Cooperative Agreement NA16FN1275.

Methods

Summary of historical data on distribution of female blue king crabs in the St. Matthew Island area. Data on distribution of female blue king crab was obtained from three sources: the NMFS EBS trawl survey from 1980-2002, the triennial pot surveys performed by ADF&G in 1995, 1998, and 2001, a special shallow-waters St. Matthew Island pot survey performed by ADF&G in 1999, and bycatch data collected by at-sea observers during the 1990–1998 commercial St. Matthew blue king crab fisheries. The 1980-2002 period over which NMFS EBS trawl survey data was examined includes the two years of highest estimated total mature biomass (1983 and 1993) and the years during which total mature biomass was estimated to be below the minimum stock size threshold defined for the St. Matthew blue king crab stock (1985-1987, 1999-2002; NPFMC 2003). Details on the NMFS survey are provided in Rugolo et al. (2002). The NMFS EBS trawl survey is performed in the summer and typically samples the St. Matthew blue king crab stock in July. The NMFS EBS survey area is divided into 20 nmi x 20 nmi squares that represent stations. Survey tows are performed in the centers of the stations except for certain areas, including an area south of St. Matthew Island, where tows are also performed at the "corners" of the stations.

The data from the 1995, 1998, 1999, and 2001 ADF&G pot surveys represents the data collected from all systematic pot surveys in the St. Matthew Section performed by ADF&G. Details on the triennial ADF&G St. Matthew Island pot survey are provided in Blau (1996), Blau and Watson (1999), and Watson and Burt (2002). The 1995, 1998, and 2001 triennial pot surveys were performed in August and covered the areas south and west of St. Matthew and Hall Islands north of 59°30' N. latitude and between 172°00' and 174°00' W. longitude. Four baited king crab pots were fished at the centers of 5 nmi x 5 nmi stations. The survey area is divided into two strata, Stratum 1 and Stratum 2. Stratum 2 is the 'nearshore stratum' north of 60°00' N. latitude, south of 60°30' N. latitude, west of 172°20' W. longitude, and east of 173°30' W. longitude. Within Stratum 2 four king crab pots were also fished at the "corners" of each station, in addition to those fished at the station centers, during the 1995 and 2001 surveys. The 1998 triennial survey also included a special, shallow-waters survey component. A total of 23 small conical pots and 13 king crab pots were also fished at 4 stations spaced 2 nmi apart south of St. Matthew Island at depths of 7–27 m, depths rarely sampled by the standard triennial survey. Details on the special shallow-waters survey performed in 1999 are provided in Blau (2000). That survey was also performed in August at depths of 7–37 m at 12 stations south of St. Matthew Island spaced 2 nmi apart and 10 stations north of St. Matthew Island spaced 2 nmi apart. Small conical pots were fished at depths of 7–18 m and king-crab pots were fished at depths of 19–37 m. Due to the shallow waters fished, in both the 1998 and 1999 shallow-waters survey work conical pots were set and retrieved from a 7.9-m skiff that was transported to the area on the larger crab-fishing vessel used for setting and retrieving the king crab pots.

The 1990-1998 period for which fishery observer data was examined represents all fishing seasons for which data was collected by observers during the commercial St. Matthew blue king crab fishery until the closure of the fishery from 1999 to present. Details on observer data collection methods from the St. Matthew Island fishery are provided in Beers (1991, 1992), Boyle et al. (1996, 1997), Moore et al. (1998, 2000), and Tracy (1994, 1995a, 1995b). Observers were deployed on all catcher-processor vessels that participated in the fishery as was required by regulation and, occasionally, on catcher-only vessels through the voluntary cooperation of fishers. Observers randomly chose a target number of pots fished each day, recorded the location and depth, enumerated the catch and bycatch by species and sex within the sampled pot, and recorded size, sex, and reproductive condition of the bycatch crabs. The St. Matthew blue king crab fishery was prosecuted each September during 1990-1998. During that period as few as one vessel and as many as nine vessels carried onboard observers during any single season and a total of 903 pots were sampled for contents by observers.

Females were classified on the basis of data recorded at collection into three reproductive-condition classes: immature (no eggs and no empty egg cases present, clean-silky setae); mature-ovigerous (eggs present); or mature-barren (empty egg cases with no eggs, matted setae). Mature females were subdivided into two reproductive condition classes (mature-ovigerous and mature-barren) to accommodate the biennial spawning cycle of blue king crabs in which there is a prolonged period between hatching of one clutch and extrusion of the next clutch (Somerton and MacIntosh 1985, Jensen and Armstrong 1989). That period between hatching and extrusion of the next clutch may range from seven months (Somerton and MacIntosh 1985) to 12 months (Jensen and Armstrong 1989). Hence a large portion of the mature females are expected to be in the mature-barren condition; their presence is not an indication of a shortage of males to breed them.

All recorded locations and depths of capture within the St. Matthew Section during 1980–2002 were mapped, examined, and summarized for each of the three reproductive-condition classes. Distributions of each of the three reproductive classes were characterized relative to the 3-nmi zone surrounding St. Matthew, Hall, and Pinnacle Islands, which is closed to state-managed fisheries.

Although the St. Matthew Section includes all Bering Sea waters under U.S. jurisdiction north of 58°39' N. latitude and south of 61°49' N. latitude, we concentrated our analysis in a study area defined as north of 59°30' N. latitude, south of 61°00' N. latitude, west of 172°00' W. longitude and east of 174°00' W. longitude. That area of roughly 5,400 nmi^2 includes all surrounding waters of St. Matthew, Hall, and Pinnacle Islands, the entire area covered by ADF&G pot surveys for St. Matthew Island blue king crab, and the statistical catch areas that accounted for 99% of the total 1980–1998 St. Matthew blue king crab fishery effort and catch. For the NMFS EBS trawl survey data, only that data from tows with the midpoint of the tow falling within the defined the study area were considered as being derived from the study area.

To first investigate major trends in the data, the data on catch of females by reproductive-condition class within the study area was grouped by the four major data sources: EBS trawl survey (1980–2002), ADF&G standard triennial pot surveys (1995, 1998, 2001), ADF&G special shallow-water pot surveys (1998–1999), and observer data from the blue king crab fishery (1990-1998). Spatio-geographic trends in each data source of the capture location of females by reproductive-condition class within the study area were examined by mapping the catch data. For mapping data from the NMFS EBS trawl survey, only the data from the years 1990–2002, the period of data collection that overlapped with that for both the fishery observer data and the ADF&G pot surveys, were included.

Results

Objective 4 – Summary of historical data on distribution of female blue king crabs in the St. Matthew Island area. The 1980–2002 NMFS EBS trawl survey data provided capture locations of 772 immature, 62 mature-ovigerous, and 284 mature-barren female blue king crab in the St. Matthew Island section. Data from ADF&G pot surveys in the St. Matthew Section during 1995, 1998, 1999, and 2001 provided capture locations of 1,418 immature, 2,627 mature-ovigerous, and 5,030 mature-barren female blue king crabs. Observer data from the 1990–1998 commercial St. Matthew blue king crab fishery provided capture locations of 5,879 immature, 33 mature-ovigerous, and 9,840 mature-barren female blue king crab. Additionally during those fisheries, observers recorded the capture locations of 4,826 female blue king crabs with no reproductive condition recorded. Most of these data were collected from the study area defined as north of 59°30' N. latitude, south of 61°00' N. latitude, west of 172°00' W. longitude and east of 174°00' W. longitude. All data from the standard triennial and special shallow-waters ADF&G pot surveys, 94% of all captures of female blue king crab within the St. Matthew Section during the 1980-2002 NMFS EBS trawl survey, and 99% of all pot lifts and captured females sampled by observers during the 1990–1998 St. Matthew blue king crab fishery occurred within the study area.

Immature females accounted for a larger portion of the total females captured by the EBS trawl survey than that of the total females captured by the pot surveys (standard triennial or special, shallow-waters) or the commercial fishery (Table 1). During 1980-2002 over two-thirds of the females captured by the trawl survey were immature and in only four years (1980, 1983, 1993, 2002) did mature (ovigerous or barren) females account for more than 50% of the female blue king crabs captured by the NMFS EBS trawl survey. In the commercial fishery and pot surveys (particularly, the shallow-waters surveys) immature females were less common than mature females. Size-at-50%-maturity for St. Matthew blue king crab is estimated at 81-mm carapace length (CL; Somerton and MacIntosh 1983). The higher incidence of immature females in the NMFS EBS trawl survey data may be due in part to the ability of trawls to catch and retain females <81-mm CL than the pots used by the ADF&G surveys or the commercial fishery. A comparison of the size distributions of females captured by the NMFS EBS trawl survey and by the standard triennial ADF&G pot surveys indicates that catchability of small females may be somewhat greater in the trawl survey than in the pot survey (Figure 1). Whereas the size distribution of mature females captured by the NMFS EBS trawl survey and by the standard triennial ADF&G pot survey are similar (median CL for mature females is 95 mm for both data sources), immature females captured by the trawl survey tend to be smaller than the those captured by the pot survey. However, the disparity in size between immature females captured by the trawl survey and the pot survey is not so substantial to account for the disparity in incidence of immature females between the two data sources; median CL of immature females in the trawl survey is 75 mm as compared to 77 mm for the pot survey.

Mature-ovigerous females were uncommon, accounting for 3% or less of total females captured, in each data source except for the shallow-water ADF&G pot surveys (Table 1). Except for in the ADF&G shallow-waters pot survey data, mature females were predominately classified as mature-barren. However, mature-ovigerous females accounted for 82% of the females captured in the ADF&G shallow-water pot surveys and, of the total 2,692 mature-ovigerous females from all data sources examined, 2,459 (91%) were collected during the 1998 and 1999 ADF&G special shallow-waters pot surveys.

During 1990-2002, 251 tows were performed by the NMFS EBS trawl survey for which the tow midpoint was inside the study area. Annual number of tows with the study area ranged from 16 (1996) to 24 (2002). Twenty-two repeated tow locations occur within the study area, with all of the tows performed outside of the 3-nmi fishery-closure area (Figure 2). Depth data was available for 232 tows and, of those, depths ranged from 42 m to 192 m with a median of 108 m. Tows at depths of 60–70 m, 100-120 m, and 170–180 m accounted for more than 40% of all tows; only six tows were performed at depths <50 m. Females occurred only rarely in the tows; of the 251 total tows, only 28% caught females; within years the percentage of tows capturing females ranged from 11% (1991) to 42% (1995). No females were captured during 1990-2002 at eight of the 22 tow locations (representing 73 tows during 1990-2002), located at the S-SW margins and the N-NE margins of the area (Figure 2). Immature females occurred at more widely distributed tow locations than mature females; immature females were captured at 13 sites, whereas mature females were captured at eight sites. Capture locations of mature females tended to be those surrounding Pinnacle Island. Interestingly, although the trawl survey captured 10 times as many mature-barren females as mature-ovigerous females, mature-ovigerous females showed a slightly wider distribution of capture locations than mature-barren females.

One-hundred-eighty-eight four-pot survey station locations have been fished at least once during the 1995, 1998, and 2001 standard triennial ADF&G pot surveys, 56 of those in the "nearshore stratum" southwest of St. Matthew Island, north of 60°00' N. latitude, south of 60°30' N. latitude, west of 172°20' W. longitude, and east of 173°30' W. longitude (Figure 3). The number of four-pot stations fished per year ranged from 137 (1998) to 158 (2001). Only five survey stations were centered within the 3-nmi fishery closure area around St. Matthew, Hall, and Pinnacle Islands. Depths of stations ranged from 33 m to 108 m (median = 69 m). Depths of stations in the nearshore stratum ranged from 34 m to 75 m (median = 59 m). Depths of the three stations within the 3-nmi closure area and to the south of St. Matthew Island ranged from 34 m to 38 m. The two stations within the 3-nmi closure area and either north of St. Matthew Island or southwest of Pinnacle Island were 55–56 m deep. Twenty percent of the stations have depths of 60–65 m and only 16 (9%) of the stations are at depths <50 m.

Over the 1995, 1998, and 2001 standard, triennial pot surveys, female blue king crabs have been captured at 109 of the 188 stations (Figure 3). Mature-barren females have been captured at 95 of the 188 stations and immature females have been captured at 86. Captures of mature-ovigerous females, however, have occurred at only 29 stations. Highest CPUE of each reproductive-condition class occurred within the nearshore stratum. Within the nearshore stratum highest CPUE of immature females tended to occur towards the northwest of the stratum whereas highest CPUE of mature-barren females tended to occur at stations surrounding Pinnacle Island. Highest CPUE of mature-ovigerous females occurred south of St. Matthew Island or adjacent to Pinnacle Island, either within the 3-nmi closure area or close to the border of the 3-nmi closure area.

A total of 37 stations were fished over the 1998 and 1999 special, shallow-waters ADF&G pot surveys (Figure 4). Twenty-one of those stations were fished with king crab pots, the remainder with smaller conical pots. All stations were fished within the 3-nmi fishery closure area in waters adjacent to St. Matthew Island. Female blue king crab were captured at all shallow-water stations except at five of the 15 stations located to the north of St. Matthew Island. Catch of immature females was low and sparsely distributed; no station CPUE exceeded 5 immature females per pot lift and at 20 stations no immature females were captured (Figure 4). Immature females were less commonly captured in the shallower stations fished by conical pots than in the deeper stations fished by king crab pots. Mature-barren females were more widely distributed in the shallow water stations than immature females, although they were captured at only moderately higher station CPUEs than were immature females (Figure 4). Mature-barren females were absent at 11 stations and, like the immature females, mature-barren females tended to show lower catch rates at the shallower stations fished by conical pots than at the deeper stations fished by king crab pots. Mature-ovigerous females were much more likely to be captured at stations south and west of St. Matthew Island (absent at only one of 22 of those stations) than at stations fished north and east of St. Matthew Island (absent at 12 of 15 of those stations; Figure 4).

Pot lifts sampled during the 1990-1998 commercial St. Matthew Island blue king crab fishery were mainly located approximately 10 to 30 nmi southwest of St. Matthew Island (Figure 5). Only 9% of the sampled pot lifts were north or east of St. Matthew Island and less than 2% of the sampled pots occurred in the 3-nmi fishery closure area. Depths of sample pots ranged from 44 to 95 m. The median depth of sampled pots was 62 m and 89% of all sampled pots were at depths from 55 to 73 m. Although immature females occurred at a wide range of sampled locations, catch rates were highest in pots northwest of Pinnacle Island and approximately 10 nmi southwest of St. Matthew Island (Figure 5). Mature-barren females were also widely distributed within the sampled area, but highest catch rates typically occurred within 10 nmi of Pinnacle Island, including locations within the 3-nmi fishery-closure area (Figure 5). Except for one pot northeast of St. Matthew Island, mature-ovigerous females occurred exclusively in the sampled pots southwest of St. Matthew Island, usually within 15 nmi of the island, or adjacent to Pinnacle Island, including locations within the 3-nmi fishery-closure area (Figure 5).

The spatial trends in reproductive-condition composition of females in the four data sources show that, at least in the late summer to early fall, mature blue king crabs in the St. Matthew Island area tend to concentrate largely within 30 nmi of the southwest shores of St. Matthew Island. Density of mature females tends to increase with proximity to the southwest shores of St. Matthew Island. Within the area where mature females concentrate, there is a clear difference between the distributions of mature-barren and mature-ovigerous females. Mature-ovigerous females have a more restricted distribution than mature-barren females, showing only low densities outside of the 3-nmi closure area. However, mature-ovigerous females occur in highest densities within the 3-nmi closure area, where their numbers exceed that of mature-barren females. Although immature females may show a slightly broader distribution than mature females, their distribution largely overlaps that of mature females. However, within that area of overlap, there are distribution trends that distinguish mature females from immature females. Mature females tend to show highest densities to the southeastern portion of the overlapping distribution, particularly in the vicinity of Pinnacle Island. Immature females tend to show highest densities to the northwest of Pinnacle Island.

The 3-nmi fishery closure area around St. Matthew, Hall, and Pinnacle Islands was established by the Alaska Board of Fisheries to close all state-managed commercial fisheries within the state waters surrounding St. Matthew Island and adjacent islands. Establishment of the closure area was motivated by the 1999 "overfished" declaration for the St. Matthew Island blue king crab stock. The intention was to protect reproductive female blue king crabs from any possible bycatch effects or habitat-disruption from commercial fishery activities. The female distribution data from the four sources examined here support the 3-nmi closure area as an effective means for protecting mature-ovigerous females. However, these data indicate that the 3-nmi closure area would have little effectiveness in protecting mature-barren females from fishing activities.

Table 1. Relative frequency distribution of reproductive-condition classes of female blue king crab captured in the vicinity of St. Matthew Island (north of 59°30' N. latitude, south of 61°00' N. latitude, west of 172°00' W. longitude, and east of 174°00' W. longitude) by data source.

Data Source	Total Females	Percent Immature	Percent Mature-Ovigerous	Percent Mature-Barren
NMFS EBS Trawl Survey (1980-2002)	1,055	70.9%	3.0%	26.1%
ADF&G Standard Pot Survey (1995, 1998, 2001)	6,064	21.9%	2.8%	75.3%
ADF&G Shallow-Waters Pot Survey (1998, 1999)	3,011	2.9%	81.7%	15.4%
Fishery Observer (1990-1998)	15,455	38.0%	0.2%	61.8%
Total Aggregated Data	25,585	31.4%	10.5%	58.1%

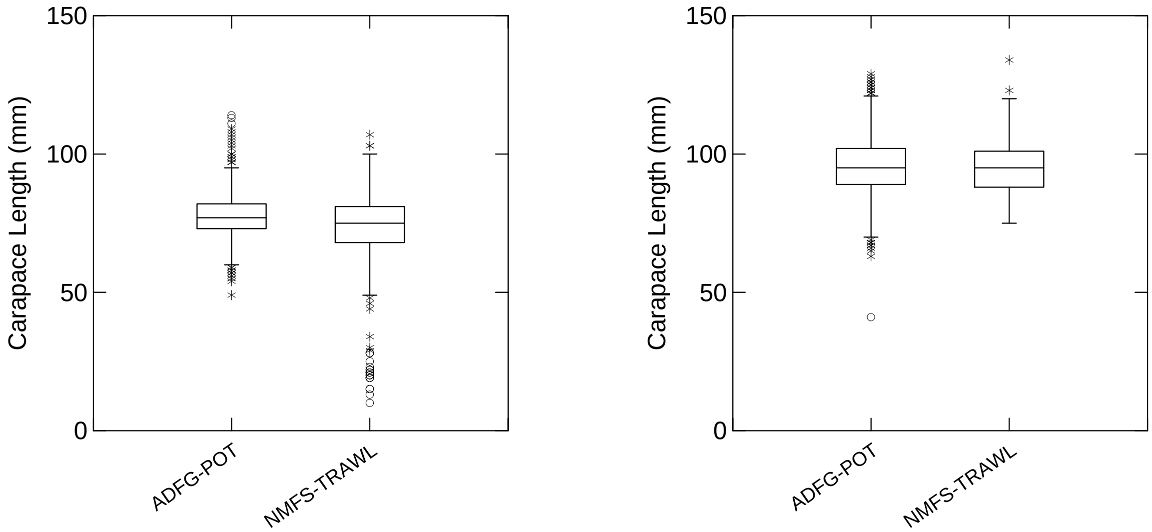


Figure 1. Box-plot comparison of size distributions of immature (left panel) and mature (right panel) female blue king crab captured by the 1995, 1998, and 2001 ADF&G St. Matthew Island blue king crab pot surveys and the 1980-2002 annual NMFS EBS trawl surveys.

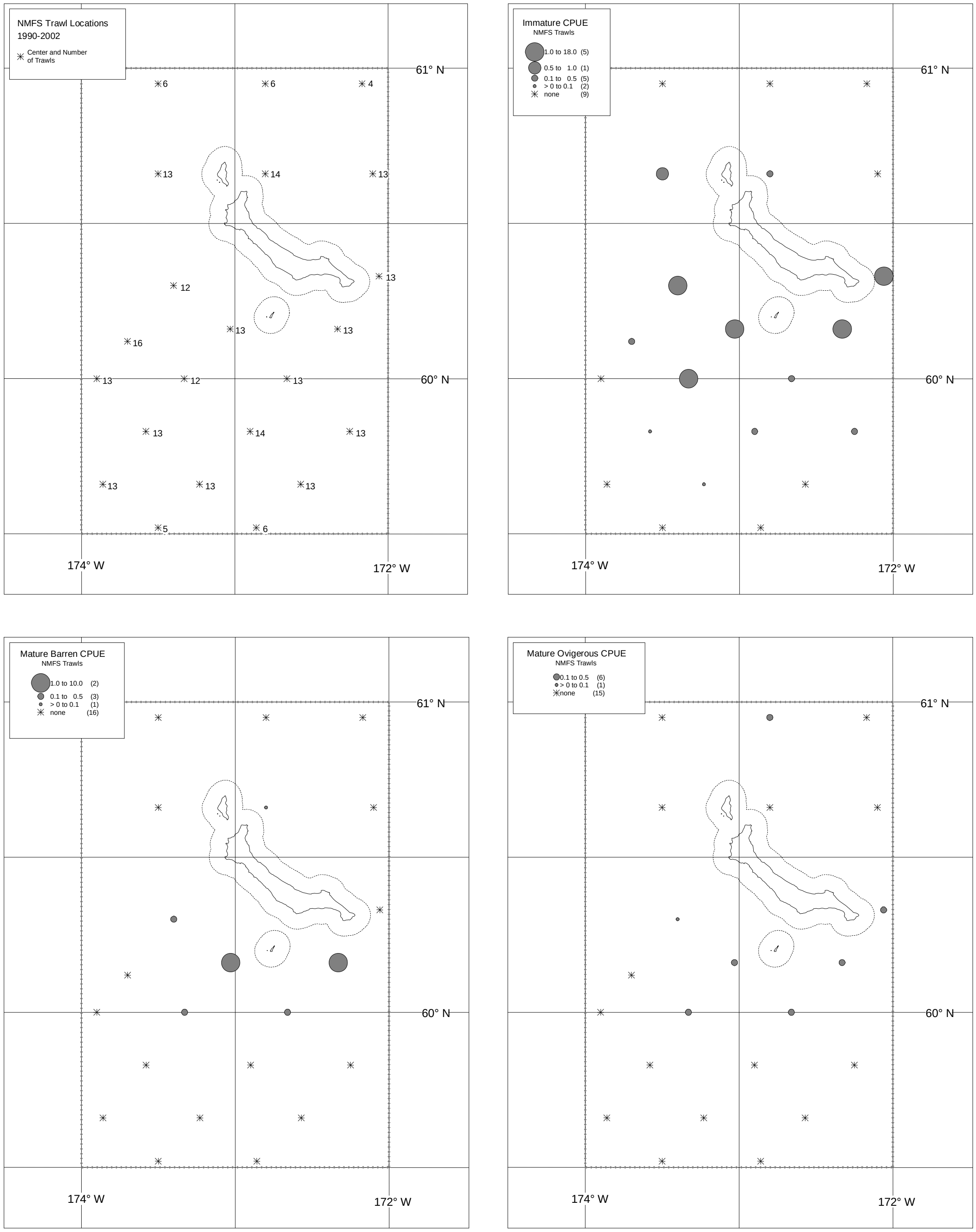


Figure 2. Distribution of number of tows (top left panel) and catch per tow of immature (top right panel), mature-barren (bottom left panel), and mature-ovigerous (bottom right panel) female blue king crabs for the 1990-2002 NMFS EBS trawl survey in the vicinity of St. Matthew Island (north of 59°30' N. latitude, south of 61°00' N. latitude, west of 172°00' W. longitude and east of 174°00' W. longitude). The dotted line surrounding the islands depicts the borders of the 3-nmi fishery closure area.

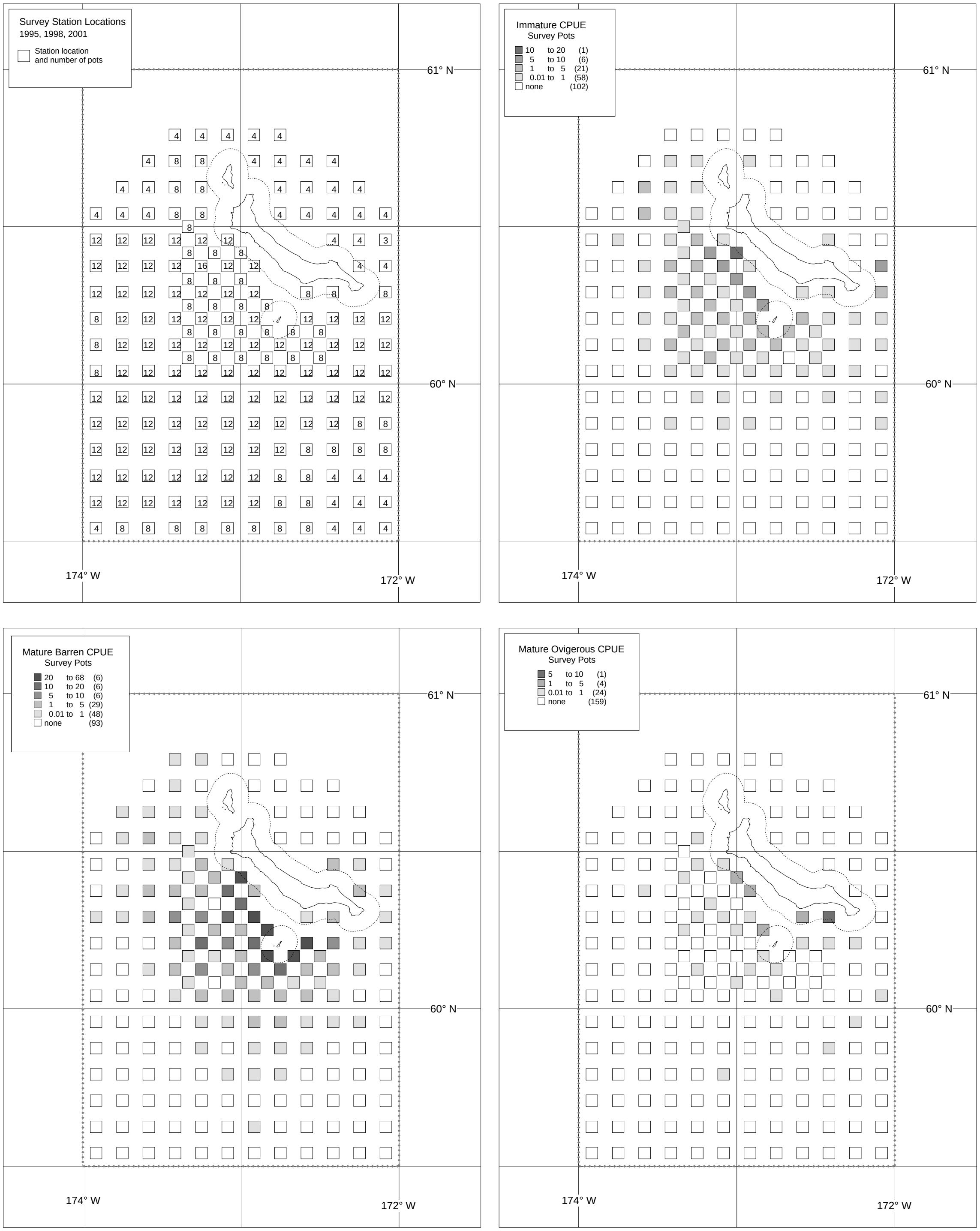


Figure 3. Distribution of number of pot lifts (top left panel) and catch per pot lift of immature (top right panel), mature-barren (bottom left panel), and mature-ovigerous (bottom right panel) female blue king crabs for the 1995, 1998 and 2001 ADF&G standard triennial St. Matthew Island blue king crab pot surveys. The dotted line surrounding the islands depicts the borders of the 3-nmi fishery closure area.

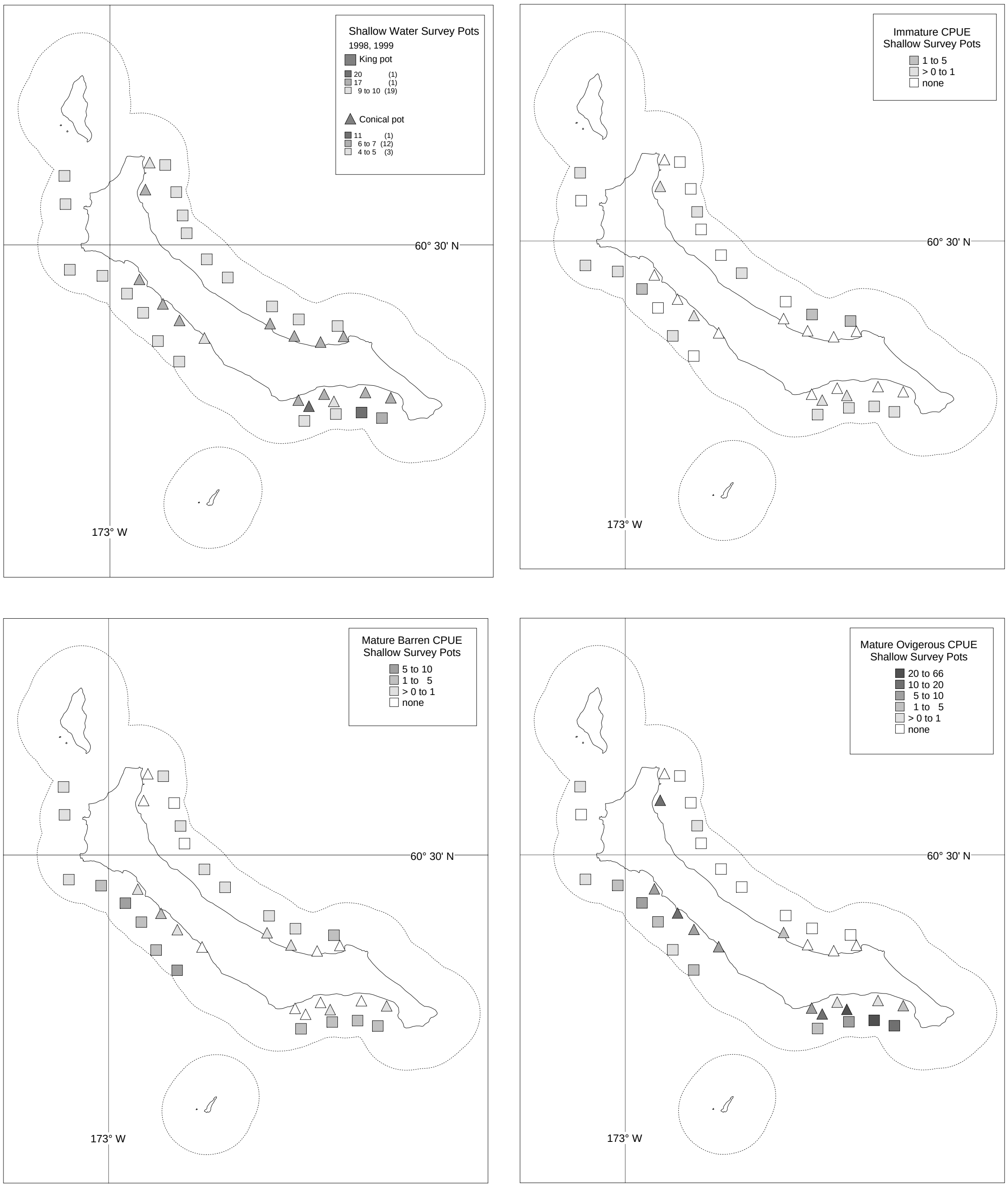


Figure 4. Distribution of number of pot lifts (top left panel) and catch per pot lift of immature (top right panel), mature-barren (bottom left panel), and mature-ovigerous (bottom right panel) female blue king crabs for the 1998 and 1999 ADF&G special shallow-waters St. Matthew Island blue king crab pot surveys. The dotted line surrounding the islands depicts the borders of the 3-nmi fishery closure area.

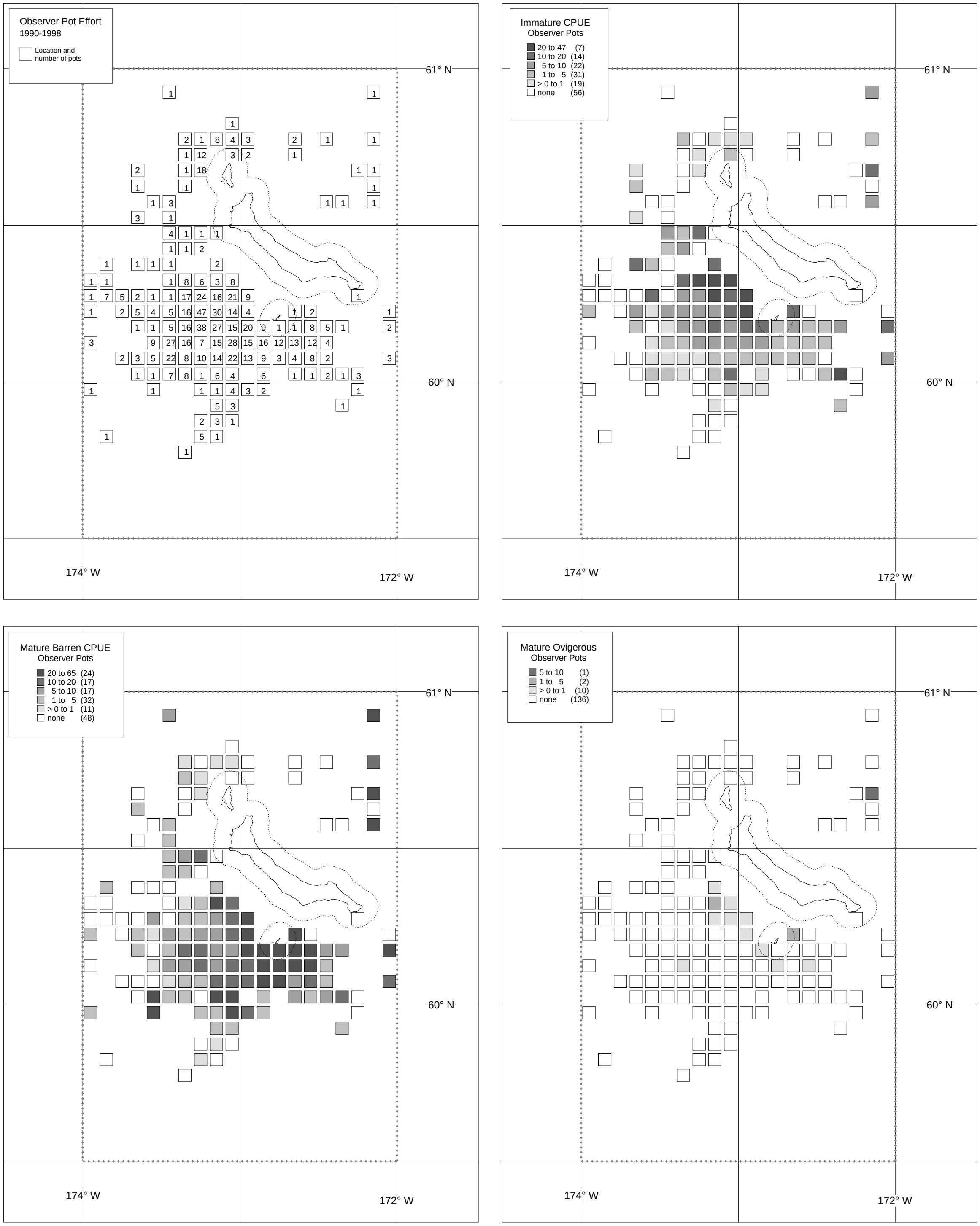


Figure 5. Distribution of number of pot lifts (top left panel) and catch per pot lift of immature (top right panel), mature-barren (bottom left panel), and mature-ovigerous (bottom right panel) female blue king crabs in pots sampled by observers during the 1990-1998 2002 St. Matthew blue king crab commercial fishery north of 59°30’ N. latitude, south of 61°00’ N. latitude, west of 172°00’ W. longitude and east of 174°00’ W. longitude. The dotted line surrounding the islands depicts the borders of the 3-nmi fishery closure area.

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