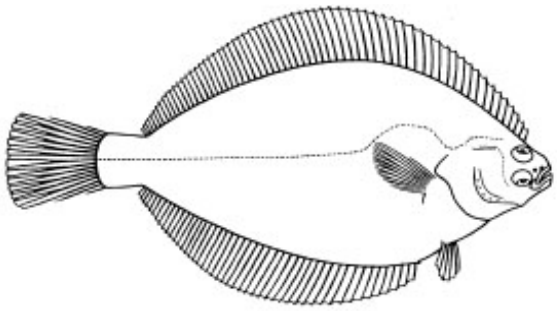
DRAFT FOR INITIAL REVIEW

Proposed Amendment 94 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area to

Require Trawl Sweep Modification in the Bering Sea Flatfish Fishery

Environmental Assessment/
Regulatory Impact Review/
Initial Regulatory Flexibility Analysis



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Abstract: This Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis analyzes a proposed gear modification to require non-pelagic trawl vessels targeting flatfish in the Bering Sea subarea to use elevating devices on trawl sweeps to raise them off the seafloor. The action follows from BSAI Amendment 89, Bering Sea Habitat Conservation Measures. The analysis also evaluates changes to the southern boundary of the Northern Bering Sea Research Area to create an area where anyone fishing with non-pelagic trawl gear must use the modified trawl sweeps required by regulation, and changes to the boundary of the St Matthew Island Habitat Conservation Area to be consistent with the Council's intent to protect blue king crab habitat. Finally, the document addresses certain housekeeping amendments to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area, which are required to correct typographical and non-substantive errors.

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List of Acronyms

AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AI	Aleutian Islands
BiOp	Biological Opinion
BS	Bering Sea
BSAI	Bering Sea and Aleutian Islands
CDQ	Community Development Quota
CFR	Code of Federal Regulations
Council	North Pacific Fishery Management Council
CP	catcher processor
CPUE	catch per unit effort
CV	catcher vessel
CW	carapace width
EA	Environmental Assessment
EBS	eastern Bering Sea
EBS	
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
ESI	environmental sensitivity index
F/V	Fishing Vessel
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRFA	Final Regulatory Flexibility Analysis
ft	foot or feet
FWS	Fish and Wildlife Service
GHL	guideline harvest level
GOA	Gulf of Alaska
HAPC	Habitat Area of Particular Concern
HCA	Habitat Conservation Area
IPHC	International Pacific Halibut Commission
IRFA	Initial Regulatory Flexibility Analysis
LEI	longterm effect index
LEI	long-term effect index
LLP	license limitation program
LOA	length overall
LOF	List of Fisheries
MESA	most environmentally sensitive areas
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
mt	metric ton
NAO	NOAA Administrative Order
NEPA	National Environmental Policy Act
nm	nautical mile
NMFS	National Marine Fishery Service

NOA	Notice of Availability
NOAA	National Oceanographic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
NPFMC	North Pacific Fishery Management Council
NSBRA	Northern Bering Sea Research Area
OLE	NOAA's Office of Law Enforcement
PBR	potential biological removal
PSC	Prohibited Species Catch
PSEIS	Programmatic Supplemental Environmental Impact Statement
QS	quota share
RACE	NOAA AFSC Resource Assessment and Conservation Engineering Division
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation Report
SAR	stock assessment report
Secretary	Secretary of Commerce
SMIHCA	St Matthew Island Habitat Conservation Area
STAL	short-tailed albatross
TAC	Total Allowable Catch
TMB	total mature biomass
URL	uniform resource locator
USCG	United States Coast Guard
VMS	vessel monitoring system

Executive Summary

ES.1 Introduction

This document analyzes a proposed gear modification to require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor. The action follows from BSAI Amendment 89, Bering Sea Habitat Conservation Measures. The analysis also evaluates changes to the southern boundary of the Northern Bering Sea Research Area (NBSRA) to create an area where anyone fishing with non-pelagic trawl gear must use the modified trawl sweeps required by regulation, and changes to the boundary of the St Matthew Island Habitat Conservation Area to be consistent with the Council's intent to protect blue king crab habitat. Finally, the document addresses certain housekeeping amendments to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP), which are required to correct typographical and non-substantive errors.

ES.2 Purpose and Need

The purpose of this analysis is to supplement the information provided in the BSAI Amendment 89 Bering Sea Habitat Conservation Measures EA/RIR/IRFA (NMFS 2008a), with respect to gear modification in the Bering Sea flatfish nonpelagic trawl fishery. The purpose of the action is to provide additional protection to Bering Sea bottom habitat from the potential adverse effects of nonpelagic trawl gear used for flatfish fishing. This would be achieved by modifying nonpelagic trawl gear used for flatfish fishing by raising the majority of the gear off the bottom. Studies have shown that elevating the trawl sweep can reduce impacts on benthic organisms, such as basketstars and sea whips. The Council endorsed this action in their final recommendation on Bering Sea habitat conservation in June 2007, but was unable to approve specific details of the gear modification component. Further research was needed in order to identify the appropriate modification that would meet the Council's desired performance standard and implementation issues needed to be resolved. Field testing of the modification has now been completed and industry workshops were held, demonstrating that the modification is workable in the fishery. The bottom habitat is an important part of the entire Bering Sea marine ecosystem. This action is needed to ensure ecosystem-based management is incorporated into flatfish fisheries management in the Bering Sea.

As part of the June 2007 motion, the Council also stated that a portion of the now closed (under Amendment 89) Northern Bering Sea Research Area may be reopened to non-pelagic trawl fishing. The Council linked the reopening of this area, colloquially referred to as the "wedge", to the implementation of the proposed gear modification requirements for the flatfish fishery. The flatfish industry had identified the area in question, the "wedge", as important to the fishery due to purported high concentrations of yellowfin sole and low concentrations of other bycatch species. The purpose of reopening the "wedge" is to allow for efficient harvest of flatfish species while providing protection to this minimally fished area by requiring modified gear. Implementing the modified gear requirement would reduce potential impacts on bottom habitat that might result from opening this area. This action is needed to ensure fishers can efficiently harvest flatfish as flatfish stocks are likely to shift locations in the Bering Sea.

The Council also recommended analysis of the eastern boundary of the St. Matthew Island Habitat Conservation Area. This boundary may have been established by Amendment 89 west of what was intended by the Council for protection of blue king crab habitat. The revision of this boundary may be needed to ensure the St. Matthew Island Habitat Conservation Area protects blue king crab habitat, based on the best available scientific information.

To allow for efficient updating of the FMP, the action would also include housekeeping amendments to address typographical or non-substantive errors. Some of these errors were introduced with Amendment 89 to the FMP. These corrections are needed to improve the readability of the FMP and to ensure the document clearly implements the Council's intent for fisheries management in the Bering Sea subarea.

The Council formulated the following problem statement to initiate this analysis:

> Research has shown that sweep modifications can reduce gear contact with the sea floor and may not have negative effects on catch rates. Modifications appear to meet the Council's intent to consider practicable measures to reduce potential adverse effects of non-pelagic trawl fishing on bottom habitat. The "wedge" is reported to contain high concentrations of flatfish and low concentrations of other bycatch species. Re-opening of the "wedge" was linked to implementation of sweep modifications in final action on Amendment 89. In addition, there may be some associated typographical, formatting, and description errors in the FMP that may not meet the Council's intent.

ES.3 Alternatives

The alternatives, as adopted by the Council in February 2009, are as follows:

Alternative 1: Status quo

Alternative 2: Require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor

Alternative 3: Require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor, and adjust the southern boundary of the Northern Bering Sea Research Area (NBSRA) to exclude an area that would be designated as a "Modified Gear Trawl Zone". Anyone fishing with non-pelagic trawl gear in this area must use the modified trawl sweeps required by regulation. The polygon would be delineated on the north by a line at 61˚ W. latitude, to the east at 168˚ W. longitude, to the south by the existing NBSRA boundary, and to the west by the St Matthew HCA boundary (which may be revised under the option listed below).

SMIHCA Option: Adjust the St Matthew HCA boundary to be consistent with the Council's intent to protect blue king crab habitat, based on the best available information. This option can be adopted under any of the three alternatives listed above.

Housekeeping changes:

a. Remove reference to the Crab and Halibut Protection Zone in the BSAI FMP
b. Renumber figures and tables in the FMP and correct cross references.
c. Adjust the coordinates for the northern boundary of the Northern Bering Sea Research Area to meet the southern boundary of Statistical Area 400 for the Chukchi Sea.

ES.4 Impacts of the Alternatives

The alternatives were analyzed for their impacts on habitat, target and non-target species, marine mammals, seabirds, and the ecosystem, and economic and socio-economic impacts. The impacts on the socio-economic environment are analyzed in the Regulatory Impact Review (Section 7) and the Initial Regulatory Flexibility Analysis (Section 0), and are summarized in the following section.

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. 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. Trawls affect the seafloor through contact of the doors and sweeps, footropes and footrope gear, and the net sweeping along the seafloor. Ninety percent of the area impacted by flatfish trawling is due to contact between the seafloor and the sweeps.

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), and no new information indicates to the contrary. Therefore, Alternative 1 is rated insignificant.

The trawl sweep modification under Alternatives 2 and 3 may have beneficial effects on the amount of biological structure in the Bering Sea compared to the status quo, due to the reduction in the amount of contact between the trawl sweeps and the sea bed. The trawl sweep modification has been tested to be effective in reducing trawl sweep impact effects to basketstars, sea whips (a long-lived species of primary concern), sponges, and siphons. The gear modification 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. Some contact with living habitat species would continue from the elevating devices contacting the bottom, however, fishery-wide adoption of devices to reduce seafloor contact with trawl sweeps is expected to be 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, benthic biodiversity, or habitat suitability is not expected to be a substantial change from status quo.

Alternative 3 would additionally reopen the Modified Gear Trawl Zone to nonpelagic trawling, which is an area that is currently part of the NBSRA. Alternative 3 is more likely to adversely impact habitat complexity, however the use of modified gear will mitigate the potential impact as compared to conventional nonpelagic trawl gear. Because the sediments in the Modified Gear Trawl Zone appear to be primarily sand and gravel, fishing in the Zone is unlikely to result in substantial changes to the community structure or habitat suitability. Therefore, the effect of Alternative 3 on habitat is likely insignificant.

The St. Matthew Island HCA option could increase the area closed to nonpelagic trawling, providing more protection to bottom habitat. Little nonpelagic trawling is currently occuring in the expanded closure area under the status quo, either because it is already part of the NBSRA, or because it is not suitable for nonpelagic trawling. Therefore this option would not result in a substantial change in mortality or damage to living substrate, community structure, or benthic biodiversity.

Target and non-target species

The effects of this action on target species are limited to those effects that may occur on habitat that support target species and their prey. All fishing done under the alternatives would be done within the

annual harvest specifications and overall harvest of target, non-target and prohibited species would be constrained by the target fishery harvest limits and by prohibited species catch measures currently applied. Based on experimental testing of the gear, the trawl sweep modification under Alternatives 2 and 3 are not expected to have any net decrease in the target catch rates compared to that of status quo conditions. The catch of target flatfish species with the modified gear was not significantly different than the catch of unmodified gear at a clearance that elevated the sweeps 2.5 inches off the seabed between disks. The proportion of non-target and PSC species removed is not expected to be different under the alternatives. Unobserved bycatch mortality of invertebrate species that may be the target of other fisheries was reduced to nearly zero compared to conventional trawl sweeps, therefore using the gear may result in a positive impact on crab stocks by reducing a source of unobserved mortality. As catch of target species is expected to remain the same under all alternatives and options, insignificant effects on stock biomass, fishing mortality, and prey species availability are anticipated.

Alternative 3 would allow trawling with modified gear in an area that is currently closed and would have more impact on target and non-target fish resources in the Modified Gear Trawl Zone than with Alternatives 1 and 2. Because the Modified Gear Trawl Zone is a limited portion of the Bering Sea subarea and because of the modified gear reducing potential impacts, it is not likely Alternative 3 would have significant impacts on the bottom habitat in this area that supports target species and their prey.

The expansion of the ST. Matthew Island HCA under the option may provide additional protection to target species that may occur in this area from the potential effects of bottom trawling, however because the area is largely unfished by nonpelagic gear at the present time, any effect is insignificant.

Marine mammals

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). 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.

Alternative 1, and the trawl sweep modification under Alternatives 2 and 3, would not change the timing or location of fishing activities in any way that may change the potential interaction of nonpelagic fishing vessels with marine mammals. Because the potential for interaction remains unchanged, no change in incidental takes or disturbance of marine mammals are expected. The gear modifications may result in protecting foraging resources in those areas where marine mammal foraging and fishing overlaps. Because of the widespread occurrence of the marine mammals and the limited locations of nonpelagic trawling, it is not likely that any protection of benthic habitat in fishing locations would result in an improvement in overall foraging for marine mammals. Because the overall amount of harvests are not likely to change under these alternatives, no difference in the overall direct competition for prey species is expected.

Alternative 3 would allow for fishing in the Modified Gear Trawl Area, which is currently closed to nonpelagic trawling. By allowing nonpelagic trawling in a closed area, the potential for interaction with marine mammals would increase for those marine mammals that may occur in this area at the same time nonpelagic trawling may occur, which may increase potential for incidental takes and disturbance. These effects are not likely a concern for strongly ice dependent marine mammals (e.g., ringed seals and female

and juvenile walrus) which are less likely to be in the area concurrent with nonpelagic trawl fishing. It is possible that northern fur seals use the Modified Gear Trawl Area for foraging and may encounter nonpelagic trawl vessels in the opened area.

If marine mammals that interact with the nonpelagic trawl fishery occur in the Modified Gear Trawl Zone, this opening may increase the potential for incidental takes and disturbance, however these are more likely dependent on the amount of overall fishing as much as the location of the fishing activity. Because the overall amount of fishing is likely to remain the same in the Bering Sea, it is not likely that opening the Modified Gear Trawl Area under Alternative 3 would result in a substantial increase in the amount of incidental takes or disturbance of fur seals, Steller sea lions, harbor seals, or any other marine mammal that may occur in this area.

Opening the area would allow for direct competition between the flatfish and Pacific cod fishery and beluga whale, resident killer whales, ribbon seals, and Steller sea lions, if they occur in the area. It appears that ribbon seals are not as likely to be in this area during the fishing season as bearded and spotted seals. Because of the modified gear requirement, the potential indirect effect on prey for spotted and bearded seals and walrus is likely not expected to be substantial.

The option to adjust the boundary of the St. Matthew Island HCA would provide protection from incidental takes and disturbance to those marine mammals that occur in the waters in the new closed area and that are likely to interact with nonpelagic trawl fisheries. This would also be beneficial to marine mammals that may use this area for foraging and for marine mammals that depend on other marine mammals that forage in this area (e. g., polar bears dependent on ice seals and walrus). Because of the limited area and the widespread occurrence of the benthic dependent mammals, this closure is not likely to result in substantial improvements in overall prey availability. Because the overall level of fishing effort would not change, no change overall in the incidental takes and disturbance of marine mammals in the Bering Sea is likely.

Seabirds

Many seabird species use the marine habitat of the Bering Sea, including several species of conservation concern. Some species are occasionally taken by cable or vessel strikes or become entangled in trawl nets, and some species depend on benthic habitat that is disrupted by non-pelagic trawling. However, Alaska Fisheries Science Center estimates that seabird takes are few and infrequent in relation to seabird population total estimates. Moreover, recent modeling suggests that even a large increase in incidental takes of short-tailed albatross by interactions with trawl cables would have negligible effects on the recovery of the species. The spatial and temporal effects of non-pelagic trawling on benthic habitat are not yet well understood, although undisturbed areas seem to produce more clam species on which eider species are dependent.

The impacts on seabirds from each of the alternatives, both positive and negative, would be insignificant. Under Alternative 1, seabird takes and disruptions to benthic habitat and prey availability are at low levels and are mitigated (to some degree) by current spatial restrictions on the trawl fisheries in the Bering Sea. The trawl sweep modification requirement under Alternatives 2 and 3 could lessen impacts to benthic habitat, thereby increasing prey availability to the species which are dependent on it for at least part of the year. It is unknown what additional effort might occur in the Modified Gear Trawl Zone, but is likely to be insignificant to seabird populations. The option to adjust the St Matthew HCA boundary may decrease effort in the area, increasing prey availability, and reducing vessel strikes.

Ecosystem

Three primary means of measurement of ecosystem change are evaluated: predator-prey relationships, energy flow and balance, and ecosystem diversity. Insignificant effects on predator-prey relationships are expected for Alternative 2 and 3, and the Option. No substantial changes would be anticipated in biomass or numbers in prey populations. No increase in the catch of higher trophic levels, nor changes in the risk of exotic species introductions are expected because there would be no change in fishing activities that would result in these types of effects. 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. Alternatives 2 and 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, Alternatives 2 and 3 would have an insignificant effect on predator-prey relationships. The areas included in the Modified Gear Trawl Zone component of Alternative 3, and the St Matthew Island HCA Option, are very localized and therefore any effect on predator-prey relationships is likely to be isolated and not observable on regional basis.

The amount and flow of energy in the ecosystem under the alternatives and option 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.

A net change in nonpelagic trawling would not occur along the Bering Sea shelf and slope by either alternative or the option. The gear modification identified in Alternatives 2 and 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 effects of the Option are localized and occur in areas of high waves and currents so it likely is not possible to observe changes to diversity that may be related to the additional closure near SMIHCA.

ES.5 Regulatory Impact Review

Table 1 provides an overview of the costs and benefits of the Alternatives and the option.

Table 1 Comparison of alternatives for economic and social impacts

	Alternative 1	Alternative 2	Alternative 3	SMIHCA option
Description	no action (status quo)	require vessels targeting flatfish in the Bering Sea to use modified sweeps	require vessels targeting flatfish in the Bering Sea to use modified sweeps **AND** adjust boundary of the NBSRA to create a "Modified Gear Trawl Zone" where nonpelagic trawl vessels must use modified sweeps	Adjust the St Matthew Island HCA boundary to ensure protection of blue king crab habitat
Protection of habitat: value to commercial fishermen, value to other users, non-use value	Baseline	Use of the gear will reduce adverse impacts to benthic habitat. Benthic communities will change somewhat, but not as greatly as they would in the absence of this gear requirement. Reduction in impacts is expected to improve the productivity of fish stocks beyond what they would have been under the status quo. This may increase harvestable surpluses beyond what they would have been, and improve catch per unit effort.	The same considerations with respect to the trawl sweep modification apply here as under Alternative 2. However, opening the Modified Gear Trawl Zone, despite the requirement for the gear modification, will adversely impact the benthic habitat within the area. Thus the protection benefits from this action are less than those under Alternative 2.	Expanding the St Matthew HCA would provide some incremental protection for benthic habitat by closing further area to nonpelagic trawling
		Persons may have non-use values for the marginal or incremental change in benthic habitat. No estimates of this are available; there is no scientific information that this is non-trivial.		same
Crab and crab fisheries	Baseline	The use of the gear will result in less crab bycatch mortality, which may improve the sustainability of crab stocks and increase the catch per unit effort in crab fisheries.		May improve sustainability of crab stocks.
Cost of gear	Baseline	Estimated to be about $3000-$3500 annually. This could be greater or less depending on the type of gear and length of sweeps in use.		n/a
		Annual cost of the modified gear may be offset if using the elevated disks increases the useful life of trawl sweeps, lengthening the time before replacement of the gear.		
		There may be a one-time cost for modifying the vessel to accommodate the modified gear. Estimates of this cost may range between zero and $800,000, depending on the vessel and its existing configuration. Vessels differ from each other so much that it is not possible to provide an average or aggregate cost.		
Cost of fishing with modified gear	Baseline	It may take longer to set and retrieve nets. Industry sources believe that this may be a cost during transitional years, as learning takes place and gear improvements are implemented.		n/a
		Research shows little or no difference in catchability of the gear using 8" disks raising the sweep 2.5" off the seafloor. No catchability study is available using 10" disks raising the sweep 2.5" off the seafloor, but the result is expected to be similar.		
Management and enforcement	Baseline	Enforcement personnel will need to verify that the modified gear meets the regulatory requirements when conducting regular vessel inspections.	The creation of the Modified Gear Trawl Zone should not create any enforcement burden beyond that of enforcing the modified trawl sweeps.	No additional management or enforcement required.

ES.6 Initial Regulatory Flexibility Analysis

In 2007, all of the catcher processors targeting flatfish in the Bering Sea exceeded the $4.0 million threshold, when considering their combined groundfish revenues, and would be considered large entities for purposes of the RFA. None of the four catcher vessels who participated in 2007 met the threshold, based on their combined groundfish revenues, and these vessels are considered small entities for purposes of the RFA. It is likely that some of these vessels are also linked by company affiliation, which may then qualify them as large entities, but information is not available to identify ownership status of all vessels at an entity level. Therefore, the IRFA may overestimate the number of small entities directly regulated by the proposed action. At the time of the preparation of this draft IRFA, the Council has not identified a preferred alternative. This section will be re-evaluated once the Council has taken further action.

ES.7 Organization of the document

There are four required components of an environmental assessment. The need for the proposal is described in Section 1.2, and the alternatives in Section 2. Section 5 discusses the environmental impacts of the proposed action and alternatives. A list of agencies and persons consulted is included in Section 13.

Also included in the document is a Regulatory Impact Review (Section 7), which discusses economic impacts of the action, and an Initial Regulatory Flexibility analysis (Section 0), which evaluates the impact of the action on small businesses. Sections 9 and 10 discusses the alternatives with respect to other analytical considerations, and Section 11 describes the housekeeping amendments that are part of this action.

1 Introduction and Purpose

This document analyzes a proposed gear modification to require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor. The action follows from BSAI Amendment 89, Bering Sea Habitat Conservation. The analysis also evaluates changes to the southern boundary of the Northern Bering Sea Research Area (NBSRA) to create an area where anyone fishing with non-pelagic trawl gear must use the modified trawl sweeps, and changes to the boundary of the St Matthew Island Habitat Conservation Area to be consistent with the Council's intent to protect blue king crab habitat. Finally, the document addresses certain housekeeping amendments to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP), which are required to correct typographical and non-substantive errors.

This document is an Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis (EA/RIR/IRFA). An EA/RIR/IRFA provides assessments of the environmental impacts of an action and its reasonable alternatives (the EA), the economic benefits and costs of the action alternatives, as well as their distribution (the RIR), and the impacts of the action on directly regulated small entities (the IRFA). This EA/RIR/IRFA addresses the statutory requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Environmental Policy Act (NEPA), Presidential Executive Order 12866, and Regulatory Flexibility Act (RFA). An EA/RIR/IRFA is a standard document produced by the Council and the NMFS Alaska Region to provide the analytical background for decision-making.

1.1 History of this action

In February 2005 the Council adopted amendments revising five FMPs by identifying essential fish habitat (EFH) and habitat areas of particular concern (HAPCs) and authorizing protection measures. This action was supported by the February 2005 Environmental Impact Statement for Essential Fish Habitat Identification and Conservation in Alaska (EFH EIS; NMFS 2005), which described EFH and included a suite of measures to conserve EFH in the GOA and AI from potential impacts due to fishing. The amendments to the groundfish, scallop, crab, and salmon FMPs were implemented July 28, 2006[1] (71 *FR* 36694; June 28, 2006).

In 2005, 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. Subsequently, the Council initiated an analysis focused specifically on nonpelagic trawl gear issues in the Bering Sea. Trawl gear was identified with high long term effect indices (LEI) on habitat, based on the 2005 EIS evaluation, and nonpelagic trawling uses gear that fishes constantly on the bottom. The nonpelagic trawl fishery in the Bering Sea is widely distributed (i.e., has a large footprint). The extent of nonpelagic trawling effort has the potential to increase with any future increases in total allowable catch (TAC) limits for flatfish species, and the footprint may increase with the movement of fish stocks in response to global warming.

In June 2007, the Council adopted a number of actions for Bering Sea habitat conservation, implemented under BSAI Amendment 89, which was approved by the Secretary of Commerce in May 2008. The

[1] The specific amendments and FMPs were Amendments 78 and 65 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area, Amendments 73 and 65 to the FMP for Groundfish of the Gulf of Alaska, Amendments 16 and 12 to the FMP for Bering Sea/Aleutian Islands King and Tanner Crabs, Amendments 7 and 9 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 off the Coast of Alaska.

supporting analysis (NMFS 2008a) followed on from the EFH EIS (NMFS 2005). In addition to the series of area closures included in the Amendment 89 management measures, the analysis evaluated an alternative to require gear modification for the flatfish fisheries. This alternative would require all vessels engaged in directed fishing for flatfish in the Bering Sea to use a trawl sweep modification intended to raise the sweeps off the seafloor while trawling. Research to develop the appropriate type of gear modification was undertaken, and an industry workshop convened in March 2007 to discuss the potential requirements. At the time of Council final action, in June 2007, it was determined that further research and refinement of the specific details of the gear modification was required. The Council endorsed the trawl sweep modification requirement, but deferred a specific recommendation on gear modification for the flatfish fisheries until June 2008. The Council asked that further gear testing and resolution of potential implementation concerns be undertaken in the meantime.

In the June 2007 motion, the Council also identified a roughly triangular-shaped area west of St Matthew (often referred to as the "wedge"). Although this area was closed to non-pelagic trawl fishing as part of the Northern Bering Sea Research Area (NBSRA), under BSAI Amendment 89, the Council indicated that this area may be opened following the implementation of the gear modification for flatfish fishing, discussed above.

A representative of the flatfish trawl industry, John Gauvin, and Dr. Craig Rose, an Alaska Fisheries Science Center researcher, made presentations to the Council at the June 2008 meeting regarding the progress of the gear testing and their research. The Council subsequently directed staff to initiate analysis to implement the gear modification requirement.

In February 2009, the Council received a presentation on the discussion paper, and adopted a motion including a problem statement and alternatives. These are described in the following sections. The Council requested preparation of an initial review EA/RIR/IRFA for its June 2009 meeting, and anticipated taking final action in October 2009.

1.1.1 Council preferred alternatives from Amendment 89

The Council adopted their preferred alternatives for Amendment 89 in June 2007, but two of the five components of the motion, which relate to the gear modification action, were delayed. The Council's preferred alternatives on the gear modification action are copied below. One component is to require a trawl sweep modification for directed flatfish trawl fishing in the Bering Sea, and the second is to reopen the area described as the "wedge" once the gear modification has been implemented. These components are the subject of the current analysis.

2. *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 Bering Sea flatfish fishery to reduce bottom habitat impacts (see item 3 below). Further, the Council encourages NMFS to include this area within the annual trawl survey design.*

3. *The Council endorses trawl sweep modifications that reduce the potential impacts on benthic habitat from gear contact with the seafloor, per Alternative 3. 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 that is currently before the Council.*

1.2 Purpose and need

The purpose of this analysis is to supplement the information provided in the BSAI Amendment 89 Bering Sea Habitat Conservation Measures EA/RIR/IRFA (NMFS 2008a), with respect to gear modification in the Bering Sea flatfish nonpelagic trawl fishery. The purpose of the action is to provide additional protection to Bering Sea bottom habitat from the potential adverse effects of nonpelagic trawl gear used for flatfish fishing. This would be achieved by modifying nonpelagic trawl gear used for flatfish fishing by raising the majority of the gear off the bottom. Studies have shown that elevating the trawl sweep can reduce impacts on benthic organisms, such as basketstars and sea whips. The Council endorsed this action in their final recommendation on Bering Sea habitat conservation in June 2007, but was unable to approve specific details of the gear modification component. Further research was needed in order to identify the appropriate modification that would meet the Council's desired performance standard and implementation issues needed to be resolved. Field testing of the modification has now been completed and industry workshops were held, demonstrating that the modification is workable in the fishery. The bottom habitat is an important part of the entire Bering Sea marine ecosystem. This action is needed to ensure ecosystem-based management is incorporated into flatfish fisheries management in the Bering Sea.

As part of the June 2007 motion, the Council also stated that a portion of the now closed (under Amendment 89) Northern Bering Sea Research Area may be reopened to non-pelagic trawl fishing. The Council linked the reopening of this area, colloquially referred to as the "wedge", to the implementation of the proposed gear modification requirements for the flatfish fishery. The flatfish industry had identified the area in question, the "wedge", as important to the fishery due to purported high concentrations of yellowfin sole and low concentrations of other bycatch species. The purpose of reopening the "wedge" is to allow for efficient harvest of flatfish species while providing protection to this minimally fished area by requiring modified gear. Implementing the modified gear requirement would reduce potential impacts on bottom habitat that might result from opening this area. This action is needed to ensure fishers can efficiently harvest flatfish as flatfish stocks are likely to shift locations in the Bering Sea.

The Council also recommended analysis of the eastern boundary of the St. Matthew Island Habitat Conservation Area. This boundary may have been established by Amendment 89 west of what was intended by the Council for protection of blue king crab habitat. The revision of this boundary may be needed to ensure the St. Matthew Island Habitat Conservation Area protects blue king crab habitat, based on the best available scientific information.

To allow for efficient updating of the FMP, the action would also include housekeeping amendments to address typographical or non-substantive errors. Some of these errors were introduced with Amendment 89 to the FMP. These corrections are needed to improve the readability of the FMP and to ensure the document clearly implements the Council's intent for fisheries management in the Bering Sea subarea.

1.3 Council problem statement

The Council formulated the following problem statement to initiate this analysis:

> Research has shown that sweep modifications can reduce gear contact with the sea floor and may not have negative effects on catch rates. Modifications appear to meet the Council's intent to consider practicable measures to reduce potential adverse effects of non-pelagic trawl fishing on bottom habitat. The "wedge" is reported to contain high concentrations of flatfish and low concentrations of other bycatch species. Re-opening of the "wedge" was linked to implementation of sweep modifications in final action on

Amendment 89. In addition, there may be some associated typographical, formatting, and description errors in the FMP that may not meet the Council's intent.

1.4 Statutory authority and relationship of this action to Federal law

National Marine Fisheries Service (NMFS) manages the U.S. groundfish fisheries of the BSAI management area in the Exclusive Economic Zone (EEZ) under the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Island Management Area (NPFMC 2009). The Council prepared, and the Secretary approved, the FMP under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801, *et seq*.).

A variety of Federal laws and policies require environmental, economic, and socio-economic analysis of proposed Federal actions. This document contains the required analysis of the proposed Federal action to ensure that the action complies with these Federal laws and executive orders (EOs):

- Magnuson-Stevens Fishery Conservation and Management Act (including Sustainable Fisheries Act of 1996, and the Magnuson-Stevens Reauthorization Act of 2008)
- National Environmental Policy Act
- Endangered Species Act
- Marine Mammal Protection Act
- Administrative Procedure Act
- Information Quality Act
- E.O. 12866
- Regulatory Flexibility Act

The Harvest Specifications FEIS provides details on the laws and executive orders directing this analysis (NMFS 2007a).

2 Description of Alternatives

The alternatives, as adopted by the Council in February 2009, are as follows:

Alternative 1: Status quo

Alternative 2: Require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor

Alternative 3: Require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor, and adjust the southern boundary of the Northern Bering Sea Research Area (NBSRA) to exclude an area that would be designated as a "Modified Gear Trawl Zone". Anyone fishing with non-pelagic trawl gear in this area must use the modified trawl sweeps required by regulation. The polygon would be delineated on the north by a line at 61˚ W. latitude, to the east at 168˚ W. longitude, to the south by the existing NBSRA boundary, and to the west by the St Matthew HCA boundary (which may be revised under the option listed below).

SMIHCA Option: Adjust the St Matthew HCA boundary to be consistent with the Council's intent to protect blue king crab habitat, based on the best available information. This option can be adopted under any of the three alternatives listed above.

Housekeeping changes:

a. Remove reference to the Crab and Halibut Protection Zone in the BSAI FMP
b. Renumber figures and tables in the FMP and correct cross references.
c. Adjust the coordinates for the northern boundary of the Northern Bering Sea Research Area to meet the southern boundary of Statistical Area 400 for the Chukchi Sea.

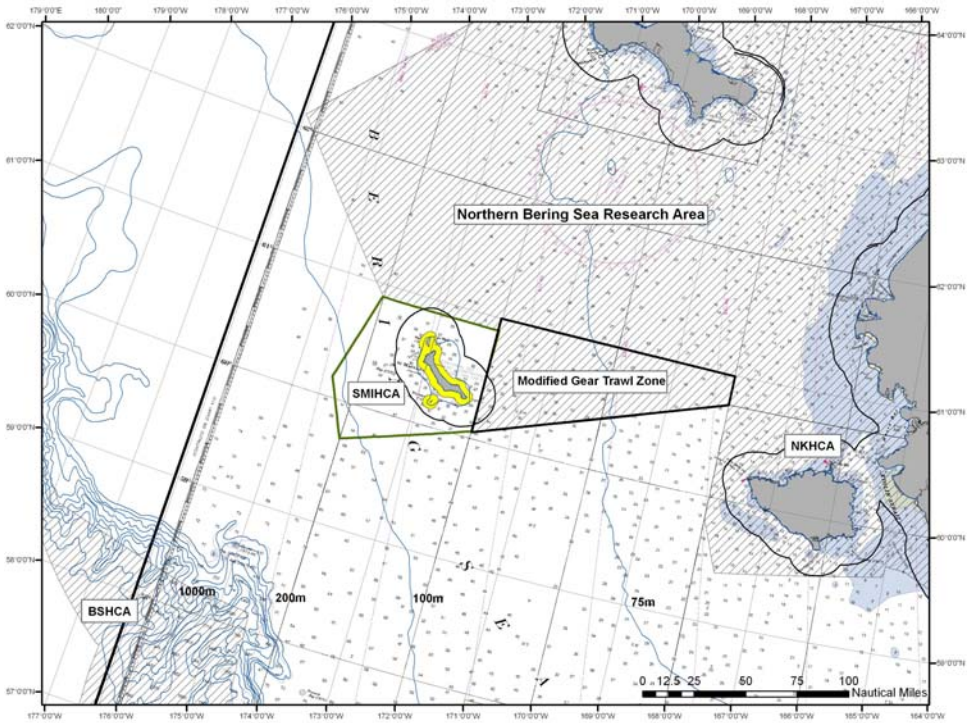
Trawl sweep modification

Both Alternatives 2 and 3 address the same requirement for trawl vessels targeting flatfish in the Bering Sea subarea to use modified trawl sweeps that elevate the sweeps off the seafloor. Draft regulations have been developed which combine a gear and performance standard for meeting this requirement (see Appendix B). The Council noted that it is their intent, under Alternatives 2 and 3, to review any regulations for elevating devices after three years.

Modified Gear Trawl Zone

In conjunction with the proposed requirement for elevating the trawl sweeps while targeting flatfish, Alternative 3 proposes re-opening a small subarea of the Northern Bering Sea Research Area. The northern, eastern, and southern boundaries of this area are fixed; the western boundary may fluctuate, depending on the re-evaluation of the protection to blue king crab offered under the St Matthew Island HCA, as discussed below. Figure 1 illustrates the maximum geographic extent of the area identified as the Modified Gear Trawl Zone; the western boundary will abut the St Matthew Island HCA, but may move further east if that boundary changes. For purposes of analysis, the impacts of opening an area equivalent to the maximum extent of the Modified Gear Trawl Zone are evaluated in this draft of the analysis. This draft will be updated with further information following the June Council meeting.

Figure 1 Maximum geographic extent of the Modified Gear Trawl Zone



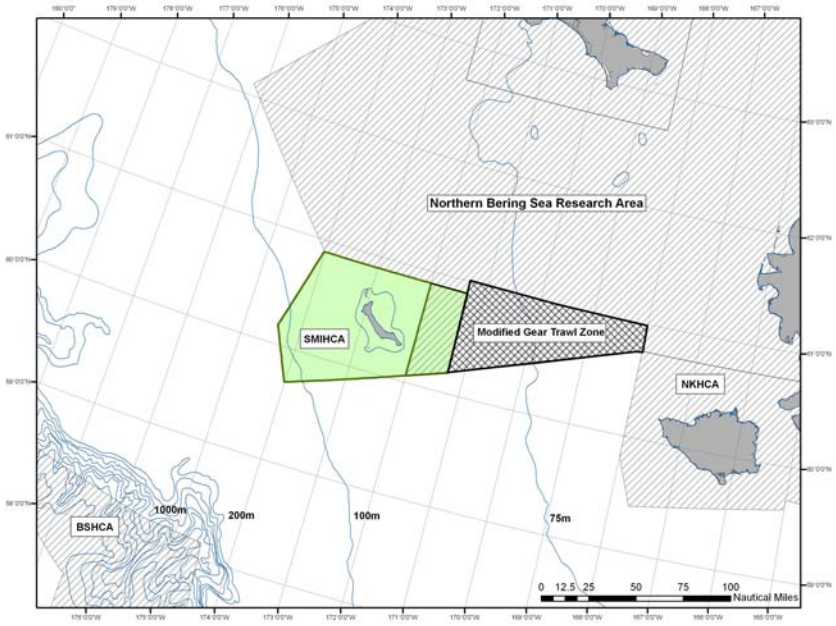
St Matthew Island HCA Option

The Council's intent under Amendment 89 was for the western boundary of the "wedge" area to abut the eastern boundary of the St Matthew Island Habitat Conservation Area (HCA). Because the gear modification and St Matthew Island HCA actions became disconnected in implementation (the latter being implemented under Amendment 89, the former being the subject of this analysis, Amendment 94), some confusion arose about the correct western boundary of the "wedge" (now the Modified Gear Trawl Zone). In considering this action, the Council decided it would be advisable to re-evaluate the current boundaries of the St Matthew Island HCA in order to ensure that it provides the appropriate level of protection for blue king crab.

The analysis includes information on historic and recent stock abundance and distribution information for crab around St Matthew Island. The Council asked for input from the Crab Plan Team to evaluate whether the current boundaries of the St. Matthew HCA provide sufficient protection for blue king crab. The Crab Plan Team will meet in mid-May, and their input will be folded into this analysis following the June Council meeting. The Council will review the Crab Plan Team recommendations, and determine whether specific adjustments are required to the boundaries of the St. Matthew HCA. If the eastern boundary of the St Matthew Island HCA is adjusted, the geographic extent of the Modified Gear Trawl Zone proposed under Alternative 3 will also be adjusted so as to abut the St Matthew Island HCA. The analysis of the protection offered by the current boundaries of the St. Matthew Island HCA will be based on the best available science, including any new survey information since the analysis for Amendment 89.

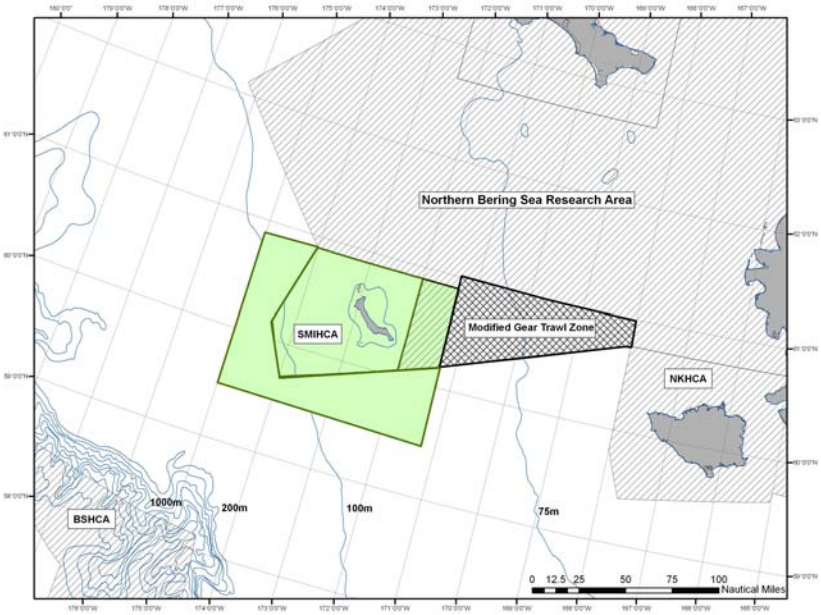
For purposes of analysis, staff looked at two possible expansions of the St Matthew Islands HCA, based on information from the NMFS survey about the locations of blue king crab. Figure 2 illustrates an expansion of the HCA to the east, encompassing all the survey stations to the east in which blue king crab were recently documented. Figure 3 illustrates a larger expansion of the HCA, extending east, south, and west, which encompasses a segment of the blue king crab population that is located southwest of the HCA. These two examples provide the basis for the analysis of the St Matthew Island HCA Option in this version of the analysis. The analysis will be revised following the June Council meeting, once the Crab Plan Team and the Council have provided input on specific changes to the boundaries.

Figure 2 **Possible eastward expansion of the St Matthew Island Habitat Conservation Area (SMIHCA), based on survey locations of blue king crab to the east**



Note: NKHCA = Nunivak-Etolin Strait-Kuskokwim Bay Habitat Conservation Area; BSHCA = Bering Sea Habitat Conservation Area

Figure 3 **Possible expansion of the St Matthew Island Habitat Conservation Area (SMIHCA), based on survey locations of blue king crab to the east, south, and west.**



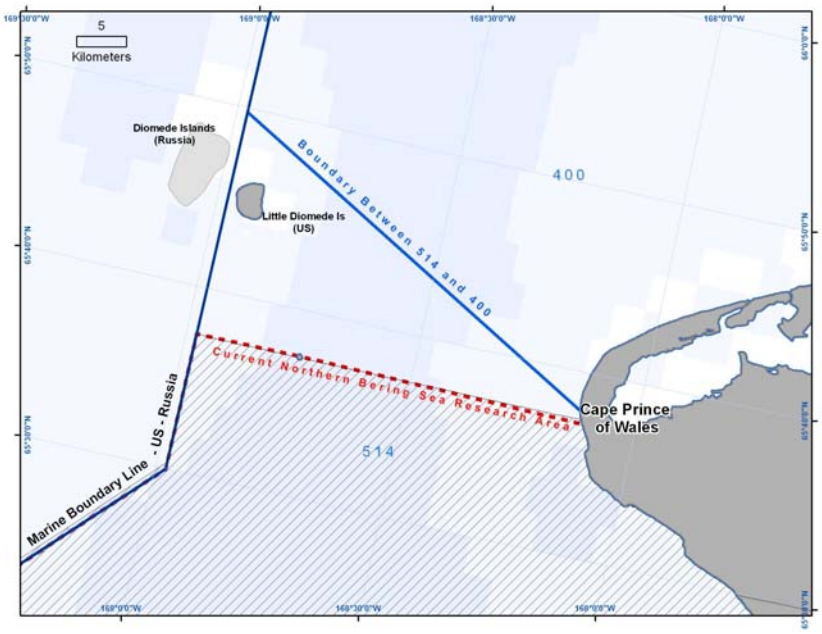
Note: NKHCA = Nunivak-Etolin Strait-Kuskokwim Bay Habitat Conservation Area; BSHCA = Bering Sea Habitat Conservation Area

Housekeeping actions

All changes to the FMP, even minor typographical changes, require an FMP amendment that is approved by the Council. The proposed changes are not substantive. The first would correct the description of the Crab and Halibut Protection Area, which was effectively superseded by the Nearshore Bristol Bay closure. The second change would renumber figures in Section 3 of the FMP, which became confused with the adoption of Amendment 89, and correct cross-references to these figures.

The third change would revise the northern boundary of the NBSRA to match the southern boundary of statistical area 400 at Bering Strait. Area 514 of the Bering Sea Subarea extends north to the southern boundary of Area 400. The current northern boundary of the NBSRA leaves a wedge of water open to nonpelagic trawling near Bering Strait due to the wrong coordinates being used for this boundary. The Council intended for the entire northern portion of the Bering Sea subarea to be part of the NBSRA, and this housekeeping amendment would close the area of water currently open to nonpelagic trawling (Figure 4).

Figure 4 **Northern boundary of the Northern Bering Sea Research Area and boundary between statistical areas 514 and 400. The area between the boundaries is currently open to nonpelagic trawl fishing.**



Source: Steve Lewis, NMFS Alaska Region Analytical Team April 30, 2009

2.1 Alternatives considered but not carried forward

The discussion paper reviewed by the Council prior to the development of this analysis suggested two other interpretations of the Council's proposed action with respect to adjusting the southern boundary of the Northern Bering Sea Research Area.

Interpretation 1: Revise the boundaries of the Northern Bering Sea Research Area to exclude the area referred to as the "wedge" (see Figure 1). The "wedge" area will be designated as a "Flatfish Trawl Zone". Only vessels targeting flatfish (and subject to modified trawl sweep requirements) may fish in the area.

Interpretation 2: Revise the boundaries of the Northern Bering Sea Research Area to exclude the area referred to as the "wedge" (see Figure 1). The "wedge" area will be designated as a "Modified Gear Trawl Zone". Non-pelagic trawling within the area can only be conducted using modified trawl sweeps.

Interpretation 3: Revise the boundaries of the Northern Bering Sea Research Area to exclude the area referred to as the "wedge" (see Figure 1). Non-pelagic trawling would be permitted in the "wedge" area, although directed fishing for flatfish in the area would be subject to modified trawl sweep requirements.

In February 2009, when the Council adopted alternatives for this action, the Council affirmed that they intended the analysis to consider the second interpretation above, to create a Modified Gear Trawl Zone. The Council indicated that the second interpretation was most consistent with the intent of the action, namely to develop and implement the gear modification requirement. The Council also intended that the area could be opened to any type of directed nonpelagic trawling as long as modified trawl sweeps are used.

3 Affected Environment

This section provides background information relevant to the analysis of this action. Section 3.1 describes the area affected by the actions proposed under this amendment. Section 3.2 describes the gear modification, and the research that has gone into its development. Section 3.3 describes the habitat types in the affected areas, Section 3.4 provides information about crab in the affected areas, and Section 7.6 describes the Bering Sea flatfish fisheries.

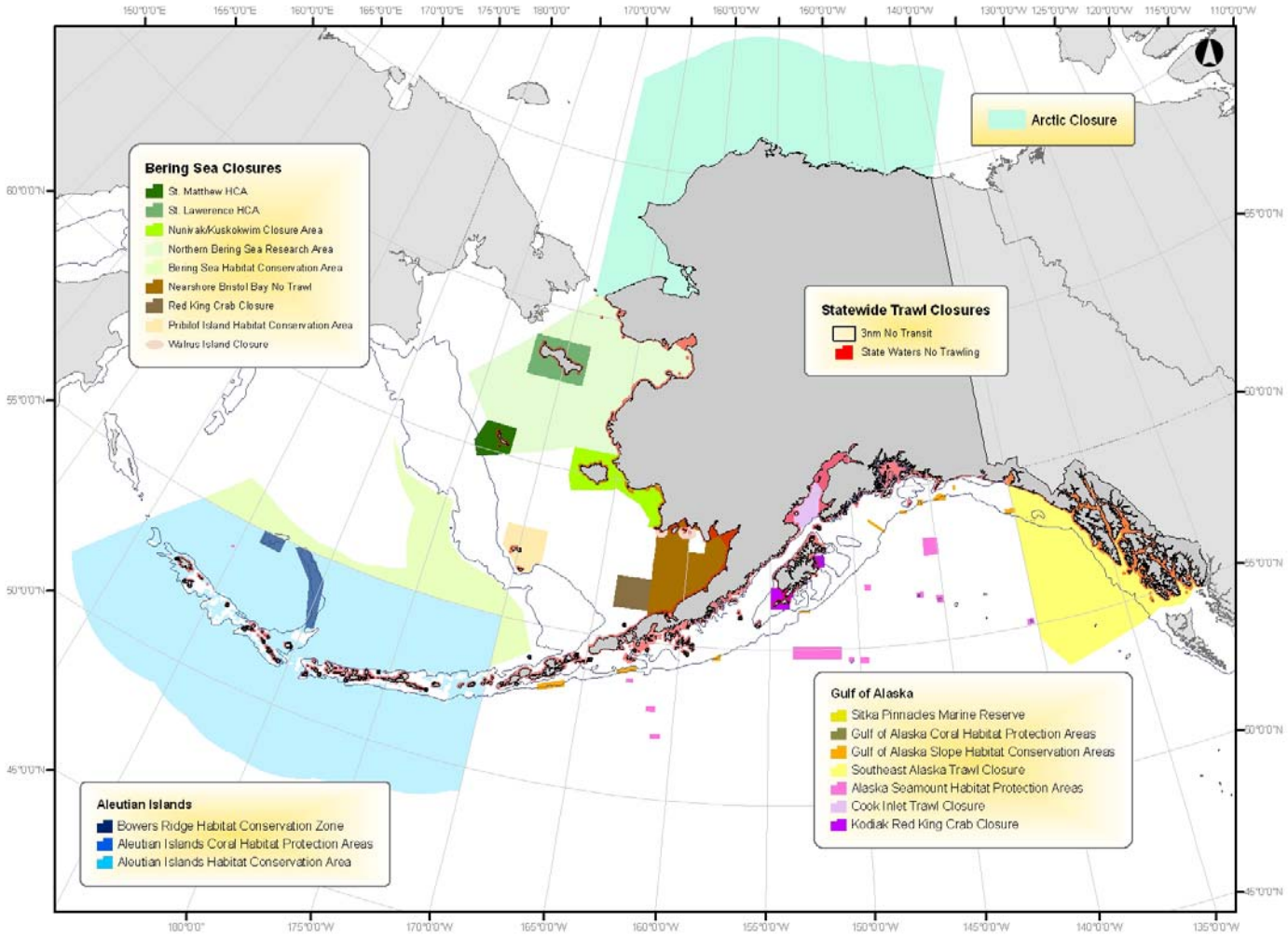
3.1 Action areas

Under Alternatives 2 and 3, the proposed gear modification requirement applies to non-pelagic trawl vessels targeting flatfish in the Bering Sea subarea. Section 3.1.1 identifies the areas of the Bering Sea that are open to non-pelagic trawling, and Section 3.1.2 looks specifically at the distribution of the flatfish fisheries in recent years. Section 3.1.3 identifies the Modified Gear Trawl Zone evaluated under Alternative 3, and Section 3.1.4 describes the St Matthew Habitat Conservation Area that is addressed under the SMIHCA option.

3.1.1 Areas of the Bering Sea open to non-pelagic trawling

The proposed trawl sweep modification included in Alternatives 2 and 3 of this analysis would apply to non-pelagic trawl fishing that targets flatfish in Federal waters of the Bering Sea (3-200 nm). Under the status quo, various time and area closures are in place to regulate where non-pelagic trawl fishing may occur. Figure 5 illustrates the current area restrictions for non-pelagic fishing in the Bering Sea; these are also described below.

Figure 5 All non-pelagic trawling closures in the Alaskan exclusive economic zone.



Source: J. Olson, NMFS Alaska Region.

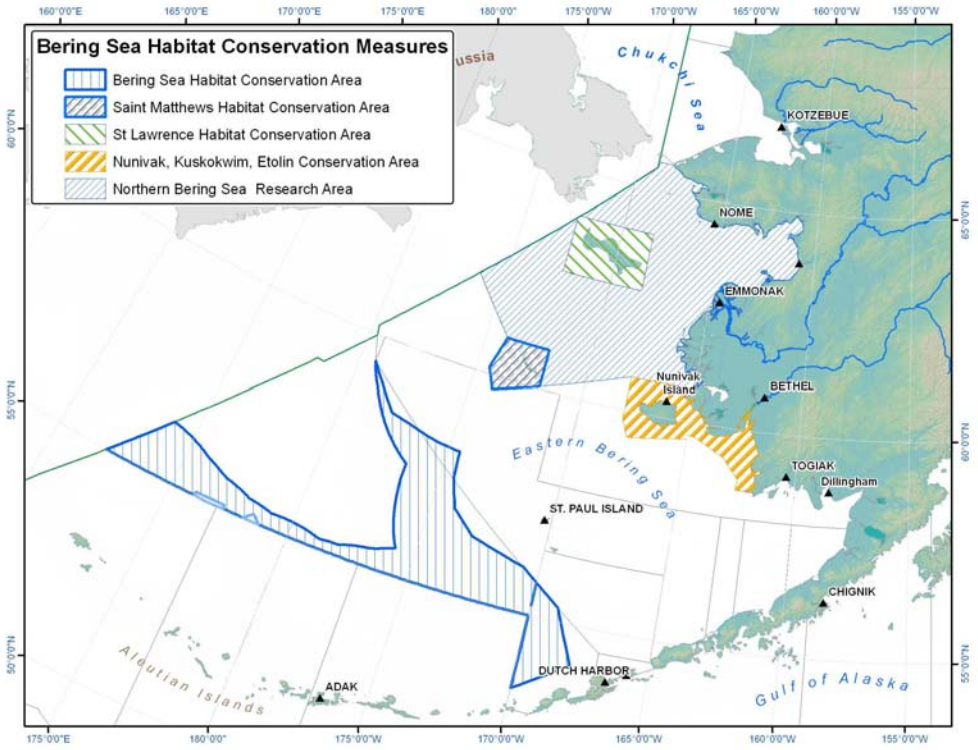
Habitat Conservation Areas and the Northern Bering Sea Research Area (Amendment 89)

In 2008, the Council adopted Amendment 89 to the BSAI groundfish FMP to establish Bering Sea habitat conservation measures. The Council's action was deemed necessary to protect portions of the Bering Sea subarea bottom habitat from the potential adverse effects of nonpelagic trawling. This amendment prohibits nonpelagic trawling in certain areas of the Bering Sea subarea to protect bottom habitat from the potential adverse effects of nonpelagic trawling (Figure 6). The Habitat Conservation Areas created under this amendment are:

- Nunivak Island, Etolin Strait, and Kuskokwim Bay Habitat Conservation Area
- St Matthew Island Habitat Conservation Area
- St Lawrence Habitat Conservation Area

The amendment also established the Northern Bering Sea Research Area (NBSRA) for studying the impacts of nonpelagic trawling on bottom habitat.

Figure 6 **Bering Sea Habitat Conservation Measures from Amendment 89**



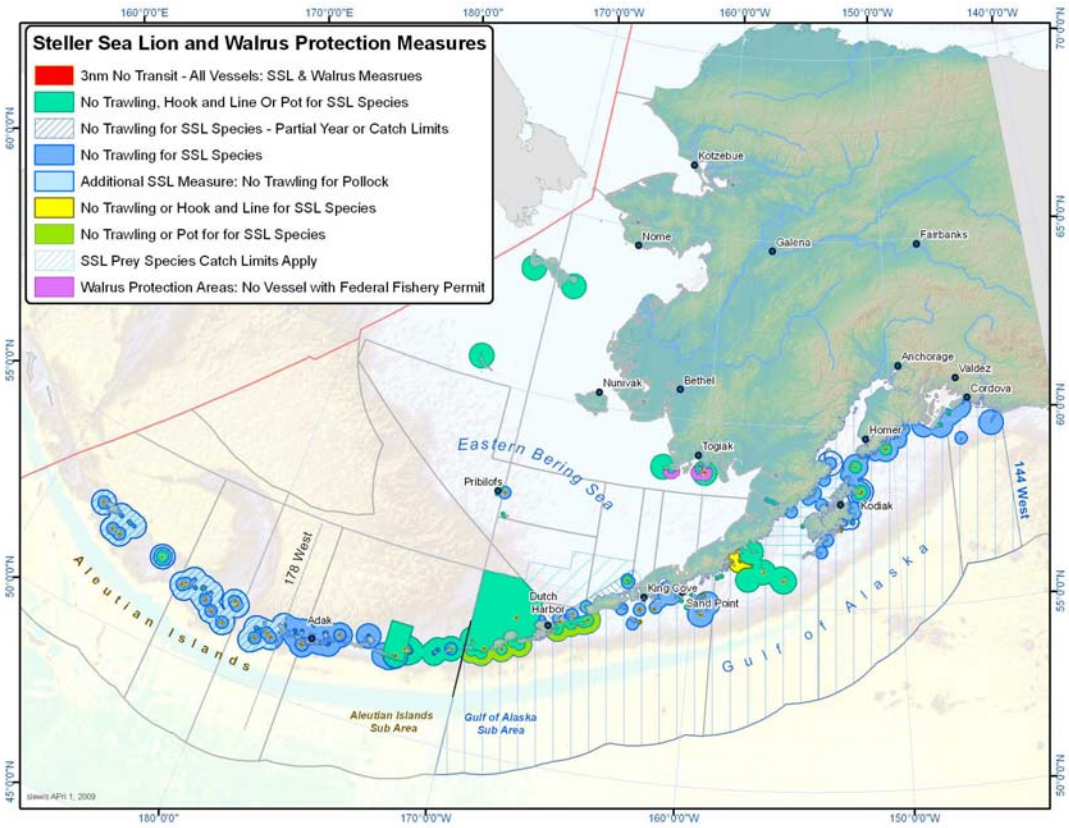
Steller sea lion closures

Cape Newenham and Round Island are Steller sea lion haulouts, are designated Steller sea lion critical habitat, and have 20 nm closures year round for pollock and Atka mackerel trawl, and Pacific cod trawl and fixed gear, fisheries. These closures overlap other closures in northern Bristol Bay. Steller sea lion closed areas are Federal groundfish fishery mitigation measures, and are mirrored in adjacent State waters through an annual Emergency Order issued by the State at the beginning of the calendar year. State waters within the 20 nm Steller sea lion protection areas around Round Island and Cape Newenham are closed to fishing for Steller sea lion prey species (pollock, Pacific cod, and Atka mackerel) (Figure 7).

Walrus Islands closure (Amendments 13 and 17)

All Federally-permitted vessels, including fishing vessels and fishing support vessels, are prohibited from entering or transiting closed areas around the Walrus Islands (Round Island and The Twins) and Cape Peirce in northern Bristol Bay. The closures extend out 3 to 12 nm, and occur during the period April 1-September 30 (Figure 7). The prohibition was implemented under Amendment 13 in 1990, and adopted permanently under Amendment 17 in 1992. This measure was put into place to reduce disturbance to walrus that inhabited these haulout areas, particularly responding to concerns raised by the public and the USFWS over noise emitted by fishing activities of the joint venture yellowfin sole fishery and apparent correlations between increased noise and observed declines in numbers of walrus using haulouts in northern Bristol Bay.

Figure 7 Steller sea lion and walrus protection measures



Nearshore Bristol Bay Trawl Closure Area (Amendment 37)

Implemented January 1, 1997, Amendment 37 prohibits all trawling year round in the Nearshore Bristol Bay Trawl Closure (NBBTC) area, specifically all waters east of 162 ˚ W, with the exception of a small area just south of Togiak called the Nearshore Bristol Bay Trawl Area that remains open to trawling April 1 to June 15 (Figure 5). This closure is to protect juvenile red king crab habitat while at the same time allowing trawling in an area known to have high catches of flatfish and low bycatch of other species (Witherell and Pautzke 1997). The area north of 58˚ 43’ N was closed to reduce bycatch of herring. The April 1 – June 15 period was chosen to avoid bycatch of halibut which move into the nearshore areas in June. Amendment 37 also requires that any catcher vessel or catcher processor used to fish for groundfish in the trawl closure area must carry an observer during 100% of its fishing days in which the vessel uses trawl gear.

Pribilof Island Habitat Conservation Area (Amendment 21a)

All trawling is prohibited at all times within the Pribilof Island Habitat Conservation Area (Figure 5). The purpose of the amendment was to eliminate trawl activities in areas of importance to blue king crab and Korean hair crab stocks, so that the stocks could rebuild. Additionally, the closures was intended to reduce bycatch of juvenile halibut and crab, and mitigate and unobserved mortality or habitat modification that occurred due to trawling.

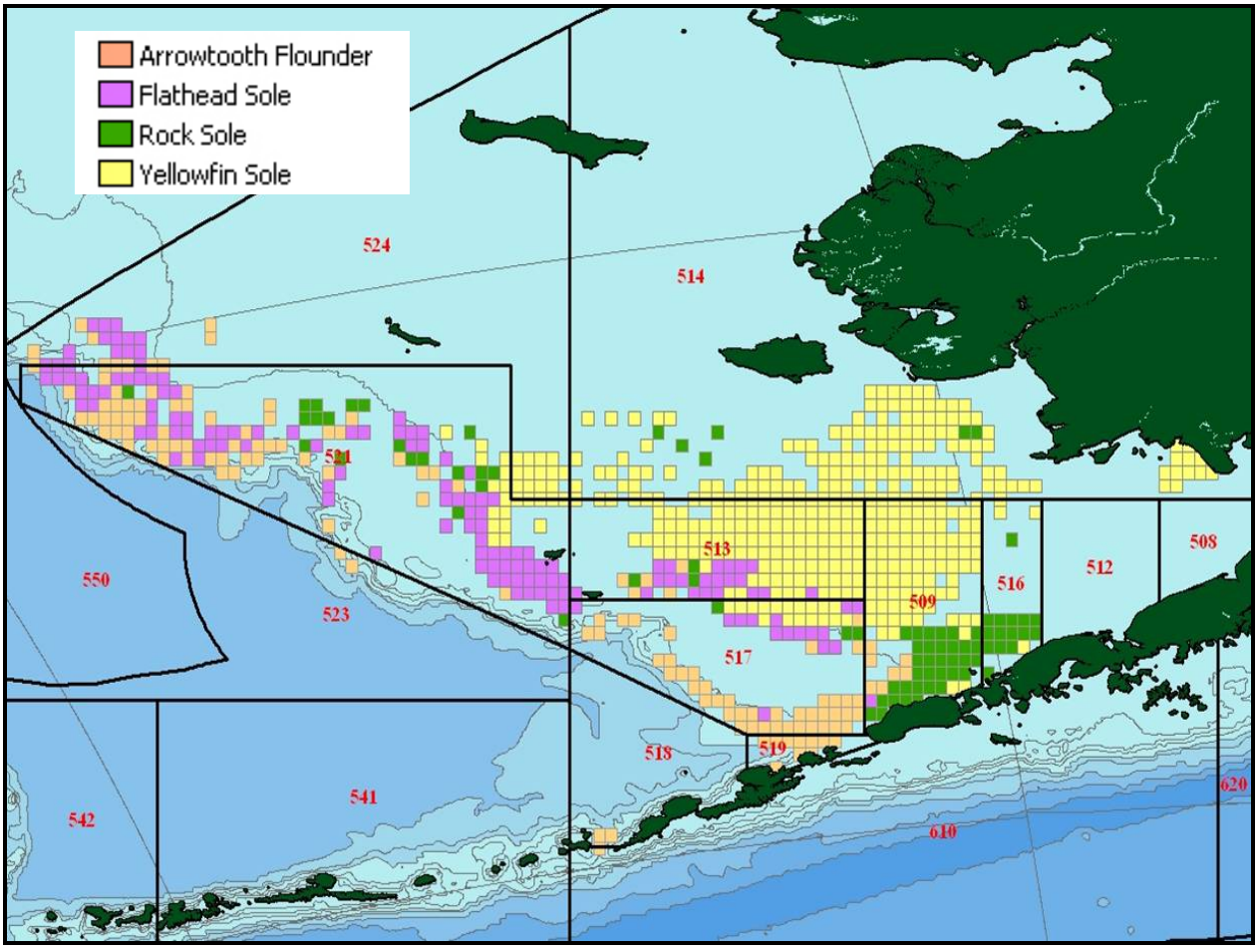
3.1.2 Distribution of the flatfish fisheries

Flatfish species that are targeted in the Bering Sea are the following:

- Yellowfin sole
- Flathead sole
- Alaska plaice
- Rock sole
- Arrowtooth flounder
- Greenland turbot
- 'Other flatfish' (a management category that includes: Arctic flounder, butter sole, curlfin sole, deepsea sole, Dover sole, English sole, longhead dab, Pacific sanddab, petrale sole, rex sole, roughscale sole, sand sole, slender sole, starry flounder, Sakhalin sole)

Figure 8 illustrates the spatial distribution of the BSAI flatfish fisheries for 2008.

Figure 8 Distribution of the BSAI flatfish fishery in 2008.



Source: NMFS catch accounting division.

3.1.3 Proposed Modified Gear Trawl Zone

The NBSRA was closed to non-pelagic trawling as part of Amendment 89, the Bering Sea Habitat Conservation measures, to create a research area where minimal fishing occurs, in order to facilitate the

study of the potential effects of nonpelagic trawling on Bering Sea benthic habitat. The Council indicated, in their final motion on Amendment 89, that a small portion of the NBSRA, referred to in the motion as the "wedge", may be reopened following implementation of the gear modification requirement for flatfish fishing. Figure 1, on page 5, illustrates the maximum extent of the area that may be re-opened under Alternative 3. While the northern, eastern, and southern boundaries of the area are fixed, the western boundary may move eastward, depending on the Council's decision with respect to the SMIHCA option included in this analysis. The Modified Gear Trawl Zone will abut the eastern boundary of the St Matthew Island HCA, wherever that boundary is located.

3.1.4 St Matthew Island Habitat Conservation Area

The St Matthew Island HCA was established under Amendment 89, and is illustrated in Figure 6 on page 12. Under the SMIHCA option in this analysis, the Council will re-evaluate the boundaries associated with the HCA, to ensure that the Council's intent to protect blue king crab is being adequately met by the HCA. The Crab Plan Team is being asked to provide input on this issue. The eastern boundary of the St Matthew Island HCA, adjusted if necessary, will abut the Modified Gear Trawl Zone proposed under Alternative 3.

3.2 Traditional and modified non-pelagic trawl flatfish gear

Section 3.2.1 describes traditional non-pelagic trawl gear as used for targeting flatfish. Section 3.2.2 proceeds to explain the proposed modifications that would be regulated under Alternatives 2 or 3. Section 3.2.3 provides a description of the research that has been undertaken to develop the modified gear, and its effects on benthic habitat and target fish catchability.

3.2.1 Description of traditional non-pelagic trawl flatfish gear

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.

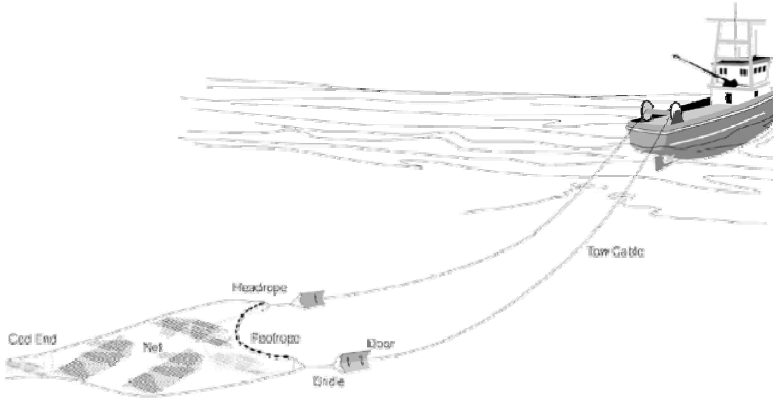
The yellowfin sole fishery is prosecuted with otter trawls (Figure 9) rigged to fish effectively for flatfish, which live on or very near the substrate. Approximately 20 to 30 trawl catcher-processor vessels are currently involved with this fishery in the eastern Bering Sea. Typical vessel length overall (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 to 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 to 18 inches in diameter, strung on chain or wire at 18 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 to 200 ft.

Figure 9 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.

3.2.2 Proposed gear modification to the trawl sweeps

This amendment evaluates the implementation of a requirement for the flatfish trawl fishery to use elevated devices on their trawl sweeps, in order to raise the sweep off the seafloor and reduce damage to habitat (Figure 10). One of the challenges with implementing this requirement has been to develop a gear modification design that both reduces the gear's contact with the seafloor and yet maintains fishing productivity. This issue has largely been addressed at this point through the research and field testing of Dr. Craig Rose and Mr. John Gauvin (see Section 3.2.3).

Dr. Rose and scientists from the Alaska Fisheries Science Center (AFSC) Resource Assessment and Conservation Engineering (RACE) Division have been working with the fishing industry, notably Mr. Gauvin and the Head and Gut Workgroup, to modify groundfish trawls to reduce their effects on the seafloor environment. Elevating devices were added to trawl sweeps and were tested for their

effectiveness at reducing effects on sessile seafloor animals on unconsolidated (sand – mud) substrates. For most Bering Sea flatfish trawls, sweeps are so long (up to 1500 ft) that they sweep 90% of the area covered between the trawl doors (Figure 11). The proposed modifications elevate most of the sweep area 2 to 3 inches above the substrate, allowing space for animals to pass beneath. In field testing, these modifications have proven effective at reducing effects on basketstars and sea whips, and did not substantially reduce catches of target flatfish.

Figure 10 Examples of elevating devices

10 inch elevating bobbin connected to 2 inch (52mm) combination wire with hammerlocks (coupling links)

8 inch elevating discs mounted on body of 2 inch (52mm) combination wire with stopper swages each side

3.2.3 Research results from experimentation with the proposed gear modification

The information in this section is abbreviated from Dr Rose's summary of current gear research, Appendix B in the Amendment 89 EA/RIR/IRFA, and from his and John Gauvin's presentations to the Council in June 2008. This research investigated two questions:

1) whether modified sweeps still herded flatfish effectively, resulting in similar catch rates to those taken with conventional gear, and

2) whether the modifications reduced damage to animals that provide habitat structure on the sand and mud substrates where flatfish fisheries are conducted.

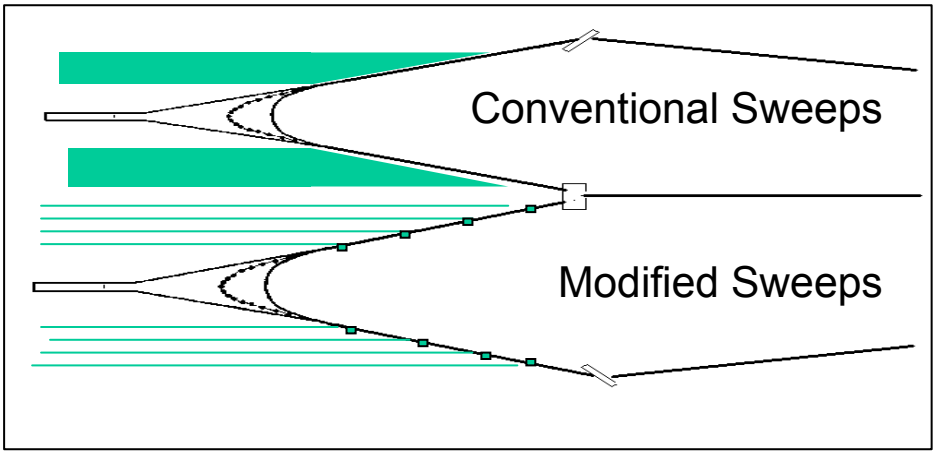
Modified sweeps had clusters of 6 inch, 8 inch, or 10 inch diameter disks lifting the sweep cables above the seafloor, creating a nominal clearance (the space created under the sweeps adjacent to the elevating device, measured on a hard surface) of 2, 3, or 4 inches. Actual clearance is influenced by nominal clearance, the degree to which the elevating device sinks into soft sand or mud, and the degree to which the sweep sags in the span between elevating devices. In contrast, 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. The original 2006 research attached the disks at 30 ft intervals on the sweep. Results with the different clearances were used to select a configuration that provided the best balance of reduced damage and effective herding.

Effects on flatfish capture

Herding tests were conducted with a twin trawl system (Figure 11), fishing two identical trawls simultaneously, side-by-side with different sweep configurations. The resulting catches were then compared to test whether the sweep modifications reduced flatfish capture. Sixty one successful tows

were completed, 19 with the 6 inch disks, 26 with the 8 inch disks and 16 with the 10 inch disks. The ratio of flatfish catches (modified vs. conventional) did not change significantly using either of the two smaller sized disks (Figure 12), while the 10 inch disks decreased rock sole and flathead sole catches by 11% and 5% respectively. Interestingly, pollock catches increased by 12 % with both of the larger disk sizes. Flatfish catches were allocated to 3 or 4 size classes, depending on species, to test for size selectivity (Figure 13). Comparisons by size class did not detect differences from overall catch ratios for any of the flatfish species. A manuscript based on these studies has been submitted to Fisheries Bulletin.

Figure 11 **Schematic of a twin trawl system, showing the concept of reducing bottom contact area of sweeps by limiting contact to disk clusters. Figure is not drawn to scale.**



Source: C. Rose, NMFS Alaska Fisheries Science Center.

Figure 12 **Ratios of catch rates with and without 6 – 10 inch diameters disk clusters placed at 30 foot spacing**

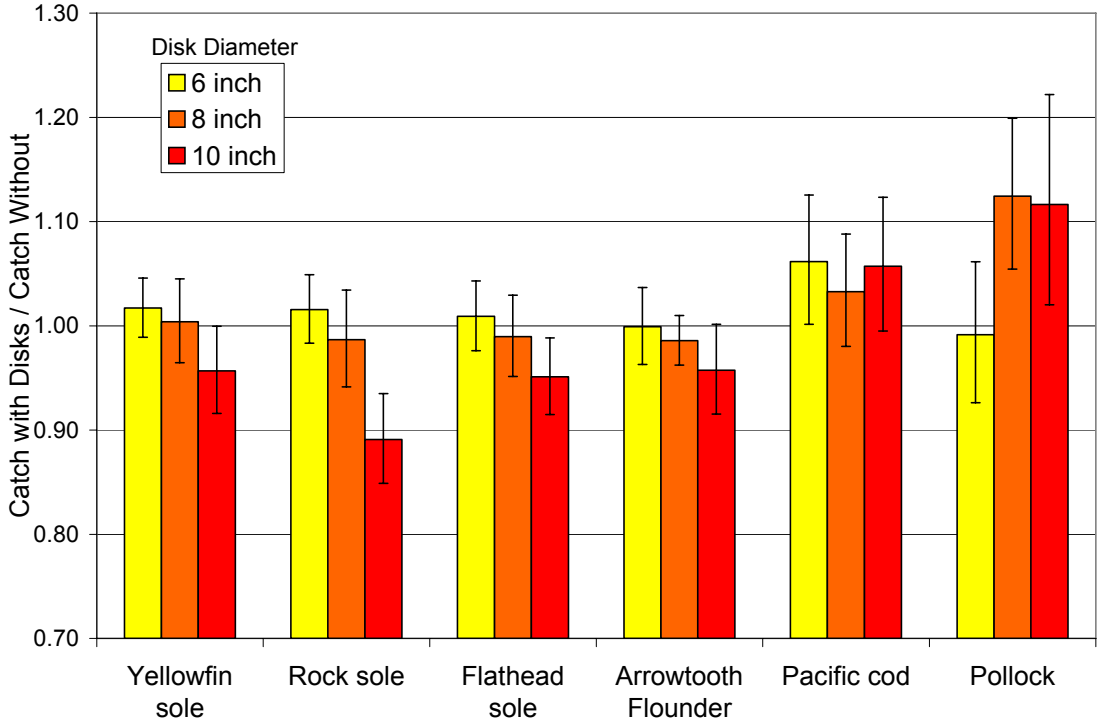
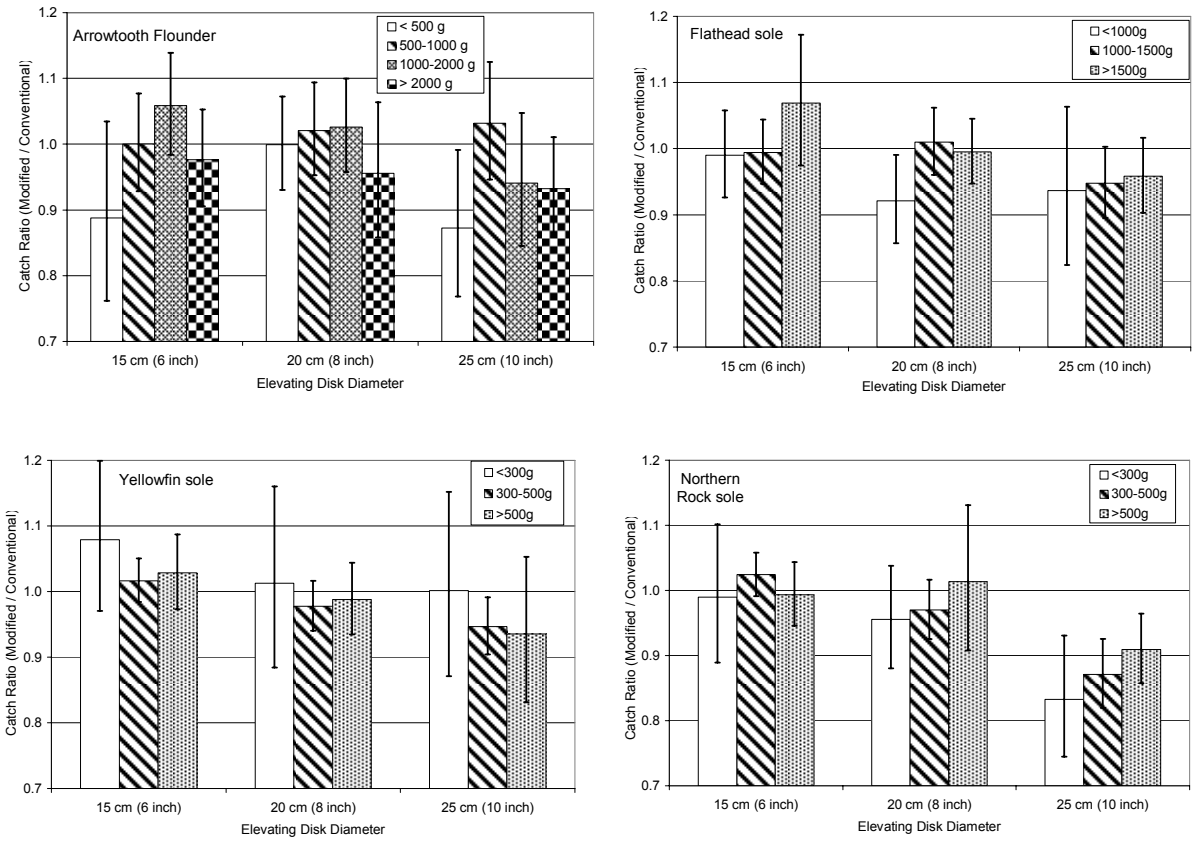


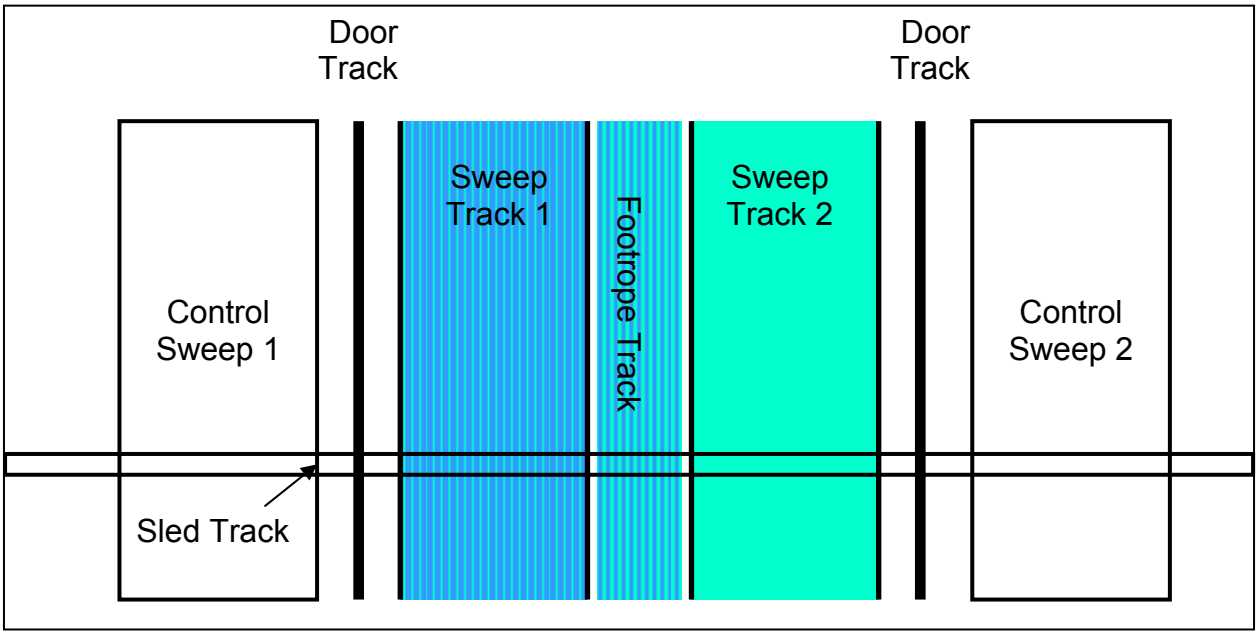
Figure 13 Ratios of catch rates by size classes with and without 6 – 10 inch diameters disk clusters placed at 30 foot spacing



Effects on damage to seafloor invertebrates

To examine how modifications affected damage to seafloor animals, the researchers created a series of parallel trawl tracks using a range of modified and conventional sweeps. One to two days later, a seafloor sled with both sonar and video sensors was towed across all of the parallel trawl tracks at several points to compare the condition of seafloor animals in areas affected by these different gears, as well as control areas between tracks (Figure 14). The imagery was analyzed to quantify the proportions of structure-forming invertebrates with specific kinds of damage. For example, sea whips damage classes included those laid flat on the substrate, and those with broken supporting rods or damaged polyps. Basketstar damage was classified into two levels based on the degree to which their filtering and supporting arms were retracted. While sponge breakage could not be directly observed, due to their irregular shapes, they were classified by size and the data examined for an increase of smaller colonies.

Figure 14 Illustration of the sled sampling of trawl tracks



Source: C. Rose, NMFS Alaska Fisheries Science Center.

During the summer of 2007, researchers extended the tests of effects on sea whips to examine the potential for recovery or delayed mortality. Preliminary results of 2006 studies focused research on the 8 inch disks modifications that provided some damage reduction while maintaining catch rates. While the 2006 study only assessed damage after 1 – 2 days, 2007 work also compared effects after approximately one week, one month and one year. As in 2006, a seafloor sled was towed across trawl tracks that included areas affected by conventional and modified sweeps. Areas covered by different gear components were identified using a sonar recording device aboard the sled and sea whip conditions were assessed from video images. The proportions of damaged seawhips in affected areas were compared with those in control areas immediately outside of the trawl tracks, as well as between those of the conventional and modified sweeps. VMS records were examined to assure that the area was not trawled by any other commercial fishing operations between trawl tows and sled tows.

Short-term evaluations of immediate effects could ignore bare rods left from sea whips that had died previously (Figure 15). After a day or a week, recently damaged sea whips were easily distinguished from rods remaining from prior mortalities. However, after a month or a year these could not be separated. Therefore, comparisons of day and week effects (Figure 16) did not count bare rods, while those across all time periods (Figure 17) included these bare rods in the total counts of sea whips used to calculate proportions of undamaged sea whips.

Figure 15 **A bare rod remaining after decomposition of a sea whip (left) and a sea whip flattened by recent passage under a trawl (right)**

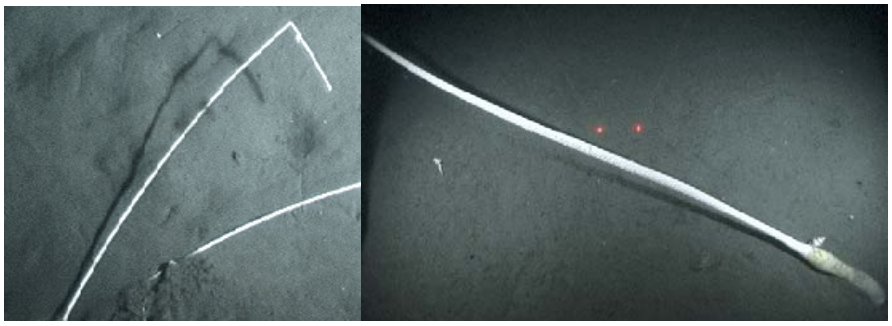


Figure 16 and Figure 17 show the proportions of upright and undamaged sea whips in the control, conventional sweep and modified sweep areas for each of the time periods. Sample units for these tests were data from each crossing of a gear track with the seafloor sled. The relationships between these proportions were similar for the day, week and month periods, with more normal sea whips in the control area than in either affected area and more in the modified sweep area than that for conventional sweep. Comparisons across time periods within gear types (control, conventional and modified sweeps) were all non- significant. In spite of an apparent drop in percentage for the one year period, differences among conventional sweeps were not statistically significant (p=0.16), though a low sample size for that period (18) made this a relatively weak test.

Figure 16 **Percentage of normal seawhips after passage under modified and unmodified trawl sweeps (compared to control area) with sample sizes in each bar and significance test results between bars (n.s. – p>0.05, *** - p < 0.001). Bare rods not included in counts.**

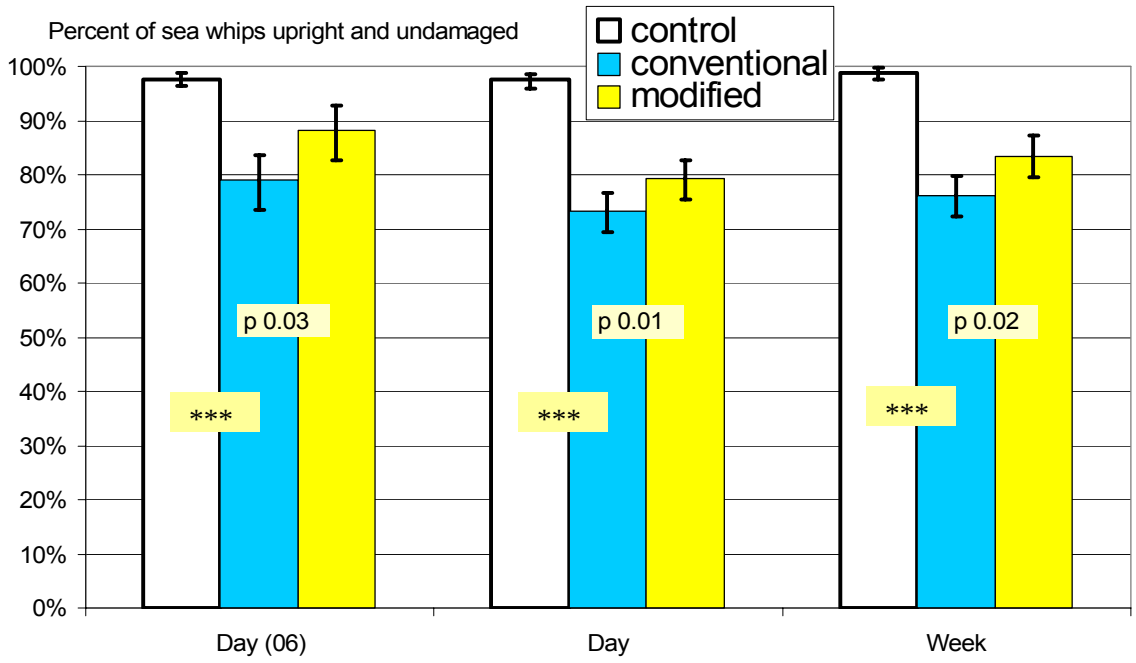
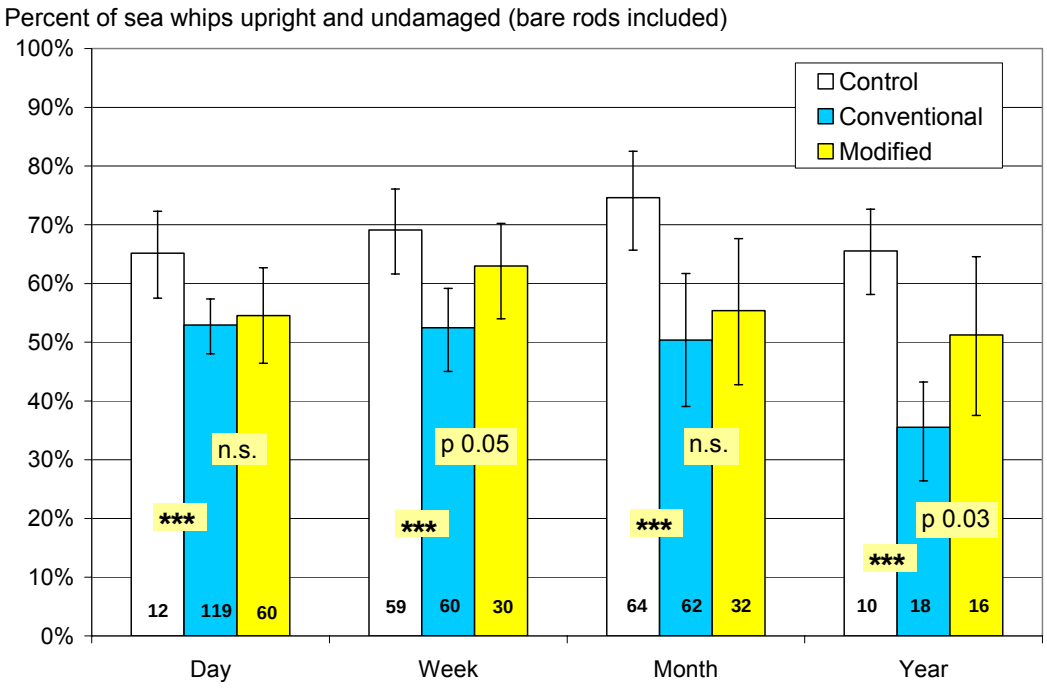


Figure 17 **Percentage of normal seawhips after passage under modified and unmodified trawl sweeps (compared to control area) with sample sizes in each bar and significance test results between bars (n.s. – p>0.05, *** - p < 0.001). Bare rods included in counts.**

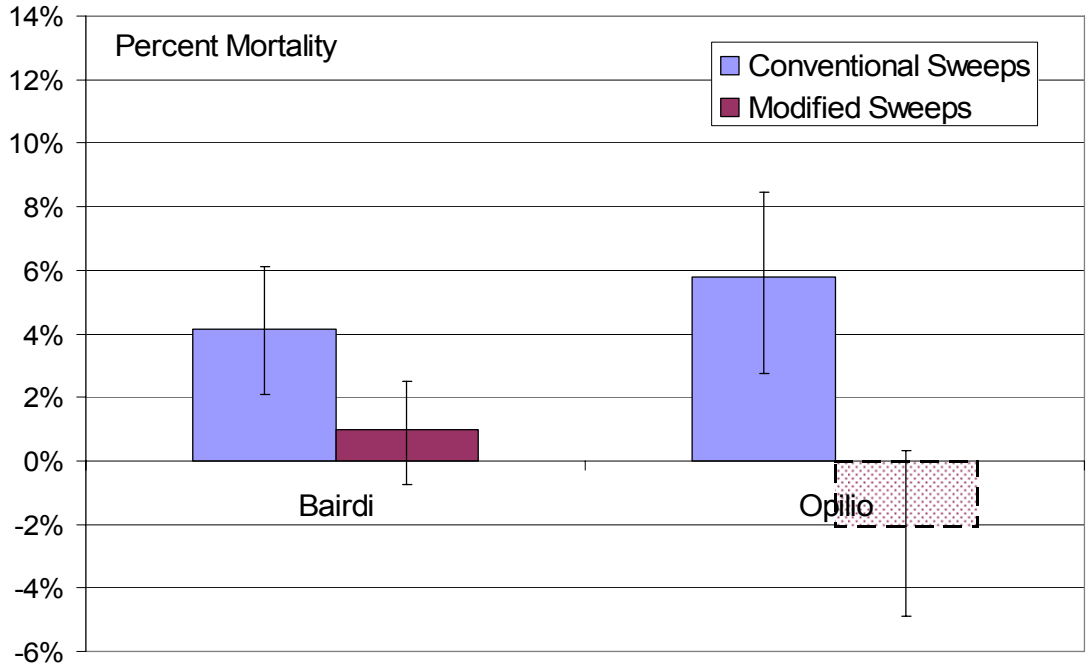


Effects on Crab Mortality

In the summer of 2008, researchers conducted a study, funded by the North Pacific Research Board, to estimate the mortality rates for snow and Tanner crabs that encounter bottom trawls, but remain on the seafloor. That study estimated mortalities for both species for conventional and modified sweeps. Briefly, crabs were captured by auxiliary nets fished behind different parts of a commercial bottom trawl. They were carefully brought aboard and assessed using a six part reflex test. A subsample of those crabs was held for 5 – 12 days to establish the relation between reflex state and delayed mortalities. The proportions of crabs in different reflex states and the reflex-mortality relationship were used to estimate raw mortality rates for crabs encountering each part of the trawl. Results for crabs captured with a control net, fished in front of the trawl to serve as a scientific control for the effects of the recapture net itself, were used to assess and adjust for mortalities due to capture and handling. Sample sizes were 21 tows for conventional and modified sweeps and 19 tows of the control net.

Estimates of mortality for crabs encountering conventional sweeps were approximately 5% for both species (Figure 18). Mortality rates dropped to nearly zero for crab encountering the modified sweeps. Significance levels for these decreases (conventional versus modified) were 0.002 for *C. bairdi* and <0.001 for *C. opilio*. While overall crab mortality varied significantly by sex and size after gear effects had been accounted for, there were no significant interactions between these factors and gear effects. Thus, the mortality reduction due to the sweep modification persisted across sizes and sexes.

Figure 18 **Estimated mortalities of Chionoecetes opilio and C. bairdi after contact with conventional and modified sweeps. Rates have been adjusted for handling mortality based on mortality estimates from a control net. (Apparent negative mortality is a non-significant artifact of the control adjustment).**

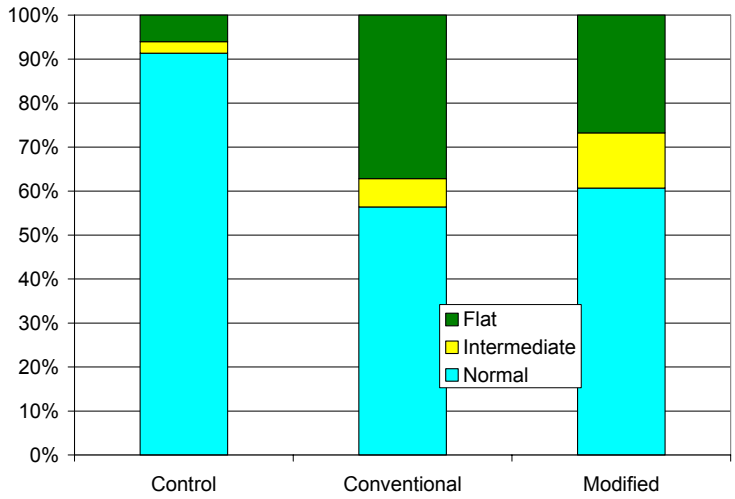


Results for other species

Tests were conducted on three other animals to examine the effects of modified sweeps. While these did not produce statistically significant results, all had effects in the direction of less damage with the modified sweeps. In addition, two similar experiments were conducted at two sites where the structural fauna was dominated by ascidians. Analyses of those data were thwarted by an inability to consistently classify those animals into damage categories. In comparison with the conditions of animals in the control areas, it was just not clear how or whether those invertebrates had been affected by either sweep configuration.

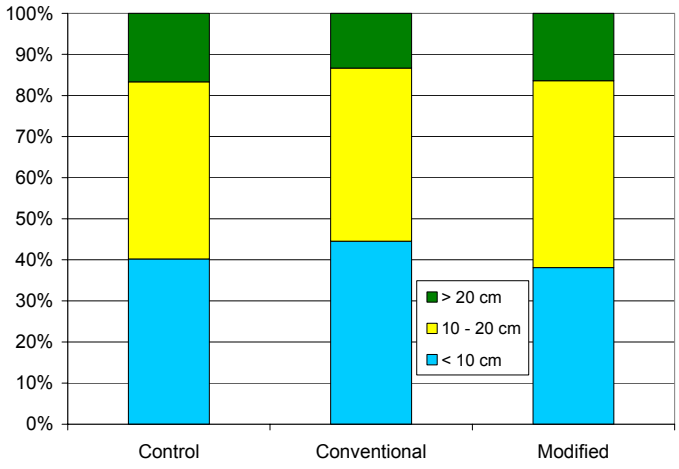
Basketstars (*Gorgonocephalus eucnemis*) were classified as normal if both filtering and support arms were extended, intermediate if only the filtering arms were withdrawn and flat if both sets of arms were substantially withdrawn. Twenty-four sled / track crossing were analyzed for both conventional and modified sweeps and compared with 144 control crossings (Figure 19). The conventional sweep areas had 57% normal, down from more than 90% in the control areas. The areas covered by modified sweeps had nominally more normal and fewer flat basketstars than those of the conventional sweeps.

Figure 19 **Proportions of different damage classes of basketstars in areas covered by conventional and modified trawl sweeps and adjacent control areas**



The major epifauna at a site in Bristol Bay was a species of sponge (*Halochondria* sp) that laid flat on the unconsolidated substrate. While some evidence of colonies being broken apart could be seen, particularly in the area covered by the trawl's footrope, it was not possible to distinguish a broken colony from two undamaged smaller colonies. Therefore, we classified the sponge colonies in three size classes and looked for a shift to smaller size as evidence of damage (Figure 20). Differences between all three classes were slight, though the control and modified areas had slightly more large colonies and slightly fewer small colonies than the areas covered by the conventional sweeps.

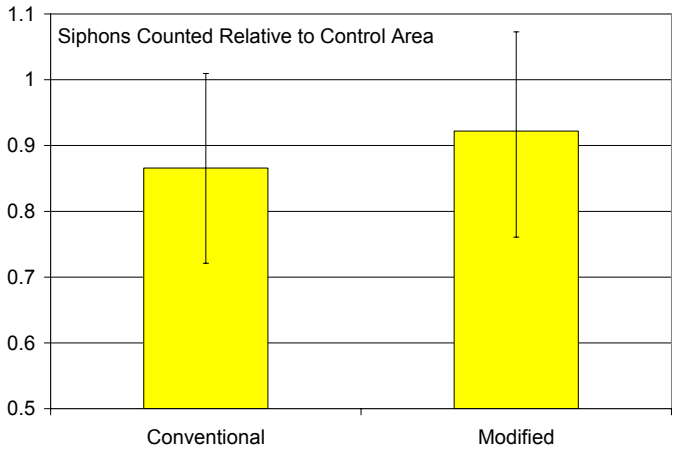
Figure 20 **Proportions of different size classes of sponge in areas covered by conventional and modified sweeps and adjacent control areas**



Finally, the same Bristol Bay site had small (1-2 cm diameter) siphons protruding from the seafloor. Grab samples from nearby areas by other projects indicated that these were most likely one or more species of polycheate worms. To examine possible effects on infauna, counts of visible siphons were made between two laser points 10 cm apart over comparable distances of control and sweep-covered areas (23 for each of conventional and modified). The ratio of these counts is shown in Figure 21. Neither was significantly

different than one, but the modified area was nominally closer to one than the areas covered by conventional sweeps.

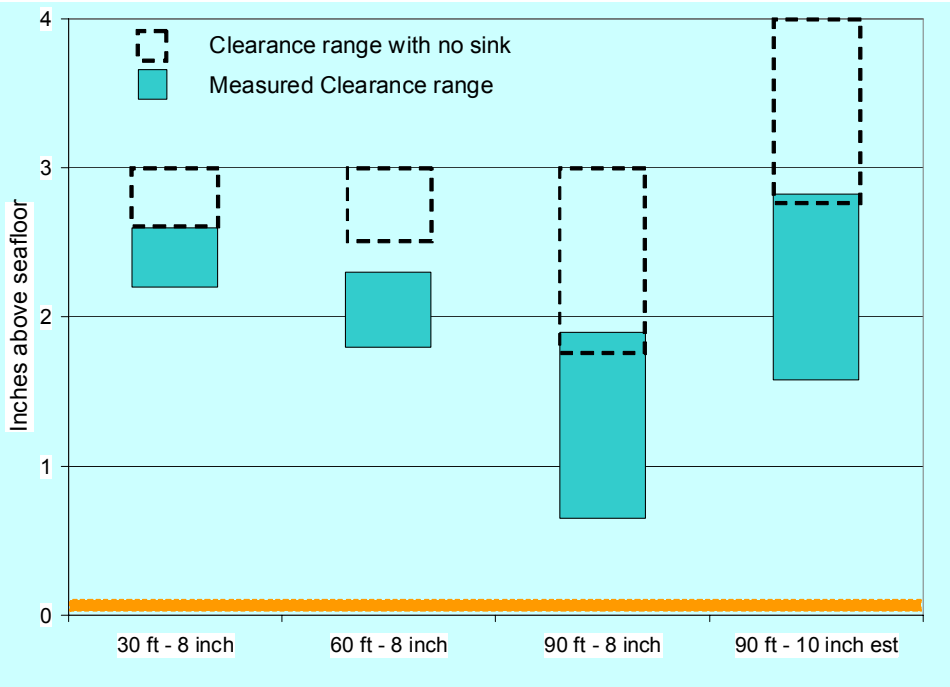
Figure 21 **Ratios of siphon abundances observed in areas covered by conventional and modified sweeps, relative to unaffected, adjacent control areas**



Effects of disk cluster spacing on seafloor clearance

Tests in 2007-08 tried to determine if the clearances achieved during the 2006 tests could be replicated while using a longer spacing between elevating devices (intervals of 45 feet, 60 feet, and 90 feet). It was recognized that longer spacings between elevating devices would be easier for fishers to work with, and would further reduce direct contact area, providing a similar actual clearance could be maintained. Clearance indicators were developed to measure actual clearances between the sweep material and the seafloor during operation. These indicators were installed at several points across the span between elevating devices. Indicators installed next to the elevating devices evaluated the degree of sinking (elevating devices may sink up to 0.5 inches into the mud), while those near the center of the span measured sag. Figure 22 illustrates various clearance ranges for the tested disk sizes and spacings. Dr Rose's general conclusion was that similar actual clearance to the 2006 tests could be achieved using elevating devices producing a 3 inch nominal clearance at 60 ft spacing (tested using 8 inch discs on 2 inch sweeps), and 4 inch nominal clearance at 90 foot spacing (10 inch discs on 2 inch sweeps). The 60 ft spacing achieved similar clearance to the 30 ft spacing, especially on firmer sediments (as illustrated by the boxes in dashed lines). At 90 ft spacing, the 10 inch bobbins provided significantly better clearance than the 8 inch bobbins.

Figure 22 **Clearance range of sweep at various elevation heights and spacings; also shows what clearance would be without accounting for the degree to which the elevation device (disk) sank into the seafloor.**



Source: C. Rose, NMFS Alaska Fisheries Science Center

All of these studies together indicate that the sweep modifications reduce damage to seafloor animals encountering them, while maintaining those with conventional sweeps. Since sweeps account for most of the area affected by Bering Sea bottom trawls, implementation of these modifications should be useful in reducing effects on habitat from flatfish fishing in that area.

3.3 Habitat types in the Bering Sea

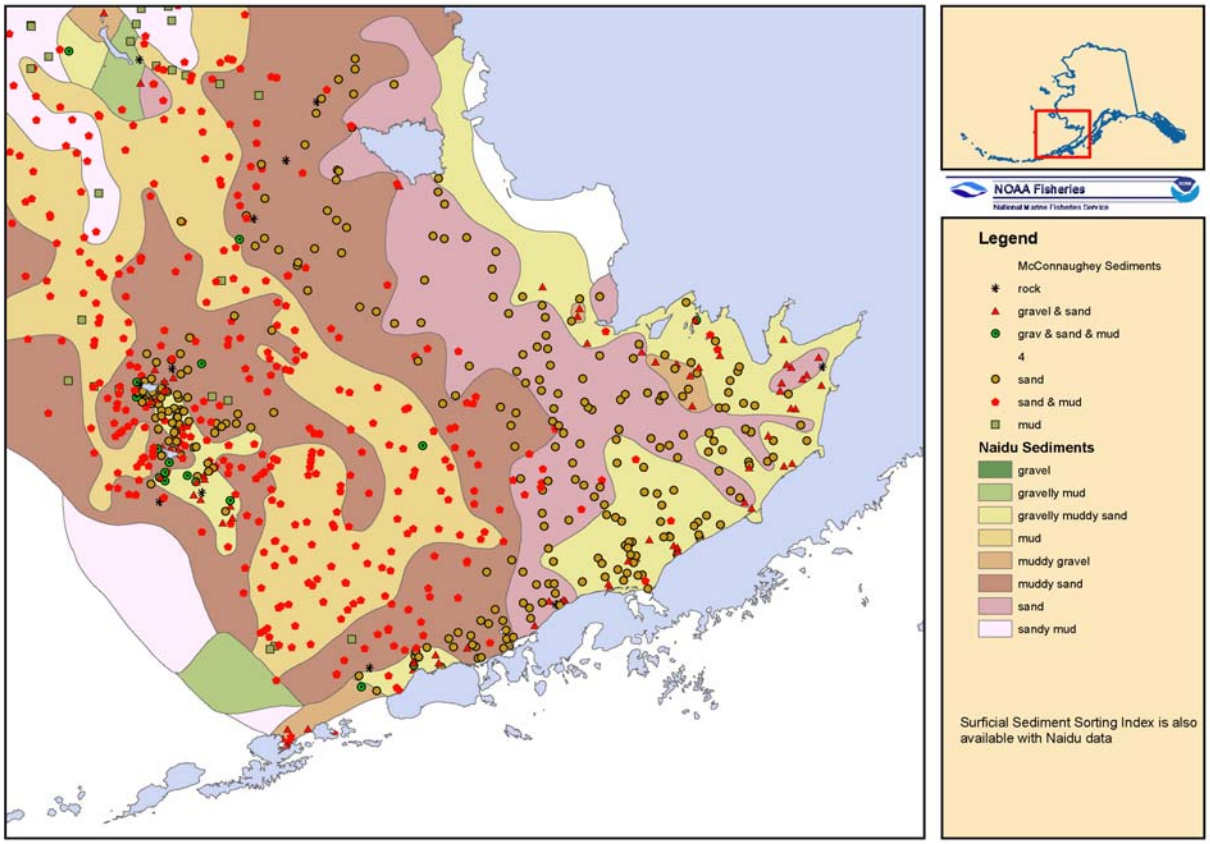
The Bering Sea is a semi-enclosed, high-latitude sea. Of its total area of 2.3 million square km, 44 percent is continental shelf, 13 percent is continental slope, and 43 percent is deep-water basin. A special feature of the Bering Sea is the pack ice that covers most of its eastern and northern continental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

The eastern Bering Sea 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 Bering Sea continental shelf in Bristol Bay and immediately westward.

The distribution of benthic sediment types in the eastern Bering Sea 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 Bering Sea shelf were classified in the EFH EIS (NMFS 2005) 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 23.

Figure 23 Available sediment data in the Bering Sea Source: Naidu and McConnaughey, NOAA Fisheries Alaska Fisheries Science Center



Source: Naidu and McConnaughey, NMFS, Alaska Fisheries Science Center

Nearshore areas of the central and northern Bering Sea have been studied. However many studies are dated (Hood and Calder 1981), narrowly focused to certain species, or not consistently sampled.

Historically, NOAA Outer Continental Shelf Environmental Assessment Program 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 Bering Sea FMP management boundary. Several sources reiterate the findings of these investigations (Louglin and Ohtani 1999) and synthesize these investigations. 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 from NOAA at http://response.restoration.noaa.gov/. 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 effect.

Essential Fish Habitat

The EFH EIS (NMFS 2005) 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. Descriptions of EFH for blue king and *C. opilio* crab are included in Section 3.4. More information on these and other species is available in the EFH EIS. 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 (NMFS 2005, 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 on 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 2. The relative contribution of the different Bering Sea target fisheries to these LEI values are shown in Table 3.

Table 2 Long-term effect indices (LEI in % reduction) for fishing effects on benthic habitat features of the Bering Sea.

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

Source: NMFS 2005 (EFH EIS, Table B.2-9)

Table 3 Long-term effect indices (LEI in % reduction) for nonpelagic trawl gear fishing effects on soft substrate biostructure of the Bering Sea by fishery.

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%**

Source: NMFS 2005 (EFH EIS, Table B.2-9)

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 (NMFS 2005). 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 EFH and HAPC Identification and Protection Measures is provided in the EFH EIS (NMFS 2005).

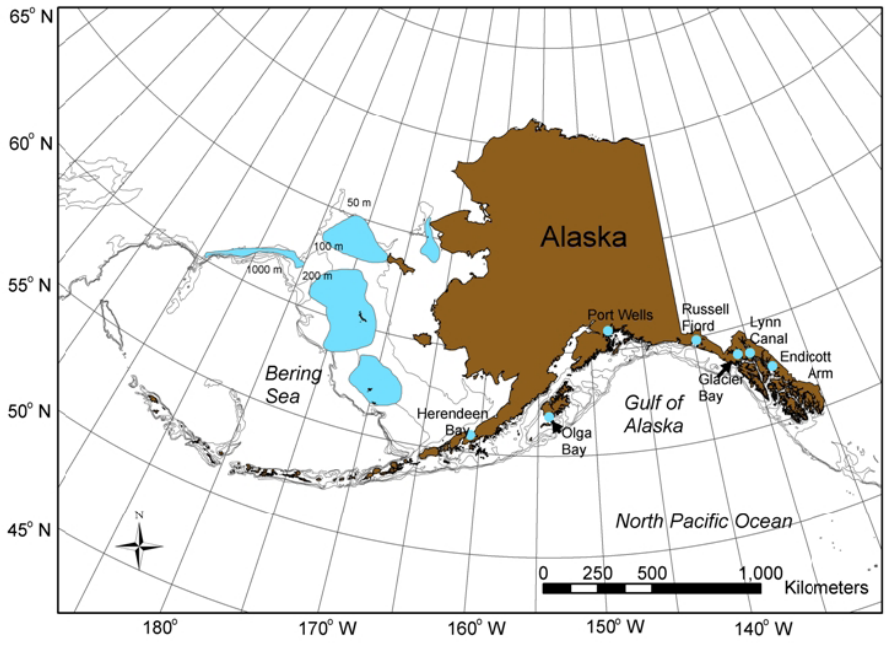
Measures included fishing equipment restrictions, marine protected areas, harvest limits, and effort controls. These measures were further augmented by the EFH and HAPC protection measures implemented in July 2006 (71 *FR* 36694, June 28, 2006). These measures established new and expansive marine protected areas in the Aleutian Islands and Gulf of Alaska. To date, over 655,162 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. Amendment 89 implemented in August 2008 provided additional bottom habitat protection in the Bering Sea (73 *FR* 43362, July 25, 2008). Figure 5 identifies the year-round non-pelagic trawl closure areas to protect bottom habitat off Alaska.

3.4 Distribution of crab

3.4.1 Blue king crab

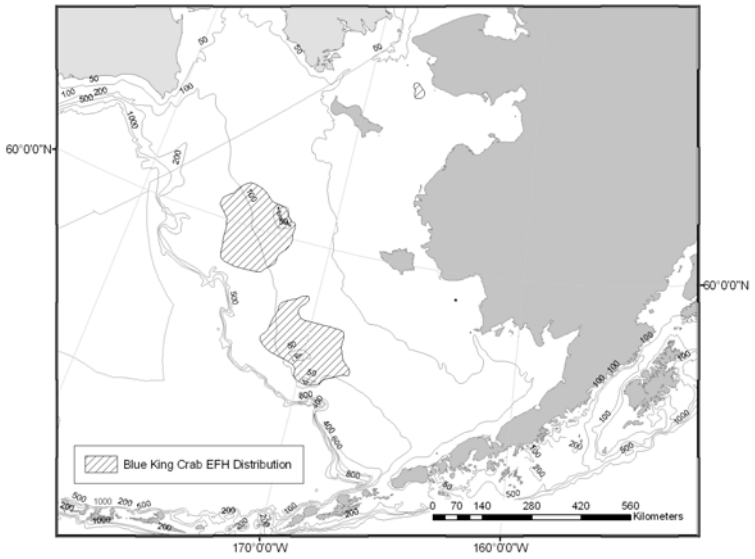
Blue king crab (*Paralithodes platypus*) has a discontinuous distribution throughout their range (Hokkaido Japan to Southeast Alaska). In the Bering Sea, discrete populations exist around the Pribilof Islands, St. Matthew Island, and St. Lawrence Island. Overall distribution of blue king crab in the Bering Sea, Aleutian Islands, and Gulf of Alaska is mapped in Figure 24; the area that has been designated essential fish habitat for blue king crab adults is in Figure 25. 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 width (CW), 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 CW 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.

Figure 24 **Distribution map of blue king crab *Paralithodes platypus* in the Gulf of Alaska, Bering Sea, and Aleutian Islands waters.**



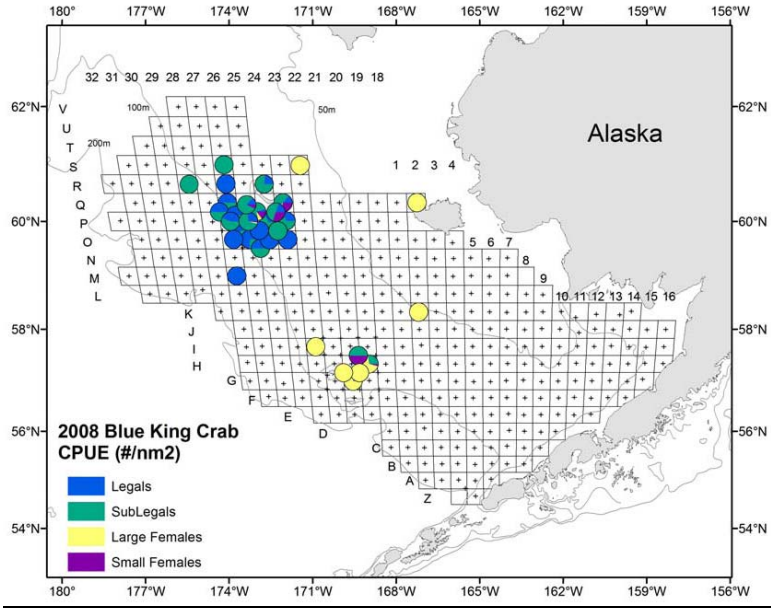
Source: Zheng et al. 2009.

Figure 25 Essential fish habitat distribution of BSAI blue king crab adults



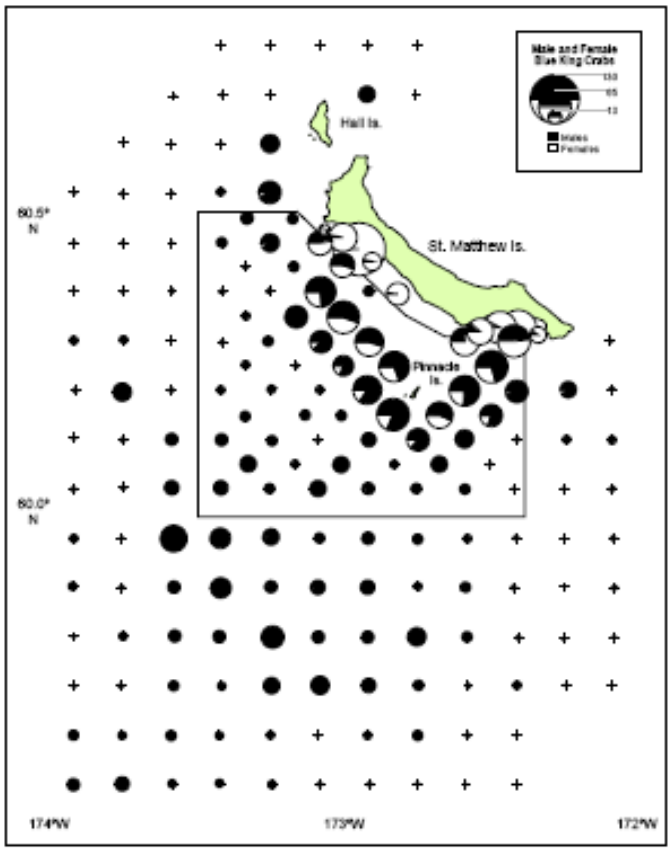
This stock is annually surveyed by the NMFS Crab/Groundfish annual trawl survey in July. The eastern Bering Sea survey area is divided into 20 nm by 20 nm squares that represent stations. In recent years, the surveys have sampled more in the northwest portion of the eastern Bering Sea. Figure 26 shows the 2008 survey distribution of blue king crab by gender and size class. 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. Catch per unit effort distribution of male and female crab from the 2007 NMFS survey in the vicinity of St. Matthew Island is shown in Figure 27.

Figure 26 2008 EBS trawl survey size class distribution of blue king crab



Source: NPFMC 2008b.

Figure 27 **Male and female blue king crab catch per unit effort (CPUE) by station in the 2007 St Matthew Island survey.**



Source: Watson 2008.

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 trawl survey to assess the stock. ADF&G performed a triennial pot survey for St. Matthew Island blue king crab in 1995, 1998, 2001, 2004, and 2007 (Watson 2008), which is able to sample from important blue king crab habitat (particularly for females) that cannot be sampled in trawl surveys. Additionally, only a small portion of the trawl survey effort in the St. Matthew Island section occurs within the area where the commercial fishery typically operated or, apparently, in the area where the crabs that are most likely to be harvested tend to inhabit preseason (Pengilly and Watson 2004). Slight changes in distribution of stock components from year to year could affect the sensitivity of 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; Table 4). It has since remained closed. The stock was declared overfished in 1999 and a rebuilding plan was implemented in 2000. This stock remains in an "overfished" condition. Survey estimates for St. Matthew Island blue king crabs indicated dramatic declines of both male and female crabs in all size categories in 1999 (Table 4). Over time, mature male biomass has fluctuated greatly in three waves. The first pulse increased from 7.6 to over 17.6 million lbs from 1978 to 1981, followed by a steady decrease to 2.9 million lbs. in 1985. The second pulse had a steady increase from the low in 1985 to 13.3 million lbs. in 1997 followed by a rapid decrease to 2.8

million lbs. in 1999. The third pulse had a steady increase from the low in 1999 to it present high of over 10.7 million lbs. in 2008.

Table 4 St. Matthew blue king crab fishery harvest relative to harvest strategy target and guideline harvest level (GHL), 1993-2008.

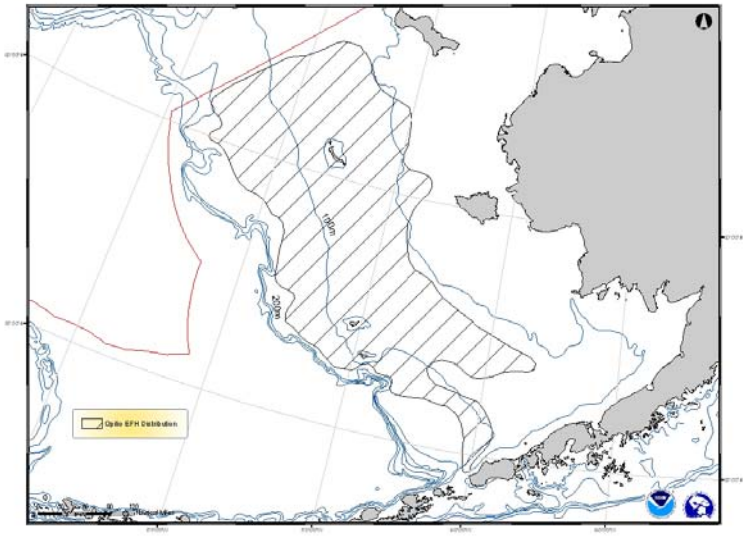
Fishery Year	Number of mature male crab[a] (in millions)	Harvest strategy target[b]	Actual harvest target[c]	Number of crab harvested (in millions)	Pounds of crab harvested (in millions)	GHL[d] (millions of pounds)
1993	5.105	20%	16%	0.63	3.00	4.4
1994	3.556	20%	20%	0.83	3.76	3.0
1995	2.929	20%	17%	0.67	3.17	2.4
1996	4.957	20%	15%	0.66	3.08	4.3
1997	6.018	20%	20%	0.94	4.65	5.0
1998	4.509	20%	15%	0.63	2.87	4.0
1999	0.779	Fishery closed				
2000	1.025	Fishery closed				
2001	1.441	Fishery closed				
2002	0.870	Fishery closed				
2003	0.745	Fishery closed				
2004	0.746	Fishery closed				
2005	0.811	Fishery closed				
2006	1.882	Fishery closed				
2007	3.212	Fishery closed				
2008	2.258	Fishery closed				

[a] Mature males from summer trawl survey, includes sublegal (105 -119mm CW) and legal (≥120mm CW).
[b] Percent harvest target of abundance of mature males as estimated from preseason survey.
[c] Actual harvest of legal males as percentage of preseason estimated abundance of mature males.
Source: Zheng et al. 2009.

3.4.2 C. opilio crab

Chionoecetes opilio (*C. opilio*) crabs are distributed on the continental shelf of the Bering Sea, the Arctic Ocean, and in the western Atlantic Ocean as far south as Maine. In the Bering Sea, they are common at depths of no more than 200 m. The eastern Bering Sea 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. The area that has been designated essential fish habitat for *C. opilio* crab adults in Alaska is mapped in Figure 28.

Figure 28 Essential fish habitat distribution of BSAI *C. opilio* crab



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, 2009).

C. opilio crab were harvested in the Bering Sea by the Japanese from the 1960s until 1980 due to the limitations on foreign fishing imposed by the MSA. Retained catch in the domestic fishery increased in the late 1980s 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 5). Mature male biomass (at the time of mating) peaked between the late-1980s and mid-1990s, declined to a minimum in 2002 and has increased thereafter. The increase in mature male biomass has been greater than in mature female biomass. Recruitment has varied considerably over the period 1979-2008, with the recruitment (at 25mm) in 1986 the highest on record. Recruitment between 2003 and 2006 is estimated to be near or above average, while the estimated recruitments for 2007 and 2008 are below average (NPFMC 2008b). The 2008/09 MMB exceeds the proxy for MSST so the stock is not currently overfished.

NMFS eastern Bering Sea 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). Figure 29 illustrates the 2008 survey abundance of males of a size that is acceptable in the commercial fishery. Directed crab fishery catch in 2007 is shown in Figure 30. Female crab > 49 mm CW occurred in higher concentration in generally three areas, just north of the Pribilof Islands, just south and west of St. Matthew Island, and to the north and west of St. Matthew Island. Males > 78 mm CW were distributed in similar areas to females, except the highest concentrations were between the Pribilof Islands and St. Matthew Island.

Table 5 **Eastern Bering Sea *C. opilio* crab fishery harvest relative to harvest strategy target and guideline harvest level (GHL), 1994-2008.**

Fishery Year	Male mature biomass [a] (millions of pounds)	GHL (millions of pounds)	Harvest (millions of pounds)
1994	379.4	105.8 [d]	149.8
1995	507.8	55.7 [d]	75.3
1996	744.9	50.7 [d]	65.7
1997	663.5	117.0 [d]	119.5
1998	529.3	234.8 [d]	252.2
1999	216.6	195.9[d]	192.3
2000	227.1	28.6 [e]	33.3
2001	339.2	27.3	25.3
2002	232.8	31.0	32.7
2003	197.8	25.8	28.5
2004	196.6	20.8	23.9
2005	294.8	20.9	24.8
2006	330.5	37.2 [f]	37.0
2007	385.2	36.6 [f]	36.4
2008	305.9	63.0 [f]	63.0

[a] Mature male biomass observed in the NMFS trawl survey. Generally males >79 mm CW are considered mature, but only males > 101mm CW are retained in the commercial fishery.

[b] Harvest strategy in effect since 2001 targets a percentage of the survey estimate of mature male biomass.

[c] Actual harvest of legal males as percentage of preseason estimated abundance of mature males.

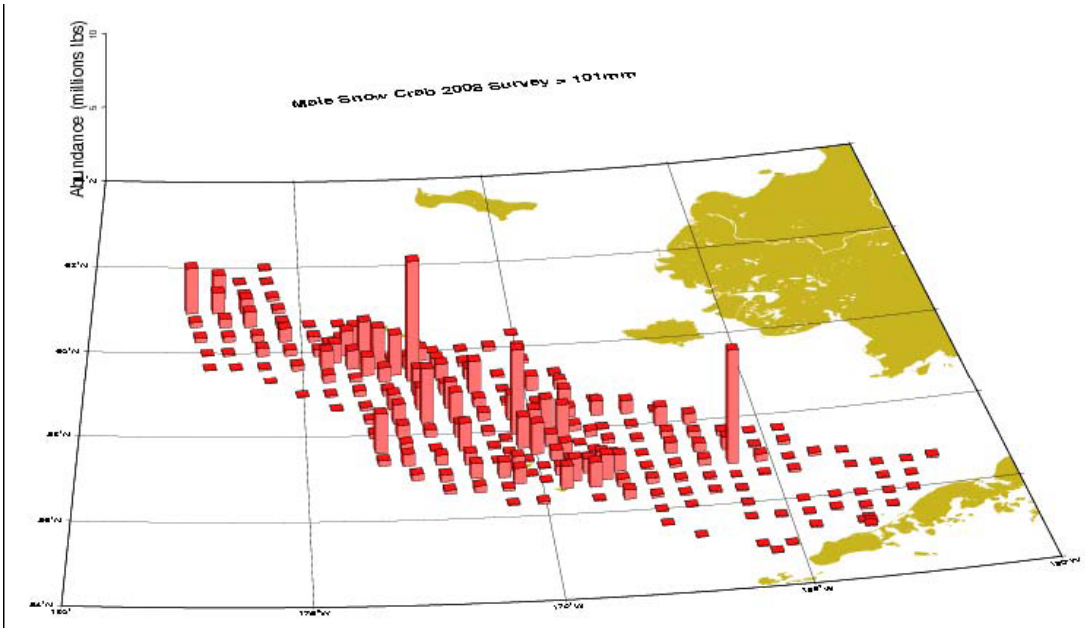
[d] GHL established as 58% percentage of males >101-mm carapace width.

[e] GHL established as 22% percentage of males >101-mm carapace width.

[f] TACs were established in 2005/6 to 2007/8.

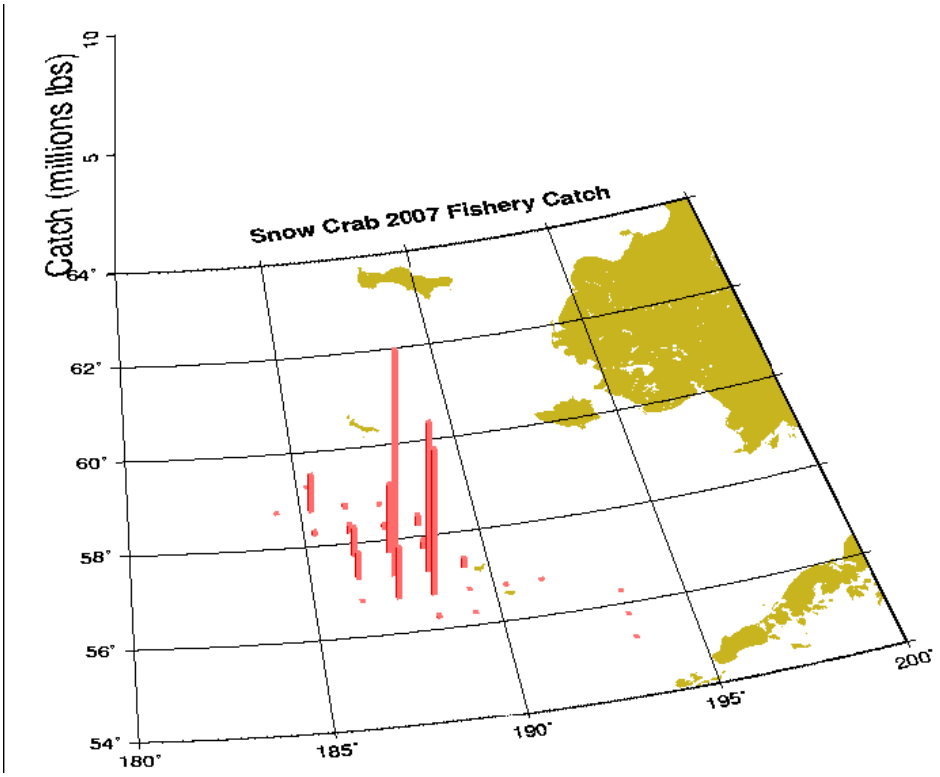
Source: Turnock and Rugolo 2009 (male mature biomass); NMFS 2008a (GHL and harvest 1994-2005); NPFMC 2008b (TAC and harvest 2005/6-2007/8).

Figure 29 **2008 survey abundance of males > 101 mm carapace length by tow. Abundance is in millions of crab.**



Source: Turnock and Rugolo 2009.

Figure 30 Retained catch in the 2007 directed *C. opilio* fishery, in millions of pounds.



Source: Turnock and Rugolo 2009.

4 Methodology for impacts analysis

This document analyzes three alternatives that evaluate a proposed gear modification to require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor, and changes to the southern boundary of the Northern Bering Sea Research Area (NBSRA) to create an area where anyone fishing with non-pelagic trawl gear must use the modified trawl sweeps required by regulation. Also included is an option to change the boundary of the St Matthew Island Habitat Conservation Area to be consistent with the Council's intent to protect blue king crab habitat, and certain housekeeping amendments to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP), which are required to correct typographical and non-substantive errors.

The housekeeping amendments are considered minor technical additions, corrections, and changes to the FMP under NOAA Administrative Order (NAO) 216-6 Section 6.03d.4(a). As allowed under Section 5.05b of NAO 216-6, the housekeeping amendments are correcting text in the FMP to implement Amendment 89, which was previously analyzed (NMFS 2008a) and found to have no significant impacts on the human environment. The housekeeping amendments are categorically excluded from further NEPA analysis per NAO 216-6 and will not be analyzed in this EA and are addressed separately in Section 11 of this document. .

The proposed action is limited to the Bering Sea and to nonpelagic trawl fishing. This type of fishing primarily impacts bottom habitat as that is the location of the target species for this fishery, and the effective method of harvesting these species involves the moving of gear across the ocean bottom. Only those environmental components that depend on bottom habitat in some way are likely to be affected by this action. These components include certain groundfish (e.g., flatfish), crab, prohibited (e.g., halibut; red king, tanner, and snow crabs), and nontarget fish species, benthic dependent marine mammals (e.g., walrus, gray whales) and seabirds (e.g., eiders), bottom habitat, and ecosystem components. This environmental assessment focuses on these potentially affected components, and no effects are expected on the other components of the marine environment in the Bering Sea.

Roadmap to impacts analysis

Section 4 describes the methodology used to analyze the impacts of this actions proposed in this analysis. In Section 5, the impacts of the alternatives and options on the various environmental components are evaluated. Section 5.1 addresses the impacts of the alternatives on habitat; Section 5.2 looks at impacts on flatfish target species, and Section 5.3 on non-target species, and Section 0 addresses impacts on marine mammals and seabirds. The socio-economic impacts of this action are described in detail in the RIR and IRFA portions of this analysis (Sections 7.8 and 8.8).

Analysis of the potential cumulative effects of a proposed action and its alternatives is a requirement of NEPA. An environmental assessment or environmental impact statement must consider cumulative effects when determining whether an action significantly affects environmental quality. The Council on Environmental Quality (CEQ) regulations for implementing NEPA define cumulative effects as:

> *"the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7*).

For the most part, the discussion of past and present cumulative effects is addressed with the analysis of direct and indirect impacts for each resource component below. The cumulative impact of reasonable foreseeable future actions is addressed in Section 0.

Section 6 addresses the management and enforcement considerations of the proposed alternatives and options.

General 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 fish species, marine mammals, seabirds, and the ecosystem.

Evaluation criteria have been developed for each of these categories recently within the Habitat Areas of Particular Concern (HAPC) EA (NMFS 2006a) 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 2006a) and the 2006-2007 Groundfish Harvest Specifications EA (NMFS 2007a) 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. The specific significance criteria for each environmental component analyzed are provided in Chapter 5, except for socioeconomic effects. Significance determinations for social and economic impacts are not required (see 40 CFR 1508.14), and the economic and social impacts are described in Sections 7 and 0.

5 Probable environmental impacts

5.1 Benthic habitat and habitat features

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 2006a) 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 from nonpelagic trawling.

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 6. 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 2006a).

Table 6 Criteria 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.

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.

Alternatives 2 and 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. These alternatives 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. As described in Section 3.2.3, 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. Some contact with living habitat species would continue from the elevating devices contacting the bottom as shown in Figure 16, Figure 17, Figure 19, and Figure 20 (on pages 21 to 24). Therefore, fishery-wide adoption of devices to reduce seafloor contact with trawl sweeps is expected to be significantly positive. Dr. Rose's research has shown some recovery of seawhips one year after exposure to modified sweeps (Figure 17). 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 Alternatives 2 and 3 on habitat complexity are likely insignificant. Alternatives 2 and 3 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).

Alternative 3 would result in trawling in the Modified Gear Trawl Zone (Figure 1, page 5), an area currently closed to trawling in the NBSRA. For habitat complexity in the Modified Gear Trawl Zone, Alternative 3 has a greater likelihood to have an effect on habitat complexity than either the Alternative 1 or Alternative 2. Because of the use of modified gear, the potential impact is much less than it could be with conventional nonpelagic trawl gear. Therefore, the effect of Alternative 3 on habitat living substrate complexity is likely insignificant.

The St. Matthew Island HCA option would increase the area closed to nonpelagic trawling, providing more protection to bottom habitat. The additional area to be added to the St. Matthew Island HCA is part of the NBSRA, which is currently closed to nonpelagic trawling. Because little nonpelagic trawling is likely to happen in this expanded closure area under the status quo, a substantial change in mortality or damage to living substrate is not expected with this option. Because no substantial change is expected in mortality or damage to living substrate, the effects of this option are likely insignificant.

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.

It is likely that Alternatives 2 and 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 effects from Alternatives 2 and 3 are likely insignificant.

Alternative 3 would allow for nonpelagic trawling with modified gear in the Modified Gear Trawl Zone (Figure 1). By allowing trawling in this area, Alternative 3 has a greater potential to impact the non-living substrate and habitat complexity than Alternatives 1 or 2. The sediments in the Modified Gear Trawl Zone area appear to be primarily sand and gravel (Figure 23) which are likely moved by currents, and the contact of the trawl gear would be reduced by the elevating devices. Because of the nature of the sediments and the elevating devices reducing gear contact, it is not likely Alternative 3 would result in damage or persistent changes in the non-living substrate, and therefore any effects are likely insignificant.

The St. Matthew Island HCA option would increase the area closed to nonpelagic trawling, providing more protection to non-living components of bottom habitat. The additional area to be added to the St. Matthew Island HCA is part of the NBSRA, which is currently closed to nonpelagic trawling. Because little nonpelagic trawling is likely to happen in this expanded closure area under the status quo, a substantial change in non-living habitat is not expected with this option. Because no substantial change is expected in the non-living habitat, the effects of this option are likely insignificant.

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 (NMFS 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.

Alternatives 2 and 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, Alternatives 2 and 3 would result in an insignificant impact.

Alternative 3 would allow for nonpelagic trawling with modified gear in the Modified Gear Trawl Zone (Figure 1). By allowing trawling in this area, Alternative 3 has a greater potential to impact the benthic biodiversity in this area than Alternatives 1 or 2. The sediments in the Modified Gear Trawl Zone appear to be primarily sand and gravel (Figure 23) which are likely moved by currents, and the contact of the trawl gear would be reduced by the elevating devices. Because of the nature of the sediments and the elevating devices reducing gear contact, it is not likely Alternative 3 would result in substantial changes to the community structure, and therefore any effects are likely insignificant.

The St. Matthew Island HCA option would increase the area closed to nonpelagic trawling, providing more protection to community structure. The additional area to be added to the St. Matthew Island HCA is part of the NBSRA, which is currently closed to nonpelagic trawling. Because little nonpelagic trawling is likely to happen in this expanded closure area under the status quo, a substantial change in community structure is not expected with this option. Because no substantial change is expected in the community structure, the effects of this option are likely insignificant.

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.

Alternatives 2 and 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. Alternatives 2 and 3 would receive an insignificant rating.

Alternative 3 would allow for nonpelagic trawling with modified gear in the Modified Gear Trawl Zone (Figure 1). By allowing trawling in this area, Alternative 3 has a greater potential to impact habitat suitability in this area than Alternatives 1 or 2. The sediments in the Modified Gear Trawl Zone appear to

be primarily sand and gravel (Figure 23) which are likely moved by currents, and the contact of the trawl gear would be reduced by the elevating devices. Because of the nature of the sediments and the elevating devices reducing gear contact, it is not likely Alternative 3 would result in substantial changes to habitat suitability, and therefore any effects are likely insignificant.

The St. Matthew Island HCA option would increase the area closed to nonpelagic trawling, providing more protection to habitat suitability. The additional area to be added to the St. Matthew Island HCA is part of the NBSRA, which is currently closed to nonpelagic trawling. Because little nonpelagic trawling is likely to happen in this expanded closure area under the status quo, a substantial change in habitat suitability is not expected with this option. Because no substantial change is expected in habitat suitability, the effects of this option are likely insignificant.

5.2 Target species (flatfish)

Target species for the Bering Sea are managed within the Bering Sea subarea and those species are described in Section 3.1.2. In terms of target species, the BSAI 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. This action primarily affects the flatfish target species, which will be the focus of this analysis.

The latest status information regarding flatfish species is in the November 2008 Stock Assessment and Fishery Evaluation Report (SAFE) for BSAI groundfish (NPFMC 2008a). No flatfish stock are being overfished or approaching an overfished condition.

The significance criteria used to evaluate the effects of the action on target species is in Table 7. These criteria are adopted from the significance criteria used in the HAPC EA (NMFS 2006a).

Table 7 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

The effects of this action on target species are limited to those effects that may occur on habitat that support target species and their prey. All fishing done under the alternatives would be done within the annual harvest specifications and within the management measures currently applied to the target fisheries. Based on the research by Dr. Rose of the AFSC, Alternatives 2 and 3 are not expected to have any net decrease in the target catch rates compared to that of status quo conditions. 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 that may be targets are not anticipated to differ from status quo. As discussed in Section 3.2.3.2, the mortality rate for crabs encountering modified sweeps was nearly zero and approximately 5 percent for conventional trawl sweeps. Based on maintaining the current harvest management and on the potential effects of the modified gear on benthic target species, the effects of Alternatives 2 and 3 are insignificant for stock biomass, fishing mortality, temporal distribution, and change in prey availability.

The only potential impacts under the alternatives would be from the type of gear used in harvest and the location of harvests. 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.

Alternatives 2 and 3 would use modified gear which would have less potential impact on benthic habitat that supports target species compared to Alternative 1. Alternative 3 would allow trawling with modified gear in an area that is currently closed and would have more impact on target fish resources in the Modified Gear Trawl Zone than with Alternatives 1 and 2. Because the Modified Gear Trawl Zone is a limited portion of the Bering Sea subarea and because of the modified gear reducing potential impacts, it is not likely Alternative 3 would have significant impacts on the bottom habitat in this area that supports target species and their prey.

The expansion of the ST. Matthew Island HCA under the option would provide additional protection to target species that may occur in this area from the potential effects of bottom trawling. Because of the small additional protected area, any additional protection from this option is not likely to result in a substantial change in the stock biomass, fishing mortality, spatial or temporal distribution, or change in prey availability for target species. Therefore, this option is not likely to result in significant impacts on target species.

5.3 Nontarget fish species and prohibited species catch effects (crab and halibut)

The nontarget fish (including invertebrates) and Prohibited Species Catch (PSC) species affected by this action are those dependent on bottom habitat for their life history. The PSC species most likely to be impacted by this action are crab and halibut based on their life history of use of bottom habitat. This section focuses on the potential effects on crab and halibut from the alternatives and option. The significance criteria used to evaluate the effects of the action on target species is in Table 8. These criteria are adopted from the significance criteria used in the HAPC EA (NMFS 2006a).

Table 8 Criteria used to estimate the significance of impacts on nontarget and prohibited species

No impact	No incidental take of the nontarget and prohibited species in question.
Adverse impact	There are incidental takes of the nontarget and prohibited species in question
Beneficial impact	Natural at-sea mortality of the nontarget and 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 on prohibited species. Operation of the groundfish fisheries in a manner that substantially increase the take of nontarget species would be a significantly adverse effect on nontarget species.
Significantly beneficial impact	No benchmarks are available for significantly beneficial impact of the groundfish fishery on the nontarget and prohibited species, and significantly beneficial impacts are not defined for these species.
Unknown impact	Not applicable

The latest status information regarding nontarget species, including PSC crab and halibut are in the SAFE report (NPFMC 2008). The groundfish fisheries are constrained by PSC limits and measures for crab and halibut incidental harvests in the nonpelagic trawl fisheries under 50 CFR 679.21. This action does not change those mitigation measures.

The groundfish harvest specifications EIS (NMFS 2007) analyzed the effects of the groundfish fisheries harvest strategy on nontarget and PSC species. The analysis concluded that impacts from the entire

groundfish fishery on nontarget species genetic structure of populations, reproductive success, prey availability and habitat are unknown. Nonpelagic trawling is more likely to have effects on bottom dwelling nontarget species such as grenadiers and sea stars. Impacts on crab and halibut are mitigated by the PSC mitigation measures and the incidental catch of crab is so low as to be not likely to impact the stocks. The IPHC accounts for halibut incidental catch in it yearly stock assessment to ensure the incidental catch does not affect the sustainability of the stocks.

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 and PSC species removed would not be very different, in relationship to the entire management, compared to the status quo. Only Alternative 3 would open additional area in the Bering Sea to nonpelagic trawling and may result in an additional location where nontarget and PSC species are removed, but the overall harvest of nontargets and PSC species would be constrained by the target fishery harvest limit and by PSC measures in 50 CFR 679.21. It is likely that the incidental take of nontarget and prohibited species would not be different among Alternatives 1, 2, and 3 and the SMIHCA option; 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 nontarget and PSC species also is not expected to increase. Therefore, the effects of any of the alternatives and the option are expected to be the same and to be insignificant. Future effects 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, especially under the opening of the Modified Gear Trawl Zone under Alternative 3, but the extent of those effects are not quantifiable at this time.

Because no overall change in the harvest of nontarget and PSC species under the alternatives and options are expected, the impacts of the alternatives and option on nontarget and PSC species are likely insignificant.

5.4 Marine mammals

A number of concerns may be related to marine mammals 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 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. The Alaska Groundfish Harvest Specifications EIS (NMFS 2007a) and the EA/RIR/IRFA for the Arctic Fishery Management Plan (NMFS 2009) provide the most recent status information on marine mammals and seabirds that may be impacted by the action. The status descriptions in that EIS and EA are incorporated here by reference.

Marine mammals, including those currently listed as endangered or threatened under the ESA, that may be present in the action area are listed in Table 9. These species include great whales and pinnipeds. NMFS is the expert agency for ESA-listed marine mammals, except Pacific walrus, sea otters, and polar bears. The U.S. Fish and Wildlife Service (FWS) is the expert agency for Pacific walrus, 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, and sperm whales (NMFS 2006c). 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 2010.

Table 9 Marine Mammals Likely to Occur in the Action Area

Common Name	Scientific Name	ESA Status
Northern Right Whale[2]	*Balaena glacialis*	Endangered
Bowhead Whale	*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
Steller Sea Lion[1]	*Eumetopias jubatus*	Endangered
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[3]	*Odobenus rosmarus divergens*	Under review
Northern sea otters[3]	*Enhydra lutis*	Threatened
Bearded Seal[4]	*Erignathus barbatus*	Under review
Spotted Seal[4]	*Phoca largha*	Under review
Ringed Seal[4]	*Phoca hispida*	Under review
Ribbon Seal	*Phoca fasciata*	None
Polar Bear[3]	*Ursus maritimus*	Threatened

[1] Steller sea lion are listed as endangered west of Cape Suckling.

[2]NMFS designated critical habitat for the northern right whale on July 6, 2006 (71 FR 38277).

[3]Pacific walrus, sea otters, and polar bear are species under the jurisdiction of the USFWS. Pacific Walrus are currently under review for potential ESA listing (http://alaska.fws.gov/fisheries/mmm/walrus/pdf/walrus_q_a.pdf)

[4]Bearded, ringed, and spotted seals are currently under review by NMFS for potential ESA listing (73 FR 51615, September 4, 2008).

5.4.1 Marine Mammals Status

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 strategic BSAI marine mammals stocks (Steller sea lions, northern fur seals, harbor porpoise, North Pacific right whales, humpback whales, sperm whales, fin whales and bowhead whales) were completed in 2008 based on a review of data available through 2006 (Angliss and Outlaw 2008). Marine mammals under FWS jurisdiction (polar bear, walrus, and sea otters) were assessed in 2002 (Angliss and Outlaw 2008). The information from NMFS 2004 and Angliss and Outlaw 2006, 2007, and 2008 is incorporated by reference to this EA. The SARs provide population estimates, population trends, and estimates of the potential biological removal (PBR) levels for each stock. The SARs also identify potential causes of mortality and whether the stock is considered a strategic stock under the MMPA. The SARs are available on the Protected Resources Division web site at http://www.nmfs.noaa.gov/pr/sars/region.htm.

The Alaska Groundfish Harvest Specifications EIS provides information on the effects of the groundfish fisheries on marine mammals (NMFS 2007a). Direct and indirect interactions between marine mammals and groundfish fishing vessels may 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 occurrence and commercial fishing activities. This discussion focuses on those marine mammals that may interact or be affected by the nonpelagic trawl fishery in the Bering Sea. These species are listed in Table 10 and Table 11. There is no known interaction between the nonpelagic trawl fishery and beaked whales, sei whales, blue whales, and Pacific whited-sided dolphins (Angliss and Outlaw 2006, 2008 and NMFS 2007a). Marine mammals species listed in Table 13 and bearded and ringed seals are taken incidentally in the BSAI flatfish trawl fishery based on the List of Fisheries for 2009 (73 FR 73032, December 1, 2008) and based on information from the National Marine Mammal Laboratory.

Table 10 Status of pinniped stocks potentially affected by the Bering Sea nonpelagic trawl fishery

Pinnipedia species and stock	*Status under the ESA*	*Status under the MMPA*	*Population Trends*	*Distribution in action area*
Steller sea lion - Western and Eastern Distinct Population Segment (DPS)	Endangered (W) Threatened (E)	Depleted & a strategic stock	For the western DPS, regional increases in counts in trend sites of some areas have been offset by decreased counts in other areas so that the overall population of the western DPS appears to have stabilized (Fritz et al. 2008). The eastern DPS is steadily increasing and has been recommended to delisting consideration (NMFS 2008).	Western DPS inhabits Alaska waters from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. Eastern DPS inhabit waters east of Prince Williams Sound to Dixon Entrance. Occur throughout AK waters, terrestrial haulouts and rookeries on Pribilof Is., Aleutian Is., St. Lawrence Island and off the mainland. Use marine areas for foraging. Critical habitat designated around major rookeries and haulouts and foraging areas.
Northern fur seal – Eastern Pacific	None	Depleted & a strategic stock	Recent pup counts show a continuing decline in the number of pups surviving in the Pribilof Islands. NMFS researchers found an approximately 9% decrease in the number of pups born between 2004 and 2006. The pup estimate decreased most sharply on Saint Paul Island.	Fur seals occur throughout Alaska waters, but their main rookeries are located in the Bering Sea on Bogoslof Island and the Pribilof Islands. Approximately 55% of the worldwide abundance of fur seals is found on the Pribilof Islands (NMFS 2007c). Forages in the pelagic area of the Bering Sea during summer breeding season, but most leave the Bering Sea in the fall to spend winter an spring in the N. Pacific.
Harbor seal – Gulf of Alaska Bering Sea	None	None	Moderate to large population declines have occurred in the Bering Sea and Gulf of Alaska stocks.	GOA stock found primarily in the coastal waters and may cross over into the Bering Sea coastal waters between islands. Bering Sea stock found primarily around the inner continental shelf between Nunivak Island and Bristol Bay and near the Pribilof Islands.
Ringed seal – Alaska	Status under review	None	Reliable data on population trends are unavailable.	Found in the northern Bering Sea from Bristol Bay to north of St. George Island and occupy ice (Figure 31).
Bearded seal – Alaska	Status under review	None	Reliable data on population trends are unavailable.	Found in the northern Bering Sea from Bristol Bay to north of St. George Island and inhabit areas of water less than 200 m that are seasonally ice covered (Figure 31).
Ribbon seal – Alaska	Status under review	None	Reliable data on population trends are unavailable.	Found throughout the offshore Bering Sea waters (Figure 31).
Spotted seal - Alaska	Status under review	None	Reliable data on population trends are unavailable.	Found throughout the Bering Sea waters (Figure 31).
Pacific Walrus	Petitioned for listing	None	Reliable data on population trends and size are unavailable.	Occur primarily is shelf waters of the Bering Sea. Primarily males stay in the Bering Sea in the summer. Major haulout sites are in Round Island in Bristol Bay and on Cape Seniavan on the north side of the Alaska Peninsula.

Source: Angliss and Outlaw 2008 and List of Fisheries for 2009 (73 FR 73032, December 1, 2008).

Northern fur seal pup data available from http://www.fakr.noaa.gov/newsreleases/2007/fursealpups020207.htm

Table 11 Status of cetacea stocks potentially affected by the Bering Sea nonpelagic trawl fishery

Cetacea species and stock	*Status under the ESA*	*Status under the MMPA*	*Population Trends*	*Distribution in action area*
Killer whale – AT1 Transient; Eastern North Pacific GOA, AI, and BS transient; West Coast transient; and Eastern North Pacific Alaska Resident	None	AT1 Transient – Depleted & a strategic stock	AT1 group has been reduced to at least 50% of its 1984 level of 22 animals, and has likely been reduced to 32% of its 1998 level of 7 animals. Unknown abundance for the eastern North Pacific Alaska resident; West Coast transient; and Eastern North Pacific Gulf of Alaska, Aleutian Islands, and Bering Sea transient stocks. The minimum abundance estimates for the Eastern North Pacific Alaska Resident and West coast transient stocks are likely underestimated because researchers continue to encounter new whales in the Alaskan waters.	Transient-type killer whales from the Aleutian Islands and Bering Sea are considered to be part of a single population that includes Gulf of Alaska transients. Killer whales are seen in the northern Bering Sea and Beaufort Sea, but little is known about these whales.
Dall's porpoise – Alaska	None	None	Reliable data on population trends are unavailable.	Found in the offshore waters from coastal western Alaska to Bering Sea.
Harbor porpoise-Bering Sea	None	Strategic	Reliable data on population trends are unavailable	Primarily in coastal waters, usually less than 100 m.
Humpback whale-Western North Pacific Central North Pacific	Endangered	Depleted & a strategic stock	Reliable data on population trends are unavailable for the western North Pacific stock. Central North Pacific stock thought to be increasing. The status of the stocks in relation to optimal sustainable population (OSP) is unknown.	W. Pacific and C. North Pacific stocks occur in Alaskan waters and may mingle in the North Pacific feeding area. Humpback whales in the Bering Sea (Moore et al. 2002) cannot be conclusively identified as belonging to the western or Central North Pacific stocks, or to a separate, unnamed stock.
North Pacific right whale Eastern North Pacific	Endangered	Depleted strategic stock	Abundance not known, but this stock is considered to represent only a small fraction of its precommercial whaling abundance and is arguably the most endangered stock of large whales in the world.	See Figure 32 for distribution and designated critical habitat.
Fin whale – Northeast Pacific	Endangered	Depleted & a strategic stock	Abundance may be increasing but surveys only provide abundance information for portions of the stock in the central-eastern and southeastern Bering and coastal waters of the Aleutian Islands and the Alaska Peninsula, and much of the North Pacific range has not been surveyed.	Found in the Bering Sea and coastal waters of the Aleutian Islands and Alaska Peninsula. Most sightings in the central-eastern Bering Sea occur in a high productivity zone on the shelf break.
Minke whale - Alaska	None	None	Considered common but abundance not known and uncertainty exists regarding the stock structure.	Common in the Bering and Chukchi Seas and in the inshore waters of the GOA.

Cetacea species and stock	*Status under the ESA*	*Status under the MMPA*	*Population Trends*	*Distribution in action area*
Sperm Whale – North Pacific	Endangered	Depleted & a strategic stock	Abundance and population trends in Alaska waters are unknown.	Inhabit waters 600 m or more depth, south of 62°N lat. Males inhabit Bering Sea in summer.
Gray Whale – Eastern North Pacific	None	None	Minimum population estimate is 17,752 animals. Increasing populations in the 1990's but below carrying capacity.	Most spend summers in the shallow waters of the northern Bering Sea and Arctic Ocean. Winters spent along the Pacific coast near Baja California.
Beluga Whale – Bristol Bay, Eastern Bering Sea, and eastern Chukchi Sea	None	None	Abundance estimate is 3,710 animals and population trend is not declining for the eastern Chuckchi Sea stock. Minimum population estimate for the eastern Bering Sea stock is 14,898 animals and population trend is unknown. The minimum population estimate for the Bristol Bay stock is 1,619 animals and the population trend is stable and may be increasing.	Summer in the Arctic Ocean and Bering Sea coastal waters, and winter in the Bering Sea in offshore waters associated with pack ice.

Source: Angliss and Outlaw 2008 and List of Fisheries for 2009 (73 FR 73032, December 1, 2008).

North Pacific right whale included based on NMFS (2006c) and Salveson (2008) http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm

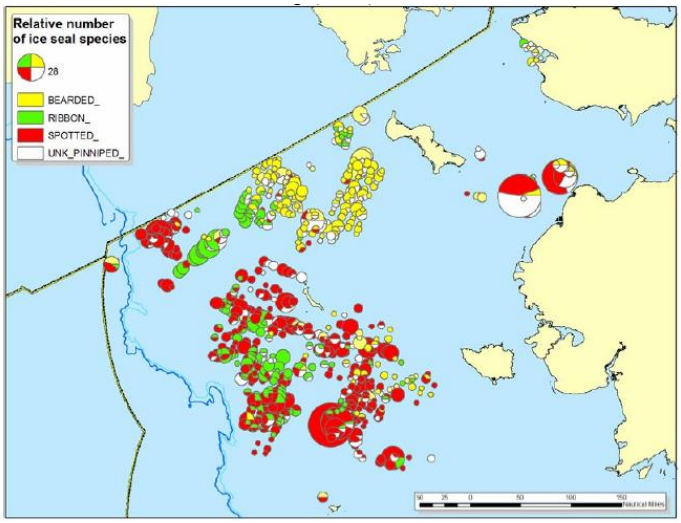
The Steller sea lion inhabits many of the shoreline areas of the BSAI, using these habitats as seasonal rookeries and year-round haulouts. The Steller sea lion has been listed as threatened under the ESA since 1990. In 1997 the population was split into two stocks or distinct population segments (DPS) 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 (Figure 7). 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).

The National Marine Mammal Laboratory surveyed ice seals during April through June 2007 from the USGC vessel Healy in the Bering Sea. Figure 31 shows the abundance and distribution of bearded, ribbon, and spotted seals over the survey area. Satellite tagged ribbon and spotted seals from late spring through July showed that the animals mostly stayed in the Bering Sea south and west of St. Matthews Island with a few animals traveling north through the Bering Strait (Boveng, et. al. 2008).

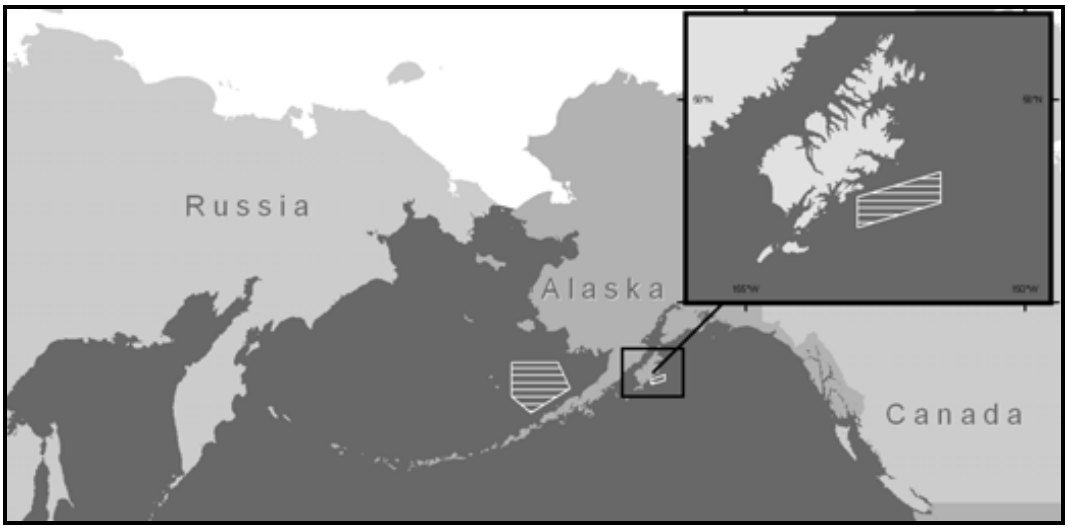
Figure 31 Ice seal survey during Healy cruises in summer in Bering Sea 2007



Source: Cameron and Boveng 2007

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 32). 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 listed the North Pacific right whale as a separate species from the Atlantic right whale and redesignated the same critical habitat (73 FR 19000, April 8, 2008). 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.

Figure 32 North Pacific right whale distribution and critical habitat shown in lined boxes



Source: Angliss and Outlaw 2008

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 2007c). 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 2007c). A conservation plan has been developed for northern fur seals (NMFS 2007c) 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 FWS 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 FWS 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 FWS 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 FWS will study whether critical habitat can be designated. On December 16, 2008, the FWS published a *Federal Register* notice proposing critical habitat designation. Critical habitat designation includes the nearshore waters less than 20 m depth and 100 m from the shore in the southern Bering Sea http://alaska.fws.gov/fisheries/mmm/seaotters/pdf/SeaOtterCriticalHabitatMaps.pdf). The farthest north designated area is the near shore waters of Amak Island in Bristol Bay. The final designation must by published by October 1, 2009. 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 FWS 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 14). The bottom trawl fishery has the potential to affect prey availability for those species that are benthic dependent (e.g., bearded seals and walrus). Any impacts of the nonpelagic trawl fisheries on polar bear would depend on the impact of the fishery on benthic habitat that may support prey for animals that are important prey to polar bears.

Management of the Pacific walrus is under the jurisdiction of the FWS. 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 (FWS 2002a). 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. On February 7, 2008, the Center for Biological Diversity petitioned the FWS to list Pacific walrus under the ESA because of the impact of global warming in the sea ice habitat (CBD 2008). As of August 2008, the FWS had not evaluated the petition (Joel Garlich-Miller, FWS, personal communication, May 2009). On December 3, 2008, the CBD filed suit against the FWS for failing to act on the petition (http://www.biologicaldiversity.org/news/ press_releases/2008/pacific-walrus-12-03-2008.html).

5.4.2 Marine Mammal Effects

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 12 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 2006d). 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 (2006d) to clearly provide a criterion for "insignificant impact" and to be consistent with other analyses of environmental components in this EA/RIR/IRFA.

Table 12 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 Effects

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the effects of the groundfish fisheries on marine mammals (Chapter 8 of NMFS 2007a) and is incorporated by reference. Potential take in the Bering Sea nonpelagic trawl fisheries is well below the potential biological removal (PBR) for all marine mammals which have a PBR determined (Table 14). This means that predicted take would be below the maximum number of animals that may be removed from these marine mammal stocks while allowing the stocks to reach or maintain their optimum sustainable population. Table 13 lists the species of marine mammals taken in the BSAI nonpelagic trawl fisheries as published in the List of Fisheries for 2009. Table 14 provides more detail on the levels of take based on the most recent SARs (Angliss and Outlaw 2008, 2007, and 2006). The BSAI flatfish fishery is a Category II fishery because it has annual mortality and serious injury of a marine mammal stock greater than 1% and less than 50% of the PBR level (73 FR 73032, December 1, 2008). The BSAI Pacific cod trawl fishery is a category III fishery based on annual mortality and serious injury of a stock being less than or equal to 1 percent of the PBR level. More species of mammal are taken in the flatfish trawl fishery than in the Pacific cod trawl fishery. Steller sea lions have the highest mean annual incidental take in the flatfish fishery compared to other marine mammals. Overall, very few marine mammals are reported taken in the Bering Sea nonpelagic trawl fisheries.

Table 13 Documented marine mammal takes from the List of Fisheries for 2009 in the BSAI Flatfish and Pacific cod fisheries

Fishery		Marine Mammal Stocks Taken
Category II	BSAI flatfish trawl	Bearded seal, AK Harbor porpoise, Bering Sea Harbor seal, Bering Sea Killer whale, AK resident Northern Fur seal Eastern North Pacific Steller sea lions, western U. S Spotted seal, AK Pacific walrus, AK
Category III	BSAI Pacific Cod Trawl	Harbor seal, Bering Sea Steller sea lion, western U.S.

Source: 73 FR 73032, December 1, 2008

Marine mammals that are not listed in Table 13 are assumed to be unlikely to be incidentally taken by any of the alternatives or option due to the absence of incidental take and entanglement records. No records of Alaska groundfish fisheries takes of North Pacific right whales exist.

Figure 33 shows the location of incidentally taken marine mammals in the BSAI flatfish trawl fishery between 1998 and 2004. Walrus taken in the flatfish fishery are likely males, which are more likely than females and juveniles to remain in the southern Bering Sea during ice free periods. Incidental takes of marine mammals southeast of Nunivak Island are in the same area where marine mammal subsistence hunting takes place (Appendix D in NMFS 2008a). 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.

Table 14 Estimated mean annual mortality of marine mammals from observed BSAI nonpelagic trawl flatfish and Pacific cod fishery compared to the total mean annual human-caused mortality and potential biological removal.

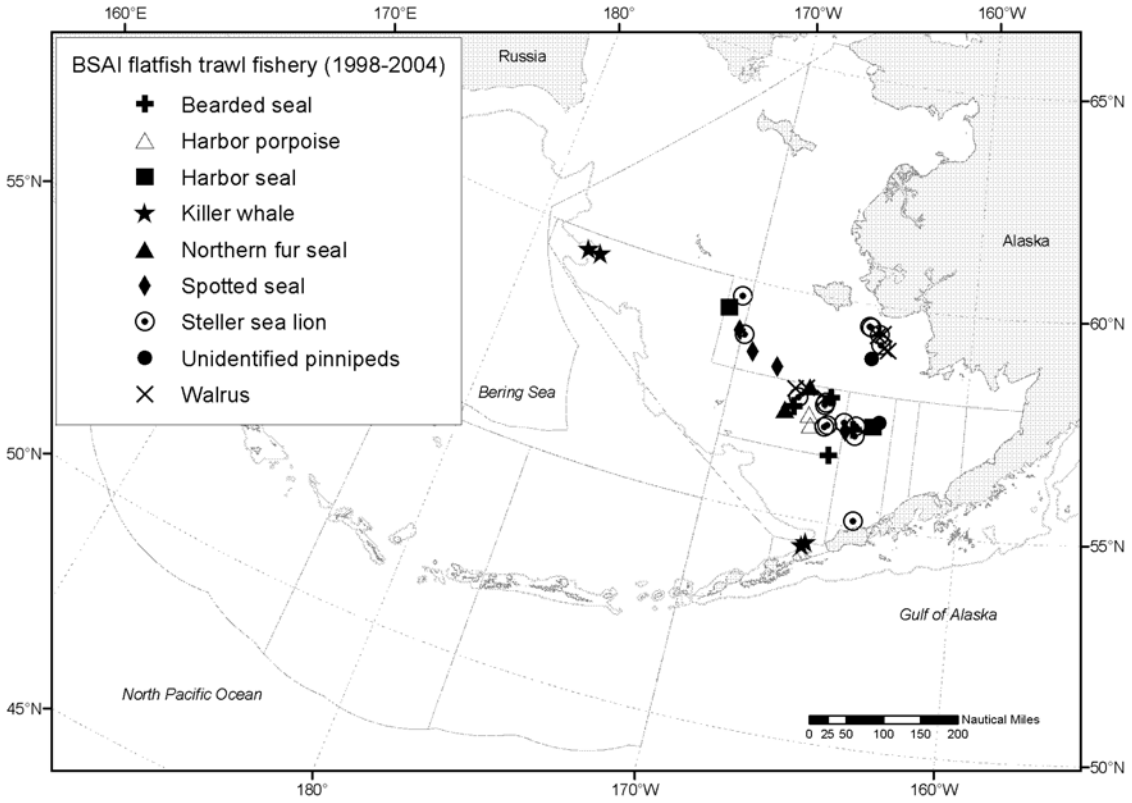
Marine Mammal Species and Stock	5 years of data used to calculate total mean annual human-caused mortality	Mean annual mortality, from BSAI flatfish and Pacific cod trawl fisheries	Total mean annual human-caused mortality*	Potential Biological Removal
Steller sea lions (western)	2002-2006	3.86	161.8	234
Northern fur seal	2001-2005	0.57	669	14,070
Harbor seal (BS)	2000-2004	1.25	176.2	603
Harbor porpoise (BS)	2002-2006	0	2	400
Spotted seal	2000-2004	0.88	5,265	Undetermined
Bearded seal	2000-2004	0.68	6,788	Undeternimed
Killer whale Eastern North Pacific AK resident	2000-2004	0.64	1.5	11.2
Pacific Walrus	1996-2000	1.2**	5,794	Undetermined

* Does not include research mortality. Other human-caused mortality is predominantly subsistence harvests for seals and sea lions.

** Incidental take in all Bering Sea groundfish trawl fisheries

Note: Mean annual mortality is expressed in number of animals and includes both incidental takes and entanglements. The averages are from the most recent 5 years of data since the last SAR update, which may vary by stock. Groundfish fisheries mortality calculated based on Angliss and Outlaw (2008).

Figure 33 Locations of marine mammals taken incidentally in the Bering Sea flatfish trawl fishery in 1998-2004. Data include only animals seriously injured or killed



Source: Perez 2006

Alternatives 1 and 2 would not change the timing or location of fishing activities in any way that may change the potential interaction of nonpelagic fishing vessels with marine mammals. Because the potential for interaction remains unchanged, no change in incidental takes of marine mammals are expected. Therefore, the effects of Alternatives 1 and 2 on incidental takes of marine mammals would be insignificant.

Alternative 3 would allow for fishing in the Modified Gear Trawl Area, which is currently closed to nonpelagic trawling. By allowing nonpelagic trawling in a closed area, the potential for interaction with marine mammals would increase for those marine mammals that may occur in this area at the same time nonpelagic trawling may occur. This is not likely a concern for strongly ice dependent marine mammals (e.g., ringed seals and female and juvenile walrus) which would not be in the area concurrent with nonpelagic trawl fishing. It is possible that northern fur seals use the wedge area for foraging, as discussed in the Draft EIS for Bering Sea Salmon Bycatch (NMFS 2008d) and incorporated here by reference. More information is needed to understand foraging behavior of northern fur seals and whether foraging may lead to increased potential for interactions with nonpelagic vessels. Figure 33 shows that Steller sea lions and harbor seals have been taken in the nonpelagic flatfish trawl fishery in an area near and south of the wedge area. If these animals occur in the wedge area, opening this area may increase the potential for incidental takes of these species in this location. The amount of incidental take for widely dispersed species is more likely dependent on the amount of overall fishing as much as the location of the fishing activity. Because the overall amount of fishing is likely to remain the same in the Bering Sea and the wide dispersal of northern fur seals in the Bering Sea during the open ice period and the relatively rare occurrence of incidental takes in the nonpleagic trawl fisheries, it is not likely that opening the wedge under Alternative 3 would result in a substantial increase in the amount of incidental takes of fur seals,

Steller sea lions, harbor seals, or any other marine mammal that may occur in this area. Because the overall nature of incidental takes in the nonpelagic trawl fishery is not likely to change, the effects of Alternative 3 on the incidental takes of marine mammals are insignificant.

The option to adjust the boundary of the St. Matthew Island HCA would provide protection to those marine mammals that occur in the waters in the new closed area and that are likely to interact with nonpelagic trawl fisheries. Because the overall level of fishing effort would not change, no change overall in the incidental takes of marine mammals in the Bering Sea is likely, and therefore this option would have insignificant effects on incidental takes of marine mammals.

Prey Species Effects

Table 15 shows the Bering Sea marine mammals that may be impacted by the nonpelagic trawl fishery and their prey species. Impacts could be either direct competition for prey species or indirect competition based on dependence on the benthic habitat for support of prey species.

Table 15 Bering Sea marine mammals dependent on benthic habitat or compete with nonpelagic trawl fisheries

Species	Prey	Benthic dependent	Prey competition
Gray whale	Benthic invertebrates	X	
Sperm whale	Mostly squid, some fish, shrimp, sharks, skates, and crab (up to 1,000 m depth)	X	
Beluga whale	Wide variety invertebrates and fish	X	X
Resident Killer whale	fish (including herring, halibut, salmon, and cod)		X
Pacific walrus	Benthic invertebrates (primarily mollusks), occasionally seals and birds	X	
Bearded seal	Primarily crab, shrimp, and mollusks; some fish (Arctic cod, saffron cod, sculpin, and pollock)	X	
Spotted seal	Primarily pelagic and nearshore fish occasionally cephalopods and crustaceans	X	
Ringed seal	Primarily Arctic cod, saffron cod, herring and smelt in fall in winter fish and crustaceans in summer and spring	X	
Ribbon seal	Arctic and saffron cods, pollock, capelin, eelpouts, sculpin and flatfish, crustaceans and celphalopods	X	X
Harbor seal	crustaceans, squid, fish, and mollusks	X	
Polar Bear	Ice seals and walrus	X*	
Steller sea lion	pollock, Atka mackerel, Pacific herring, Capelin, Pacific sand lance, Pacific cod, and salmon		X

Sources: NOAA 1988; NMFS 2007a; NMFS 2004; Nemoto 1959; Tomilin 1957; Lowry et al. 1980; Kawamura 1980; http://www.afsc.noaa.gov/nmml/education/cetaceans/sperm.php; and http://www.adfg.state.ak.us/pubs/notebook/marine/orca.php.

*Based on prey needs for benthic habitat

Nearly all of the species listed in Table 15 are either directly or indirectly dependent on the benthic habitat for prey. For example, gray whales directly feed on benthic invertebrates and polar bears feed on walrus which depend on mollusks, resulting in an indirect dependence by polar bears on benthic habitat. Several marine mammals may be impacted indirectly by any effects that the nonpelagic trawl gear may have on the benthic habitat where marine mammals are dependent on benthic prey. These species include gray, beluga, and sperm whales; bearded, spotted, ringed, ribbon, and harbor seals; and walrus. Species that may directly compete with the nonpelagic trawl fisheries include Steller sea lions (for Atka mackerel

and Pacific cod), ribbon seals (for flatfish), beluga whales (various fish), and resident killer whale (for cod).

Whether the benthic prey dependent species are indirectly affected by nonpelagic trawling will depend on the effects of this type of fishing on the benthos and whether the marine mammal forages on benthic species in the impacted area and their dependence on the benthic prey in that area. The EFH EIS provides a description of the effects of nonpelagic trawl fishing on bottom habitat in the Appendix (NMFS 2005), including the effects of the nonpelagic trawl fishery on the Bering Sea slope and shelf. Nonpelagic trawl gear is used in contact with the bottom and may impact benthic habitat. The fisheries effects analysis in the EFH EIS determined that the long term effects indices for yellowfin sole and flathead sole/flatfish fisheries on sand/mud biostructure is 2.9 percent and 1.8 percent, respectively. The impacts on the slope biostructure in the Bering Sea were 0.2 percent and 1.6 percent, respectively (Table B.2-10 in NMFS 2005).

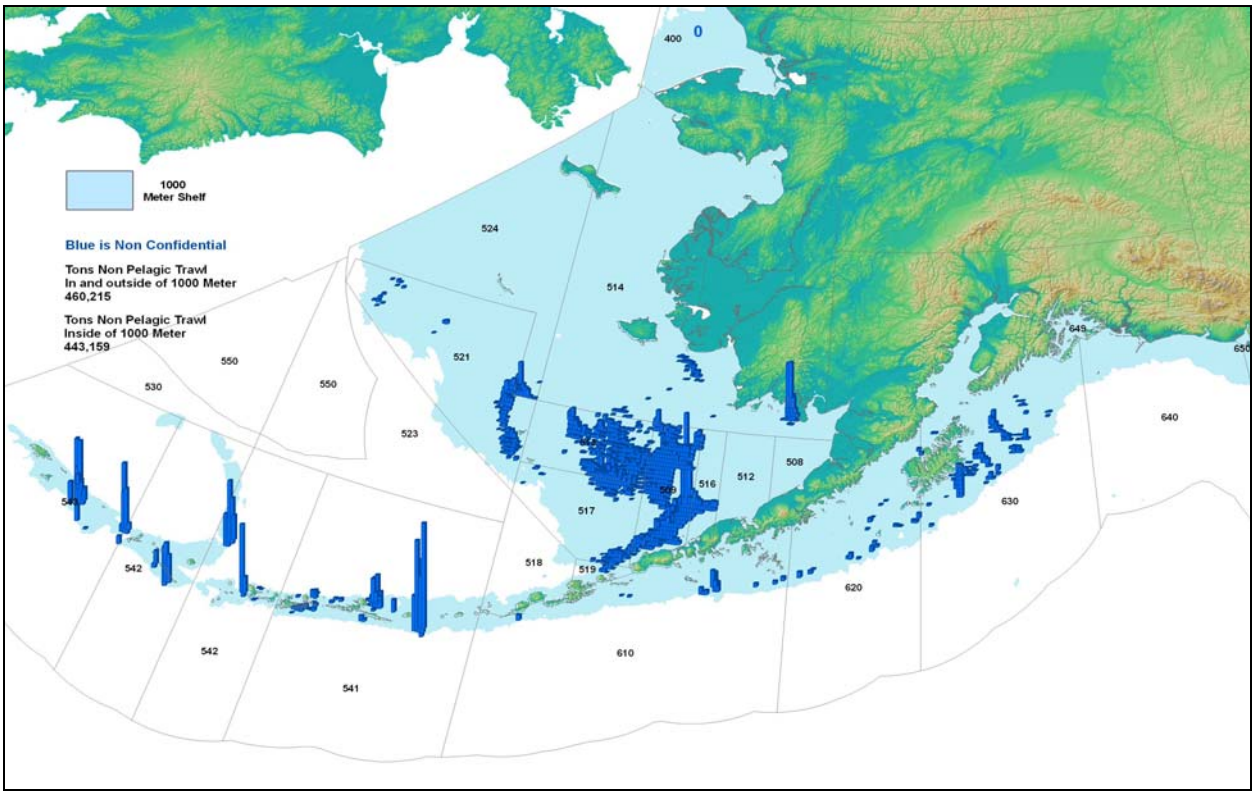
Table 16 shows the marine mammals that may depend on benthic prey and the known depths of diving and Bering Sea locations. Nonpelagic fisheries can be conducted in waters up to 1000 m depth and are generally in the slope area of the southern Bering Sea (Figure 34). Diving activity may be associated with foraging.

Table 16 Listing of benthic dependent marine mammals and location and diving depths in the Bering Sea

Species	Depth of Diving and location
Bearded seal	Occur in waters < 200 m, at least 20 nm from shore during spring and summer
Ringed seal	Usually shallow but can dive up to 500 m. Throughout pack ice.
Ribbon seal	Mostly dive < 150 m on shelf, deeper off shore. Shelf and slope areas
Spotted seal	Up to 300 m. Coastal habitats in summer and fall and ice edge in winter
Harbor seal	Up to 183 m. Generally coastal
Pacific walrus	Usually in waters < 80 m. Shelf area, concentrated SW of St. Lawrence Island and in Nunivak Island/Bristol Bay area. In summer, females and young follow ice and males use land for resting platforms.
Gray whale	< 60 m waters, coastal and shelf area.
Beluga whale	6-30 m, shelf area and nearshore estuaries and river mouths
Sperm whale	Up to 1,000 m, but generally in waters > 600 m

Sources: http://www.adfg.state.ak.us/pubs/notebook/marine/harseal.php; http://www.afsc.noaa.gov/nmml/species/species_ribbon.php; http://www.adfg.state.ak.us/pubs/notebook/marine/rib-seal.php; Bengston et al. 2005; Burns et al. 1981; Angliss and Outlaw 2008; Angliss and Outlaw 2007; http://www.adfg.state.ak.us/pubs/notebook/marine/gray.php; http://alaska.fws.gov/fisheries/mmm/walrus/nhistory.htm; http://www.adfg.state.ak.us/pubs/notebook/marine/beluga.php; Fay and Burns 1988; and Jay et al. 2001

Figure 34 2008 nonpelagic trawl locations in Alaska waters.



Waters in shaded area are less than 1,000 m.
Source: Steve Lewis, NMFS Analytical Team, May 5, 2009

Of the species listed in Table 16, beluga whales, gray whales, and harbor seal are less likely to compete with the nonpelagic trawl fishery due to the shallow dive behavior and use of more nearshore waters. Bristol Bay may be an exception to this, as flatfish fishing occurs in near shore waters in the bay. The remaining marine mammals in the table are likely to have foraging habitat that overlaps with the nonpelagic trawl fishery shown in Figure 34.

Sperm whales feed primarily on squid so potential competition with nonpelagic fisheries for prey is not likely to be significant. Pacific walrus and ice seals are more likely to experience direct or indirect competition with the nonpelagic trawl fisheries because of the overlap of feeding locations, depths and fishery locations. Walrus and bearded seals feed on benthic invertebrates that may be disturbed by nonpelagic trawling. Spotted, ribbon, and bearded seals occur in ice free waters of the Bering sea in locations where nonpelagic trawling may occur (Figure 31 and Figure 34). Ribbon seals may directly compete for flatfish with the flatfish fishery and may have benthic prey affected by nonpelagic trawling.

Ice seals are most likely of the marine mammals listed in Table 16 to potentially have benthic prey affected by the nonpelagic trawl fishery because of their overlap with this fishery location and depth for diving. Ice seals use ice in areas of the Bering Sea where fishing is conducted during ice free conditions. It is not know what the affects of nonpelagic trawling may be on the benthic habitat supporting prey and the recovery time for the prey species.

Alternatives 1 and 2 are not likely to have any discernable effects on prey competition beyond those already analyzed in NMFS (2007a). The gear modifications under Alternative 2 are likely to reduce the potential impact on benthic habitat which may result in protecting foraging resources in those areas where

marine mammal foraging and fishing overlaps. Because of the widespread occurrence of the marine mammals and the limited locations of nonpelagic trawling, it is not likely that any protection of benthic habitat in fishing locations would result in an improvement in overall foraging for marine mammals. Because the overall amount of harvests of flatfish and Pacific cod are not likely to change under these alternatives, no difference in the overall direct competition for prey species is expected. For these reasons, the impacts of Alternatives 1 and 2 on prey competition for marine mammals are insignificant.

Alternative 3 would have similar effects as Alternative 2 except for the opening of the Modified Gear Trawl Zone. Opening this are would allow for direct competition between the flatfish and Pacific cod fishery and beluga whale, resident killer whales, ribbon seals and Steller sea lions, if they occur in this area. Steller sea lions are less likely to be affected because the fishery in this area is more likely to be flatfish, reducing potential for competition. It appears that ribbon seals are not as likely to be in this area during the fishing season as bearded and spotted seals (Figure 31). Because of the modified gear requirement, the potential indirect effect on prey for spotted and bearded seals and walrus is likely not expected to be substantial. Overall the effect of Alternative 3 on prey competition for marine mammals is likely insignificant.

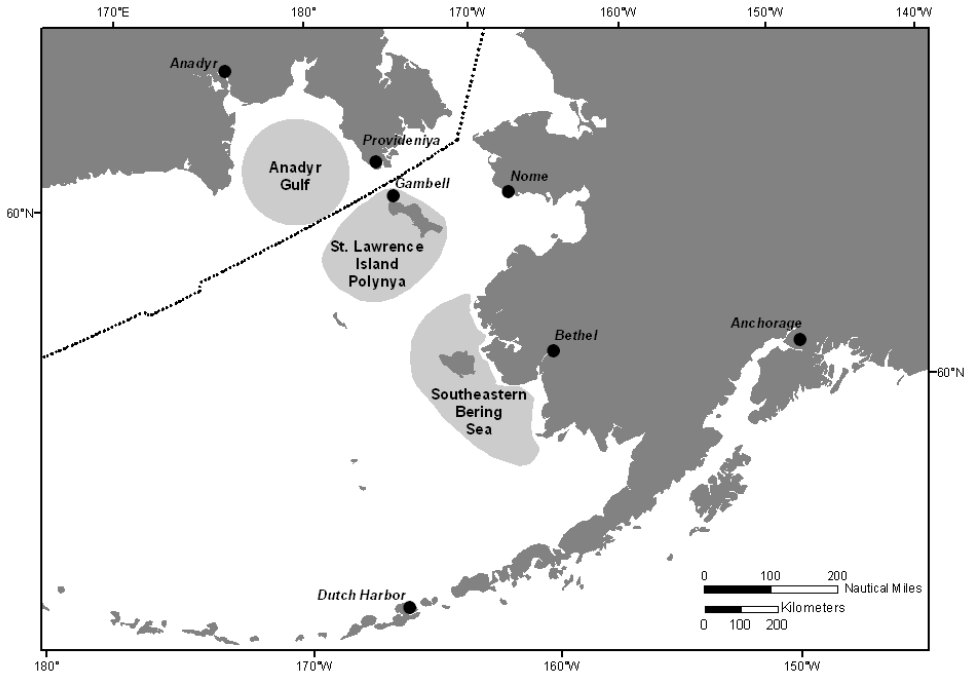
The SMIHCA option would close additional area around St. Matthew Island to nonpelagic trawling. This would be beneficial to marine mammals that may use this area for foraging and for marine mammals that depend on other marine mammals that forage in this area (e. g., polar bears dependent on ice seals and walrus). Because of the limited area and the widespread occurrence of the benthic dependent mammals, this closure is not likely to result in substantial improvements in overall prey availability. The effects of the option on prey availability for marine mammals are likely insignificant.

Disturbance Effects

The disturbance of marine mammals would depend on the timing and location of the fishery in relation to the occurrence of the marine mammals. The Alaska Groundfish Harvest Specifications EIS analyzed the potential disturbance of marine mammals by the groundfish fisheries (Section 8.3.3 of NMFS 2007a). The EIS concluded that the status quo fishery does not cause disturbance to marine mammals that may cause population level effects, and fishery closures exist to limit the potential interaction between the fishing vessels and marine mammals. Alternatives 1 and 2 have no effect on the timing or location of the nonpelagic trawl fishery and would therefore have the same insignificant effect.

Alternative 3 and the SMIHCA option would change the potential location of the nonpelagic trawl fishery, potentially affecting those species that would be present in the SMIHCA and in the Modified Gear Trawl Zone. Animals occurring in the modified gear trawl zone would be more likely to experience disturbance with the opening of the area under Alternative 3. Marine mammals in the SMIHCA option area to be closed would have less potential for disturbance. It appears that the areas to be opened under Alternative 3 and the option are not within the Pacific walrus breeding areas, used in December through March (Figure 35 and http://alaska.fws.gov/fisheries/mmm/walrus/nhistory.htm) so any disturbance effects on breeding walrus by the nonpelagic trawl fishery are not likely. Figure 31 shows that spotted, ribbon, and bearded seals are likely to occur in the areas opened under Alternative 3 and closed under the option during the summer which may result in more potential for disturbance to these species in the Modified Gear Trawl Zone and less potential for disturbance in the SMIHCA option area. Because overall the intensity of the nonpelagic trawl fishery in this northern area of the Bering Sea is not likely to change (Figure 34) and the large dispersal of marine mammals in the Bering Sea, the effects of Alternative 3 and the option on the disturbance of marine mammals is likely insignificant.

Figure 35 Pacific walrus breeding areas



Source: Joel Garlich-Miller, USFWS, May 2009

5.5 Seabirds

Seabird breeding populations in the Bering Sea are estimated at 36 million individual birds, and total population size (including subadults and nonbreeders) is estimated to be approximately 30% higher. Five additional species that breed elsewhere but occur in Alaskan waters during the summer months contribute another 30 million birds. Seabird species that occur in the Bering Sea are listed in Table 17.

Table 17 Seabird species in the BSAI

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

Source: NMFS 2004

As noted in NMFS 2004, seabird life history includes low reproductive rates, low adult mortality rates, long life span, and delayed sexual maturity. These traits make seabird populations extremely sensitive to changes in adult survival and less sensitive to fluctuations in reproductive effort. The problem with attributing population changes to specific impacts is that, because seabirds are long-lived animals, it may take years or decades before relatively small changes in survival rates result in observable impacts on the breeding population. Moloney et al (1994) estimated a 5- to 10-year lag time in detecting a breeding population decline from modeled hook-and-line incidental take of juvenile wandering albatross, and a 30- to 50-year population stabilization period after conservation measures were put in place.

More information on seabirds in Alaska's EEZ may be found in several NMFS, NPFMC, and FWS documents:

- The URL for the FWS Migratory Bird Management program is at: http://alaska.fws.gov/mbsp/mbm/index.htm
- Section 3.7 of the PSEIS (NMFS 2004) provides background on seabirds in the action area and their interactions with the fisheries. This may be accessed at http://www.fakr.noaa.gov/sustainablefisheries/seis/final062004/Chaps/chpt_3/chpt_3_7.pdf
- The annual Ecosystems Considerations chapter of the SAFE reports has a chapter on seabirds. Back issues of the Ecosystem SAFE reports may be accessed at http://www.afsc.noaa.gov/REFM/REEM/Assess/Default.htm
- The Seabird Fishery Interaction Research webpage of the Alaska Fisheries Science Center: http://www.afsc.noaa.gov/refm/reem/Seabirds/Default.htm
- The NMFS Alaska Region's Seabird Incidental Take Reduction webpage: http://www.fakr.noaa.gov/protectedresources/seabirds.html
- The BSAI and GOA Groundfish FMPs each contain an "Appendix I" dealing with marine mammal and seabird populations that interact with the fisheries. The FMPs may be accessed from the Council's home page at http://www.fakr.noaa.gov/npfmc/default.htm
- Washington Sea Grant has several publications on seabird takes, and technologies and practices for reducing them: http://www.wsg.washington.edu/publications/online/index.html
- Seabirds and fishery impacts are also described in Chapter 9 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a).

5.5.1 ESA-Listed Seabirds in the Bering Sea

Three species of seabirds that range into the Bering Sea are listed under the ESA: the endangered short-tailed albatross (STAL) , the threatened spectacled eider, and the threatened Steller's eider. Two additional species, Kittitz's murrelet and yellow-billed loon, are currently candidate species for listing under the ESA.

Short-tailed albatross (Phoebastria albatrus)

STAL feeding grounds are continental shelf breaks and areas of upwelling and high productivity (FWS 2008b). Although recent reliable diet information is not available, short-tailed albatross likely feed on squid and forage fish. Although surface foragers, their diet could include mid-water species that are positively buoyant after mortality (e.g. post-spawning for some squid species) or fragments of larger prey floating to the surface after being caught by subsurface predators (R. Suryan, pers.com.). Figure 36 shows the results of a kernel density distribution analysis of satellite tag data collected by Suryan (2006). The

analysis is described in NMFS 2008b. Darker purple areas in this figure are areas where STAL are likely to spend more time in the Bering Sea, based on the data set analyzed. Figure 37 shows the locations of STAL takes in Alaska fisheries to date, observations of STAL in at-sea surveys (Melvin 2006), and satellite tag locations (Suryan 2006).

Piatt et al (2006) discuss oceanic areas of seabird concentrations; they explain that STAL hotspots are characterized by vertical mixing and upwelling caused by currents and bathymetric relief and which persist over time. In the Bering Sea, hotspots were located along margins of Zhemchug, St. Matthews and Pervenets Canyons. Similar findings in Byrd et al (2005) confirm the frequent presence of surface-feeding piscivores near the medium and large passes that create the bathymetric conditions for vertical mixing and upwelling. Researchers surmise that prior to decimation of the short-tailed albatross population by feather hunters around the turn of the century, the albatrosses may have been reasonably common nearshore (thus the term "coastal" albatross) but only where upwelling "hotspots" occurred near the coast. As short-tailed albatross numbers increase, it is likely that their distribution will shift into areas less utilized currently, including the coastal areas.

In the context of this analysis, STAL hotspots in the Bering Sea are located along the Zhemchug, St Matthew, Pervenets, and Pribilof canyons along the continental shelf. Piatt et al report large groups (10-136 birds) of STAL concentrated along the Bering Sea canyons and call attention to a 2004 STAL flock sighting where approximately 10% of the world's population gathered at one hotspot near Pervenets canyon. These hotspots occur in the northern mid-Bering Sea area largely unprotected by the current habitat closures, see Figure 37.

Figure 36 Bird Habitat and areas closed to non-pelagic trawling in the Bering Sea

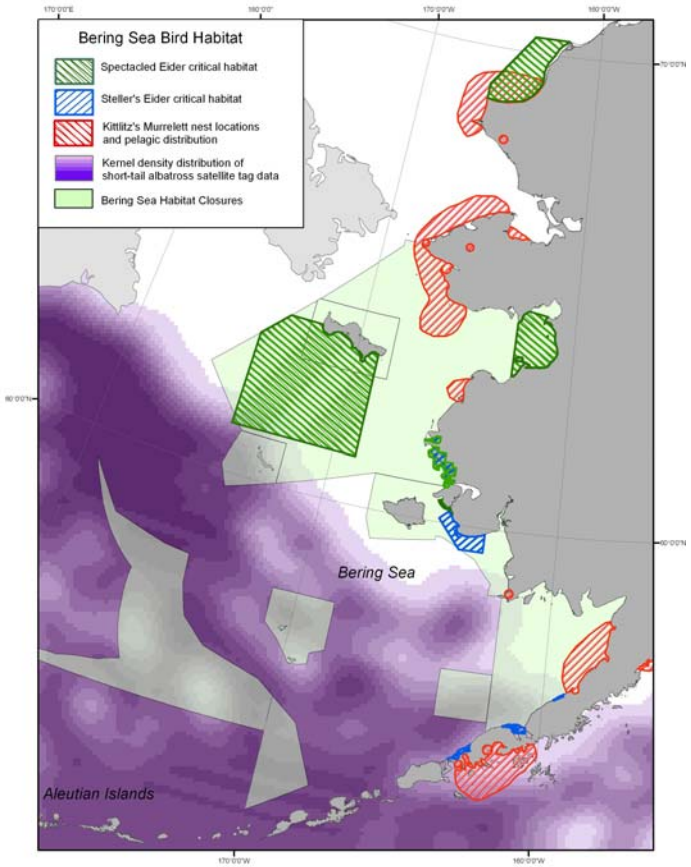
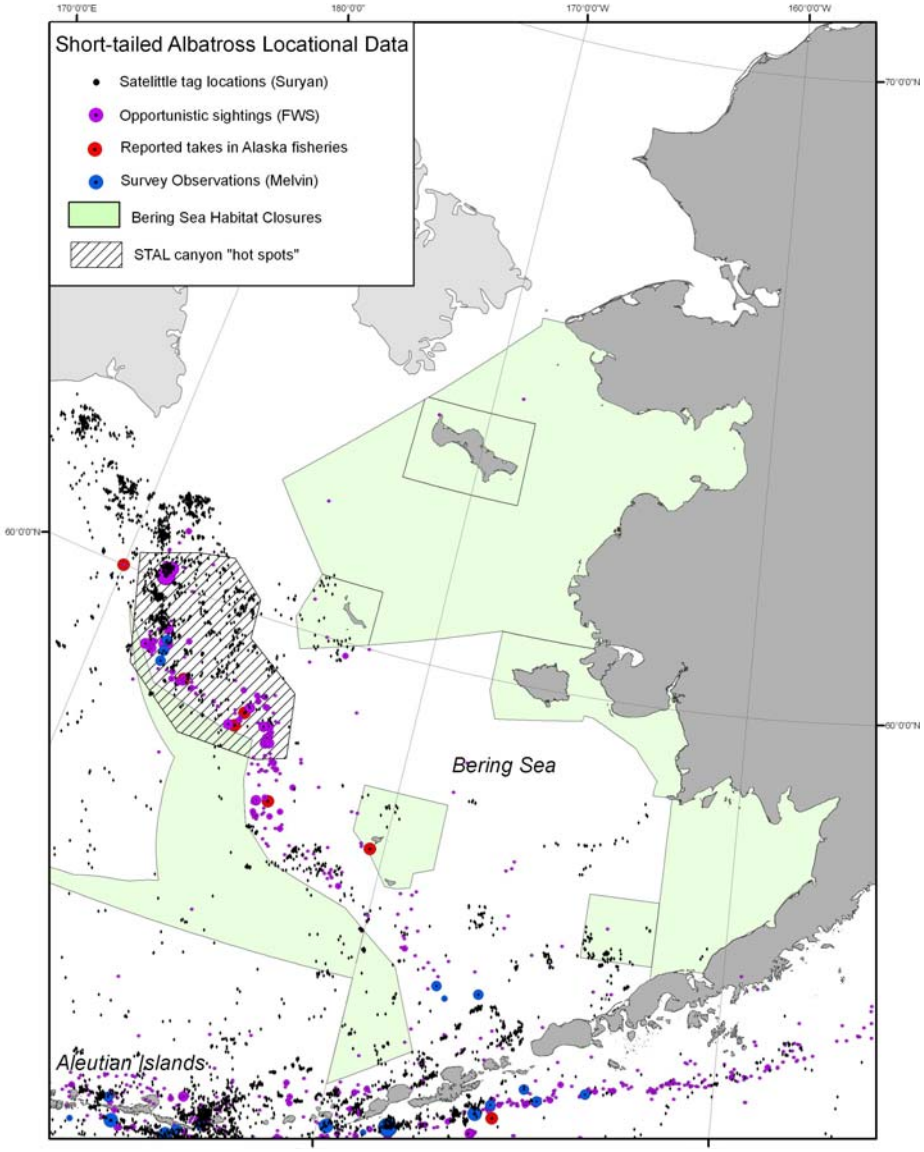


Figure 37 Short-tailed albatross takes



Note: Each take (red dot) is reported as a single observation. Bigger dots in the same color indicate greater numbers of short-tailed albatross observed. Comparisons are not valid between colors. Hatched area comprises Zemchung, Pervenents, and St. Matthew canyons, which are considered "hot spots" for short-tailed albatross.

Source: Satellite tag observations (Suryan 2006), survey data (Melvin et al 2006), and opportunistic sightings of Short-tailed Albatrosses (Balogh et al 2006).

STAL populations were decimated by hunters and volcanic activity at nesting sites in the early 1900s, and the species was reported to be extinct in 1949. By 1954 there were 25 total birds seen on Torishima Island. Prohibition of hunting and habitat enhancement work has allowed the population to recover at a 7%–8% rate based on egg counts from 1990-1998. The current world-wide breeding population is estimated at around 1,114 individuals, with a world-wide sub-adult population of 1,292, for a total 2007-2008 world-wide population of 2,406 individuals (FWS 2008b). No critical habitat has been designated for the short-tailed albatross in the US, since the population growth rate doesn't appear to be limited by marine habitat loss (NMFS 2004).

Because 80%–85% of nesting occurs at a colony subject to erosion and mudslides on Torishima Island, an active volcano in Japan, an international collaborative effort was begun to translocate STAL chicks to a safer colony within their historic breeding range. In February 2008, ten chicks were translocated from Torishima Island to Mukojima Island. All ten fledged. FWS plans to continue the translocation of 15 chicks each year for the next 4 years (FWS 2008b).

Because the short-tailed albatross population is rapidly increasing at approximately 7% annually (Zador et al. *in review*), the potential for interaction with North Pacific fisheries is also increasing. However, recent modeling of the impact of trawl mortality on the endangered STAL population suggests that even if the current estimated take (two birds in a 5 year period) was increased ten-fold, it would have little impact on the time course of achieving the species' proposed recovery goals, barring significant changes in non-trawl bycatch and a large volcanic eruption at the breeding colony (Zadar et al 2008).

Steller's eider (Polysticta stelleri)

Steller's eiders are diving ducks that spend most of the year in shallow, near-shore marine waters. Molting and wintering flocks congregate in protected lagoons and bays, as well as along rocky headlands and islets. They feed by diving and dabbling for molluscs and crustaceans in shallow water. In summer, they nest on coastal tundra adjacent to small ponds or within drained lake basins. During the breeding season they feed on aquatic insects and plants in freshwater ponds and streams.

There are five distinct areas of critical habitat depicted in Figure 36: Izembeck, Nelson, Seal Island, Kuskokwim Shoals, and an area that is also critical habitat for spectacled eiders at Yukon-Kuskokwim Delta (FWS 2001b).

Current primary nesting range in Alaska consists of a portion of the central arctic coastal plain between Wainwright and Prudhoe Bay, primarily near Barrow. Biologists estimate that the world population of Steller's eiders is around 220,000 birds, the majority of which nest in Russia. The number of pairs nesting on Alaska's arctic coastal plain is very roughly estimated at 1,000. Overall, the worldwide population of Steller's eiders may have decreased by as much as 50% over the last 30 years. At least 150,000 Steller's eiders, the majority of the world population, winter in Alaska from the eastern Aleutian Islands to Lower Cook Inlet. During their northward spring migration from wintering areas in Alaska, Steller's eiders can be found in large flocks close to shore from northern Bristol Bay to Hooper Bay (FWS 2002b).

Spectacled eider (Somateria fischeri)

Spectacled eiders are large diving sea ducks that spend most of the year in marine waters, where they primarily feed on bottom-dwelling mollusks and crustaceans. Besides breeding and molting in some Alaska coastal areas, spectacled eiders congregate during the winter in exceedingly large and dense flocks in open leads in the pack ice in the central Bering Sea between Saint Lawrence and St. Matthew Island Islands (FWS 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 (FWS 2003a).

Winter surveys in the Bering Sea, which includes non-breeding birds, indicate a worldwide population of about 360,000 birds (FWS 1996). 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).

Critical habitat has been designated for the spectacled eider in their wintering area between St. Lawrence and St. Matthew Islands (Figure 36; FWS 2001a). Kuletz and Labunski (2008) report that on March 23, 2008, observers on the USCGC Healy estimated 250,000 -350,000 spectacled eiders about 80 km off of SW Cape on St. Lawrence Island. The most important feature of the critical habitat is the density of benthic fauna available to foraging eiders (Greg Balogh, FWS, pers. comm.). 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.).

Exact causes of the population decline of both eider species world-wide are not known, but threats include lead poisoning, predation by ravens, large gulls, and foxes, hunting, marine contaminants, and changes in the Bering Sea ecosystem affecting food availability. There is no recorded take of these species in Alaska trawl fisheries, and no take estimates produced by the Alaska Fisheries Science Center (NMFS 2006b).

Kittlitz's murrelet (Brachyramphus brevirostris)

Kittlitz's murrelet is a small diving seabird that forages in shallow waters for capelin, Pacific sandlance, zooplankton and other invertebrates. It feeds near glaciers, icebergs, and outflows of glacial streams, sometimes nesting up to 45 miles inland on rugged mountains near glaciers. They nest on the ground, and not in colonies, thus less is known about their breeding behaviors. The entire North American population, and most of the world's population, inhabits Alaskan coastal waters discontinuously from Point Lay south to northern portions of Southeast Alaska. Kittlitz's murrelet is a relatively rare seabird. Most recent population estimates indicate that it has the smallest population of any seabird considered a regular breeder in Alaska (9,000 to 25,000 birds). This species appears to have undergone significant population declines in several of its core population centers—Prince William Sound (up to 84%), Malaspina Forelands (up to 75%), Kenai Fjords (up to 83%) and in Glacier Bay. Causes for the declines are not well known, but likely include: habitat loss or degradation, increased adult and juvenile mortality, and low recruitment. FWS believes that glacial retreat and oceanic regime shifts are the factors that are most likely causing population-level declines in this species.

On May 4, 2004, FWS (2004) gave the Kittlitz's murrelet (Brachyramphus brevirostris) a low ESA listing priority because it has no imminent, high magnitude threats (50 CFR Part 17 Volume 69, Number 86). The listing priority elevated from 5 to 2 in 2008 in recognition that climate change will have a more immediate effect on this species than previously believed and because of more evidence of declining population trends. In December of 2008, FWS published a finding to retain the candidate status. On March 10, 2009, the Center for Biological Diversity petitioned the State of Alaska to list Kittlitz's murrelet as endangered under state law, but the Alaska Department of Fish and Game denied the petition citing insufficient information available to indicate a threat to its continued existence as required under Alaska statutes.

The FWS has conducted surveys for Kittlitz's murrelet in the Alaska Maritime National Wildlife Refuge over the past few years (FWS 2006). These surveys have revealed populations at Attu, Atka, Unalaska, and Adak. Intensive surveys in 2006 found an additional 10 nests in the mountains of Agattu. Bird biologists will now be able to study the species' breeding biology for the first time.

No Kittlitz's murrelets were specifically reported taken in the observed groundfish fisheries between 1993 and 2001 (NMFS 2004), and no estimates are presented by AFSC (NMFS 2006b). While KIMU have been observed in the Bering Sea, their foraging techniques, diet composition, and the fact that they do not follow fishing vessels or congregate around them reduces the likelihood of incidental take in groundfish fisheries (K. Rivera, NMFS, pers. comm.) (FWS 2006).

Yellow-billed Loon (Gavia adamsii)

Yellow-billed loons breed abundantly in the Alaska tundra on the North Slope all summer, in association with large permanent fish-bearing lakes greater than two meters deep. They are believed to be long-lived and dependent upon high annual adult survival to maintain current population size. Globally the species has about 16,500 individuals, but the total Alaska population is estimated at between 3,700 and 4,900. There has been no discernible population trend, but due to limitations of current surveys and available information, researchers are not confident of being able to detect even significant declines in the breeding population. In 1993, researchers estimated a breeding population of 680 on the Seward Peninsula, in addition to yellow-billed loons' use of the North Slope.

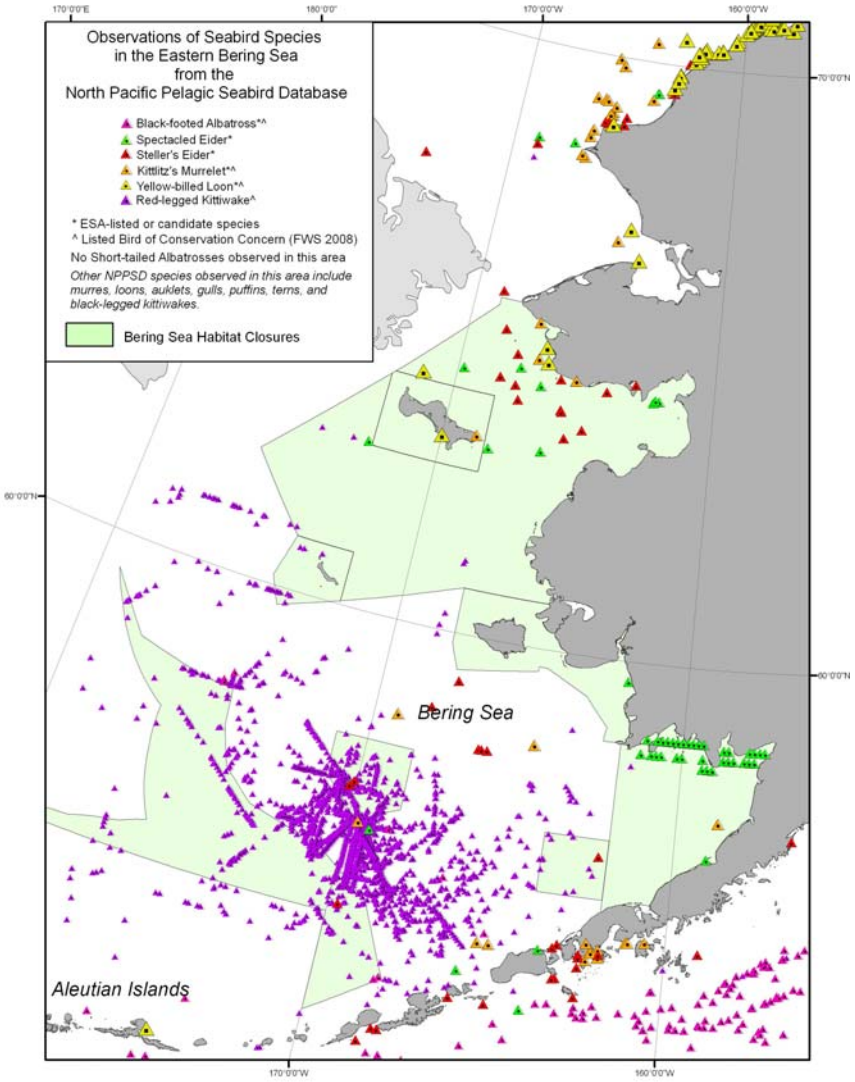
Yellow-billed loons are threatened by destruction of habitat, introduced predators, disturbance, and pollutants from oil and gas exploration and development. Most of the summer breeding habitat of the yellow-billed loon is available for oil and gas leasing and development. Human disturbance at up to one mile away can cause behavioral changes in yellow-billed loons such as leaving eggs or chicks unattended.

On March 25, 2009 the FWS published a finding that the yellow-billed loon warrants listing under the ESA, in response to a 2004 petition brought by the Center for Biological Diversity. However, it is not likely to be added to the list of species protected under the Act in the near future due to higher priority listing actions. In 2006, the Bureau of Land Management, FWS, and other agencies developed a conservation agreement for yellow-billed loons. This agreement strives to (1) implement specific actions to protect yellow-billed loons and their breeding habitats from impacts associated with human activities; (2) monitor populations in Alaska; (3) monitor and reduce (if necessary) subsistence impacts; and (4) conduct further research.

Other Seabird Species of Conservation Concern in the Bering Sea

The 1988 amendment to the Fish and Wildlife Conservation Act mandates the FWS to "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973." Birds of Conservation Concern (FWS 2008a) identifies the migratory and non-migratory bird species (beyond those already designated as Federally threatened or endangered) with their highest conservation priorities and draws attention to species in need of conservation action. NMFS' Evaluating Bycatch report says the purpose of the BCC list is to highlight potential conservation issues and concerns before species get listed. The Birds of Conservation Concern report, FWS (2008a) lists 28 species of birds in Region 7 (Alaska Region). Many of these species do not interact with Alaska fisheries, and thus are not addressed in this analysis. Figure 38 shows reported locations of birds of conservation concern that occur in the Bering Sea.

Figure 38 Observations of seabird species in the Bering Sea from the North Pacific Pelagic Seabird Database



Black-footed albatross (Phoebastria nigripes)

Although not an ESA-listed species, the black-footed albatross (BFAL) is a bird of conservation concern (FWS 2008) because some of the major colony population counts may be decreasing or of unknown status. World population estimates range from 275,000 to 327,753 individuals (Brooke 2004), with a total breeding population of 58,000 pairs (FWS, 2006). Most of the population (95%) breeds in the Hawaiian Islands. Conservation concerns in the last century have included albatross mortalities by feather hunters, the degradation of nesting habitat due to introduced species such as rabbits, and population reduction programs operated by the military. Tuna and swordfish pelagic longline fisheries in the North Pacific, including the Hawaiian longline fishery, and to a lesser extent the Alaska groundfish demersal longline fishery, take black-footed albatrosses incidentally.

On October 1st, 2004, the U.S. Fish and Wildlife Service received a petition to list the black footed albatross as a threatened or endangered species, and to designate critical habitat at the time of listing. The Service's response to the 90-day finding was deferred until October 9, 2007, due to insufficient resources.

At that time, the Service found that the petition warranted further review. Following the publication of the black-footed albatross population status review, the Service began developing its 12-month finding indicating whether it believes a proposal to list this species as threatened or endangered is warranted. That 12-month finding is not yet available.

Melvin et al (2006) cites the fact that the World Conservation Union changed its conservation status of the species under the international classification criteria from vulnerable to endangered in 2003. Additionally, the FWS has been working with Dr. Paul Sievert and Dr. Javier Arata of the U.S. Geological Survey to develop a status assessment of Laysan and Black-footed Albatrosses. This assessment is in response to growing concerns regarding the current status and population trends of these two north Pacific albatrosses, particularly the black-footed.

Black-footed albatrosses occur in Alaska waters mainly in the northern Gulf of Alaska, but do occur in the Bering Sea (FWS, 2006). Although bycatch in commercial fisheries is the most significant source of mortality for black-footed albatrosses, the estimated bycatch due to bottom fisheries off Alaska is only a small fraction of that bycatch (Naughton et al, 2007).

Red-legged kittiwake (Rissa brevirostris)

The red-legged kittiwake is a small gull that breeds at only a few locations in the world, all of which are in the Bering Sea (FWS 2006). They feed mainly on small fish, squid, and marine zooplankton. During the summer breeding period, they forage over deep water by either plunging or dipping into the water. Both red-legged kittiwakes and black-legged kittiwakes can feed during the day and night, but it has been suggested that red-legged, with larger eyes, is better adapted for catching prey that migrate to the ocean surface during the nighttime (Byrd 1993).

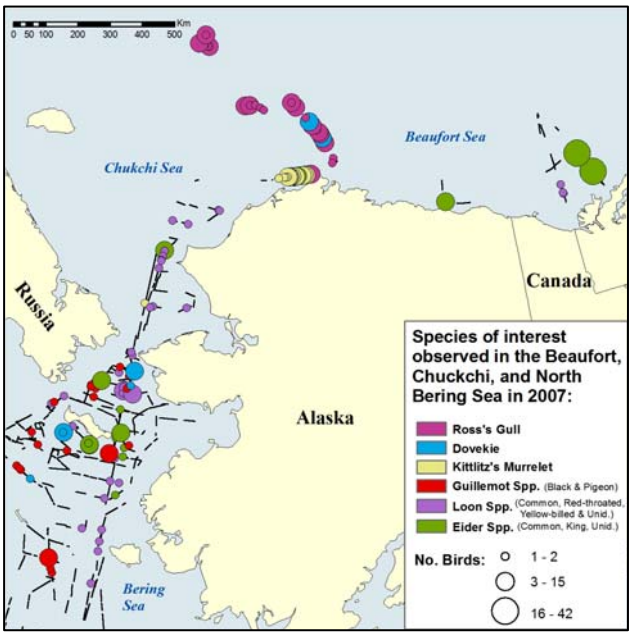
Eighty percent of its worldwide population nests at St. George Island, with the remainder nesting at St. Paul, the Otter Islands, Bogoslof and Buldir Islands. The total population is estimated at around 209,000 birds (FWS 2006). They are listed as a FWS bird of conservation concern (FWS 2008a) because recent severe population declines remain unexplained (NMFS 2004), but could be due to irregular food supplies in the Pribilof Islands. Recent harbor construction and other development in the Pribilof Islands could potentially increase the chance of introducing rats to the islands. Nest predation by rats would have a serious negative effect on rRed-legged kittiwake and other nesting seabirds on the islands. Red-legged kittiwakes have not been reported as taken by fisheries observers.

Seabird Colonies

The FWS Beringian Seabird Colony Catalog (2004) represents the location, population size, and species composition for each colony based on the most recent information available (Figure 39). These population estimates are based on opportunistic surveys of colonies, and may rely on historical information at some locations (Stephensen, FWS, pers. com.). Colonies in the Bering Sea include large numbers of cormorants, murres, puffins, auklets, black-legged kittiwakes, and gulls.

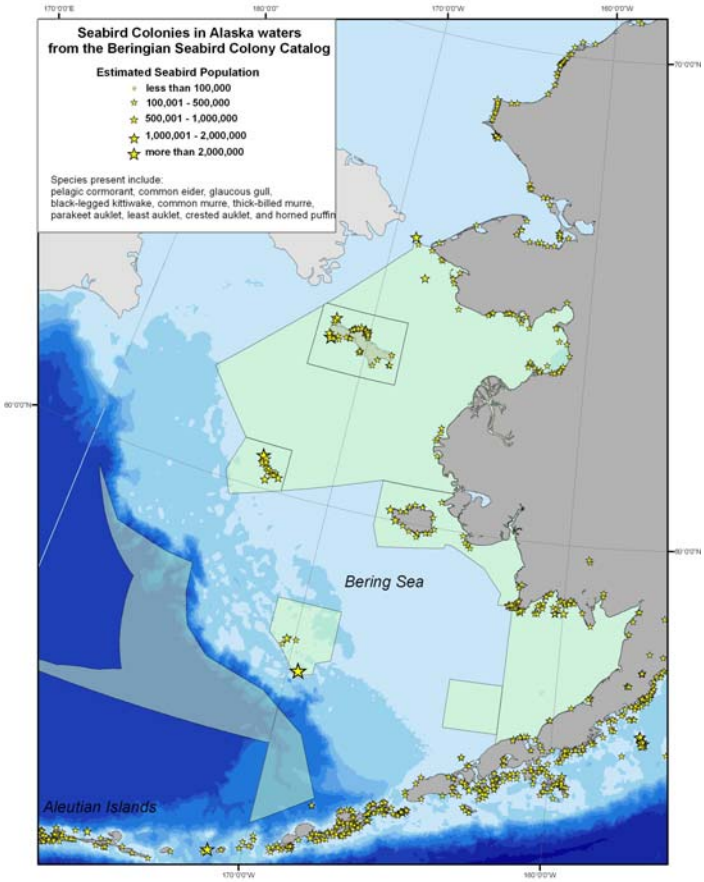
Irons and Kuletz (2008) describe the Bering Straits area, in particular, as a “prolific location for colonial nesting seabirds”. The majority of birds at colonies in the Bering Straits area are alcids which are diving seabirds. Alcids forage offshore for prey, making them vulnerable to oil spills and boat traffic. Kuletz and Labunski (2008) report on seabird distribution in this area from recent FWS surveys. They observed a seasonal pattern to bird distribution associated with ice breakup with higher summer densities of auklets near St. Lawrence Island and fall shearwater feeding in the Bering Straits before migrating south. Several other species of interest were observed including Dovekies, Kittlitz's murrelets, black guillemots, loons, and eiders, see Figure 40.

Figure 39 Species of interest observed in the Beaufort, Chukchi, and North Bering Sea in 2007



Source: Kuletz and Labunski 2008

Figure 40 Seabird colonies in the Bering Sea. Green areas are closed to fishing with non-pelagic trawl gear.



5.5.2 Seabird Interactions with Alaska Groundfish Trawl Fisheries

Alaska groundfish fisheries' impacts on seabirds were analyzed in the Alaska Harvest Specifications EIS (NMFS 2007a). That document evaluates the impacts of the alternative harvest strategies on seabird takes, prey availability, and seabird ability to exploit benthic habitat. The focus of this analysis is similar, as any changes to the non-pelagic trawl fishery in the Bering Sea could change the potential for direct take of seabirds and effects to benthic habitat and prey availability. The nature of these interactions is described for the reader briefly below and an evaluation of the current level of interaction follows.

Incidental Take

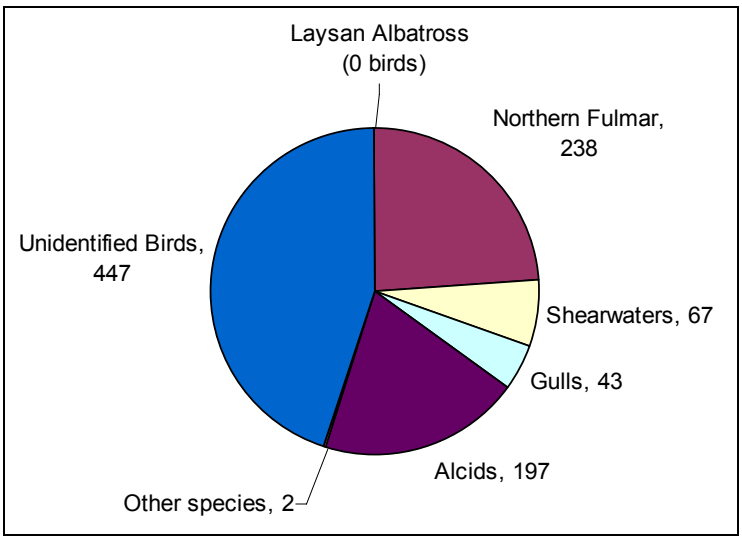
Seabirds can interact with trawl fishing vessels in several ways. Birds foraging at the water surface or in the water column are sometimes caught in the trawl net as it is brought back on board. These net-entangled birds are referred to as "bycatch" and are recorded by fisheries observers as discussed below. In addition to getting caught in the fishing nets of trawl vessels, some species get caught in cables attached to the infrastructure of vessels or collide with the infrastructure itself. These direct interactions called strikes are also discussed below.

Fisheries Bycatch

Estimated incidental take of birds recovered in the nets from trawling operations in the BSAI is approximately 855 birds per year (NMFS 2007b). Gull, shearwaters and fulmars make up 78 percent of the average annual trawl incidental catch for Alaska waters (NMFS 2007b). The estimated takes of gulls, fulmars and shearwaters in the entire groundfish fishery are very small portions of these species populations (NMFS 2007b).

Figure 41 shows the seabird species taken as bycatch in the Bering Sea trawl fisheries from 2002-2006. This includes trawl fisheries for pollock, Pacific cod, Atka mackerel, rockfish, and flatfish. [The high number of unidentified seabirds was influenced by one haul in the Pacific cod fishery in 2006 that occurred in NMFS Area 517.] These birds are brought up in trawl nets and do not include those taken by colliding with vessel infrastructure or wires.

Figure 41 Bycatch composition of seabirds in the Bering Sea trawl fisheries, 2002-2006

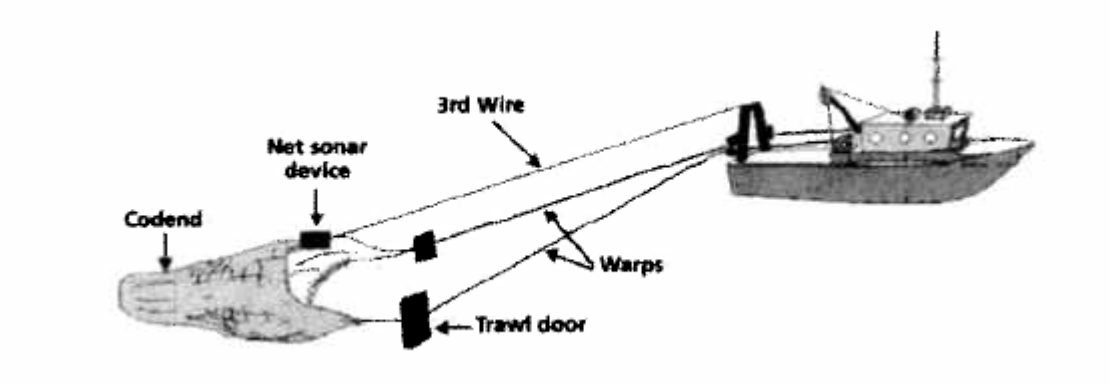


Note: More recent data is not yet available. Source: S. Fitzgerald, NMFS Alaska Fisheries Science Center.

Vessel/Infrastructure Strikes

FWS has determined that trawl gear may pose an additional threat to seabirds, primarily albatrosses and fulmars that strike cables extending from the vessel to the trawl net. Large winged birds such as albatrosses are most susceptible to mortalities from trawl-cable strikes (CCAMLR 2006a). Third wire cables have been prohibited in some southern hemisphere fisheries since the early 1990's due to substantial albatross mortality from cable strikes. No short-tailed albatrosses have been observed taken on trawl gear in Alaska fisheries, but mortalities to Laysan albatrosses have been observed. Much of the description of impacts in this section comes from Dietrich and Melvin (2007).

Figure 42 Trawl vessel diagram



Source: Reproduced from Dietrich and Melvin 2007, courtesy of K Williams

Birds can collide or become entangled with either warp cables that connect the trawl net to the vessel, or by third wire, netsonde, or paravane cables that connect to net monitoring devices. In some trawl fisheries, equipment is mounted on the trawl net that sends signals to the vessel so net performance can be monitored. This is most important in midwater fisheries such as pollock trawl, but is employed in some bottom-trawl fishing applications as well. Seabirds attracted to offal and discards from the ship may either strike the hard-to-see cable while in flight, or get caught and tangled in the cable while they sit on the water due to the forward motion of the vessel. Onboard observations of birds (including Laysan albatross) colliding with either of these cables have been made by both researchers and observers. Some birds that strike vessels or fishing gear fly away without injury, while others are injured or killed. When the cable or third wire encounters a bird sitting on the water, the bird can be forced underwater and drown. The main distinction between the two systems is the different location of the transducer cables and third wires. The transducer wires are deployed from the side of the ship and can be very close to where offal is discharged. There, they are not so likely to be hit by flying birds, but very likely to encounter swimming birds. Alternatively, transducer cables can be suspended from relatively long outriggers. This gets them out of the offal discharge area, but puts them more into the birds' flying zone. In contrast, trawl sonar cables (third wires) are deployed from the center of the stern, above the main deck, and can be above the water for longer distances. Thus, they are more likely to intersect the birds' flying zone than the concentration of swimming birds feeding on offal. These differences in location are likely to affect the probability and mechanism of bird strikes.

Up to the present, information on seabird interactions with transducer or third wire cables in Alaska has not been collected systematically. NMFS (2002) reports that the 3000+ observation records by NMFS-certified observers from 1993 to 2001 include 25 definitive reports of birds specifically striking or being drowned by the 'third wire' on trawl gear, and one report of birds striking the main trawl cables. Many of the observer notes were not about the third wires, and all observations may not have been recorded, so

encounter rates cannot be calculated from this information. The third wire incidents that were noted involved 92 birds, including about 30 northern fulmars and 19 Laysan albatross (NMFS 2002; FWS Observer Notes Database).

There are presently no standardized observer data on seabird mortality from trawler third wire collisions in Alaskan waters. Direct collection of seabird-third wire interaction data is problematic, for several reasons. Any birds killed by third wire collisions would most likely not be recorded in the observers' sampling of the trawl haul, as it is unlikely that such birds would make their way into the trawl net. Some trawlers are configured such that an observer's safety might be compromised were he or she to monitor the third wire during the tow, because direct observations would place the observer immediately below the net cables or expose them to heavy seas. Also, observer effort on trawlers is already fully allocated, and to monitor trawl third wire cables while gear is being towed may require abandoning some existing observer duties, or adding an additional observer to the trawl vessel. To date, striking of trawl vessels or gear by the short-tailed albatross has not been reported by observers. The probability of short-tailed albatross collisions with third wires or other trawl vessel gear in Alaskan waters cannot be assessed; however, given the available observer information and the observed at-sea locations of short-tailed albatrosses relative to trawling effort, the possibility of such collisions cannot be completely discounted. USFWS' biological opinion included an incidental take limit (ITS) of two short-tailed albatross for the trawl groundfish fisheries off Alaska (FWS 2003a) as discussed below.

Although the vast majority of warp and third wire effort during 2003-2005 occurred in three fisheries—pollock, cod and flatfish—overlap with albatross sighted during the NMFS surveys was minimal (June through August), except at the BS shelf break in 2004, when it was moderate to high. (Dietrich and Melvin, 2007). Dietrich and Melvin recommend that further studies to determine overlap of albatross distribution and the use of trawl gear focus on rockfish fisheries in the GOA, Atka mackerel fisheries in the BSAI from May to October, and Pacific cod fisheries in the AI in winter.

Status of Endangered Species Act Consultations on Groundfish and Halibut Fisheries

The FWS listed the short-tailed albatross as an endangered species under the ESA throughout its United States range (65 FR 46643, July 31, 2000). The current population status, life history, population biology, and foraging ecology of these species, as well as a history of ESA section 7 consultations and NMFS actions carried out as a result of those consultations are described in detail in section 3.7 of the PSEIS (NMFS, 2004). Although critical habitat has not been established for the short-tailed albatross, the FWS did designate critical habitat for the spectacled eider (66 FR 9146; February 6, 2001) and the Steller's eider (66 FR 8850; February 2, 2001; Figure 36).

In 1997, NMFS initiated a section 7 consultation with FWS on the effects of the Pacific halibut fishery off Alaska on the short-tailed albatross. FWS issued a Biological Opinion in 1998 that concluded that the Pacific halibut fishery off Alaska was not likely to jeopardize the continued existence of the short-tailed albatross (FWS 1998b). FWS issued an Incidental Take Statement of two short-tailed albatross in a two year period (1998/1999, 2000/2001, 2002/2003, etc.), reflecting what the agency anticipated the incidental take could be from the fishery action. Under the authority of ESA, FWS identified non-discretionary reasonable and prudent measures that NMFS must implement to minimize the impacts of any incidental take.

Two updated FWS Biological Opinions were published in 2003:

- Section 7 Consultation - Biological Opinion on the Effects of the Total Allowable Catch (TAC)-Setting Process for the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fisheries to

the Endangered Short-tailed Albatross (*Phoebastria albatrus*) and Threatened Steller's Eider (*Polysticta stelleri*), September 2003 (FWS 2003b).

- Section 7 Consultation - Programmatic Biological Opinion on the effects of the Fishery Management Plans for the Gulf of Alaska and Bering Sea/Aleutian Islands groundfish fisheries on the endangered short-tailed albatross (*Phoebastria albatrus*) and threatened Steller's eider (*Polysticta stelleri*), September 2003 (FWS 2003a).

Although FWS has determined that the short-tailed albatross is adversely affected by hook-and-line Pacific halibut and groundfish fisheries off Alaska, both FWS opinions concluded that the GOA and BSAI fishery actions are not likely to jeopardize the continued existence of the short-tailed albatross or Steller's edier or result in adverse modification of Steller's eider critical habitat. The FWS also concluded that these fisheries are not likely to adversely affect the threatened spectacled eider. The Biological Opinion on the TAC-setting process updated incidental take limits of:

- four short-tailed albatross taken every two years in the hook-and-line groundfish fishery off Alaska, and
- two short-tailed albatross taken in the groundfish trawl fishery off Alaska while the BO is in effect (approximately 5 years).

These incidental take limits are in addition to previous take limit set in 1998 for the Pacific halibut hook-and-line fishery off Alaska of two STAL in a two year period.

The 2003 Biological Opinion on the TAC-setting process also included mandatory terms and conditions that NOAA must follow in order to be in compliance with the ESA. One is the implementation of seabird deterrent measures (NMFS 2002). Additionally, NOAA Fisheries must continue outreach and training of fishing crews as to proper deterrence techniques, continued training of observers in seabird identification, retention of all seabird carcasses until observers can identify and record takes, continued analysis and publication of estimated incidental take in the fisheries, collection of information regarding the efficacy of seabird protection measures, cooperation in reporting sightings of short-tailed albatross, and continued research and reporting on the incidental take of short-tailed albatross in trawl gear.

The FWS released a short-tailed albatross recovery plan dated September 2008 (FWS 2008b). This recovery plan meets the ESA requirements of describing site-specific actions necessary to achieve conservation and survival of the species, downlisting and delisting criteria, and estimates of time and cost required to implement the recovery plan. FWS estimates that the STAL may be delisted in the year 2033 with a total world-wide population of 5,485, if translocation continues and new colony establishment is successful.

Short-tailed albatross takes in Alaska fisheries

Table 18 details the short-tailed albatrosses reported taken in Alaska fisheries since 1983 and they are shown in Figure 37. Note that no takes are reported from groundfish trawl fisheries. Except for the 2nd take in 1998, leg bands were recovered from all of the albatrosses allowing scientists to verify identification and age. Since 1977, Dr. Hiroshi Hasegawa has banded all short-tailed albatross chicks at their breeding colony on Torishima Island, Japan.

Table 18 Reported takes of short-tailed albatross in Alaska fisheries

Date of Take	Location	Fishery	Age when taken
July 1983	Bering Sea	brown crab	juvenile (4 months)
1 October, 1987	Gulf of Alaska	halibut	juvenile (6 months)
28 August, 1995	Eastern Aleutian Islands	hook-and-line	sub-adult (16 months)
8 October, 1995	Bering Sea	hook-and-line	sub-adult
27 September, 1996	Bering Sea	hook-and-line	sub-adult (5 years)
21 September, 1998	Bering Sea	Pacific cod hook-and-line	adult (8 years)
28 September,1998	Bering Sea	Pacific cod hook-and-line	sub-adult

Source: NPPSD 2004

Prey Availability – Disturbance of Benthic Habitat

As noted in the table below, fish targeted by non-pelagic commercial fishing gear are not major diet components of seabird species in the Bering Sea. However, seabird species may be impacted indirectly by effects of the non-pelagic trawl gear on the benthic habitat of seabird prey, such as clams, bottom fish, and crab. The EFH EIS (NMFS 2005) provides a description of the effects of trawling on bottom habitat in the Appendix, including the effects of the commercial fisheries on the Bering Sea slope and shelf.

Table 19 Bering Sea Seabird Prey

Species	Foraging Habitats	Prey
Red-legged Kittiwake	Surface fish feeder	Myctophids, squid, amphipods, euphausids, minor amounts of pollock and sand lance
Black-footed albatross	Surface fish	Fish eggs, fish, squid, crustaceans
Spectacled Eider	Diving	Mollusks and crustaceans
Kittlitz's Murrelet	Surface dives	Fish, invertebrates, macroplankton
Short-tailed shearwater	Surface dives	Crustaceans, fish, squid
Northern Fulmar	Surface fish feeder	Fish, squid, crustraceans
Murres (thick-billed and common)	Diving fish-feeders offshore	Fish, crustaceans, invertebrates
Cormorants (pelagic and red-faced)	Diving fish-feeders nearshore	Bottom fish, crab, shrimp
Glaucos winged gull	Surface fish feeder	Fish, marine invertebrates, birds

Source: FWS 2006 and Dragoo 2008

It is not known how much seabird species use benthic habitat directly, although research funded by the NPRB has been conducted on foraging behavior of seabirds in the Bering Sea in recent years. Thick-billed murres easily dive to 100 meters, and have been documented diving to 200 meters, while common murres dive to 100m+ also. Since cephalopods and benthic fish comprise some of their diet, murres could be foraging on or near the bottom (K. Kuletz, pers. com., October 2008).

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. NMFS (2007a) 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. 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 commercial target species. Most of the forage fish bycatch is smelt taken in the pollock fishery, which is not included in this action. 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 2008). 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 (2008).

Spectacled eiders congregate in the open leads of ice in the winter in the critical habitat area 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 and vessels are likely to encounter the dispersed population only in October before the sea ice develops. Direct disturbance of the eiders is 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, FWS, per. comm.). Because nonpelagic trawl gear contacts the bottom, nonpelagic trawl gear in the critical habitat may have an impact on spectacled eider prey, particularly *Nuculana radiata* clams upon which spectacled eiders depend during winter. 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.). Use of nonpelagic trawl gear has been limited within the spectacled eider critical habitat, and is currently not permitted in the block of critical habitat south of St. Lawrence Island because of the Northern Bering Sea Research Area habitat closure.

New research on the effects of trawling on the seafloor report the following results. 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), but clam abundance in these studies was depressed for the first 3 years after trawling occurred. McConnaughey et al. (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. 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 could 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 et al. 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 et al. 1993). It is not known which category *Nuculana radiata* or other potential spectacled eider prey may occupy. 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.

5.5.3 Analysis of Alternatives

Table 20 explains the criteria used in this analysis to gauge significance of effects on seabird populations in the Bering Sea. These criteria are used in the analysis of alternatives and options that follows.

Table 20 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.

Alternative 1: Status Quo

The effects of the status quo fisheries on the incidental takes of seabirds are detailed in the 2007 harvest specifications EIS (NMFS 2007a). These take estimates are small in comparison to seabird population estimates, and under the status quo alternative, it is reasonable to conclude that the impacts would continue to be small and are considered insignificant in this analysis.

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 and therefore insignificant for all alternatives and options.

Figures 1-4 show that large regions of the Bering Sea (colored in light green) are currently closed to non-pelagic trawling effort in order to protect habitat. These closures decrease the potential for incidental takes of seabirds either through bycatch or vessel/cable strikes and the disruption of benthic habitat and prey availability inside the closures, by decreasing total fishing effort in these areas. These restrictions are not anticipated to change (except slightly under Alternative 2 with the creation of a Modified Gear Trawl Zone), so this protection would continue to be provided under any of the alternatives in this analysis.

Alternative 2: Require elevating devices on trawl sweeps

Requiring elevating devices throughout the Bering Sea could lessen impacts to benthic habitat, thereby increasing prey availability. As exact relationships between prey distribution, foraging success, and ice cover is variable year to year, requiring elevating devices throughout the Bering Sea could provide more potential benefit to seabirds than Alternative 1, but is impossible to quantify and considered insignificant at a population level.

Alternative 3: Require elevating devices on trawl sweeps and create Modified Gear Trawl Zone

The effects on seabird species by proposed changes in the use of trawl gear are discussed in Alternative 2. Although it is not possible to predict changes in fishing effort, opening up the southern portion of the Northern Bering Sea Research Area to create a Modified Gear Trawl Zone would likely not have significant effects on the incidental take of seabirds or benthic habitat and prey availability. Spectacled eiders move along the coast between Nunivak Island and their critical habitat at Yukon-Kuskokwim delta up towards Norton Sound and then across to St. Lawrence Island and their wintering area (Greg Balogh, pers. comm.). While there is use of this area by many seabird species (Kuletz and Labunski 2008), it is not considered a hot spot or critical habitat for any species of conservation concern, so the effects of trawling in this area with elevating devices would be insignificant at the population level of seabirds in that area.

St. Matthew Island HCA Option

Any expansion of the St. Matthew Island HCA could result in greater protection of benthic habitat, greater availability of seabird prey, and fewer vessel strikes. However, the degree of expansion considered in this action, based on the approximations in Section 2, either to the east or southwest, would not be significant enough to have a significant beneficial impact on seabirds; nor would the expansion likely cause a significant shift in fishing effort to other areas. (Figure 38 and Figure 39 show seabird colonies and seabird habitat use around St. Matthew by several seabird species of conservation concern. Figure 36 and Figure 37show short-tailed albatross hotspots and density distribution to the west of the St. Matthew habitat closure.)

5.5.4 Conclusions

Many seabird species use the marine habitat of the Bering Sea, including several species of conservation concern. Some species are occasionally taken by cable or vessel strikes or become entangled in trawl nets, and some species depend on benthic habitat that is disrupted by non-pelagic trawling. However, AFSC estimates that seabird takes are few and infrequent in relation to seabird population total estimates. Moreover, recent modeling suggests that even a large increase in incidental takes of short-tailed albatross by interactions with trawl cables would have negligible effects on the recovery of the species. The spatial and temporal effects of non-pelagic trawling on benthic habitat are not yet well understood, although undisturbed areas seem to produce more clam species on which eider species are dependent.

The impacts on seabirds from each of the alternatives are summarized below in Table 21. Although the action alternatives may provide small positive effects to seabirds, NMFS has determined that all effects (both positive and negative) would be insignificant.

Table 21 Summary of impacts to seabirds from alternatives in this analysis

Alternative	Component	Impact on Seabird populations in Alaska waters
Alternative 1	Status quo	Seabird takes and disruptions to benthic habitat and prey availability are at low levels and are mitigated (to some degree) by current spatial restrictions on the trawl fisheries in the Bering Sea.
Alternative 2	Require elevating devices	Requiring the devices throughout the Bering Sea could lessen impacts to benthic habitat, thereby increasing prey availability to the species who are dependent on it for at least part of the year.
Alternative 3	Require elevating devices and create "Modified Trawl Gear Zone"	Same potential benefit as Alternative 2. It is unknown what additional effort might exist in the Zone, but is considered to be insignificant to seabird populations.
Option	Adjust St. Matthew habitat closure boundary	Increasing the closed area around St. Matthew could decrease effort in this area, lessening impacts to benthic habitat, increasing prey availability, and reducing vessel strikes.

5.6 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 22. 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 22 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 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 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 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 two action alternatives are also similar for effects on

marine ecosystems. The Option would be more protective of ecosystem relationships within the additional closure area of SMIHCA, but no nonpelagic fishing currently occurs in this area and therefore the effects of the option would be the same as the alternatives.

Predator-Prey Relationships– Insignificant effects on predator-prey relationships are expected for Alternative 2 and 3, and the Option. No substantial changes would be anticipated in biomass or numbers in prey populations. No increase in the catch of higher trophic levels, nor changes in the risk of exotic species introductions are expected because there would be no change in fishing activities that would result in these types of effects. 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. Alternatives 2 and 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. The Option is very localized and therefore any effect on predator-prey relationships is likely to be isolated and not observable on regional basis.

Energy Flow and Balance – The amount and flow of energy in the ecosystem under the alternatives and option 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 option are the same and insignificant.

Diversity – A net change in nonpelagic trawling would not occur along the Bering Sea shelf and slope by either alternative or the option. The gear modification identified in Alternatives 2 and 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 effects of the Option 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 the additional closure near SMIHCA. The impacts of the Option on diversity are likely insignificant.

5.7 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 2007a). No additional RFFAs have been identified for this proposed action. The RFFAs are described in the Harvest Specifications EIS section 3.3 (NMFS 2007a), are applicable for this analysis, and are incorporated by reference. A summary table of these RFFAs is provided below (Table 23). 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 23 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 23. 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 3 gear modification. 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 the trawl sweep modification proposed under Alternatives 2 and 3 is likely to be primarily beneficial and is not likely to be significant because of the limited habitat benefits under Alternatives 2 and 3 and the limited area to be opened under Alternative 3. The creation of the Modified Gear Trawl Zone under Alternative 3 would remove a small area from the habitat protection created under the Northern Bering Sea Research Closure area. However, this area is not currently utilized by the fishery, and only vessels using a modified gear that reduces adverse impacts to benthic habitat would be allowed to fish in the area. Both the programmatic groundfish management review (NMFS 2004) and the harvest specifications EIS (NMFS 2007a) analyzed the effects of the flatfish fishery while the area is question was still open to non-pelagic trawling, and found the impact rating to be insignificant. A more detailed review of cumulative effects for marine mammals is included below.

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 2007a). 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 flatfish fisheries (yellowfin sole, rock sole, flathead sole, arrowtooth flounder, rex sole, Alaska plaice) are in the process of applying for Marine Stewardship Certification for ensuring harvests is conducted in a manner that maintains structure, productivity, function, and diversity of the ecosystem. A final assessment is expected to be completed in 2009. Overall, the cumulative effects on habitat and ecosystems are primarily beneficial in combination with the implementation of the trawl sweep modification proposed under Alternatives 2 and 3, and are not likely to be significant because of the limited costs and habitat benefits of the gear modification. Creating the Modified Gear Trawl Zone

under Alternative 3 is not likely to result in substantial or observable changes to habitat or the ecosystem and therefore the impacts are cumulatively 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 3.3.

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 21^{st} 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.

Marine mammals cumulative effects

A description of past and present cumulative effects for the Programmatic EIS for the Alaska Groundfish Fisheries (NMFS 2004) and is incorporated by reference. The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the effects of the alternatives on marine mammals. Some of these actions are broadly based on the potential changes to the groundfish fisheries that may result in impacts on marine mammals.

Ecosystem-sensitive management

Increased attention to ecosystem-sensitive management is likely to lead to more consideration for the impact of the nonpelagic trawl fishery on marine mammals and more efforts to ensure the ecosystem structure that marine mammals depend on is maintained, including prey availability. Increasing the potential for observers collecting information on marine mammals and groundfish fisheries interaction, and any take reduction plans, may lead to less incidental take and interaction with the groundfish fisheries, thus reducing the adverse effects of the groundfish fisheries on marine mammals.

Changes in the status of species listed under the ESA, the addition of new listed species or critical habitat, and results of future Section 7 consultations may require modifications to groundfish fishing practices to reduce the impacts of these fisheries on listed species and critical habitat. Listing any of the ice seals and designating critical habitat would require Section 7 consultation for the groundfish fisheries to determine if they are likely to adversely affect the listed species or designated critical habitat. Change to the fisheries may be required if it is determined that the fishery may pose jeopardy or adverse modification or destruction of critical habitat. Fishery measures would be needed to reduce that potential harm.

Modifications to Steller sea lion protection measures will result in Section 7 consultations. These changes may be a result of recommendations by the Council based on a review of the current protection measures, potential State actions, or recommendations from the draft FMP-level biological opinion which is scheduled for release in springe 2010. Any change in protection measures likely would have insignificant effects because any changes would be unlikely to result in the PBR being exceeded and would not be likely to result in jeopardy of extinction or adverse modification or destruction of designated critical habitat.

Improved management of fur seals may result from the Council's formation of the Fur Seal Committee, and the continued development of information regarding groundfish fishery interactions and fur seals. The timing and nature of potential future protection measures for fur seals are unknown, but any action is likely to reduce the adverse effects of the groundfish fisheries on fur seals.

The ongoing research efforts are likely to improve our understanding of the interactions between the harvest of flatfish and Pacific cod and the impacts on marine mammals in the Bering Sea. NMFS is conducting or participating in several research projects which include understanding the ecosystems and fisheries interactions. These projects will allow NMFS to better understand the potential impacts of commercial fisheries and the Bering Sea ecosystem. The results of the research will be useful in

managing the fisheries with ecosystem considerations and is likely to result in reducing potential effects on marine mammals.

The implementation of an Arctic fishery management plan may provide protection to those marine mammals that use Arctic and Bering Sea waters, such as ice seals. The plan is likely to result in no fishing in either the Chukchi or Beaufort Seas which would prevent the potential for incidental takes, disturbance or competition for prey species between fishing vessels and marine mammals. This plan is scheduled for Secretary of Commerce review in summer 2009.

Traditional management tools

The cumulative impact of the annual harvest specifications in combination with future harvest specifications may have lasting effects on marine mammals. However, as long as future incidental takes remain at or below the PBR, the stocks will still be able to reach or maintain their optimal sustainable population. Additionally, since future TACs will be set with existing or enhanced protection measures, it is reasonable to assume that the effects of the fishery on the harvest of prey species and disturbance will likely decrease in future years. Improved monitoring and enforcement through the use of technology would improve the effectiveness of existing and future marine mammal protection measures by ensuring the fleet complies with the protection measures, and thus, reducing the adverse impacts of the alternatives.

Actions by other Federal, State, and International Agencies

Expansion of State pollock or Pacific cod fisheries may increase the potential for effects on marine mammals. However, due to ESA requirements, any expansion of State groundfish fisheries may result in reductions in Federal groundfish fisheries to ensure that the total removals of these species do not jeopardize any ESA-listed species or adversely modify designated critical habitat, including Steller sea lion critical habitat.

State management of the salmon fisheries of Alaska will continue into the future. The State's first priority for management is to meet spawning escapement goals to sustain salmon resources for future generations. Subsistence use is the highest priority use under both State and Federal law. Surplus fish beyond escapement needs and subsistence use are made available for other uses, such as commercial and sport harvests. The State carefully monitors the status of salmon stocks returning to Alaska streams and controls fishing pressure on these stocks. Even though prey availability is not accounted for in the setting of salmon harvest levels, the management of salmon stocks effectively maintains healthy populations of salmon where possible and may provide sufficient prey availability to marine mammals.

Incidental takes of Steller sea lions and other marine mammals occur in the State managed set and drift gillnet salmon fisheries (73 FR 73032, December 1, 2008). Marine mammal species taken in the State-managed fisheries and also the nonpelagic trawl fishery are in Table 24. Only Steller sea lions have recent takes in the State fisheries that allow for determining the mean annual mortality. The other species listed with 0 mean annual mortality are listed as species taken in the List of Fisheries based on more years of data than used for the Stock Assessment Report (Angliss and Outlaw 2008).

Table 24 Marine mammals taken in State-managed and Federal nonpelagic trawl fisheries

Marine Mammal Stocks Taken in State Managed and Federal Nonpelagic Trawl Fishery#	State Fisheries mean annual mortality*
Northern fur seal	0
Harbor seal, Bering Sea	0
Steller sea lions, western	14.5
Harbor Porpoise	0
Spotted seal	0

*Angliss and Outlaw 2008

#LOF 73 FR 73032, December 1, 2008

The mortalities listed in Table 24 are included in the total mean annual human caused mortalities in Table 14. The combination of the incidental takes in the nonpelagic trawl fishery with takes in the State-managed fisheries for these species is either well below the PBR or a small portion of the total mean annual human caused mortality for species which PBR is not determined. It is not likely that any of the alternatives or options would change the nonpelagic trawl fishery in a manner that would greatly increase the overall incidental takes of these marine mammals to where either the PBR would be exceeded or the proportion of fishery mortality in the total mean annual human caused mortality would greatly change.

Private actions

Subsistence harvest is the primary source of direct mortality for many species of marine mammals. Current levels of subsistence harvests, reflected in column 3 of Table 14, are controlled only for fur seals. Subsistence harvest information is collected for other marine mammals and considered in the stock assessment reports. It is unknown how rates of subsistence harvests of marine mammals may change in the future.

Other factors that may impact marine mammals include continued commercial fishing; non-fishing commercial, recreational, and military vessel traffic in Alaskan waters; oil and gas exploration; seismic surveying; and tourism and population growth that may impact the coastal zone. Little is known about the impacts of these activities on marine mammals in the BSAI. However, Alaska's coasts are currently relatively lightly developed, compared to coastal regions elsewhere. Despite the likelihood of localized impacts, the overall impact of these activities on marine mammal populations is expected to be modest.

Future Actions Conclusions

The continuing fishing activity and continued subsistence harvest are potentially the most important sources of additional annual adverse impacts on marine mammals. Both of these activities are monitored and are not expected to increase beyond the PBRs for most marine mammals. The extent of the fishery impacts would depend on the size of the fisheries, the protection measures in place, and the level of interactions between the fisheries and marine mammals. However, a number of factors will tend to reduce the impacts of fishing activity on marine mammals in the future, most importantly ecosystem management. Ecosystem-sensitive management and institutionalization of ecosystem considerations into fisheries governance are likely to increase our understanding of marine mammal populations and interactions with fisheries. The effects of actions of other Federal, State, and international agencies are likely to be less important when compared to the direct interaction of the commercial fisheries, subsistence harvests, and marine mammals.

6 Management and enforcement considerations

6.1.1 Management

The regulations will describe the modification in more detail, and will combine a gear and performance standard. Vessels must employ elevating devices on the sweeps that achieve one of two options, combining a nominal clearance (the space created under the sweeps adjacent to the elevating device, measured on a hard surface), and a maximum distance between elevating devices. The draft regulation includes a figure to identify the location on the gear where elevating devices are required. Elevating devices may also be required on trawl door and net bridles that are longer than the standard size (180 feet). The draft regulation is still subject to revision, but is included in Appendix B for reference.

6.1.2 Enforcement

The draft regulation is intended to ensure clearance of the sweep off the seafloor based on research but must be able to be easily checked for compliance by both vessel operators and enforcement personnel. Developing such a regulation has been challenging and required participation from industry, NMFS, North Pacific Groundfish Observer Program (NPGOP), U.S. Coast Guard (USCG), and NOAA Office for Law Enforcement (OLE) and General Council Enforcement. By working with industry, the regulation provides the fleet with sufficient flexibility to allow them to use the gear modifications on diverse vessel and gear type configurations that are currently employed in the flatfish fishery.

The details of the regulation were developed and reviewed with federal monitoring and enforcement personnel, gear manufacturers, and the industry at public workshops (September 2008 as detailed in Appendix C, and January 2009 as further described below). There was discussion about whether to include more specific detail in the regulation, for example whether to specify the height of the elevating device required to meet the standard, or whether to require spacing markers on the sweeps to indicate that the correct spacing had been met. After much discussion, the workshop participants agreed that the intent of the action would be met by regulating the clearance standard and spacing requirements, and that by leaving the other details out of the regulation, the fleet would have more flexibility to individualize the gear as appropriate to their vessel and gear type configurations. The regulation includes a figure to define the parts of the gear on which elevating devices are required.

The implementation of a modified trawl sweep program will involve manufacturers, fishers, NMFS, the NOAA OLE, USCG, and NPGOP personnel. The fishers will be responsible to ensure their sweeps meet the standards, and compliance with the standards may be randomly checked by several methods. Agency enforcement activities will focus on ensuring compliance with the regulation that prohibits targeting flatfish without using a modified trawl gear in the Bering Sea subarea. An at-sea observer may observe the deployment or retrieval of the net to determine the presence or absence of the modified gear. The OLE would be notified if the modified gear 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, the design and use of various devices such as “wear indicators” on the bobbins to enable visual detection of worn or inadequate modified trawl gear, and the actual procedures to be used by the vessels and the monitoring bodies in undertaking an inspection of modified trawl gear will need to be developed prior to implementation of the gear modification requirement.

During the development of the regulation, various discussions about enforcement of the proposed regulation have occurred, both in the forum of the Council’s Enforcement Committee, and at a meeting of agency enforcement personnel. The minutes from these meetings are included in Appendix D. The focus

of the discussions was primarily whether a regulatory standard that specifies only a required clearance and spacing standard be credibly enforced by NMFS.

In order to resolve some of the outstanding concerns about the enforceability of the modified gear, it was determined that an at-sea demonstration of the gear on board a vessel would be most useful. Consequently, Mr. John Gauvin arranged for the F/V Vaerdahl, with Captain Bill Hayes, to take onboard representatives of the various interested agencies. The demonstration occurred in Seattle on the afternoon of January 9, 2009, and fourteen agency personnel attended. A report on the demonstration was presented at the February 2009 Council meeting. Overall, the experience was very informative, and provided insight into the feasibility of conducting inspections of the gear while in use on the vessel. In general, the enforcement personnel appeared to agree that boarding a vessel at sea and inspecting the gear for compliance with the regulatory requirements is feasible and likely to be successful. The elevating devices are easy to see and measure while the sweeps are being set or hauled back, and worn devices should be easy to replace. Onboard observers should also be able to see and note gross violations, such as the vessel not using the modified gear for flatfish fishing. The enforcement personnel agreed that it would be important to come up with a penalty schedule, so that not using the gear, or using it in an improper manner (e.g., with the bobbins worn down so as not to meet the correct clearance), presents a serious violation. They also agreed that the Coast Guard and OLE should cooperate in the first year of implementation of the program, to put OLE staff on vessels and aim to do onboard inspections of a large proportion of vessels in the flatfish fleet. With these conditions in place, the enforcement personnel indicated that some of the previous, more onerous recommendations (e. g., mandatory wear indicators or spacing markings) for the regulation of this proposed amendment may not be necessary.

The Council's Enforcement Committee met at the February 2009 Council meeting, and revised its recommendations in light of the at-sea demonstration, removing their objections with respect to the enforceability of the action.

7 Regulatory impact review and probable economic and socioeconomic impacts

7.1 Introduction

This Regulatory Impact Review (RIR) evaluates the costs and benefits of three alternatives that evaluate a proposed gear modification to require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor, and changes to the southern boundary of the Northern Bering Sea Research Area (NBSRA) to create an area where anyone fishing with non-pelagic trawl gear must use the modified trawl sweeps required by regulation. Also included is an option to change the boundary of the St Matthew Island Habitat Conservation Area to be consistent with the Council's intent to protect blue king crab habitat. This proposed amendment also addresses certain housekeeping changes to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP), which are required to correct typographical and non-substantive errors, but these are not analyzed as part of this RIR.

7.2 What is a Regulatory Impact Review

This RIR is required under Presidential Executive Order 12866 (58 *FR* 51735, September 30, 1993). The requirements for all regulatory actions specified in EO 12866 are summarized in the following statement from the order:

> *In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but 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.*

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

- 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.

7.3 Problem Statement

The Council formulated the following problem statement to initiate this analysis:

> Research has shown that sweep modifications can reduce gear contact with the sea floor and may not have negative effects on catch rates. Modifications appear to meet the Council's intent to consider practicable measures to reduce potential adverse effects of non-pelagic trawl fishing on bottom habitat. The "wedge" is reported to contain high concentrations of flatfish and low concentrations of other bycatch species. Re-opening of the "wedge" was linked to implementation of sweep modifications in final action on Amendment 89. In addition, there may be some associated typographical, formatting, and description errors in the FMP that may not meet the Council's intent.

The history leading up to the Council's decision to initiate this analysis is described in Section 1.1, on page 1 of this analysis, and a detailed discussion of the purpose and need for this action is included in Section 1.2.

7.4 Description of the Alternatives

The alternatives, as adopted by the Council in February 2009, are as follows:

Alternative 1: Status quo

Alternative 2: Require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor

Alternative 3: Require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor, and adjust the southern boundary of the Northern Bering Sea Research Area (NBSRA) to exclude an area that would be designated as a "Modified Gear Trawl Zone". Anyone fishing with non-pelagic trawl gear in this area must use the modified trawl sweeps required by regulation. The polygon would be delineated on the north by a line at 61˚ W. latitude, to the east at 168˚ W. longitude, to the south by the existing NBSRA boundary, and to the west by the St Matthew Habitat Conservation Area boundary (which may be revised under the option listed below). Figure 43 illustrates the maximum geographic extent of the area identified as the Modified Gear Trawl Zone.

SMIHCA Option: Adjust the St Matthew HCA boundary to be consistent with the Council's intent to protect blue king crab habitat, based on the best available information. This option can be adopted under any of the three alternatives listed above[2].

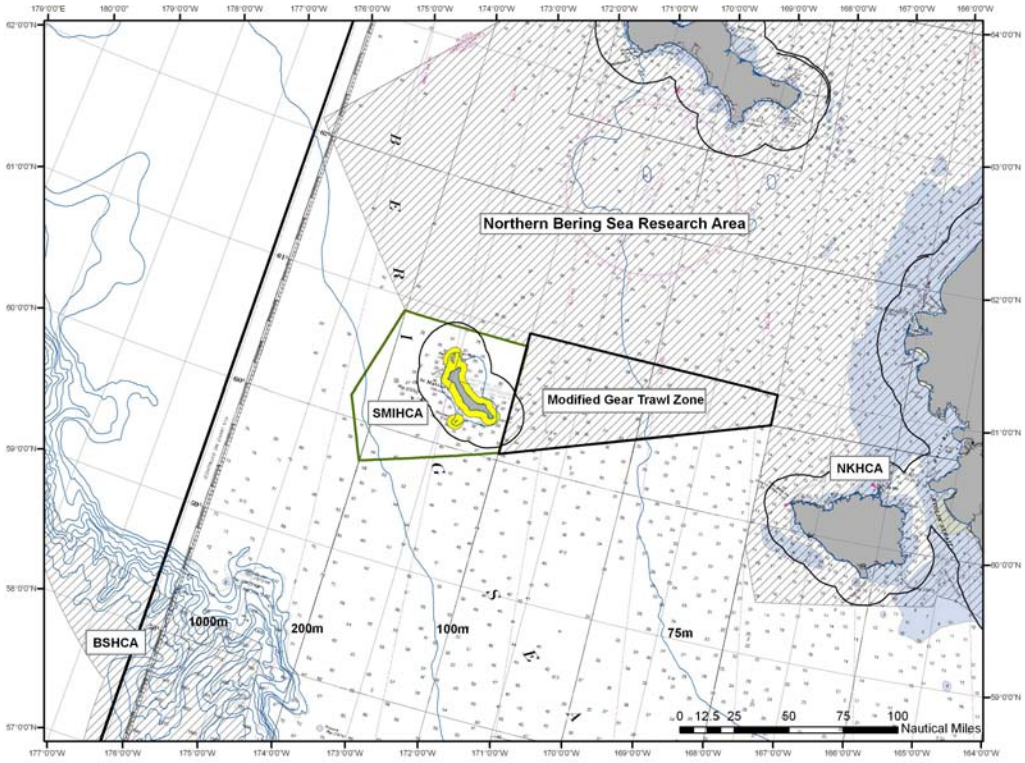
[2] The Council has asked the Crab Plan Team to evaluate whether the current boundaries of the St. Matthew HCA provide sufficient protection for blue king crab. The Crab Plan Team will meet in mid-May, and their input will be folded into this analysis following the June Council meeting. For purposes of analysis, staff considerd two possible expansions of the St Matthew Islands HCA, based on information from the NMFS survey about the locations of blue king crab. Figure 2, on page 7, illustrates an expansion of the HCA to the east, encompassing all the survey stations to the east in which blue king crab were recently documented. Figure 3 illustrates a larger expansion of the HCA, extending east, south, and west, which encompasses a segment of the blue king crab population that is located southwest of the HCA. These two examples provide the basis for the analysis of the St Matthew Island HCA Option in this version of the analysis. The analysis will be revised following the June Council meeting, once the Crab Plan Team and the Council have provided input on specific changes to the boundaries.

Housekeeping changes:

a. Remove reference to the Crab and Halibut Protection Zone in the BSAI FMP
b. Renumber figures and tables in the FMP and correct cross-references
c. Adjust the northern boundary of the Northern Bering Sea Research Area northwards to abut at Bering Strait.

Further description of the alternatives is included in Section 2, on page 4 of this document. The housekeeping changes do not require analysis under EO12866, and are described in Section 11.

Figure 43 Maximum geographic extent of the Modified Gear Trawl Zone



7.5 Description of the flatfish fisheries

Most of the flatfish catch in the Bering Sea is harvested by the Amendment 80 sector, also known as the non-American Fisheries Act (AFA) trawl catcher processor sector, or the head and gut sector. Some flatfish is also harvested by other trawl vessels (both catcher vessels and catcher processors), and by vessels using longline and pot gear. Up until 2008, both trawl and non-trawl fisheries for flatfish in the Bering Sea were prosecuted under a single total allowable catch (TAC). In 2008, Amendments 80 and 85 to the BSAI FMP were implemented, which created sector allocations for the three main flatfish species (yellowfin sole, rock sole, and flathead sole), as well as three other species, and allowed cooperatives to form in the Amendment 80 sector.

Because this action is specific to target fishing in the flatfish trawl fisheries, the trawl fisheries are the focus of this document. The Amendment 80 sector harvests the majority of the flatfish catch, and a brief description of the program is included immediately following this section.

7.5.1 Overview of the Amendment 80 Program

In 2005, Congress defined the non-AFA trawl catcher processor sector, also referred to as the Amendment 80 sector, and thus determined who might participate in the Amendment 80 program. To qualify, vessels must have been a non-AFA trawl catcher processor and have a valid limited license permit (LLP) with a BSAI catcher processor endorsement, and have processed more than 150 mt of groundfish (other than pollock) during the period 1997 through 2002.

The BSAI Amendment 80 program was approved by the Council in June 2006. The program allocates a portion of total allowable catches (TACs) for Atka mackerel, Pacific ocean perch, and 3 flatfish species (yellowfin sole, rock sole, and flathead sole), along with an allocation of prohibited species catch (PSC) quota for halibut and crab, to the Amendment 80 sector. All of the allocations are managed as a hard cap. These allocations are issued annually, as quota share (QS) to owners of Amendment 80 vessels (or LLP holders, if the vessel is 'lost'), based on the vessel's catch history from 1998 - 2004. The QS can be fished within a cooperative (comprised of at least 3 separate entities, with at least 30% of the Amendment 80 vessels) as aggregated cooperative quota. Amendment 80 QS holders who do not form a cooperative arrangement with others are placed in the Amendment 80 limited access fishery, and continue to compete with each other for catch and PSC.

During the development of Amendment 80, the Council recommended a separate action, Amendment 85 to the BSAI FMP, to revise allocations of Pacific cod among the many BSAI groundfish sectors. Amendment 85 allocates Pacific cod and additional PSC to nine harvesting sectors, including the Amendment 80 sector. The timing of these amendments coincided so that the Pacific cod allocation was integrated with the Amendment 80 program as implemented beginning in 2008.

Allocations of target species to the Amendment 80 sector are as follows:

- Yellowfin sole (up to 93% of the TAC, depending on overall TAC)
- Rock sole (100%)
- Flathead sole (100%)
- Atka mackerel (90% - 100% of the TAC depending on subarea)
- Aleutian Islands Pacific ocean perch (90% - 98% depending on subarea)
- Pacific cod (13.4% of the TAC, allocated under Amendment 85)

Allocations of halibut and crab PSC are made to the Amendment 80 sector and the BSAI trawl limited access sector (which includes all trawl vessels that are not in the Amendment 80 sector or fishing for community development quota (CDQ) groundfish). For the Amendment 80 sector, these PSC limits are reduced annually, over the first 5 years following implementation. The program was implemented at the start of the 2008 fishery.

For the 2008 and 2009 fishing years, participants have formed one cooperative, the Best Use Cooperative, which includes 17 of the 24 vessels that received initial quota share.

7.5.2 Bering Sea flatfish trawl fisheries

Table 25 identifies all the target flatfish species and species categories in the Bering Sea for which total allowable catch is allocated, and the areas and, as appropriate, seasons, for which TACs are apportioned. Although TACs are set for the BSAI as a whole, flatfish are mainly caught in the Bering Sea, with the exception of Greenland turbot. The proposed gear modification for directed flatfish fishing would apply only in the Bering Sea subarea.

NMFS inseason management determines whether to allow directed fishing for a target species, based on their ability to manage the resultant fishery in such a way as to meet the quota without exceeding the overfishing limit for each target species. For some species and sectors, the TACs are not large enough to support a directed fishery, and can only be harvested incidentally to other target fisheries. Also, the directed fisheries in the BSAI cannot be prosecuted without bycatch of other species, so incidental catch needs as well as directed fishery needs are taken into account.

Table 25 Status of flatfish trawl fisheries, 2008

Species	Apportionments	Open for directed fishing	Bycatch-only status[a]
Yellowfin sole	BSAI	Amd 80 cooperatives: 20-Jan to yearend Amd 80 limited access: 20-Jan to yearend BSAI trawl limited access: 20-Jan to 19-May, 1-Jul to 22-Nov	Amd 80 limited access: 20-May to 30-Jun, 23-Nov to yearend
Flathead sole	BSAI	Amd 80 cooperatives: 20-Jan to yearend Amd 80 limited access: 20-Jan to 22-Nov	BSAI trawl limited access: 20-Jan to yearend Amd 80 limited access: 23-Nov to yearend
Rock sole	BSAI	Amd 80 cooperatives: 20-Jan to yearend Amd 80 limited access: 20-Jan to 22-Nov	BSAI trawl limited access: 20-Jan to yearend Amd 80 limited access: 23-Nov to yearend
Arrowtooth flounder	BSAI; directed fishing begins May 1	Amd 80 cooperatives: 1-May to yearend	all other trawl: 1-Jan to yearend
Alaska plaice	BSAI	Amd 80 cooperatives: 20-Jan to yearend Amd 80 limited access: 20-Jan to yearend BSAI trawl limited access: 20-Jan to 22-Nov	Amd 80 limited access: 23-Nov to yearend
Other flatfish	BSAI	Amd 80 cooperatives: 20-Jan to yearend Amd 80 limited access: 20-Jan to yearend BSAI trawl limited access: 20-Jan to yearend	---
Greenland turbot	separate for BS and AI; directed fishing begins May 1	Amd 80 cooperatives: 1-May to yearend	all other trawl: 1-Jan

Source: NMFS website, Status of Trawl Gear Fisheries, updated 11/21/2008. www.fakr.noaa.gov/2008/trawl2008.txt

[a] Vessels may only retain the species incidentally while fishing in another directed fishery, up to a specified maximum retainable amount.

The three main flatfish targets are yellowfin sole, rock sole, and flathead sole. Catch of flatfish species in the Bering Sea subarea, from 2000 to 2008, is shown in Table 26. Yellowfin sole is one of the most abundant flatfish species in the eastern Bering Sea (EBS) and is the target of the largest flatfish fishery in the United States. In 2008, 148,237 mt of yellowfin sole was caught in the Bering Sea subarea. The directed fishery can occur from spring through December. Yellowfin sole have been caught with nonpelagic trawls on the Bering Sea shelf since the fishery began in 1954. The species was traditionally taken exclusively by foreign fisheries and these fisheries continued to dominate through 1984. Since 1990, however, only domestic harvesting and processing has occurred.

Table 26 Total catch of Bering Sea flatfish species by vessels using trawl gear, including community development quota catch, 2000-2008.

Year	Yellowfin sole	Rock sole	Flathead sole	Arrowtooth flounder	Alaska plaice	'Other flatfish'	Greenland turbot
2000	83,444	47,519	19,207	10,271	*	16,167	1,760
2001	62,654	28,201	17,132	11,170	*	9,738	1,609
2002	74,097	39,338	14,467	8,704	12,163	2,389	777
2003	73,581	34,495	13,381	10,531	9,673	2,756	575
2004	74,808	47,824	16,763	15,751	7,888	4,566	479
2005	93,590	36,764	15,450	11,532	11,194	4,311	427
2006	98,624	35,854	17,399	10,412	17,314	2,977	183
2007	120,554	35,990	18,350	9,394	19,426	5,760	251
2008	148,237	50,911	24,188	17,421	17,375	3,544	1,222

* Alaska plaice was part of the 'other flatfish' category until 2002.
Source: NMFS catch accounting database, January 2009.

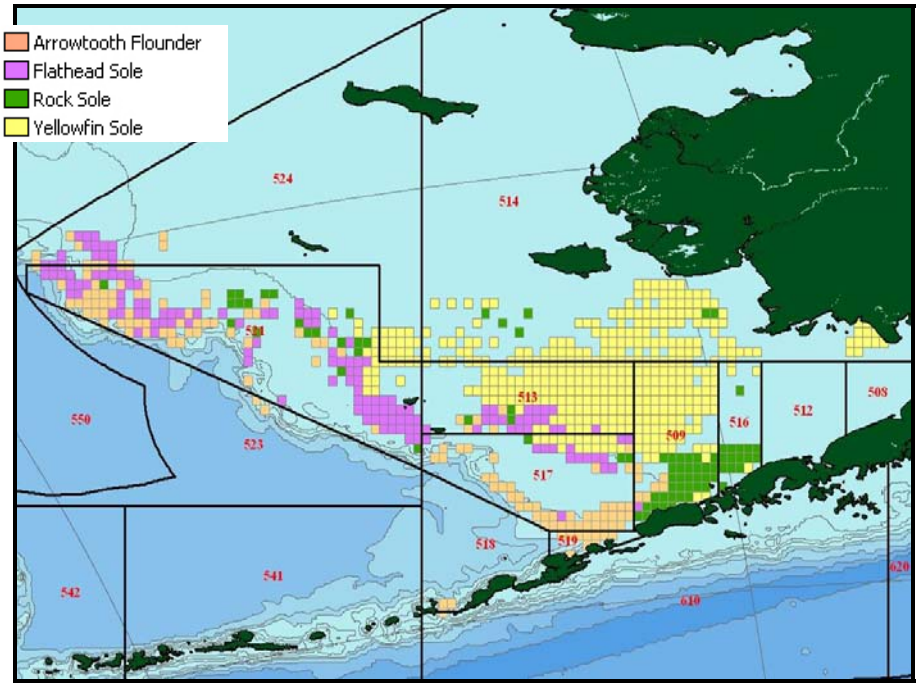
Northern rock sole is distributed primarily on the EBS continental shelf and in much lesser amounts in the Aleutian Islands region. Rock sole are important as the target of a high value roe fishery, occurring in February and March, which accounts for the majority of the annual catch. In 2008, the trawl fishery harvested 50,911 mt of rock sole (Table 26), but the stock remains lightly harvested in the Bering Sea and Aleutian Islands compared to the allowable biological catch.

Flathead sole is managed as a unit stock with other *Hippoglossoides* species (including Bering flounder) in the Bering Sea and Aleutian Islands. 2008 trawl catch in the Bering Sea was 24,188 mt. The most recent descriptions of the BSAI flatfish fisheries are from the Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions (NPFMC 2008), where further details about the status of flatfish stocks in the BSAI may be found.

7.5.3 Timing and location of flatfish fisheries

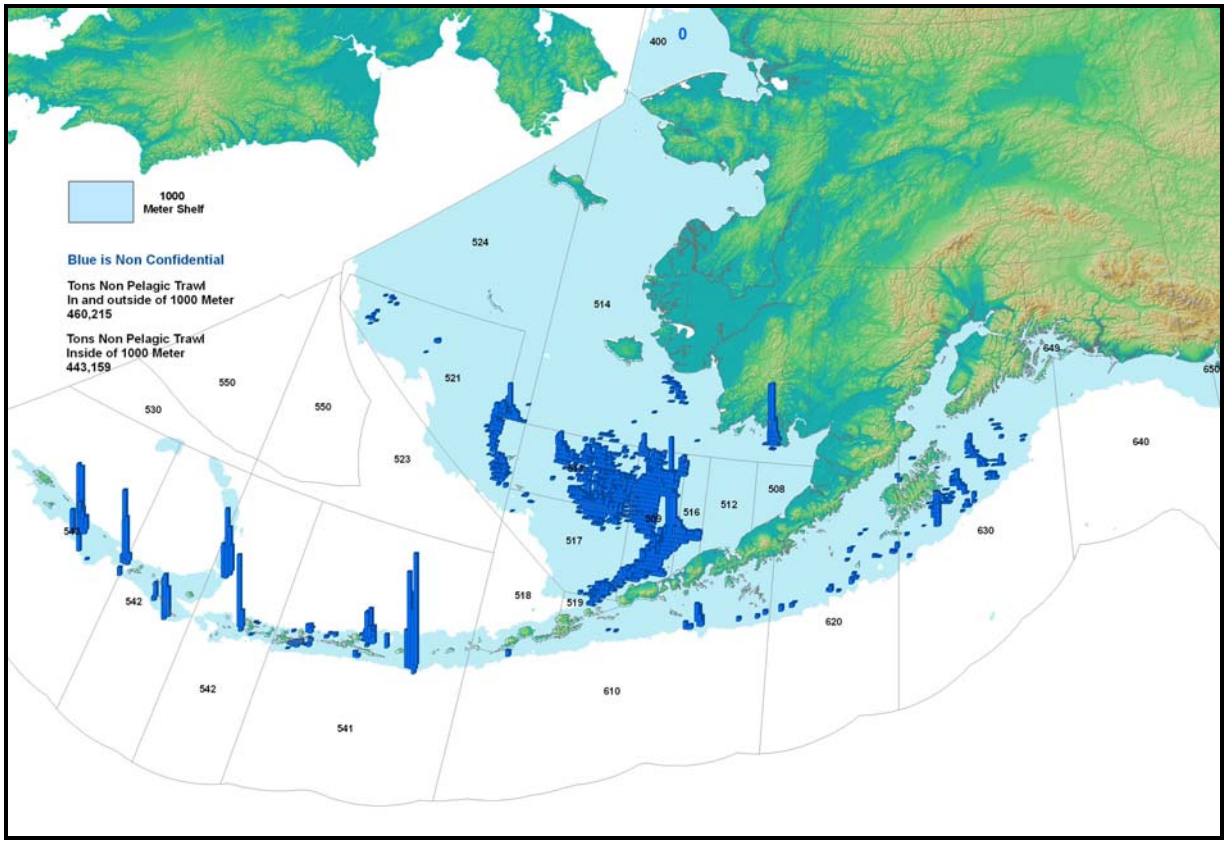
Flatfish fishing occurs primarily in the shelf area of the Bering Sea, south of Nunivak and St. Matthew Islands (Figure 44). The trawl sweep gear modification proposed under Alternatives 2 and 3 would be required for all vessels targeting flatfish. Figure 45 illustrates all target species taken with non-pelagic trawl gear in 2008, including flatfish and Pacific cod. Alternative 3 would also create the Modified Gear Trawl Zone, located just east of St Matthew Island, where nonpelagic trawling for any target could only be conducted using modified sweeps. Figure 46 shows the timing of all of the BSAI flatfish fisheries for 2008. For the three main flatfish fishery species, yellowfin sole, rock sole, and flathead sole, Figure 47 illustrates catch by month for 2006 to 2008. The ability to extend the fishing season later into the year is the result of the implementation of Amendment 80 in 2008, which has allowed vessels participating in that program to begin to use their allocation of Pacific halibut more efficiently in order to maximize their target flatfish harvest.

Figure 44 Distribution of the BSAI flatfish fishery in 2008.



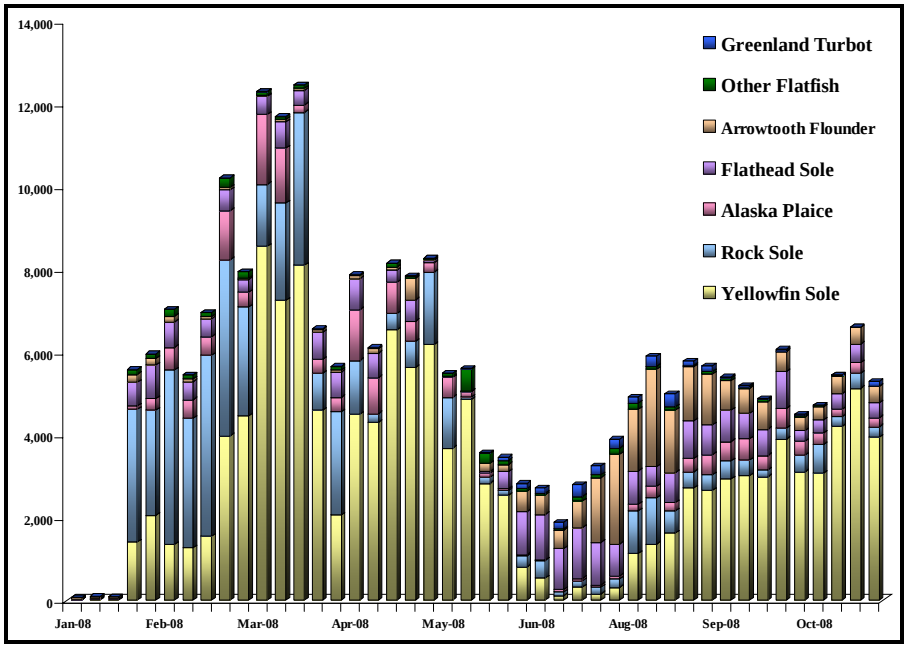
Note: The action in this analysis only affects the Bering Sea subarea, vessels targeting flatfish in statistical areas 541, 542, or 543 would not be required to use modified trawl sweeps. 2008 catch data through November 1.
Source: NMFS 2008c.

Figure 45 2008 non-pelagic trawling in Alaska waters



Source: S. Lewis, NMFS Alaska Region, April 30, 2009

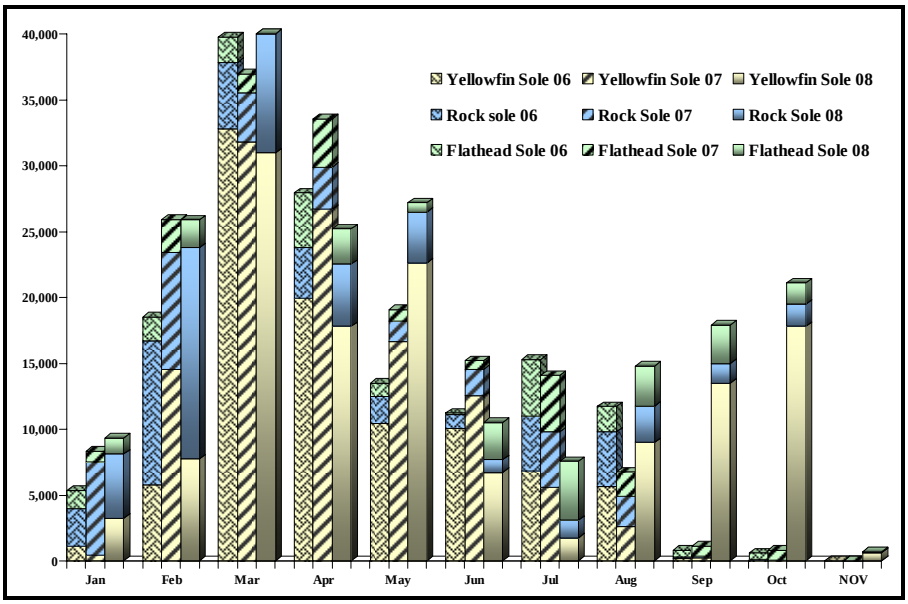
Figure 46 Timing of the BSAI flatfish fisheries in 2008.



Note: This action only affects the Bering Sea subarea, vessels targeting flatfish in the Aleutian Islands would not be required to use modified trawl sweeps. 2008 catch data through November 1.

Source: NMFS 2008c.

Figure 47 Catch of BSAI yellowfin sole, rock sole, and flathead sole, 2006-2008.



Note: 2008 catch data through November 1. Source: NMFS 2008c.

7.5.4 Prohibited species bycatch in the flatfish fisheries

Regulations require that Pacific halibut, salmon, crab, and herring be immediately returned to the sea with a minimum of injury when caught in groundfish fisheries. In order to control the catch of those species in the groundfish fisheries, the Council has established prohibited species catch (PSC) limits for all these species in the BSAI, which are apportioned among gear types, sectors, target fisheries, and seasons.

Pacific halibut bycatch

In recent years, many flatfish fisheries have been closed prior to attainment of the TAC, due to the bycatch of halibut. This is illustrated for 2008 in Table 27, which shows the actual catch of flatfish species compared to total allowable catch, for 2008 only. Actual harvest through November 1, 2008, represents between 10 and 69% of the TAC for each flatfish fishery.

Table 27 Catch of Bering Sea flatfish in 2008, as a percent of total allowable catch (TAC).

Flatfish fishery		Total Catch (mt)	TAC (mt)	Percentage
Yellowfin sole	non-CDQ	139,403	200,925	69%
	CDQ	6,713	24,075	28%
Rock sole	non-CDQ	49,291	66,975	74%
	CDQ	1,911	8,025	24%
Flathead sole	non-CDQ	24,027	44,650	54%
	CDQ	464	5,350	16%
Arrowtooth flounder	non-CDQ	20,925	63,750	33%
	CDQ	828	8,025	10%
Alaska plaice	combined	17,126	42,500	40%
'Other flatfish'	combined	3,620	18,360	20%

Note: 2008 catch data through November 1. Source: NMFS 2008c.

The trawl PSC limits are apportioned to Amendment 80 cooperatives and seasonally to seven target fishery categories: yellowfin sole fishery, rock sole/flathead sole/'other flatfish' fishery, Greenland turbot/ arrowtooth flounder/ sablefish fishery, rockfish fishery, Pacific cod fishery, midwater pollock fishery[3], and pollock/ Atka mackerel/ 'other species' fishery. For the vessels of concern in this analysis, halibut PSC is often the biggest constraint, and it has traditionally been allocated to the more valuable fisheries (Pacific cod, some flatfish fisheries), while other fishery categories (e.g., Greenland turbot/ arrowtooth flounder/ sablefish fishery) are almost always underfunded. For this reason, these latter fisheries have rarely been open for directed trawl fishing, even if their TACs are large enough to support a directed fishery. A comparison of halibut mortality by target fishery, for 2007 and 2008, is provided in Table 28.

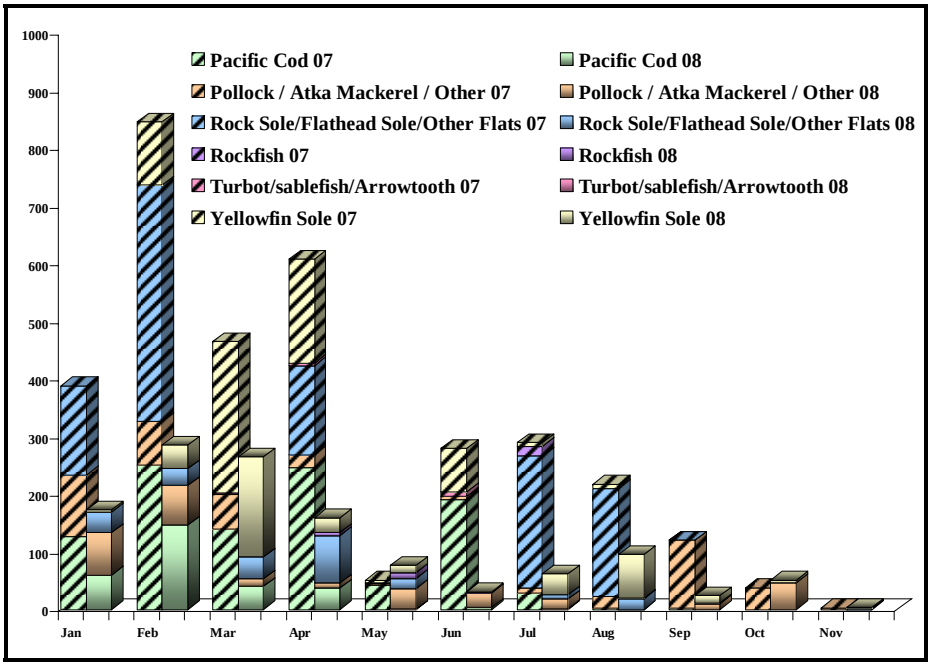
As of 2008, vessels belonging to an Amendment 80 cooperative have a lot more flexibility in their use of halibut PSC. Instead of having the halibut PSC assigned to a specific target fishery, the cooperative receives a lump sum allocation of halibut PSC, which they can dedicate to whichever target fisheries they choose. Consequently, in 2008, the Greenland turbot and arrowtooth flounder fisheries are open to directed fishing, but only by Amendment 80 cooperatives (Table 25). Figure 48 illustrates the overall reduction in halibut bycatch mortality under Amendment 80, implemented in 2008.

Table 28 2007 and 2008 Halibut mortality PSC limits for trawl fisheries, by sector, target fishery, and season

Year	Gear and sector	Target fishery category	Season	Halibut mortality (mt)
2007	Trawl fisheries	Yellowfin sole	January 20–April 1	312
			April 1–May 21	195
			May 21–July 1	49
			July 1–December 31	380
		Rock sole/other flat/flathead sole	January 20–April 1	498
			April 1–July 1	164
			July 1–December 31	167
		Turbot/arrowtooth/sablefish		0
		Rockfish	July 1–December 31	69
		Pacific cod		1,334
		Pollock/Atka mackerel/other		232
		2007 Trawl Fishery TOTAL		3,400
2008	Amendment 80 cooperatives			1,837
	Amendment 80 limited access	Yellowfin sole	January 20–July 1	214
			July 1–December 31	149
		Rock sole/other flat/flathead sole	January 20–April 1	180
			April 1–July 1	20
			July 1–December 31	24
		Turbot/arrowtooth/sablefish		0
		Rockfish		50
		Pacific cod		1
		Pollock/Atka mackerel/other		50
	BSAI trawl limited access	Yellowfin sole		162
		Rock sole/other flat/flathead sole		0
		Turbot/arrowtooth/sablefish		0
		Rockfish		3
		Pacific cod		585
		Pollock/Atka mackerel/other		125
		2008 Trawl Fishery TOTAL		3,400

[3] Halibut PSC is not apportioned to the midwater pollock trawl fishery.

Figure 48 Trawl halibut bycatch mortality, by target fishery, for 2007-2008.



Note: 2008 catch data through November 1. Source: NMFS 2008c.

Crab bycatch

Management measures to reduce crab bycatch in the groundfish fisheries have been implemented under BSAI Groundfish FMP for king crab, *C. opilio*, and *C. bairdi*. 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. 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 Pautzke 1997).

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.

Reaching a PSC limits triggers a closure of specified PSC Limitation Zones. The PSC limits are apportioned by gear, target fishery, and season. Table 29 illustrates the PSC limits and bycatch of crab species from 2002 to 2007, 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 has closed Zone 1 to the yellowfin sole fishery in the past..

Table 29 Crab PSC limits for target flatfish fisheries, and bycatch, in numbers of crab

Year	Zone 1 red king crab		*C. opilio*		Zone 1 *C. bairdi*		Zone 2 *C. bairdi*	
	PSC limit	bycatch	PSC limit	bycatch	PSC limit	bycatch	PSC limit	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
2007	155,256	55,865	3,782,326	131,826	706,164	136,965	2,384,613	160,961

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. opilio* PSC limit applies to crab caught within the *C. opilio* Bycatch Limitation Zone, which encompasses the Pribilof Islands and extends northwest.

7.6 Participants in the flatfish fisheries

The gear modification requirement, as proposed, will apply to any vessel conducting directed fishing for flatfish in the Bering Sea. For the most part, vessels that fish flatfish are participants in the Amendment 80 program. There are, however, some other vessels that target flatfish, and they also would be required to use the modified gear when fishing for flatfish.

7.6.1 Participants by sector

In the BSAI, the flatfish fisheries are almost exclusively prosecuted by catcher processors using nonpelagic trawl gear. The majority of catch is harvested by vessels that are now in the Amendment 80 sector (Table 30). A total of 28 vessels qualified for Amendment 80, of which 24 applied for initial quota share in 2008. The remainder of the catch of flatfish species is primarily taken by other trawl vessels, with the notable exception of Greenland turbot (77% of the total BSAI Greenland turbot catch was taken by hook and line gear in 2007).

Table 30 Proportion of total trawl catch[a] of Bering Sea flatfish species harvested by vessels that are now part of the Amendment 80 sector, 2000-2008.

Year	Yellowfin sole	Rock sole	Flathead sole	Arrowtooth flounder	Alaska plaice	'Other flatfish'	Greenland turbot
2000	87%	92%	89%	92%	*	92%	95%
2001	96%	93%	89%	97%	*	98%	97%
2002	96%	96%	89%	95%	97%	93%	96%
2003	94%	92%	86%	85%	96%	86%	95%
2004	93%	92%	86%	91%	96%	88%	96%
2005	91%	93%	82%	91%	90%	85%	91%
2006	85%	91%	80%	86%	79%	77%	63%
2007	80%	92%	72%	69%	80%	80%	56%
2008	86%	90%	79%	90%	88%	84%	93%

[a] Includes CDQ catch

* Alaska plaice was part of the 'other flatfish' category until 2002.

Source: NMFS catch accounting database, January 2009.

The Amendment 80 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.

More information on Amendment 80 trawl sector is provided in the EA/RIR/IRFA for Amendment 80 (NPFMC 2007).

There are a small number of other trawl vessels that harvest flatfish in the Bering Sea. These include vessels of the AFA trawl catcher processor and the AFA trawl catcher vessel fleets, and other trawl catcher vessels that are not in an AFA cooperative. Table 31 provides a count of the number of catcher processor and catcher vessels that have participated in the fishery from 2000 to 2008. Amendment 80 sector vessels are consistently the major participants in the Bering Sea flatfish fisheries. A small number of other catcher processors regularly participate, in addition to their activities in the AFA pollock fishery. Catcher vessels have tended to participate in the Bering Sea flatfish fisheries in years of higher flatfish TACs (2000 and recent years). In both latter cases, there are a total of ten unique vessels that have retained flatfish in the Bering Sea directed flatfish fisheries since 2000.

Table 31 Number of vessels targeting flatfish in the Bering Sea, 2000-2008

Year	Amendment 80 sector catcher processors	American Fisheries Act (AFA) catcher processors [a]	Catcher vessels (AFA and other)
2000	23	5	4
2001	22	3	0
2002	22	4	1
2003	22	4	0
2004	23	4	2
2005	22	5	1
2006	22	6	4
2007	22	8	4
2008	22	12	3

[a] There is one vessel that participates in both the Amendment 80 and AFA sectors. For the purposes of this analysis, that vessel is categorized with the Amendment 80 sector only.

Note: For the years 2000-2002, the database does not identify a trip target for catcher vessels (i.e., it is not possible readily to identify whether these vessels were directed fishing for flatfish). For catcher vessels in these years, the vessels' retained catch of flatfish was evaluated, and a trip target was assigned retroactively.

Source: NMFS catch accounting database, and ADFG fish tickets for catcher vessels 2000-2002, January 2009.

7.6.2 Dependency of participants on flatfish fisheries

Catcher processors participating in the Amendment 80 program are the only vessels that depend on the flatfish fisheries for a significant portion of their revenue. For almost all other catcher processor or catcher vessels participating in the directed flatfish fisheries, the weight and gross revenue from flatfish harvests in the Bering Sea is minor, relative to their baseline gross annual revenues. Table 32 lists the estimated value of Bering Sea flatfish harvests compared to the value of total groundfish harvests in the Bering Sea, Aleutian Islands, and Gulf of Alaska, for Amendment 80 and AFA catcher processors, and for catcher vessels.

Bering Sea flatfish represent from 46% to 56% of estimated first wholesale revenues for Amendment 80 catcher processors, whereas for AFA catcher processors, Bering Sea flatfish are from 2% to 7% of wholesale revenues. For catcher vessels, Bering Sea flatfish has generally comprised a small proportion of groundfish revenues, with the exception of 2007, when 28% or revenues for participating vessels were from Bering Sea flatfish.

Table 32 Value of flatfish harvests compared to value of total Alaska groundfish harvests for vessels participating in the Bering Sea flatfish fisheries, 2000-2007, in millions of dollars

Sector	Year	Total number of vessels fishing BS flatfish	BS flatfish	Alaska groundfish	BS flatfish as % of total groundfish
Amendment 80 catcher processors	2000	23	$86.5	$162.2	53%
	2001	22	$75.0	$163.0	46%
	2002	22	$85.5	$164.1	52%
	2003	22	$86.4	$170.2	51%
	2004	23	$105.1	$199.3	53%
	2005	22	$141.4	$250.6	56%
	2006	22	$136.0	$266.0	51%
	2007	22	$133.2	$284.4	47%
American Fisheries Act catcher processors	2000	5	$6.1	$115.0	5%
	2001	3	$1.9	$117.9	2%
	2002	4	$1.8	$106.5	2%
	2003	4	$3.5	$146.2	2%
	2004	4	$4.0	$129.8	3%
	2005	5	$8.3	$217.9	4%
	2006	6	$17.5	$238.5	7%
	2007	8	$23.9	$328.4	7%
catcher vessels	2000	4	$0.3	$8.5	3%
	2001	0	--	--	--
	2002	1	conf	conf	conf
	2003	0	--	--	--
	2004	2	conf	conf	conf
	2005	1	conf	conf	conf
	2006	4	$0.4	$7.6	5%
	2007	4	$1.3	$4.4	28%

Note: 'conf' = confidential data.

[a] In each year, the total groundfish revenue or exvessel value is calculated only for those vessels who participated in the Bering Sea flatfish fishery.

Source: First wholesale revenue estimates (catcher processors) from T. Hiatt, AFSC (April 2009); exvessel value (catcher vessels) from CFEC gross revenue estimates (April 2009).

For the Amendment 80 sector, two primary fisheries have historically contributed relatively equal shares of the first wholesale value for the Amendment 80 fleet. Yellowfin sole at $73 million, and Pacific cod at $57 million, were two of the largest contributors to sector's gross revenue in 2006. Other fisheries which have historically contributed a significant share of the total first wholesale value for the head and gut fleet are rock sole and Atka mackerel.

7.6.3 Community information

The fishing communities that are expected to be potentially directly impacted by the proposed action are those communities which serve as homeports to the flatfish vessels, offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. The flatfish 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 flatfish potentially affected by the proposed action, as measured in areas of fishing effort over the period 2000-2008, such as Kodiak, Anchorage, and Juneau, Alaska, and Rockland, Maine, but these communities are not expected to be materially affected by the proposed action.

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 Bering Sea flatfish 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.

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.

7.7 Value of Bering Sea flatfish fisheries, product flows, and markets

An indication of the value of the Bering Sea flatfish fisheries is identified in the previous section (Section 7.6.2), and particularly in Table 32. Additionally, a gauge to the value of individual species can be attributed from the degree to which catch of these species is retained[4]. The main three flatfish species, yellowfin sole, rock sole, flathead sole, have high retention rates (76%, 78%, and 91%, respectively, in 2006). For the minor flatfish fisheries, retention of arrowtooth flounder is intermediate (44% in 2007), and retention of Alaska plaice and 'other flatfish' is fairly low (20% and 27%, respectively, in 2007). Greenland turbot is a high value species, with high retention rates (86% in 2007), but a relatively small amount of the species is caught by trawl vessels in the Bering Sea.

The Amendment 80 sector is 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.

Table 33 provides price per pound to catcher processor products for the whole of Alaska, for flatfish fisheries, 2003-2007. Figure 49 illustrates the wholesale value of primary production for rock sole and yellowfin sole, 1996-2007. The Amendment 80 sector has traditionally produced, almost exclusively, high quality whole and head and gut products. Catch is typically processed quickly after it is brought on board, maintaining relatively high quality across the fleet. A large majority (80-90%) of the primary

[4] Note, a groundfish retention standard was implemented for the Amendment 80 sector in 2008, which is designed to encourage vessels to increase their rate of groundfish retention.

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. In recent years, China has played a prominent role in the reprocessing of head and gut groundfish from the Amendment 80 sector. In particular, a large portion of the flatfish harvested from the BSAI is shipped to China, where it is reprocessed into individual frozen, skinless, boneless fillets. Larger fish, which are capable of producing larger fillets, receive a higher price. After reprocessing, production from the fisheries reaches a variety of markets, including the US, Europe, Japan, and other Asian countries. Some US shoreside processors produce some fillets, and other products, but due to the high labor cost for fillet production, most of the product is sent to China for reprocessing.

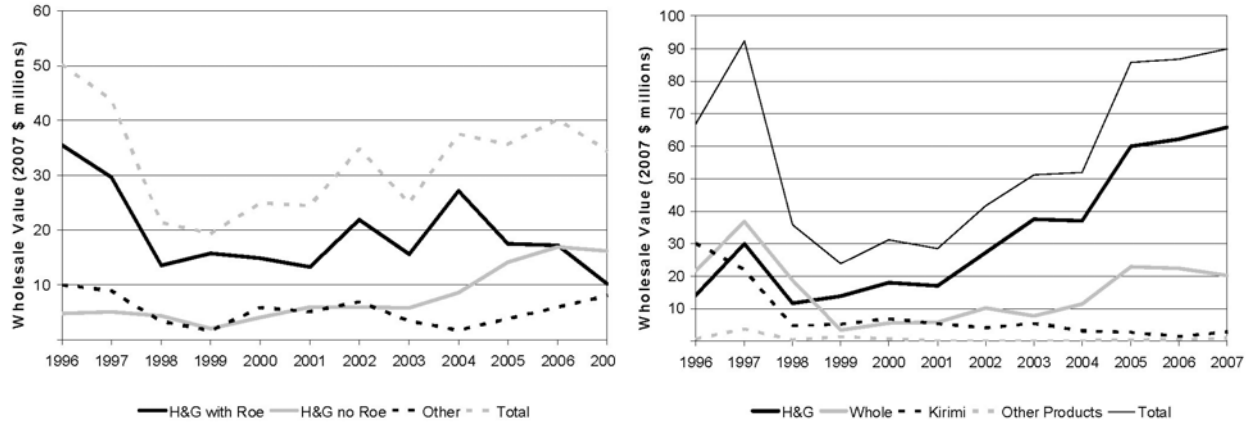
Other markets are used for other product types. A small percentage of yellowfin sole are made into kirimi, a steak-like product, which is exported to Japan. Female rock sole with roe are also exported to Japan, although due to a decreasing demand, these sales have been declining. Whole yellowfin sole are sold to South Korea for domestic consumption.

Table 33 Price per pound of at-sea product, in Alaska flatfish fisheries, 2003–2007 (US dollars).

Directed fishery	Product type	2003	2004	2005	2006	2007
Yellowfin sole	whole fish	$.30	$.35	$.49	$.51	$.51
	head and gut	$.46	$.47	$.65	$.66	$.69
	kirimi	$.53	$.63	$.48		
	other products	$.36	$.35	$.35	$.39	$.56
	all products	$.43	$.45	$.59	$.61	$.63
Rock sole	whole fish			$.50	$.45	$.42
	head and gut	$.43	$.52	$.76	$.72	$.74
	head and gut with roe	$1.09	$1.04	$1.19	$1.53	$1.24
	other products	$.30	$.46	$.25	$.29	$.27
	all products	$.76	$.84	$.95	$.96	$.86
Flathead sole	whole fish			$.53	$.35	$.39
	head and gut	$.57	$.68	$.87	$.87	$.89
	other products	$.89	$.83	$.99	$1.25	$.83
	all products	$.62	$.73	$.87	$.99	$.88
Other flatfish	whole fish	$.96	$.97	$1.15	$1.08	$.99
	head and gut	$.23	$.43	$.67	$.48	$.71
	other products	$.30	$.32	$.26	$.29	$.42
	all products	$.90	$.92	$1.09	$.86	$.85
Arrowtooth flounder	whole fish	$.25				
	head and gut	$.39	$.54	$.72	$.57	$.51
	other products	$.15	$.32	$.25	$.29	$.37
	all products	$.38	$.54	$.72	$.57	$.51
Greenland turbot	head and gut	$1.29	$1.46	$1.83	$1.74	$1.34
	other products	$.86	$.77	$.99	$1.05	$1.32
	all products	$1.19	$1.29	$1.60	$1.71	$1.34

Source: Hiatt et al 2008.

Figure 49 Wholesale value of Alaska primary production of rock sole (left) and yellowfin sole (right), by product type, 1996-2007



Note: Product types may include several more specific products.

Source: Hiatt et al 2008, from NMFS weekly product reports and ADF&G commercial operator annual reports 1996-2007.

Historically, arrowtooth flounder has had limited value compared to other flatfish species, however, since 1997, markets for arrowtooth flounder have gradually been developing. Although arrowtooth flounder market prices fluctuate widely, this species now supports a viable target fishery in the GOA, and the Amendment 80 sector has testified to their interest in pursuing this fishery. The principle buyers of arrowtooth flounder are China and Japan. The primary product for arrowtooth flounder is the frill: fleshy fins which are used for engawa, a type of sushi. Engawa, normally a premium sushi made from halibut or Greenland turbot, is more affordable using arrowtooth flounder. Unlike most other flatfish, the frill of the arrowtooth flounder is sufficiently sized to cover the rice on sushi, which is critical in sushi markets. The primary market for arrowtooth flounder engawa is Japan.

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 market. As a consequence, effects of production of the fleet on consumer markets are far reaching and difficult to estimate.

7.8 Cost of modifying the gear to elevate the sweeps

A major difference in vessel configuration with respect to the use of modified sweeps is whether a vessel has a net reel, or uses a main line winch to set the trawl doors and sweeps. The costs for using the modified gear are estimated below for each scenario. Estimates of the cost of purchasing and installing modified trawl sweeps have been obtained with assistance from representatives of vessel operators and the gear manufacturers that supply the fleet, whenever possible, especially Mr John Gauvin, working for the Amendment 80 cooperative.

Vessels with net reels

Most of the vessels targeting flatfish in the Bering Sea have net reels. For most dedicated flatfish Amendment 80 vessels, lengths of combination rope sweeps are between 50 and 200 fathoms, depending on their door size and spread and their horsepower and catch needs. Bigger flatfish boats may use approximately 150 to 200 fathoms of sweep, and smaller boats use approximately 50 to 90 fathoms. A

hypothetical average case of a vessel deploying 90 fathom sweeps is discussed below, comparing the cost for modified versus unmodified sweeps. It is assumed that the sweeps are replaced on an annual basis.

The cost of a typical spool (50 fathom shot) of the 52 mm combination rope is $2,400. When splice "eyes" are added to this, this spool makes 45 fathoms of combination rope sweep. To replace the gear, a vessel would need four spools of combination rope (two 45 fathoms shots on each side), at a cost of 4 times $2,400, equaling $9,600 per year for unmodified sweep replacement each year on a typical, dedicated flatfish boat. To comply with the modified trawl sweep requirements, a vessel may choose to purchase the modified sweeps in 15 fathom sections (eyes at 15 fathoms, or 90 foot sections), with the connections and 10 inch bobbins. According to a Seattle gear manufacturer who has been closely involved with the development of the modified sweeps, each 15 fathom shot will cost approximately $1050 with the tackle and bobbins. Six of those sections would be needed for each side, in the hypothetical case, representing 12 times $1050, or a total of $12,600. In the hypothetical average scenario, the difference for using the modified sweeps would be approximately $3000 per year.

For some vessels, there may also be structural issues with the vessel that add additional costs to compliance with the modified sweep requirement. Vessels need to have sufficient capacity on their net reels to accommodate the additional bulk of the elevating devices. Additionally, the experimental research and testing has shown that it is easier to fish with the modified sweeps if the vessel has a split net reel with independently operated hydraulic controls. If a boat is currently using an amount of sweep that is close to the limit of their net reel, then without modification to the net reel, the boat would have to reduce the amount of sweep it uses. This would reduce the area swept by the net, and fishing capacity (catch rates) would be reduced proportionally. Anecdotally, it has been suggested that for some vessels that are currently at their reel capacity now, the sweep may have to be reduced by as much as 30%, which would adversely impact on fishing and processing operations (J. Gauvin, pers. comm., 4/17/09).

If reel capacity is an issue, the affected vessel is likely to consider alternatives to regain its target production output and efficiency. A likely solution is for vessels to modify their net reel to regain lost sweep capacity, by raising up the net reel and adding to the flange of the reel to increase available capacity. This would require the hydraulics and the driver on the net reel to be increased, to make the new net reel size workable. One captain's estimate of these adjustments was a cost $100,000 in all. Another captain is evaluating the opportunity to upgrade the net reel to a split reel that operates independently. This would involve adding to the net reel and the hydraulics, as before, as well as adding another motor and reinforcing the transfer beams and foundation under the deck so the new net reel will be properly installed. In this case, the total estimated cost was quoted at $800,000 (J. Gauvin, pers. comm., 4/17/09).

There is no consensus as to whether there will be an opportunity cost for fishing with the modified trawl sweeps, in terms of longer setting and hauling back time. There is likely to be a learning curve for captains adjusting to the new gear, so in the immediate term, fishing operations are likely to slow down. Whether any increase in fishing time will be required in the long term is unknown. Certainly, the operation of the gear will work more smoothly for vessels with split net reels that can be independently operated.

It is not known how frequently the bobbins will wear down on the modified sweeps, but it is likely that vessels may choose to carry spare bobbins to avoid being out of compliance with the modified trawl sweep requirement. The cost of individual 10 inch bobbins is estimated at $50 a bobbin, so a full set of 14 replacement bobbins for the hypothetical case discussed above would cost approximately $700.

Some cost savings may accrue from using the modified sweeps, because there is some evidence from experimental testing that using the bobbins to elevate the sweeps may reduce the wear on the combination

rope, and extend the length of time before the sweeps need to be replaced. If, for example, the sweeps only need replacing every 1.5 to 2 years, a cost saving from the gear could accrue in the long term.

Vessels without net reels, using main line winches to set and haul back the sweeps

Most of the vessels fishing flatfish in the Bering Sea 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. Vessels that put their sweeps on the main winches (i.e., do not have net reels) typically use much shorter bare wire sweeps. Vessels using main line winches will likely use disks that are clamped on to cable to comply with the modified sweep requirement. Most of the vessels without net reels are likely to use the regulatory option that allows the use of 8 inch disks at 60 ft spacing.

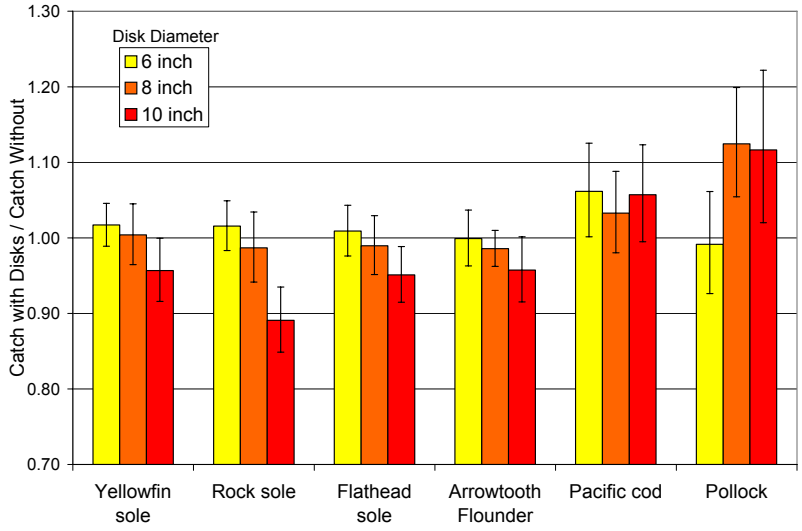
An estimate of costs for a vessel without a net reel is as follows. The vessel anticipates replacing the sweeps twice annually. The cost of cable for the each of the two 328 ft sweep sections on the vessel is $1142, for a total annual cost of $4568 for unmodified sweeps. To comply with the regulations, the vessel might now purchase two 164 ft sections of sweep for each side of the vessel, complete with connections and elevating devices. Given two complete sets per season, the cost for the modified sweeps is 8 times $994/section, or an annual cost of $7952. Therefore, the increased cost of using the modified sweeps is $3384, on an annual basis.

The proposed gear modification 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. For three of the five Amendment 80 vessels that do not have net reels, the 8 inch discs will pass through the mechanical level winds on the vessels without any major adjustment. There are two vessels, however, that may require heavy duty re-engineering in order to widen the level wind in order to accommodate the modified sweeps (B. McGill, pers. comm., 2/8/09). It was not possible to obtain estimates of the costs for modifying the gear in these cases, but the costs were thought to be substantial.

7.8.1 Effects of modified trawl sweeps on flatfish capture

Research results from the testing of the modified trawl sweeps are summarized in Section 3.2.3. A brief synopsis of the results of the gear testing on catch of target species, including flatfish, follows. Herding tests were conducted with a twin trawl system, fishing two identical trawls simultaneously, side-by-side with different sweep configurations. The resulting catches were then compared, to test whether the sweep modifications reduced flatfish capture. Sixty one successful tows were completed, 19 with the 6 inch disks, 26 with the 8 inch disks and 16 with the 10 inch disks. The ratio of flatfish catches (modified versus conventional) did not change significantly using either of the two smaller sized disks (Figure 12), while the 10 inch disks decreased rock sole and flathead sole catches by 11% and 5% respectively. Flatfish catches were allocated to 3 or 4 size classes, depending on species, to test for size selectivity. Comparisons by size class did not detect differences from overall catch ratios for any of the flatfish species. A manuscript based on these studies has been submitted to Fisheries Bulletin.

Figure 50 **Ratios of catch rates with and without 6 – 10 inch diameters disk clusters placed at 30 foot spacing**



7.9 Fishery usage of proposed Modified Gear Trawl Zone and the area around St Matthew Island

The area that is being considered for the Modified Gear Trawl Zone is to the east of St Matthew Island (Figure 43). The area was included as part of the Northern Bering Sea Research Area, in which nonpelagic trawling was prohibited beginning in July 2008. Prior to that time, the area was open to all gear types.

Records in the observer database show that the Modified Gear Trawl Zone has been frequented on a periodic basis by vessels targeting rock sole, flathead sole, and other flatfish species. Only a small amount of flatfish has been harvested from the area over the years. The observer records may underestimate the amount of fishing that has occurred in the area, however. Prior to the implementation of Amendment 80 in 2008, several of the vessels that are now a part of that sector were only subject to 30% observer coverage, due to their vessel size. In general, these vessels try to fulfill their observer coverage requirements on trips that are closer to Dutch Harbor, to avoid paying for an observer for fishing days that exceed the 30% minimum requirement. Because the Modified Gear Trawl Zone is far from Dutch Harbor, it is likely that the 30% observed vessels would not have been fishing with an observer while fishing in the Zone.

Anecdotally, industry has reported that they have fished in the area, primarily for rock sole and flathead sole. In particularly, it has been reported that some of the vessels that target flathead sole (which also tend to be smaller vessels, i.e., 30% observed prior to 2008) have had success fishing to the east of St Matthew Island. An area southeast of St Matthew Island was also identified as an area for rock sole (J. Gauvin, pers. comm.). Although the area would be open to other, non-flatfish targets, should Alternative 3 be adopted, as long as vessels were using the modified sweeps, there does not appear to have been a history of targeting Pacific cod in the area.

An option is included in this analysis to adjust the boundaries of the St Matthew Island HCA in order to ensure adequate protection for blue king crab. The Crab Plan Team will be providing advice to the Council on the appropriate boundaries of that HCA, which will be included in the next draft of this

analysis. In the interim, the analysts looked at the distribution of blue king crab around St Matthew Island, from the NMFS trawl survey (Section 3.4.1). The areas outside of the HCA where crab are located are to the east, west, and south, with the largest part of the population to the southwest. Nonpelagic trawl vessels are currently closed out of the area to the east of St Matthew, as it is encompassed in the NBSRA. This is the area under consideration for the Modified Gear Trawl Zone. Comparing the area southwest of the HCA to the distribution of fishing maps for 2008 (Figure 44 and Figure 45), it does not appear that this area is used by the fishery.

7.10 Analysis of alternatives

Alternative 1 Status quo

Under Alternative 1, the status quo, there is no regulatory requirement for vessels to use elevating devices on the trawl sweeps. The impacts of the nonpelagic trawl flatfish fleet on benthic habitat have been analyzed in detail in other documents, in particular the EFH EIS (NMFS 2005). The flatfish fleet's participation in the fisheries has changed somewhat as a result of Amendment 80, but the impacts of that change have also been analyzed in other Council documents (NPFMC 2007).

In anticipation of the Council implementing this requirement, several vessels in the flatfish fleet have voluntarily bought and tested the modified sweeps, in order to become familiar with their use prior to the regulatory requirement. The vessels who have opted to voluntarily test the modified gear are primarily those that do not require a major structural change to the vessel in order to use the sweeps and continue to fish with the same vessel efficiency. If Alternative 1 is adopted, it is unknown whether any of these vessels will continue to use the modified gear on a voluntary basis, or whether they will revert to conventional sweep gear.

Under the status quo, the area identified in this document as the Modified Gear Trawl Zone is part of the Northern Bering Sea Research Area, and as such is currently closed to nonpelagic trawling. Industry sources have expressed interest in fishing in this area, particularly if a northward distribution of rock sole and flathead sole makes other, more southerly fishing grounds less productive. It is possible that some parts of the NBSRA will be open for experimental fishing in the future, under the auspices of a research plan currently being developed by the Alaska Fisheries Science Center. The possible location of open areas for future fishing is as yet unknown, however, and it is uncertain whether fishermen would be able to fish in this area under that program. To the extent that these areas become valuable fishing grounds in the future, the adoption of Alternative 1 would be costly to rock sole and flathead sole fishermen.

Alternatives 2 and 3: Trawl sweep modification

Under Alternatives 2 or 3, the Council and NMFS would require elevating disks on nonpelagic trawl sweeps used to target flatfish in the Bering Sea, 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 at this time, a device at least 8 inches in diameter would meet the 2.5 inches of clearance in various substrates when used at 60 ft spacing, or a 10 inch diameter device could be used at 90 ft spacing.

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(see Section 3.2.3, beginning on page 17, and in particular Figure 12 in that section). For 10 inch disks, catchability was somewhat reduced over the tested 30 ft spacing. The regulation, however, is to

achieve a seabed clearance of 2.5 inches, more consistent with that achieved by the smaller disks, so the catchability of 10 inch disks over the regulatory 90 ft spacing is more likely to be similar to that of 6 to 8 inch disks over 30 ft spacing, and therefore the difference in catchability of flatfish from using the modified gear is not expected to be significant. Because the field studies showed that target flatfish species catch using the modified gear was not significantly diminished, there does not appear to be any cost from lost revenue from the proposed gear modification.

Gear modification resulted in a decrease of the trawl sweep contact with seabed by about 90% and was effective in reducing trawl sweep impact effects to basketstars, sea whips, sponges, and siphons (Section 3.2.3). Additionally, using the modified sweeps reduced estimates of mortality for *C. bairdi* and *C. opilio* crabs from 5% with conventional sweeps, to nearly zero for the modified sweeps. Trawl vessels operate under various PSC limits for crab species. To the extent that reduced catch of crab may result from the modified sweeps, this may also benefit fishermen by forestalling the area closures that occur once a PSC limit is reached.

The proposed trawl sweep 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. For all vessels, the additional cost of purchasing the modified gear appears to be in the range of $3000 to $3400, annually, which is anywhere from a 25 to 75% increase over the current cost of sweeps. There may, however, be some potential for offset of this cost, or even overall savings, if the use of the elevating devices reduces wear on the sweep rope or cable (Section 7.8). Additionally, for vessels with net reels, there may be an additional cost for keeping replacement bobbins on board, at a cost of approximately $700 for a full replacement set.

For vessels requiring a structural change to accommodate the modified trawl sweeps and continue to maintain the same catch rates, the cost to modify the vessel may be large. Estimates in the range of $100,000 to $800,000 have been suggested by industry. Of the vessels in the Amendment 80 sector, there will be a subset of vessels that are likely to opt for some vessel modifications in order to comply with this regulation. AFA catcher processors that participate in the flatfish fisheries tend to be larger vessels, and are more likely to be able to accommodate the required extra capacity on their net reels. Some catcher vessels may need to increase capacity in order to maintain their former catch rates in the flatfish fisheries.

Passive use and habitat productivity benefits

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 2005), 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.

Alternative 3: Creating the Modified Trawl Gear Zone

In addition to the trawl gear modification, Alternative 3 also proposes to reopen an area of the NBSRA that is currently closed to nonpelagic trawling. Fishing in the area with nonpelagic trawl gear would only be allowed by vessels using the modified trawl sweeps.

The area to be designated as the Modified Gear Trawl Zone was closed to fishing with nonpelagic trawl gear in July 2008. The degree to which the area was used for fishing prior to that time is discussed in Section 7.9. While the area was not a major fishing ground for the fleet, nonetheless some exploratory fishing was conducted in the area. Anecdotal evidence also suggests that it was more frequently used by vessels fishing for flathead sole, but the importance of the area is unverifiable because those fishing trips were not observed.

Reopening the area for use by vessels with modified gear would allow fishermen additional access to fishing grounds where some flatfish have historically been harvested. Additionally, there is some evidence that flathead sole and rock sole are likely to distribute further north and northwest during warm periods (Spencer 2006), and as ocean temperatures increase, it may be important to the fleet to have access to fishing grounds in the north. To the extent that this northward distribution occurs, and more southerly fishing grounds for these species are no longer productive, it may be important to fishermen to have access to the Modified Gear Trawl Zone. The potential adverse effect on benthic habitat of reopening a closed area to fishing is mitigated by the fact that the area is small, and that all vessels fishing with nonpelagic gear would be required to use modified sweeps (the habitat benefits of which are discussed above). Any nonpelagic trawl vessel fishing in the area would be required to use the modified sweeps, regardless of what species it may be targeting.

SMIHCA Option: Adjusting the St Matthew Island HCA boundaries

The analysis includes an option to adjust the boundaries for the St Matthew Island HCA. Currently, nonpelagic trawl fishing is prohibited within the HCA. The Council has asked for input from the Crab Plan Team as to whether and how these boundaries should be adjusted. The Crab Plan Team will provide their recommendations at the June Council meeting. Based on the crab survey information (3.4.1), however, some blue king crab have been surveyed outside of the HCA to the east, and others to the southwest of the HCA. For purposes of analysis, Section 2 provides two possible scenarios for expanding the boundaries of the HCA: extending the boundary to the east, and extending the boundaries both to the east and southwest (Figure 2 and Figure 3). Moving the boundary further east would not represent a change from the status quo, as the area to the east is currently closed to nonpelagic trawling. Based on the information from the crab survey, much of the blue king crab population is located to the southwest of the current St Matthew Island HCA. If the boundaries were extended to encompass more of this southwestern population, the impact on nonpelagic trawl fisheries would negligible. Figure 44, on page 99,and Figure 45, show the 2008 distribution of flatfish fishing and nonpelagic trawling generally. In neither case would the expansion of the HCA be likely to affect fishing operations. Observer records of nonpelagic trawl fishing effort from 1990 to 2005 were also examined, and while there has in the past been some effort in this area, the area to the southwest is not a major fishing area for the fleet. If the HCA were extended to include area to the southeast, this has been an area that in the past has been used by the rock sole fishery, and the closure of this area might incur some cost to that fleet.

Monitoring and enforcement costs

Section 6 describes the discussions that have been undertaken within the enforcement agencies, and with the public, to ensure that the draft regulation (see Appendix B) will be enforceable. The implementation of the trawl sweep modification under either Alternative 2 or 3 will impose an additional inspection

requirement on enforcement personnel. Preliminary work has been done to ensure that the ability to inspect the gear will be both simple and effective.

The implementation of the Modified Gear Trawl Zone also imposes an additional burden on inspection agencies, as they must also ensure that any nonpelagic trawl vessel fishing in the Zone is using the modified gear. To the extent that most of the fishing in that area is likely to be by vessels targeting flatfish, however, the burden is unlikely to be any more onerous than it will be for monitoring the trawl sweep modification in the flatfish alone.

Adjusting the boundaries of the St Matthew Island HCA is unlikely to present any difference in monitoring or enforcement costs than under the status quo.

Net benefits to the Nation

An overall net benefit to the Nation is likely to accrue from the reduced impacts to benthic habitat and reduced bycatch of crab resulting from the trawl sweep gear modification requirement. The net benefit to the Nation will be slightly smaller under Alternative 3, which also reopens a small area of the Northern Bering Sea Research Area which is currently closed to nonpelagic trawling. The modified gear requirement will be in effect for any nonpelagic trawl fishing taking place in the Modified Gear Trawl Zone, which minimizes the degree to which an adverse impact on benthic habitat may occur.

7.11 Summary

Table 34 provides an overview of the costs and benefits of the Alternatives and the option.

Table 34 Comparison of alternatives for economic and social impacts

	Alternative 1	Alternative 2	Alternative 3	SMIHCA option
Description	no action (status quo)	require vessels targeting flatfish in the Bering Sea to use modified sweeps	require vessels targeting flatfish in the Bering Sea to use modified sweeps **AND** adjust boundary of the NBSRA to create a "Modified Gear Trawl Zone" where nonpelagic trawl vessels must use modified sweeps	Adjust the St Matthew Island HCA boundary to ensure protection of blue king crab habitat
Protection of habitat: value to commercial fishermen, value to other users, non-use value	Baseline	Use of the gear will reduce adverse impacts to benthic habitat. Benthic communities will change somewhat, but not as greatly as they would in the absence of this gear requirement. Reduction in impacts is expected to improve the productivity of fish stocks beyond what they would have been under the status quo. This may increase harvestable surpluses beyond what they would have been, and improve catch per unit effort.	The same considerations with respect to the trawl sweep modification apply here as under Alternative 2. However, opening the Modified Gear Trawl Zone, despite the requirement for the gear modification, will adversely impact the benthic habitat within the area. Thus the protection benefits from this action are less than those under Alternative 2.	Expanding the St Matthew HCA would provide some incremental protection for benthic habitat by closing further area to nonpelagic trawling
		Persons may have non-use values for the marginal or incremental change in benthic habitat. No estimates of this are available; there is no scientific information that this is non-trivial.		same

	Alternative 1	Alternative 2	Alternative 3	SMIHCA option
Crab and crab fisheries	Baseline	The use of the gear will result in less crab bycatch mortality, which may improve the sustainability of crab stocks and increase the catch per unit effort in crab fisheries.		May improve sustainability of crab stocks.
Cost of gear	Baseline	Estimated to be about $3000-$3500 annually. This could be greater or less depending on the type of gear and length of sweeps in use.		n/a
		Annual cost of the modified gear may be offset if using the elevated disks increases the useful life of trawl sweeps, lengthening the time before replacement of the gear.		
		There may be a one-time cost for modifying the vessel to accommodate the modified gear. Estimates of this cost may range between zero and $800,000, depending on the vessel and its existing configuration. Vessels differ from each other so much that it is not possible to provide an average or aggregate cost.		
Cost of fishing with modified gear	Baseline	It may take longer to set and retrieve nets. Industry sources believe that this may be a cost during transitional years, as learning takes place and gear improvements are implemented.		n/a
		Research shows little or no difference in catchability of the gear using 8” disks raising the sweep 2.5” off the seafloor. No catchability study is available using 10” disks raising the sweep 2.5” off the seafloor, but the result is expected to be similar.		
Management and enforcement		Enforcement personnel will need to verify that the modified gear meets the regulatory requirements when conducting regular vessel inspections.	The creation of the Modified Gear Trawl Zone should not create any enforcement burden beyond that of enforcing the modified trawl sweeps.	No additional management or enforcement required.
Net benefits to the Nation		The annual cost to fishermen of purchasing and using more expensive modified gear is balanced against the reduced impact to benthic habitat, and the potential for increased productivity of species as a result.	Net benefits of this alternative are smaller than those for Alternative 2, as a currently closed area is reopened to fishing. This is somewhat mitigated by the facts that the area is small, and any nonpelagic trawl fishing in the area would be with modified gear.	If the SMIHCA boundaries need to be adjusted in order to increase protection for blue king crab, the nation benefits from a more productive stock. Few costs should arise as much of the area of expansion is either currently closed to fishing or not being used by fishermen.

8 Initial Regulatory Flexibility Analysis

8.1 Introduction

This IRFA evaluates the impacts on directly regulated small entities of the proposed action, to require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor, and to consider changes to the southern boundary of the Northern Bering Sea Research Area (NBSRA) to create an area where anyone fishing with non-pelagic trawl gear must use the modified trawl sweeps required by regulation. Also included is an option to change the boundary of the St Matthew Island Habitat Conservation Area to be consistent with the Council’s intent to protect blue king crab habitat. This IRFA addresses the statutory requirements of the Regulatory Flexibility Act (RFA) of

1980, as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (5 U.S.C. 601-612).

8.2 The purpose of an IRFA

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

Data on cost structure, affiliation, and operational procedures and strategies in the fishing sectors subject to the proposed regulatory action are insufficient, at present, to permit preparation of a "factual basis" upon which to certify that the preferred alternative does not have the potential to result in "significant 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 IRFA has been prepared and is included in this package for Secretarial review.

8.3 What is required in an IRFA?

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

- A description of the reasons why action by the agency is being considered;
- A succinct statement of the objectives of, and the legal basis for, the proposed rule;
- A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply (including a profile of the industry divided into industry segments, if appropriate);

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

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

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

    3. The use of performance rather than design standards;

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

8.4 What is a small entity?

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

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

The SBA has established size criteria for all major industry sectors in the United States, including fish harvesting and fish processing businesses. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $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. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $4.0 million criterion for fish harvesting operations. Finally a wholesale business servicing the fishing industry is a small business 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 control the board of directors and/or the management of another concern. Parties to a joint venture also may be affiliates. A contractor or subcontractor is treated as a participant in a joint venture 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 non-profit 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.

8.5 What is this action?

This document analyzes three alternatives that evaluate a proposed gear modification to require non-pelagic trawl vessels targeting flatfish in the BS to use elevating devices on trawl sweeps to raise them off the seafloor, and changes to the southern boundary of the Northern Bering Sea Research Area (NBSRA) to create an area where anyone fishing with non-pelagic trawl gear must use the modified trawl sweeps required by regulation. Also included is an option to change the boundary of the St Matthew Island Habitat Conservation Area to be consistent with the Council's intent to protect blue king crab habitat, and certain housekeeping amendments to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area (BSAI FMP), which are required to correct typographical and non-substantive errors.

The final proposed action has not yet been determined, and the housekeeping amendments are not subject to the RFA, and are not analyzed in this section.

8.6 Objectives and reasons for considering the proposed action

The Council formulated the following problem statement to initiate this analysis:

> Research has shown that sweep modifications can reduce gear contact with the sea floor and may not have negative effects on catch rates. Modifications appear to meet the Council's intent to consider practicable measures to reduce potential adverse effects of non-pelagic trawl fishing on bottom habitat. The "wedge" is reported to contain high concentrations of flatfish and low concentrations of other bycatch species. Re-opening of the "wedge" was linked to implementation of sweep modifications in final action on Amendment 89. In addition, there may be some associated typographical, formatting, and description errors in the FMP that may not meet the Council's intent.

8.7 Legal basis for the proposed action

NMFS manages the US groundfish fisheries of the BSAI under the Fishery Management Plan (FMP) for this area. The Council prepared the FMP under the authority of the Magnuson-Stevens Act, and regulations implement the FMPs at 50 CFR part 679. General regulations that also pertain to U.S. fisheries appear at subpart H of 50 CFR part 600.

8.8 Number and description of small entities directly regulated by the proposed action

This action would directly regulate all vessels conducting directed fishing for flatfish in the Bering Sea subarea. The analysis has identified approximately 46 such vessels operating in one or multiple years in the Bering Sea subarea, from 2000 to 2008.

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 or Amendment 80 fishing cooperative. The members of these cooperatives had combined revenues that exceeded the $4.0 million threshold.

In 2007, all of the catcher processors targeting flatfish in the Bering Sea exceeded the $4.0 million threshold, when considering their combined groundfish revenues, and would be considered large entities for purposes of the RFA. None of the four catcher vessels who participated in 2007 met the threshold, based on their combined groundfish revenues, and these vessels are considered small entities for purposes of the RFA. It is likely that some of these vessels are also linked by company affiliation, which may then qualify them as large entities, but information is not available to identify ownership status of all vessels at an entity level. Therefore, the IRFA may overestimate the number of small entities directly regulated by the proposed action.

8.9 Recordkeeping and reporting requirements

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

Implementation of the proposed action would not change the overall reporting structure and record keeping requirements of the vessels participating in the Bering Sea flatfish fisheries.

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

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

There do not appear to be any Federal rules that duplicate, overlap, or conflict with the proposed action. Some current Federal regulations will need modification to implement the proposed action, as described in Appendix B Proposed regulatory amendment text.

8.11 Description of significant alternatives

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

At the time of the preparation of this draft IRFA, the Council has not identified a preferred alternative. This section will be re-evaluated once the Council has taken further action.

9 FMP and Magnuson-Stevens Act considerations

9.1 Magnuson-Stevens Act National Standards

Below are the 10 National Standards as contained in the Magnuson-Stevens Act, and a brief discussion of the consistency of the proposed alternatives with those National Standards, where applicable.

National Standard 1 - Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery

The proposed action would impose gear modifications on the nonpelagic trawl fishery for BS yellowfin sole, rock sole, and flathead sole, 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.

National Standard 2 - Conservation and management measures shall be based upon the best scientific information available.

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' harvest specification process. 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 in this analysis.

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 proposed gear modifications.

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 flatfish fleet. As detailed in 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 the RIR.

An analysis of the alternatives 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.

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 flatfish fleet would change safety requirements for fishing vessels.

9.2 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. The impacts of these actions on participants in the fisheries and fishing communities are the topic of Sections 7 and 0, in the RIR and IRFA.

Fishery Participants

The proposed actions directly impact the participants in the BSAI flatfish fisheries. Participants in the Amendment 80 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 generally harvested over 90 percent of each of those species (Table 30). Generally, allocations of these species to the CDQ program are harvested under contract by participants in the non-CDQ fishery.

From 2000 to 2008, there have been a total of 48 different vessels participating in the directed flatfish fisheries, although only 27 of them have fished in at least six of the last nine years. 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.

In addition to the vessels in the Amendment 80 sector, there has been some participation in the Bering Sea flatfish fisheries by AFA catcher processors, and other trawl catcher vessels (including, but not limited to, AFA catcher vessels). Bering Sea flatfish generally represents a small proportion of total groundfish revenues for these vessels.

Fishing Communities

The fishing communities that are expected to be potentially directly impacted by the proposed action are those communities which serve as homeports to the flatfish vessels, offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. The flatfish 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 flatfish 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.

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 Bering Sea flatfish 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.

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.

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.

9.3 BSAI FMP - groundfish management policy priorities

The alternatives discussed in this action accord with the management policy of the BSAI Groundfish FMP. The Council's management policy (NPFMC 2009) includes the following objectives:

- Identify and designate EFH and HAPC pursuant to Magnuson-Stevens Act rules, and mitigate fishery impacts as necessary and practicable to continue the sustainability of managmened species.
- Continue program to reduce discards by developing management measures that encourage the use of gear and fishing techniques that reduce bycatch which includes economic discards.

By requiring gear modifications to nonpelagic trawl gear, to reduce impacts on habitat and reduce bycatch of crab, the Council is consistent with its management policy.

10 NEPA summary

One of the purposes of an environmental assessment is to provide the evidence and analysis necessary to decide whether an agency must prepare an environmental impact statement (EIS). The Finding of No Significant Impact (FONSI) is the decision maker's determination that the action will not result in significant impacts to the human environment, and therefore, further analysis in an EIS is not needed. The Council on Environmental Quality regulations at 40 CFR 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." An action must be evaluated at different spatial scales and settings to determine the context of the action. Intensity is evaluated with respect to the nature of impacts and the resources or environmental components affected by the action. NOAA Administrative Order (NAO) 216-6 provides guidance on the National Environmental Policy Act (NEPA) specifically to line agencies within NOAA. It specifies the definition of significance in the fishery management context by listing criteria that should be used to test the significance of fishery management actions (NAO 216-6 §§ 6.01 and 6.02). These factors form the basis of the analysis presented in this EA/RIR/IRFA. The results of that analysis are summarized here for those criteria.

Context: For this action, the setting is the BS subarea groundfish non-pelagic trawl fisheries. Any effects of this action are limited to this area. The effects of this action on society within this area are on individuals directly and indirectly participating in these fisheries and on those who use the ocean resources. Because this action concerns the use of a present and future resource, this action may have impacts on society as a whole or regionally.

Intensity: Considerations to determine intensity of the impacts are set forth in 40 CFR 1508.27(b) and in the NAO 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 sections of the EA that address the considerations are identified.

1) Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

(EA Section 5.2). No. No significant adverse impacts on target species were identified for Alternatives 2, 3, or the Option. No changes in overall amount, timing, or location of harvest of target species are expected with any of the alternatives or Option in the proposed action and therefore no impacts on the sustainability of any target species are expected.

2) Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?

(EA Section 5.3) No. Potential effects of Alternatives 2, 3, or the Option 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. Because no overall changes in target species harvests under the alternatives and option is expected, the alternatives and Option are not likely to jeopardize the sustainability of any nontarget/prohibited species.

3) *Can the proposed action reasonably be 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 the fishery management plans (FMPs)?*

(EA Sections 5.1). No. No significant adverse impacts were identified for Alternatives 2, 3, or the Option on ocean or coastal habitats or EFH. The alternatives and the Option provide additional protection to areas in the Bering Sea where flatfish fishing occurs by reducing the potential impact of gear on the bottom. Alternative 3 is less protective of habitat than Alternative 2 because it allows fishing with modified gear in an area that is currently closed to nonpelagic trawling. The requirement to use modified gear in the Modified Gear Trawl Zone under Alternative 3 reduces the potential impacts on the bottom in this area. Substantial damage to ocean or coastal habitat or EFH by Alternatives 2, 3, or the Option is not expected.

4) *Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?*

(EA Section 6). 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 Alternatives 2 and 3 and the Option 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. Use of the modified gear has been determined by industry and agency personnel to be practical and is not expected to have a substantial adverse impact on public health or safety.

5) *Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?*

(EA Sections 5.4 and 5.5) No. Alternatives 2 and 3 would require the use of modified trawl gear which would provide protection to benthic habitat that may support benthic dependent ESA-listed and candidate species (e. g., Steller's and spectacled eiders and Pacific walrus). 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. Opening the Modified Gear Trawl Zone under Alternative 3 may affect those species that may depend on benthic habitat in this area, but the modified gear reduced the potential for impacts. This area is not identified as critical habitat for any ESA-listed species and population level effects are not expected. Because of the modified gear requirement, no change in overall harvest, the location of the Modified Gear Trawl Zone, and the dependence of benthic using species on this area, the alternatives and option are not likely to adversely affect ESA-listed species or their designated critical habitat.

6) *Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

(EA Section 5.6). No significant adverse impacts on biodiversity or ecosystem function were identified for Alternatives 2, 3, or the Option. The alternatives would provide protection to biodiversity and ecosystem function by reducing potential impacts of nonpelagic gear on benthic habitat. The Option would close additional area around St. Matthew Island, protecting additional blue king crab habitat and likely benefiting other features of bottom habitat that provide an ecosystem function. No significant effects were expected on biodiversity, the ecosystem, marine mammals, or seabirds

7) *Are significant social or economic impacts interrelated with natural or physical environmental effects?*

(EA/RIR/IRFA Chapters 5, 7, and 0). Socioeconomic impacts of this action are limited to the requirement for using modified gear, the opening of the Modified Gear Trawl Zone, and the additional closure for the SMIHCA. The social or economic impacts of the alternatives and the Option are not expected to be significant as the implementation of the modified gear requirements does not appear to be excessively expensive to the flatfish trawl fleet and the areas to be opened and closed are not currently areas where fishing occurs. 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 Option for social or economic impacts interrelated with natural or physical environmental effects.

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 and the potential impacts on the human environment are well understood. No issues of controversy were identified in the process (EA Sections 1 and 5).

9) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

(EA Section 3.1). No. This action would not affect any categories of areas on shore. 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 option provide protection to EFH and ecologically critical nearshore areas

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 marine mammals and seabirds 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 Sections 5.4 and 5.5). The potential impacts of bottom trawling on habitat also are well understood as described in the EFH EIS (NMFS 2005) (EA Section 5.1).

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

(EA Chapter 5) No. Beyond the cumulative impact analyses in the 2006 and 2007 harvest specifications EA and the Groundfish Harvest Specifications EIS, no other additional past or present cumulative impact issues were identified. Reasonably foreseeable future impacts in this analysis include potential effects of global warming. 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?

(EA Section 3.1) 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

13) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

(EA Section 3.2) No. This action poses no effect on the introduction or spread of nonindigenous species into the Bering Sea beyond those previously identified because it does not change fishing, processing, or shipping practices that may lead to the introduction of nonindigenous species.

14) Is the proposed action likely to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

No. This action would provide for additional protection to Bering Sea bottom habitat by the use of modified trawl gear with is not expected to have a significant effect. This action does not establish a precedent for future action because any additional application of modified gear would require additional research to support the 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 reasonably be 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 reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

(EA Section 5.2 and 5.3) No. The effects on target and non-target species from the alternatives and Option are mostly beneficial effects by protection of benthic habitat with the use of modified trawl gear and the additional closure for the SMIHCA. No cumulative effects were identified that added to the direct and indirect effects on target and nontarget species would result in significant effects.

11 Housekeeping changes to the BSAI FMP

Three housekeeping changes are proposed for inclusion in Amendment 94 to the BSAI FMP. All changes to the FMP, even minor typographical changes, require an FMP amendment that is approved by the Council. The proposed changes are not substantive.

11.1 Remove reference to Crab and Halibut Protection Zone

Section 3.5.2.1.1 of the BSAI FMP refers to the Crab and Halibut Protection Zone (CHPZ) as a current area restriction affecting all trawl vessels in the Bering Sea. The Zone was implemented under Amendment 10 to the BSAI FMP, approved by the Council in 1987. In 1997, the Council implemented Amendment 37 to the BSAI FMP, creating the Nearshore Bristol Bay Trawl Closure Area. This new area restriction for trawl vessels superseded the CHPZ. The regulations were amended to change the area

restriction as appropriate, but reference to the CHPZ was not removed from the FMP. This housekeeping amendment would remove Section 3.5.2.1.1, referring to the CHPZ, and the associated figure, and accordingly renumber all figures and figure cross-references in the document. It would also remove reference to the CHPZ coordinates in Appendix B.2 of the FMP, and clarify in the description of Amendment 37 in Appendix A that the Nearshore Bristol Bay Trawl Closure Area superseded the CHPZ.

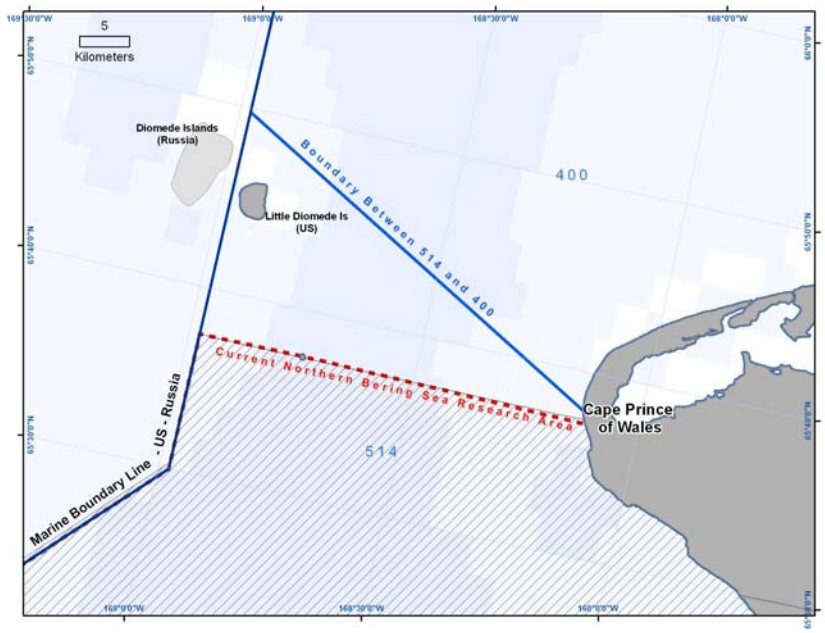
11.2 Renumber figures in Chapter 3 of the FMP

Amendment 89 caused a number of figures depicting closure areas in the BSAI to be inserted in Chapter 3 of the FMP. During the process of writing that amendment text, the numbering of the figures and all associated cross-references, became confused. This housekeeping amendment would renumber all of the figures in the FMP sequentially, and ensure that all citations reference the correct figure number.

11.3 Revise northern boundary of NBSRA

The third housekeeping amendment would revise the northern boundary of the NBSRA to match the southern boundary of statistical area 400 at Bering Strait. The Chukchi statistical Area 400 is currently described in the regulations as north of a diagonal line between 66° 00' N, 169° 42.5' W (Cape Dezhneva, Russia); and 65° 37.5' N, 168° 7. 5' W (Cape Prince of Wales, Alaska) and to the limits of the U.S. EEZ as described in the current edition of NOAA chart INT 814 Bering Sea (Northern Part). Area 514 of the Bering Sea Subarea extends north to the southern boundary of Area 400. The current northern boundary of the NBSRA leaves a wedge of water open to nonpelagic trawling near Bering Strait due to the wrong coordinates being used for this boundary. The Council intended for the entire northern portion of the Bering Sea subarea to be part of the NBSRA, and this housekeeping amendment would remove the area of water currently open to nonpelagic trawling (Figure 4). The amendment would include both FMP and regulatory changes to the coordinate table (Table 43 to 50 CFR part 679) for the NBSRA to revise the last coordinate to read 65º 49.8’ N latitude and 168º 58.7’ W longitude.

Figure 51 Northern boundary of the Northern Bering Sea Research Area and boundary between statistical areas 514 and 400. The area between the boundaries is currently open to nonpelagic trawl fishing.



Source: Steve Lewis, NMFS Alaska Region Analytical Team April 30, 2009

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Some of the analysis from BSAI Amendment 89 (NMFS 2008a) was also used in this document.

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Appendices

Appendix A Proposed amendment text for the BSAI Groundfish FMP

Appendix B Proposed regulatory amendment text

Appendix C Report from the Council's public workshop, September 2008

Appendix D Reports from the Council's Enforcement Committee, October 2008 to February 2009

Appendix A Proposed amendment text for the BSAI Groundfish FMP

If the Council adopts Alternative 2, the following language will be added to Section 3.4.2 of the FMP:

Flatfish

The use of elevating devices on the sweeps is required in the directed fisheries for flatfish species.

If the Council adopts Alternative 3, the change listed above will be made, and additionally the Modified Gear Trawl Zone will be listed in Section 3.5.2 and also in Appendix B.

If the Council adjusts the boundaries of the St Matthew Island HCA, the relevant changes will be made in Section 3.5.2.1.9, and in Appendix B.

The changes to the FMP that will be made under the housekeeping amendments are described in Section 11.

As appropriate, the changes under the amendment will be summarized in Table ES-2 and in Appendix A.

Appendix B Proposed regulatory amendment text

Several regulations in 50 CFR part 679 would need to be revised to implement a modified trawl sweep requirement. **Note, this language is a draft only, and is still subject to revision.** 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 directed fishing for flatfish for purposes of the gear modification requirement. The flatfish fishing definition includes any exemption from a nonpelagic trawl closures based on the use of modified gear. The definition for federally permitted vessels should be revised to include modified trawl gear for flatfish fishing in the Bering Sea. Fishing trip will need to be revised to apply to its use in the directed fishing for flatfish definition.

§ 679.2 Definitions

* * * *

Directed Fishing for Flatfish means for purposes of nonpelagic trawl restrictions under § 679.22 (a) and gear modification requirements under §§ 679.7(c)(3) and 679.24(f), fishing with nonpelagic trawl gear during any fishing trip 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).

Note: The closure area at 679.22(a) would need to be included if the wedge in Fig. 4 applies only to flatfish fishing with modified gear.

* * *

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.

* * *

Fishing trip means:

(1) With respect to retention requirements (MRA, IR/IU, and pollock roe stripping) and to gear requirements for directed flatfish fishing

(i) An operator of a catcher/processor or mothership processor vessel is engaged in a fishing trip from the time the harvesting, receiving, or processing of groundfish is begun or resumed in an area until:

(A) The effective date of a notification prohibiting directed fishing in the same area under § 679.20 or § 679.21;

(B) The offload or transfer of all fish or fish product from that vessel;

(C) The vessel enters or leaves an area where a different directed fishing prohibition applies;

(D) The vessel begins fishing with different type of authorized fishing gear; or

(E) The end of a weekly reporting period, whichever comes first.

(ii) An operator of a catcher vessel is engaged in a fishing trip from the time the harvesting of groundfish is begun until the offload or transfer of all fish or fish product from that vessel.

* * * * *

3. 2. A new subparagraph (3) also would be added to § 679.7(c) to prohibit directed fishing for BS flatfish without sweeps that meet 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 vessel required to be federally permitted in any reporting area of the Bering Sea subarea as described in Figure 1 to this part and adjacent State of Alaska waters without meeting the requirements for the nonpelagic trawl sweeps specified in § 679.24(f).

* * * *

4. A new subparagraph would be added to § 679.7(a) to reopen the "wedge" area, to limit fishing in that area to only those fishing with modified non-pelagic trawl gear.

Figures – Part 679

The NBSRA figures and coordinate table would need to be changed.

* * * *

679.22(a)(21) Modified Gear Trawl Zone. No federally permitted vessel may fish with nonpelagic trawl gear in the Modified Gear Trawl Zone specified at Table 46 and Figure 22 to this part, except for vessels directly fishing for flatfish using modified gear as specified in § 679.24(f).

Note: A coordinate table and possibly a figure would be added to the regulations for this zone.

* * * *

5. To establish standards and requirements for the use of modified nonpelagic trawl gear, add paragraph (f) to § 679.24.

§ 679.24 Gear Limitations

* * * *

§ 679.24(f) Nonpelagic trawl bottom line and sweep of Section A of Figure X for directed flatfish fishing with federally permitted vessels in reporting areas and adjacent State waters of the BS. Vessel owner or operators using nonpelagic trawl gear for directed flatfish fishing must meet the following standards in subparagraphs (1) through (3):

(1) elevating discs, bobbins or similar devices installed on the bottom line and sweep of Section A of Figure X raise the bottom line and sweep at least 2.5 inches, as measured adjacent to the elevating device when resting unsupported on a hard, flat surface, regardless of the elevating

device orientation, and measured between the supporting surface and the lowest part of the line material;

(2) ating devices secured along the entire length of the bottom line and sweep of Section A on Figure X at no less than 30 feet between devices and either

(i) no more than 65 feet between elevating devices that raise the bottom line and sweep of Section A on Figure X 3.5 inches (8.89 cm) or less, or

(ii) no more than 95 feet between elevating devices that raise the bottom line and sweep of Section A on Figure X more than 3.5 inches (8.89 cm);

and

(3)The largest cross-section of the bottom line and sweep in Section A of Figure X 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. Where a device is installed over material different from the bottom line and sweep, (for example, on a chain joining two bottom line sections), that material must be at least as wide as the bottom line and sweep material.

Note: A minimum distance is also recommended to reduce the amount of contact of the elevating devices on the bottom, using only the amount of elevating devices necessary to provide the sweep clearance.

* * * *

Appendix C Report from the Council's public workshop, September 2008

Public workshop on proposed gear modifications to trawl sweeps used in the BSAI flatfish fisheries

September 8, 2008 1-4pm
Dantrawl, 1121 NW 52nd, Seattle, WA 98107

Report

The agenda for the workshop and a handout listing questions to be resolved, which was used at the workshop, is included as Appendix 1, on page 6. A list of the workshop attendees is included as Appendix 2, on page 10.

Introduction

Melanie Brown introduced the purpose of workshop, to educate participants on the latest modified gear research and come up with solutions to implementation issues.

Latest Research

Dr. Craig Rose reviewed the material presented to the Council in June 2008 on the field testing and research conducted over the last year for the modified gear. Results presented last year, assessing effects of the modification on habitat effects and catch rates, used 6, 8, and 10 inch disks over 2 inch combination rope at 30 foot intervals. Actual clearance between the sweep and the seafloor is influenced by nominal clearance (the space created under the sweeps adjacent to the elevating device, measured on a hard surface), the degree to which the elevating device sinks into soft sand or mud, and the degree to which the sweep sags in the span between elevating devices. While some damage reduction was seen with the 6 inch disks (with 2 inches nominal clearance), the 8 inch disks (with 3 inches nominal clearance) performed somewhat better with no detectable reduction in catch rates. It was recognized that longer spacings between elevating devices would be easier for fishers to work with and would further reduce direct contact area, up to the point that actual clearances are substantially reduced due to sag. The goal of this year's studies was to identify the longest spacing that achieved similar clearance characteristics to the 30 foot spacing used in initial tests.

Clearance indicators were developed to measure actual clearances between the sweep material and the seafloor during operation. These indicators were installed at several points across the span between elevating devices placed at 30, 60, and 90 foot spacings. Indicators installed next to the elevating devices evaluated the degree of sinking (elevating devices may sink up to 0.5 inches into the mud), while those near the center of the span measured sag. The general conclusion was that similar actual clearance to last year's tests was achieved over a longer spacing, using elevating devices producing a 3 inch nominal clearance at 60 ft spacing (tested using 8 inch discs on 2 inch sweeps), and 4 inch nominal clearance at 90 foot spacing (10 inch discs on 2 inch sweeps).

John Gauvin explained some of the background for the gear modification action. In the Environmental Impact Statement for Essential Fish Habitat (EFH) Identification and Conservation in Alaska, the flatfish fleet was identified as having the highest impact on EFH, of Bering Sea fisheries. This is primarily because the fleet fish over broad areas, following the movement of the flatfish, so the total area affected by the fishery is high. Consequently, when the Council began considering habitat conservation measures for the Bering Sea, they focused on the flatfish fishery. The Council's first strategy, to close areas with

low catch per unit effort over a series of years, would have closed out much of the flathead sole fishing grounds (as this is a highly mobile species). As an alternative, gear modifications were proposed as a mechanism to reduce the impact on the seafloor, without closing areas to fishing. An industry workshop was held in March 2007 to discuss implementation issues with attaching elevating devices to the sweeps, but there continued to be unresolved issues at the time of the Council's final action on Bering Sea Habitat Conservation (Amendment 89, in June 2007).

The purpose of the additional research in 2007 and 2008 was to resolve three outstanding issues: spacing, methods of attachment and wear rates, and how to work with modified gear on vessels without net reels. Extending the spacing between devices by using larger discs was successful (60 ft for main wire using 8 inches elevating devices and 90 foot for combination rope with 10 inch elevating devices). Connecting the elevating devices at the eyes, where the sections of sweep are spliced together, worked well, while clamps did not work as well as attachment between sections. Finally, testing was done on the F/V Seafisher, a vessel without a net reel, using graduated bobbins rather than discs, which was successful.

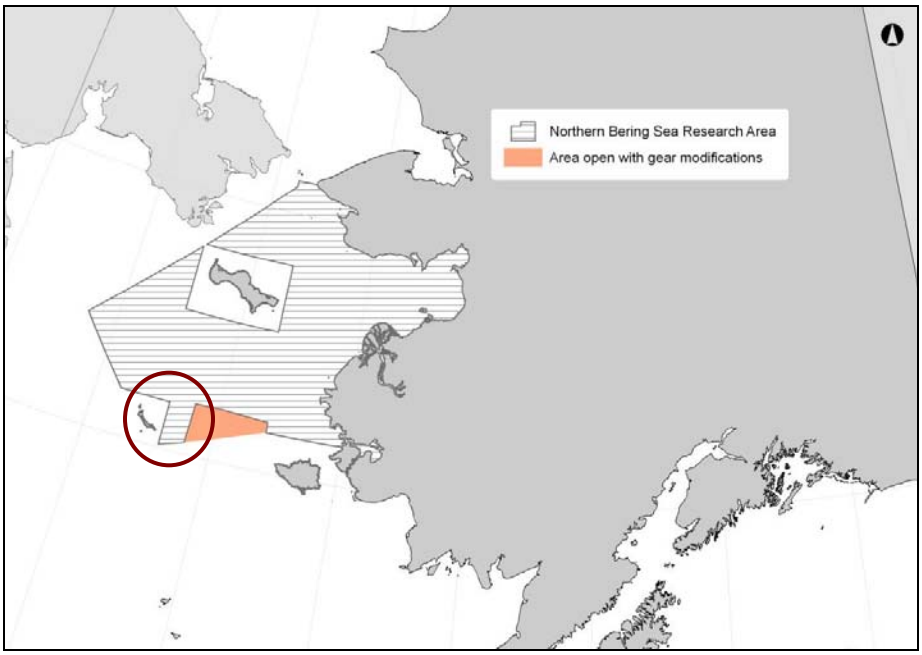
Given that these issues have been resolved, the remaining issues revolve around how to define the requirement in a regulation. Mr Gauvin strongly recommended that the regulation allow for the maximum flexibility. As people use the gear in the fishery, they will likely come up with improvements and changes, and should not be locked into a particular gear configuration as long as the gear meets the overall clearance standard. Mr Gauvin also recommended that the Council include in their final action a formal time period for reconsidering the regulatory standard, to allow any changes that may be required.

Council action and reopening a closed area (the 'wedge')

Diana Evans spoke about the Council's motions with respect to gear modification in June 2007 and June 2008, and the likely timing of an amendment. The Council is currently scheduled to take initial review of this amendment in December 2008, and final action in February 2009. Implementation would likely be for the 2010 fishing year.

Once the gear modification requirement is in place, the Council has indicated that it may reopen an area of the Northern Bering Sea Research Area, which is currently closed to non-pelagic trawling. An alternative proposing this action will be included in the Council's amendment analysis. Ms Evans noted that the wording of the Council's June 2007 motion regarding the reopening of the area is ambiguous – will the area only be open to flatfish fishery participants using the modified gear, or will the area reopen to all non-pelagic trawling. Workshop participants indicated that they had understood that the area would only be opened to vessels using modified gear, but the modified gear could be used to target more than just flatfish in that area. Ms Evans indicated that she would be asking the Council for further clarification on this matter at the October Council meeting. Dr. Rose stated that there has been some research on targeting Pacific cod using modified gear, and this may be a potential species to be harvested in the area. However, workshop participants thought it was unlikely Pacific cod in fishable quantities would occur in the reopened area.

Lori Swanson and John Gauvin also noted that the figure depicting the area to be reopened, known as the 'wedge', did not look correct. They believe the western border should extend to the closure border of the St. Matthew Island closure. The figure here was included in the Federal Register notice for Amendment 89; the circle roughly indicates the disputed boundary.



Implementation and the draft regulation

Melanie Brown presented the draft regulation for § 679.24(f), as currently proposed, and went through the list of questions identified in the handout (Appendix 1). Overall, there was agreement that the draft regulations should establish the required clearance standard, yet leave some flexibility for how to meet the standard, for minor slippage of the elevating devices, and for various sizes of elevating devices. Research has shown that the elevating devices can be securely attached to both bare wire and combination wire.

Participants were much more comfortable with the current proposals for meeting the clearance standard than they were a year ago, and stated that 90 foot spacing with 10 inch elevating devices is a viable solution, whereas the requirement to place the devices at shorter spacing intervals was not. Manufacturers are able to produce the requisite parts to meet the standard; there were a couple of examples available at the workshop site to illustrate how the devices may be attached to combination wire and bare wire.

10 inch elevating bobbin connected to 2 inch (52mm) combination wire with hammerlocks (coupling links)

8 inch elevating discs mounted on body of 2 inch (52mm) combination wire with stopper swages each side

According to Dr Rose and Mr Gauvin, who have field tested the gear, the biggest challenge with implementation will be that there will be frustrations among the crew as they get used to handling the gear. Winding of the modified gear will take practice for vessel operators. However, research has shown that this challenge can be met.

Applies to directed flatfish fishing

The regulation will be written so that any Federally-permitted vessel that is directed fishing for flatfish in the Bering Sea will be required to use the modified gear. This means that it will apply to pollock vessels directly fishing for flatfish, as well as the head and gut fleet. Definitions would be revised and added to the regulations to address flatfish fishing by a Federally-permitted vessel, and to define directed flatfish fishing.

Regulations combine gear standard and performance standard

The group agreed that the regulations should specify the minimum nominal clearance required for an elevating device over a given spacing. The regulations would be written to require a minimum of 2.5 inches nominal clearance for devices used at intervals of a maximum of 65 ft, or a minimum of 3.5 inches of nominal clearance for devices used at intervals of a maximum of 95 ft. The details of the size or type of elevating device would not be included in the regulation, to allow flexibility for the fleet in meeting the standard.

The group discussed the wording in the regulation requiring the nominal clearance be measured adjacent to the elevating device, given that some devices may not be able to be measured immediately adjacent due, for example, to the use of graduated discs. After looking at the example devices, the Coast Guard and NOAA Enforcement representatives at the meeting felt comfortable that they would be able to interpret the word 'adjacent' appropriately under different configurations (see 'Measuring clearance' section below, also).

Defining what part of the gear on which the devices are required (the sweep)

The participants discussed how to identify in regulations the part of the trawl that would need to have elevating devices. The intent is to put elevating devices on the sweeps, which are usually the line between the door bridles and the net bridles. However, some trawl configurations (e.g., parallel rig for semi-pelagic trawl) have a top net bridal that extends the entire length of the bottom sweep to the door bridle, making it difficult to define what part of the sweep needs elevating devices. The participants agreed that 180 feet in front of the net should be excluded from the elevating device requirement, to prevent tangling of the gear. If the net bridle exceeds 180 feet, elevating devices would need to be put on the bottom bridle at the appropriate spacing. This would allow for flexibility in the length of the bridle yet still meet the intent of having most of the bottom lines elevated.

While everyone in the room understood exactly where the elevating devices where supposed to be placed, it was very difficult to come up with a regulatory standard to describe this. The group discussed many different ways to define 'sweep', or to define 'bridle' (the sweep then being everything in between the bridles), but was unable to arrive at an unambiguous definition. The problem is especially difficult because parts may be used differently on different trawl configurations. The group discussed the possibility of using a figure in the regulations, which could be used to identify the location where the elevating devices need to be placed. Ms Brown will continue to work on clarifying this issue.

Measuring spacing

The spacing of the elevating devices can be easily inspected on combination wire that is in 90 foot sections. An elevating device would be mounted at the location where sections of sweep are joined

together. For devices used with bare wire, a sleeve could be mounted on the wire at 60 foot intervals to help achieve proper spacing. The participants agreed that marking the sweeps for the elevating device spacing should not be a requirement, but would only be a convenience for crew and inspectors. Marking the vessel deck to assure correct spacing for elevating devices is not practical for the smaller vessels.

The group discussed briefly whether there was a need to specify a minimum spacing for use of the devices in the regulation (using more devices on the sweeps than necessary may increase habitat impacts). It was decided that it was very unlikely that fishermen would want to place more devices on the gear than would be necessary to meet the clearance requirements, due to the inconvenience of using the gear if so configured. Therefore, a minimum spacing requirement is not needed.

Measuring clearance

The participants agreed that the performance standard would be measured as the nominal clearance from the deck to the elevating devices. The group discussed how to measure the nominal clearance of the elevating devices, when different methods are used to attach the devices to the sweeps. For elevating devices mounted on a shaft, the measurements could be made from the shaft to the deck surface. For devices attached over a chain connector, the chain would need to be rotated to measure the distance from where the chain contacts the inside of the elevating device (the wide part of the chain link) to the deck. The measurements could also be done from the top side of the hole through the elevating device to the top of the bobbin or disk. It is also important that the diameter of the chain or shaft passing through the elevating device have the same or greater diameter than the diameter of the sweep itself. Smaller diameters would overestimate the sweep's nominal clearance. Elevating devices that are mounted on bare wire with graduated disks (to allow even winding) could be measured using a caliper that reaches from the top of the elevating device, beyond the graduated disks, to the top of the wire.

Dantrawl has made elevating devices with a brass ring on the inside. When the device is worn down so that the brass shows, the device is no longer providing the necessary clearance, and needs to be replaced. A similar wear indicator can also be added to a home-made device, by drilling holes in the disc or bobbin. As with spacing, these indicators may be more helpful to the crew, but could also assist visual inspections by federal personnel. The workshop participants agreed that such indicators should not be required, however.

Manufacturer's warranty or certification

The USCG will do further research into the feasibility of a program where the manufacturers could certify that the modified sweeps meet the regulatory standards. Even without such a formal program, however, the participants noted that the vessel operator could file a letter from the manufacturer and bill of sale with the ship's records indicating that the purchased gear met the requirements. This would be similar to the requirement for a manufacturer's statement for mid-water trawl gear, and could facilitate inspections by USCG and NOAA personnel. The participants agreed that this document should not be a requirement, but just something that could be done as a convenience to the gear owner and the inspection personnel.

Accommodating gear on net reels

The vessel net reels will need to accommodate the increased bulk of the modified gear. Mr Gauvin and Dr Rose indicated that in most cases they should be able to do so, but learning to wind the gear efficiently would take practice. It was noted that this would be easier for vessels with split net reels. For other vessels, several options may have to be considered. Some net reels can be modified to increase the diameter for winding the gear. Another option is to raise the net reel to allow for more gear to be wound on the reel, however this may be a concern for the stability of the vessel and the strength of the deck. The other option is to reduce the length of the sweeps. Making changes to the net reels will be an expense to the vessels using modified gear. Decreasing the sweep lengths may impact fishing efficiency and reduce harvests.

Council reconsideration of modified gear requirements

The participants agreed that it would be desirable to have a set date for the Council to revisit the modified gear requirement. This would ensure a place on the agenda for any needed revisions to the requirement, which can be difficult to obtain. The participants agreed that the preferred time period for reconsideration would be three years after implementation.

Appendix 1 Agenda and Issues for Discussion

1. Introductions
2. Latest research results (Craig Rose)
3. Gear designs - bobbins, placement, rope types, net reels and without net reels; practical applications (John Gauvin)
4. Council June motion (Diana Evans)
5. Draft regulations (Melanie Brown)
6. Monitoring and enforcement issues: identify problems and suggest solutions (Melanie Brown, moderator)

Regulation Issues:

1. Should the definition of the sweeps include all lines between the doors and the fishing line or the footrope?

Current definition:
fishing line is a length of chain or wire rope in the bottom front end of a trawl to which the webbing or lead ropes are attached.
footrope is a chain or wire rope attached to the bottom front end of a trawl and attached to the fishing line.

For purposes of establishing where to measure and attach elevating devices, we should describe whether the sweep extends to the footrope or beyond that to the fishing line.

2. What distances should be excluded in the spacing measurements for the elevating devices next to the doors and next to the trawl?

The bridles can include a substantial portion of the length of the trawl gear. Adding the length of the bridles at the door and trawl end of the sweep would increase the number of elevating devices needed. The suggested regulatory definition of the sweep excludes 90 feet closest to the doors and the 150 feet closest to the forward ends of the fishing line.

Are these exclusion distances appropriate?

Should fishing line be footrope (depends on question 1 answer)?

3. Should the regulations be written as a gear standard, performance standard, or a combination?

The draft regulations set the elevating device spacing dependent on the clearance provided by the elevating device. Clearances greater than 3.5 inches allow for greater elevating device spacing (95 feet). Research showed 10-inch diameter devices on combination wire and 8-inch devices on wire to be effective at providing the 2.5 inch clearance mininum. The following are the draft regulations which are a combination of gear and performance standards.

> § 679.24(f) Nonpelagic trawl sweeps for directed flatfish fishing with federally permitted vessels in reporting areas and adjacent State waters of the BS, as described in Figure 1 to this part. Vessel owner or operators using nonpelagic trawl gear for directed flatfish fishing must meet the following standards in subparagraphs (1) through (3):

(1) elevating discs, bobbins or similar devices installed on the sweeps that raise the sweeps at least 2.5 inches, as measured adjacent to the device when resting unsupported on a hard, flat surface, regardless of device orientation, and measured between the supporting surface and the lowest part of the sweep material;

(2) elevating devices secured along the entire length of the sweeps at either

(i) no more than 65 feet between elevating devices that raise sweeps between 2.5 and 3.5 inches (6.35 to 8.89 cm), or

(ii) no more than 95 feet between elevating devices that raise sweeps more than 3.5 inches (8.89 cm);

and

(3) 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. Where a device is installed over material different from the sweeps, (for example, on a chain joining two sweeps sections), that material must be at least as wide as the sweep material.

Should the regulations be specific to the size of the disk and the type of sweep? **or**

Should the standard of at least 2.5 inches continue to be used but work with the manufacturer and industry to use the right size discs for the type of sweep?

4. Should the regulations specify a range of values for the spacing of the devices and for the diameter of the devices? If so, what should that range be?

New elevating devices are likely to be made in a standard size of either 8 inches or 10 inches in diameter. *Is this true?*

Is there a certain amount of wear that is acceptable so that a range of diameter size could be used in the regulations? The spacing of the devices is dependent on the diameter of the devices.

Understanding that some slippage may occur in one or more points of connection, can we specify an acceptable range of distances between devices? Is not more than a certain distance OK? See current draft regulation language.

Implementation Issues:

1. What method is preferred to easily see if the spacing of the elevating devices is correct?

Combination rope sweeps usually come in 100-fathom (600-foot) sections. But gear manufacturers have indicated that they can place **spliced "eyes"** at 90-foot sections. Additionally, manufacturers of combination rope may be able to produce 90-foot combination rope "shots" with spliced eyes or other such sections at 90-foot intervals for attaching disc/bobbins. The spliced eyes provide a viable means of placing shackles such as a "hammerlock" or short length of chain and shackles where elevating discs or bobbins can be attached. This method of attachment reportedly provides a reliable means of attaching the discs/bobbins to combination rope sweeps than using clamps or other approaches that fishers and gear manufacturers have tried to date.

If the regulations require spacing at 60 feet, the elevating device would need to be placed on parts of combination rope sweep sections that may or may not be where the sections are joined with spliced eyes. This may make it difficult to reliably attach the elevating discs/bobbins on combination rope sweeps.

Attachment of discs/bobbins to steel cable or chain sweeps that are covered with small (typically 2 inches in diameter) rubber discs (i.e."cookie sweeps") does not present the same potential difficulties for disc attachment at spaced intervals.

One manufacturer has used **metal sleeves on the sweep** to mark the 60 and 90-foot intervals which would provide a quick visual method to determine spacing**. Can this method be used on any sweep material and is it economical?**

Marking the vessel deck, trawl alley or trawl way fence at 60-foot intervals where the sweep is brought back onto the vessel may make it easier to quickly see if the elevating devices are in the proper locations. This method **may work better for larger vessels** using forward net reels.

Should some method of easy visuals be required or should it be left up to the operator, knowing that hand measurements would be time consuming for all?

2. Can the elevating devices be manufactured to easily see if they have worn to the point of not providing the elevation necessary to meet the standards?

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.

According to gear manufacturers, discs/bobbins used on the combination sweep line could be equipped with **wear indicating devices** such as the ones used on some automobile tires (tread wear indicators) such that it would indicate if wear has made the device not meet the standard. Discs could have **three 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.

Are there other types of wear indicators and should this be a requirement?

3. Are there considerations for modified sweep fitting on the reels and being wound level?

For fishers currently using a trawl net and sweeps that fill their net reel fully, the additional load of the discs/bobbins may not be accommodated on their net reels. Some fishers facing this situation may have to modify net reels. This can usually be done by increased drum diameter of the net reel and possibly elevating the net reel to achieve necessary deck clearance. Alternatively, fishers may have to reduce the amount of sweep they use under the modified disc requirement relative to what they use currently. This may have some effect on catch rates of fishing efficiencies. Fishers who have to cut back on sweep lengths as part of this regulation may lose some fishing efficiency, which would be a cost as a result of the requirement to modify sweeps.

4. Can modified sweeps be used on vessels without net reels?

Field trials on industry vessels without net reels indicate that disks of graduated diameters should be attached to the sweeps where the elevating discs are installed. This apparently facilitates winding the elevating discs through the level winds. The level winds may need to be modified and require extra maintenance to allow discs to be rolled onto main winches. Sweep winches may need to be added if main winches cannot be made to work on a regular basis. The use of 8-inch disks at 60-foot spacing is expected to be the preferred set up for vessels without net reels.

5. **Should the Council do a review in 3 or 4 years, or should they wait until they are notified by the industry or the AFSC that enough additional work has been done to justify looking at new techniques?**

The lighter Spectra rope may allow for better lift than the combination rope. It may be possible that not as many elevating devices would be needed on Spectra or other lighter weight rope to achieve the same clearance as heavier gear. Additional research is needed to explore this option, and the Council may wish to review progress on this method in the future.

6. **Can the elevating devices be securely attached to the sweeps?**

Research showed that the most effective way to attach the elevating devices to combination rope is at the rope "eyes" use for connecting sections. This may be another reason why it may be desirable to use 90-foot spacing as the standard instead of 60 feet. According to industry feedback, there is no problem attaching elevating devices to cookie gear sweeps and to the wire for sweeps on vessels without net reels.

7. **Is it possible to have an industry inspection program to certify the modified sweeps meet the standard?**

It would be helpful to have an industry program to certify that new and used modified sweeps meet the standards. This would allow for documentation for a sweep to be presented during inspections and would be efficient for fixing any problems noted during inspection.

Additional Question for the Workshop if time allows:

Should the Wedge be open to all nonpelagic trawl gear, or only to those using modified gear?

The Council may want to analyze options for the wedge area with the modified gear requirement to either allow all nonpelagic trawling in the wedge area or to only allow modified gear for flatfish fishing in the area. See Figure 4. If time allows, identify the pros and cons to the options?

Appendix 2 Gear Modification Workshop Attendees, September 8, 2008

Name	Affiliation
Ben Langholt	Dantrawl
Bill Hayes	Jubilee Fish
Brian Fujimoto	Hampidjan USA
Carwyn Hammond	NOAA/AFSC
Dave Wilson	Iquique
Diana Evans	NPFMC
Elias Olafsson	Dantrawl
Frank Vargas	American Seafoods
Garland Walker	NMFS GC
Jason Anderson	BUC
Jim Strickland	US Seafoods
Jody Cook	Trawl Skipper
Jody Nummer	USCG
John Adams	NET-sys
John Gauvin	H & G Workgroup
John Olson	NMFS
JR Osuga	Cascade Fishing
Keith Bruton	O'Hara Corp.
Ken Hansen	NMFS Enforcement
Kim Hampton	US Seafoods
Lori Swanson	GFF
Melanie Brown	NMFS-SF
Mitch Hull	OP
Patti Nelson	NMFS-AFSC
Paul Ison	Iquique
Steven Patterson	NETS
Susan Robinson	Fishermen's Finest
Takeo Inoue	NET-sys
Thorbjorn Finnboganson	US Seafoods
Tim Meintz	Cascade Fishing
Vidir Vernhardsson	Hampidjan USA

Appendix D History of enforcement discussions, October 2008 to February 2009

Included in this section:

- Council's Enforcement Committee minutes, October 2008
- Summary of meeting among agency personnel, October 2008
- Council's Enforcement Committee minutes, December 2008
- Report on the at-sea demonstration of trawl sweep modified gear, January 2009
- Council's Enforcement Committee minutes, February 2009

Excerpt from Enforcement Committee Minutes
September 30, 2008
Sheraton, Anchorage, Alaska

Committee present: Roy Hyder (Chair), Sue Salveson, LCDR Lisa Ragone, Herman Savikko, Garland Walker, Jeff Passer, Matt Brown, and Jon McCracken (staff)

Other present: Bill Wilson, Diana Evans, Melanie Brown, John Olson

V. BSAI Trawl Gear Modifications

Melanie Brown gave an overview of a discussion paper on BSAI trawl gear modifications. At the June 2008 meeting, the Council initiated an analysis to require modified trawl sweeps in Bering Sea flatfish bottom trawl fisheries. Although the sweep modification for flatfish trawls in the Bering Sea was included in the preferred alternative for Bering Sea Habitat Conservation, the modification was not included in Amendment 89. Action was deferred because of implementation issues with regard to the practicality and enforceability of requiring the modified sweeps on all vessels participating in the fishery.

The Enforcement Committee had a number of recommendations concerning the enforcement of the modified sweeps. These recommendations are presented below:

- For the purposes of enforcement, modified trawl sweeps should be of "standard" design, and such gear should be commercially manufactured by certified companies. A company could be required to submit its design of bobbins and sweeps to NMFS along with an actual sample. If the design (materials, etc) is acceptable, then its product is certified as meeting modified trawl gear standards by NMFS. In addition, each certified manufacturer should be required to stamp a manufacture seal on its bobbin in a conspicuous place. The great advantage of using certified gear, is that anyone inspecting the gear to insure that the gear presumptively meets required design specifications, simply has to start with a review of the paper certification/documentation. Of course, if there is continued doubt as to the gear's set up, then the inspecting party can conduct a visual inspection of the gear. In addition to requiring that only certified gear be used and to assist in making any modified gear verifiable and measurable (primarily as an aid to observers and USCG boarding parties), NMFS should require that "wear indicators" be built into the bobbins. When a wear indicator can be visually seen, then the regulations would require replacement of the bobbin prior to redeployment of the sweep/net.

- Further, given the difficulty in checking bobbin spacing, it maybe necessary to have several manufactured types of modified trawl sweep "units" (i.e., bobbins and sweep sold as a unit and intended for deployment as an integral unit) certified by NMFS. There may be several combinations of bobbin heights and spacing that will raise the sweep off of the sea floor to the necessary clearance. Having a number of the manufacturers certify these manufactured combinations (integral units) for use would allow flexibility for vessels based on their fishing needs while also providing some reassurance to Enforcement that modified gear presumptively meets the required standards. For example, the trawl sweeps would be accompanied by a letter from the manufacturer that states something like: Dantrawl, Inc. assembled trawl sweeps for the F/V Blank. These 150 foot trawl sweeps have bobbins of 10 inch diameter with serial number ###### installed at 60 foot indicators. These bobbins have brass/yellow rubber wear indicators imbedded within the black rubber. Once these wear indicators are visible, the bobbins should be replaced. It is expected that the modified sweep combinations would be initiated by industry and designed in collaboration between the industry, manufacturers and NMFS.

- Regulations should **require** the vessel to conduct visual inspections of the modified gear for any wear on deployment and hauling of each set. Penalties for improper use will be a difficult issue. Enforcement Committee members believe that unless the penalties are pretty significant for a failure to use required modified gear and for any failure to properly deploy that gear, there will be little incentive for a vessel to stop or slow fishing operations to change worn or incorrectly set up gear. Furthermore, the Committee believes it is fairer to the industry to let them know early on that if they want the benefit of using modified gear in an area that would otherwise be closed to trawl gear, then they have the responsibility/obligation to inspect/repair/replace gear as necessary to make sure the gear is functioning as envisioned.

- Vessels using modified gear should be "endorsed" on their FFP (or other appropriate permit that is issued to them by NMFS) for such use. Failure to properly use or maintain modified trawl gear as required would subject the vessel to penalties and/or sanction of the endorsement thereby preventing that vessel from having the privilege of using modified gear.

Summary issues – discussion of trawl sweep modification enforcement

Thursday, October 23, 2008 10:30am-12:30pm
Sustainable Fisheries conference room, NMFS, Juneau, AK

NMFS SF:	Melanie Brown, Sue Salveson, Jennifer Watson
NMFS AFSC:	Craig Rose (teleconference)
NOAA Enforcement:	Ken Hanson, Matt Brown
NOAA GC – Enforcement:	Garland Walker
NPFMC:	Diana Evans
USCG:	Lisa Ragone, Pat Barelli

The Council is currently considering an amendment for vessels targeting flatfish in the BSAI, which would require them to install disks or bobbins on their trawl sweeps, to elevate the trawl sweep off the seafloor. The current Council schedule for this action is as follows:

- February 2009 – Council reviews discussion paper on the problem statement and alternatives, Council's Enforcement Committee discusses proposed amendment
- April 2009 – Council initial review of amendment analysis
- June 2009 – Council final action on amendment
- 2010 – earliest implementation of the regulation

The draft regulation is not written to establish a performance standard for elevating the sweep off the seafloor, even though that is its ultimate purpose. This standard would be impossible to measure. Instead, the regulation, as currently written, comprises two standards intended to be measured on deck, which research has demonstrated should achieve seafloor clearance: a spacing requirement between the discs or bobbins, and a clearance standard that specifies what the minimum clearance must be between the deck and the bottom of the sweep. All sweeps must provide at least 2.5 inches of clearance. Vessels may achieve compliance with the regulation in one of two ways:

1. Devices with a clearance of less than or equal to 3.5 inches must be spaced at no more than 65 ft
2. Devices with a clearance of more than 3.5 inches must be spaced at no more than 95 ft

There are some other elements of the regulation, specifying where on the sweep elevating devices must be placed. However, the draft regulation, as currently written, purposely does not regulate the type of gear that is used to meet the clearance and spacing standards.

The group primarily met to discuss the Council's Enforcement Committee minutes, which identified several enforcement concerns with the draft regulation as currently written.

Major outstanding enforcement issues to be resolved

The group spent the majority of their time discussing the following issues, and acknowledges a lack of consensus regarding them.

- **Can a regulatory standard that specifies only a required clearance and spacing standard be credibly enforced by NMFS?**
- If not, do we need to require wear indicators on the bobbins? This would appear to lead down a path of requiring the agency to certify / type-approve each manufactured bobbin and sweep configuration.

- Advantages: Wear indicators would significantly improve the enforceability of the clearance standard by providing a visual cue to crew, observers, and enforcement personnel. A two color indicator may be the most effective, when the bobbin is approaching and is actually out of compliance. Most of the flatfish vessels will probably buy gear from one of several major manufacturers, so this would not be a hardship for most of the fleet.
- Disadvantages: Getting a gear configuration certified is a time-intensive process. The wear indicator on a bobbin would be dependent on the sweep material used which limits flexibility. This program would be resource intensive for NMFS in both development and implementation. This significantly reduces the ability of the fleet and gear manufacturers to experiment and improve on the gear configuration (especially important since this gear is a very new tool). Experience shows that certification often leads to a limited number of manufacturers supplying the gear (often one). Vessels that occasionally fish flatfish may be deterred from the fishery due to the cost of going through an approved manufacturer. The certification is only reliable at the time when the equipment is purchased. Once the equipment is used, the gear will still need to be checked against the standards.

How will enforcement occur?

The discussion with regard to the major issues identified above centered on the practicability of enforcing the regulatory standard. The group all agreed that wear indicators would definitely improve the enforceability of the regulations, and that many of the vessels would probably be using gear from reputable manufacturers who will incorporate the wear indicators. The discussion, however, centered around what should be required in the regulation in order to assure regulatory compliance by all vessels.

Measuring clearance

- Physical inspection during setting or haulback: This appears to be the best way to measure clearance, but may not be practical. The vessel operator would stop the gear for the required measurement. Enforcement would probably want to measure 4 points on each bobbin, to ensure that clearance is met at all points if bobbins are not wearing evenly.
    - this method is used for other types of gear inspections (e.g., checking the pelagic trawl footrope. Frequency?)
    - there may be safety issues (serious?) with measuring the gear while it is being deployed or hauled back
    - For safety in rough seas (e.g., greater than 4 feet), it may be necessary for the vessel operator to chain off the gear at the stern ramp, and then insert slack into the gear on deck. It was noted that boardings are less likely in seas greater than 4 feet. Seas less than 4 ft would represent relatively calm conditions, relative to the size of vessels common to the affected fishery.
- Physical inspection at sea or dockside: The vessel operator could perhaps unfurl the net so that one or two bobbins could be checked, but not all of them (no space). Clearance cannot be measured while on the net reel (they are compressed).
- Visual inspections during setting or haulback: Visual inspections are definitely practical, but may not be as effective. Observers or inspection personnel may be able to tell whether a bobbin looks worn down, while watching from a vantage point. They could then follow up by physically measuring the bobbin (feasibility discussed above).
    - wear indicators would obviously facilitate such inspection, but could only be relied upon for accuracy if their manufacturer was also considered reliable

- the group discussed how far away an observer or inspection officer would safely be standing from the gear, and whether s/he would be able to identify differences in the relatively small clearances that distinguish between compliance and noncompliance

Measuring spacing

- Physical inspection during setting or haulback: this appears to be the only way to measure the spacing. As most decks are not long enough to accommodate the entire 90 ft spacing between bobbins, the inspection officer would need to know the distance from the forward net reel to the stern of the boat; as the bobbin reaches the reel, the crew would be requested to mark the sweep, and continue reeling in the line – one or two such repetitions should allow the inspection officer to measure the spacing between bobbins.
    - a similar method has been used in the past for measuring cod ends
- Visual inspection: To assist in measuring the spacing, the vessel could be required to insert markings on the sweep at the appropriate spacing (60, 90 ft) so that it is identifiable from an observer/inspection personnel's standpoint (50 feet away?)
    - this could be done by the fishing vessel crew or built into the gear by the manufacturer

Role of observers?

The group agreed that enforcement solutions that minimized additional tasks or enforcement responsibilities for observers were most desirable, however they did discuss ways in which observers might help to ensure vessel compliance with the regulation.

Other suggestions or ideas – these were not necessarily endorsed or pursued by the group as a whole

- Regulate that captains/crew must inspect the gear at each deployment to ensure that the gear is compliant, and worn bobbins are replaced if necessary
    - Advantage – puts enforcement responsibility on captain, removes vessel's excuse that they didn't realize the gear was non-compliant
    - Group discussed whether to require the inspection on a longer timeline (e.g. weekly), whether an observer should be present during inspection, and whether the captain would need to have paperwork affirming the inspection has taken place. All of these additional requirements have the disadvantage of creating additional paperwork requirements and resulting in compliance that is doubtful.
- Institute a two-part standard: the regulatory standard as currently drafted could apply to all flatfish fishing within the existing footprint, however should the Council open new areas to non-pelagic trawl (e.g., the "wedge", or the Northern Bering Sea Research Area), fishing in these areas could be governed by a more strictly enforceable standard (e.g., certified gear only)
- Require each vessel to carry onboard a manufacturers or gear builder's statement describing the how the elevating disk gear is configured (e.g., what spacing is being used, what types of bobbins, whether they have wear indicators and how the indicator is visible). This would be available to assist enforcement on boarding the vessel.
    - Official manufacturer's statements would be permissible for gear bought from major manufacturers, but statements describing the configuration and construction of home-developed gear would also be required
    - Would need to avoid pitfalls of seabird avoidance plan for seabird avoidance measures (which was recently removed from the regulations due to not being effective and compliance problems.)

- Institute a longer testing period for the gear, providing information on a) how many hauls before the bobbins are worn out, b) how well is the gear working at elevating the gear off the seafloor, c) what configurations are needed to accommodate gear use variability in the fleet, d) what configurations and regulatory standards are feasible for enforcement
    - It was suggested that this type of testing would not be practicable without implementing the gear requirement first; however, the Council could build in a time-certain re-evaluation date, or even a sunset date for the amendment. It has already been recommended that the Council revisit the gear modification requirement in 3 years, for adjustments based on industry experience.
- In determining the appropriate level of enforcement, we should also consider the nature of the threat of non-compliance with the regulation, and comparable enforcement level of other, similar fishery regulations.
    - However we may not be able to have adequate facts on which to know/estimate the nature of the threat of non-compliance with the regulation, and each enforcement regimen should stand on its own unique facts

Issues raised but not discussed

The Enforcement Committee minutes raised the issue of penalties for non-compliance with the regulation. The group briefly touched on this issue, but decided to address it another time.

Next steps

- The group agreed that the best way to work out some of the outstanding issues regarding practicability of enforcement is to see the gear on a vessel. Melanie and Diana will work with John Gauvin to arrange a meeting where the group, with the addition of the remaining members of the Council's Enforcement Committee, can see the gear on deck.
    - Ideally this would occur during the February Council meeting as previously scheduled, however we may need to be flexible about the timing due to vessel availability

  UPDATE: John Gauvin is exploring the possibility of enforcement committee members participating in a field test of the modified gear before the 2009 fishing season starts.
- Craig Rose will look through his collection of video from the field tests he conducted last summer, to see whether he has any footage of the setting or haulback of the gear on deck, which may help the group get a feel for the practicability of how to enforce compliance.
- John Gauvin has also offered to look into the possibility of video-taping the gear in use on a vessel, to demonstrate how enforcement might be made practicable.
- Melanie and Diana will retrieve information about the vessels participating in the flatfish fisheries, to whom this regulation would apply, the approximate deck size of the vessels, and how many are likely to order gear through a major manufacturer versus make their own gear.
- Melanie and Diana will share the enforcement concerns with industry (John Gauvin and any others as appropriate) to see whether they can suggest ways to resolve these concerns.

Excerpt from Enforcement Committee Minutes
December 9, 2008
Hilton, Anchorage, Alaska

Committee present: Roy Hyder (Chair), Sue Salveson, LCDR Lisa Ragone, Herman Savikko, Garland Walker, Jeff Passer, Matt Brown, Ken Hanson, Martin Loefflad, and Jon McCracken (staff)

Other present: Diana Evans, John Olson. John Gauvin, and Mike Kelly joined the meeting via teleconference

I. BSAI Trawl Gear Modifications

John Gauvin presented a quick overview of a sea trial demonstration of the modified trawl sweep gear for January 9th and 10th. The individual agencies that are represented on the Council's Enforcement Committee have been invited to participate in the demonstration, although the event is not hosted or sanctioned by the Council. The demonstration will take place aboard F/V Vaerdal, which is a 120 ft vessel captained by Bill Hayes.

Enforcement representatives planning to participate in the demonstration identified the following interests (although there might be others that come up during the demonstration):

- to observe the mechanics of fully deploying and hauling back the sweeps, including winding the sweeps on the net reel
- to see how easy or difficult it is to stop the deployment or haulback of gear prior to completion, to chain off the sweeps, and to physically measure the gear on the deck
- a representative available to discuss the proceedings during the demonstration (this might be the deck boss and/or John Gauvin)
- an opportunity for a debriefing with the captain at the conclusion of the demonstration (this could be on the journey back to shore, or after arriving onshore). This would give the participants a chance to discuss any potential problems that might arise from using the gear.

Following the demonstration, Council staff will write up a summary of the demonstration and the enforcement discussions. This report will be discussed at the February Enforcement Committee meeting, and the Committee will then provide recommendations to the Council about the proposed trawl sweep modification issue.

The demonstration will help to address enforcement concerns about inspection of the gear at sea, to determine whether the gear being used meets the required standards. There are other, outstanding enforcement concerns (included in the Enforcement Committee's October minutes) about whether there is a need for primary verification that vessels are installing the appropriate gear, such as through the requirement for a manufacturer's certification. **The Committee expects that the demonstration will provide clarity about the importance or need for primary verification of the modified sweeps.** A discussion of all issues related to the proposed trawl sweep modification is anticipated for the February meeting.

At-sea demonstration of trawl sweep modified gear: Report

Friday, January 9, 2009 3:30pm-7pm
Onboard the F/V Vaerdal, out of Shilshole Marina, Seattle, WA

ADF&G:	Herman Savikko
NMFS AFSC:	Craig Rose, Carwyn Hammond, Martin Loefflad
NMFS AKR:	Melanie Brown, John Olson
NOAA Enforcement:	Ken Hansen, Matt Brown, Doug Marsden, Hans Brubaker
NOAA GC – Enforcement:	Garland Walker
NPFMC:	Diana Evans, Jon McCracken
USCG:	Pat Barelli
F/V Vaerdal:	Capt Bill Hayes, crew
Best Use Cooperative:	John Gauvin
Groundfish Forum:	Greer Cowan, Lori Swanson
Dantrawl:	Pol Pederson

Background

The Council is currently considering an amendment for vessels targeting flatfish in the BSAI, which would require installation of elevating devices, such as disks or bobbins, on the trawl sweeps, in order to elevate the trawl sweep off the seafloor. Following discussions within the Council's Enforcement Committee, and internally within the agencies responsible for enforcing the proposed regulation, it was determined that a visual demonstration of the gear would be the best way to resolve outstanding enforcement questions regarding enforceability of the proposed gear modifications and how the regulation could be written.

Logistics of the demonstration, and vessel configuration

The demonstration took place onboard the F/V Vaerdal, on the afternoon of January 9, 2009. The Vaerdal is a 118 ft trawl catcher processor, captained by Bill Hayes, a long-time participant in Bering Sea and Gulf of Alaska flatfish fisheries. In addition to the above list of interested people, the captain had six crew members on board who readied the test gear on the way out to an area where gear testing is allowed in Puget Sound. After arriving at the site, the crew set and hauled back the net and sweeps from fore and aft net reels. Upon request, the captain and crew stopped the gear and let the group inspect and ask questions. The trip lasted approximately 3 hours.

The Vaerdal is somewhat unique in the flatfish CP fleet because it uses both forward and aft net reels on a regular basis. Most flatfish CPs have aft net reels but rely on their forward net reel for most if not all of their fishing. Aft net reels on most flatfish CPs are used primarily for temporary storage of sweeps, bridles, and nets from the forward net reel, used during maintenance or while switching out a net from the forward net reel. Additionally, the Vaerdal also has a relatively short trawl deck (44 ft) compared to most flatfish CPs that are currently fishing.

Fishing with an aft net reel is generally expected to create more difficulty for accessing the elevating devices for taking measurements to ensure minimal clearance standards. Also, a shorter deck is likely to add difficulty to the task of taking measurements to ensure that the distance between elevating devices is correct. So the Vaerdal served as a good platform for the demonstration, because it represents one of the more challenging platforms for enforcement of the modified sweep requirements for flatfish CPs. It also was the best available catcher processor "proxy" for looking at enforcement issues for Bering Sea catcher vessels that may target flatfish under the requirements for modified sweeps.

For the demonstration, the vessel had installed modified sweeps and a net on both reels (without attaching a cod end). On the forward reel, a total of 16 10-inch bobbins were connected to 2-inch combination wire with hammerlocks, in 90 ft 'shots' or sections, 8 on each sweep. The aft net reel was set up with shortened sweeps, a total of 4 bobbins attached, just to demonstrate the relative degree of difficulty for inspection from the aft reel. At the aft end of the sweeps on the forward reel, a very large rubber disk (approximately 15 inches in diameter) was installed on the gear at the point the net bridle meets the end of the sweep combination wire. This is used to protect the splice at the point the top and bottom net bridles meet, and the captain noted that this aspect was a commonly-used configuration. The bottom net bridle was cookie gear and the top net bridle, bare wire. The forward end of the sweeps attached to two 10-20 ft sections of heavy chain, which connect to two sections of cable, approximately 90 ft each, attaching to midwater doors. The chains help force the sweeps to the seafloor. About half of the cable contacts the bottom.

The Vaerdal is part of the Amendment 80 sector in the Bering Sea and Aleutian Islands (BSAI), and fishes flatfish and Pacific cod in both the BSAI and the GOA. The vessel will be taking a set of modified sweeps onboard for the 2009 fishing season, and will test them in the first BSAI flatfish fishery (probably rock sole).

Tools for measuring clearance

Both the captain and Ken Hansen had anticipated the need for simple tools to measure the clearance of the bobbin or elevating device and both had constructed prototype tools for the demonstration. Ken Hansen had two tools made of a square of metal and a wooden handle. The tools are 2.5- and 3.5-inches high, and can be placed between the deck and the rod holding the bobbin, to measure the respective minimum distances stipulated in the draft regulation. Bill Hayes' tool, made from a metal ruler and two clamps, rests on top of the bobbin and extends down on each side to the rod holding the bobbin. He had cut the extensions to represent the 3.5 inch minimum distance. The tools are very simple to make and both worked well. The tools could easily be given to inspection personnel, or used by the crew to ensure the elevating devices meet the clearance standard.

Physical inspection of the gear – measuring clearance

The regulatory standard is currently written to measure the clearance of the elevating device from the deck. In actuality, it became apparent from the sea trial that the easiest way to measure the gear will be in mid-air, as it is being deployed between the net reel and the stern ramp. This is because measuring the clearance is best done when the gear is under tension and this is easiest to achieve while the gear is being set or retrieved. As such, it will be important to measure from above, as the rod will be pushed up against the top of the bobbin and this will represent the minimum clearance. In general, inspectors would want to rotate the bobbin or the measuring device to find the smallest clearance. If the disc/bobbin set up does not allow for easy rotation, then the person taking the measurement will need to maneuver the measurement device to take the measurement at a point that appears to provide the least clearance. Both clearance measurement tools worked well for measurement. Measuring clearance on the bobbins from the forward reel was easier than from the aft reel. There is more time to access the bobbins as they cross the deck, and the bobbins are clearly visible from many places on the vessel. From the aft reel, one has to reach across the trawl alley next to the stern ramp to reach the device as the gear descends from the reel, before entering the water. Measurement of clearance was successful, but a small person may have trouble conducting the measurement. Because most flatfish CP vessels predominantly rely on forward net reels, for the most part measurement of elevating devices on aft net reels will not be required.

Physical inspection of the gear – measuring spacing between bobbins/devices

The sweep gear used by the Vaerdal is in 90 ft sections, which is standard for trawl sweeps. To accommodate the modified gear, the length of combination wire for a normal trawl sweep was shortened slightly, so that the extent of a length of wire plus one bobbin constitutes a 90 ft section on the modified gear. As the vessel is using purpose-built modified gear from Dantrawl, the enforcement personnel had confidence that the spacing between the bobbins was consistent and accurate, and met the draft regulatory standard of no more than 95 ft between bobbins.

In order to measure spacing between bobbins, should distances be in doubt, the crew used a tape measure to cut a 95 ft piece of twine. This was attached, by the crew, to the bobbin hammerlock as it was being set or hauled back. By running the twine along the sweep as it deployed, the onlookers were clearly able to see that the spacing between bobbins met the regulatory standard. The crew were successfully able to measure the spacing on the aft reel sweeps using the same method, but not as easily as from the forward reel, because of reaching across the trawl alley well. This methodology was deemed by enforcement personnel to represent a logical approach to determining compliance with spacing requirements, especially on vessels with shorter trawl decks or aboard vessels where the gear is set or hauled from the aft net reel. In the demonstration, the twine was left on the sweep. If this becomes standard practice, the string should probably be of some sort of biodegradable material, or should be removed during the next launch.

On vessels with a longer trawl deck, if the gear is set or hauled from the forward net reel, the deck could be paced off or measured, and spacing estimated by observing the spacing of the bobbins relative to pre-determined points on the trawl deck.

Visual inspection of the gear

The net takes up several turns of the net reel before one can see the sweeps. While the net was wrapped on the reel, it was very difficult to see any elevating devices. Only one or two could be seen on the forward reel, and none on the aft. The tools could be used to measure for compliance any bobbins accessible on the net reel, which were not covered by the net.

As the gear was being set from the forward reel, an inspector could be standing in safety, on the upper deck, within 10 ft of the gear. Either of the measuring tools could be given to the crew to measure clearance on the bobbins, and the inspector, standing on the upper deck, would easily be able to see whether the gear met the required standard. The same holds true for measuring spacing – the crew could be given a piece of twine of the appropriate length to measure spacing. It would not be necessary for the observer or enforcement personnel to be in the trawl alley to ensure whether the gear was in compliance. When fishing off the aft reel, visual inspection would likely need to be from on deck, but the inspector would still be able to stand back from the moving gear and witness the crew measuring clearance and spacing.

If enforcement officers desired to inspect the trawl sweeps more closely in rougher sea conditions, this could be safely conducted during setting or hauling of the net. The crew could briefly "chain off" the net at the stern ramp. This involves cinching the gear as it comes up or down the stern ramp, and allowing it to drag behind the vessel, while underway. Sweep gear can also be rolled from the net reel to the deck, where it could be measured and inspected for compliance. Finally, on flatfish CP vessels that generally use the aft net reel mainly for net storage and maintenance, the net and sweeps could be rolled off the forward net and placed onto the aft net reel during inspection. This would provide the same tension for taking measurements as setting the gear out underway and using the aft net reel for this purpose provides a convenient way of taking measurements with the gear under tension even during shoreside instpections.

How typical is the Vaerdal among flatfish trawl vessels?

At 118 ft, the Vaerdal is one of the smaller vessels in the Amendment 80 catcher processor sector, which catches the majority of flatfish in the BSAI. It should be easier to inspect the modified gear on larger vessels, as there is more deck space for measuring the distance between the bobbins, more time to inspect the bobbins on the moving gear when using the forward net reel as the gear traverses the deck, and more room for personnel to maneuver. Most vessels are not configured with a forward and aft net reel; it is more common to fish only with forward net reels. The Vaerdal is unusual in that it tends to fish with both.

The Vaerdal is also fairly unique among flatfish vessels in that it is conducting on-going experiments with the use of off-bottom trawl doors. But this feature had no effect on the enforcement sea trial because doors did not need to be set to allow the visitors to evaluate the enforcement issues surrounding spacing and elevating disc/bobbin clearance.

Most of the vessels in the Amendment 80 sector buy their gear from either Dantrawl or Northeastern Trawl Systems (NETS), both of which have worked with the research team to develop the modified sweeps. There are also some pollock vessels that occasionally fish in the BSAI flatfish fisheries, particularly for yellowfin sole. It was noted that some smaller catcher vessels, many based out of Kodiak, tend to fish more with the aft net reel, and may be more likely to want to manufacture their own gear.

Some of the Amendment 80 vessels do not have net reels. The option in the regulation to achieve the lower 2.5 inches minimum clearance, but over shorter (not to exceed 60 feet) spacing, was suggested because research shows that it meets the same seafloor clearance standard, but it is workable on these other vessels. NETS have worked with Dr Rose and the F/V Seafisher to develop ways to attach the elevating devices to main winch wire systems. The elevating device is not connected to the sweep between sections, but rather consists of a series of graduated disks that are installed over the cable between pressed steel or aluminum sleeves referred to as "swages".

Industry participants attending the sea trial on the Vaerdal commented that once the regulation was in place, all vessels with a net reel would be likely to switch over to using the one shot (90 foot section) system with elevating devices, because it is so much easier to use.

Identifying the sweeps and exemption distances for the bridles

Lacking a way to accurately describe sweeps, the draft regulations instead specify, in pictorial form, that elevating devices must be used on all of the gear except for 180 ft from the net (to account for the net bridles) and 90 ft from the trawl doors (to account for the connection of door bridles to the sweeps). On the Vaerdal, the portion of the gear to which the regulation would apply was clearly identifiable. At one end, the sweeps connect to the chain used with the midwater doors, and at the other, there is a large rubber disk at the point that the sweeps connect with the net bridles. Industry representatives have indicated that the presence of this large rubber disk is common to bottom trawl configurations, so it should be fairly easy for inspectors to determine what portion of the gear should have elevating devices attached.

Starting in the 2009 season, the Vaerdal will be using midwater doors for flatfish fishing. In this new technique, the doors stay above the bottom, and cables with heavy chains either in-line or serving as a "weight clump"(as is done on pollock vessels) are attached behind the doors to bring the forward ends of the sweeps down to the seafloor. On the Vaerdal, a 90 ft length of single cable line extends on each side extended between the door bridles and the in-line weight chains. As currently written, the draft regulation exempts 90 ft forward of the sweeps from the requirement for elevating devices. Adding the cable length to the length of the weight chain (10-20 ft), this would put the Vaerdal's configuration just over the exempted distance. The captain raised the point that on larger vessels using midwater gear, the cable and chain lines might need to be longer still. If so, you could have a situation where, according to the regulation, you would need to attach a bobbin to cable or chain that would be suspended in the water column, and not serving the purpose of raising the sweep off the seafloor. In order to account for this, it was suggested that the draft regulation be adjusted to allow a 180 ft exemption both fore and aft of the sweep. This would accord with the way the aft 180 ft exemption was arrived at – to take the normal bridle length, which is 90 ft, and double it to allow for individual vessel flexibility of configuration. Lengthening the forward door line exemption from 90 to 180 ft could reduce the requirement by one less elevating device, but would allow for midwater doors to be used and would accommodate larger vessels that may need more length in the door lines. The extent to which flatfish fishermen will utilize midwater doors in the future is not known at this time, but flatfish industry representatives have expressed an interest in adopting the 180 foot arrangement described above in case midwater doors prove to be a useful fishing tool for achieving net spread at reduced fuel cost. The impact of losing the one elevating device would be greater on vessels using shorter sweeps than longer ones, as the percentage reduction in gear being raised above the seafloor would be less for the vessels with longer sweeps.

Whether to require wear indicators in the regulation

Agency personnel discussed again the issue of whether to require wear indicators in the regulation. The advantage is that wear indicators clearly would help both compliance with and enforceability of the regulation. Wear indicators would help the captain and crew know easily when the elevating devices need to be replaced. In terms of enforcement, it would be easier to involve observers in enforcement with visible wear indicators. At the same time, if wear indicators are required in the regulation, this means that enforcement personnel may be required to check to see if wear indicators are present, even though they may not become visible until the gear is worn through. This would mean that enforcement personnel may need, for example, to cut through the gear in order to see whether the indicator is present – which would seem to be wasteful. A wear indicator requirement may also mean that the agency would need to institute a manufacturer's certification process, the disadvantages of which have been discussed previously, and the requirement for which significantly reduces the flexibility of the industry to develop new and better gear types.

Threat of non-compliance with the modification requirement

During retrieval, the captain repeatedly had to wind and unwind the gear in order to get the bobbins to go on straight, and had to swing the vessel to evenly wind the gear on the reel (the vessel acting as a level wind). Because the Vaerdal was such an ideal vessel for the sea trial, the captain was asked to make his vessel available for the sea trial even if he had not done any fishing with modified sweeps. Captain Hayes has also purchased a set of modified sweeps that he plans to use in order to become familiar with them prior to the requirement to use them. But this was the first time the captain had used the modified gear at sea and so some learning curve for fishing with them is apparently not uncommon according to Dr. Rose and others involved in the research on the modified sweeps. The researchers who have been developing the gear noted that the most frustrating aspect of compliance would be the learning to get used to hauling back this type of gear, but that this was somewhat easier for vessels with a split net reel. Captain Hayes noted that one reason he was testing the gear this year was to see whether he would need to get a split net reel, which the Vaerdal does not currently have. Under normal fishing operations, the entire process of retrieval and deployment usually takes 25 minutes. Based on the experience during the demonstration, Captain Hayes estimated that using the modified gear on his current configuration might add an additional 10 minutes to this process, which might increase costs to fishing operations unless practice with loading the sweeps on the net reel makes the task easier and less time consuming.

At the same time, while this aspect of compliance may be frustrating, and may require vessel modifications in order to make using the gear easier, once the regulation is in place, most vessels are unlikely to go flatfish fishing without using a form of the modified gear. It was agreed that observers could certainly be tasked to report gross violations of the requirement to use modified gear, such as bobbins that were clearly missing, or the complete failure of the vessel to use any modified trawl gear. All of the Amendment 80 sector vessels are required to have 200% observer coverage, and most of the other vessels fishing for flatfish will have 100% observer coverage, so vessels are unlikely to be able to avoid compliance with the modified gear requirement.

With respect to whether the vessel would allow the gear to become worn down without changing out the bobbins, the demonstration showed that, for the gear supplied by Dantrawl, bobbins appear to be easy to install and exchange. The bobbins are installed between sweep sections (shots) with hammerlocks. Captain Hayes estimated that replacing a bobbin (for example, should it become worn down) would take approximately 5 minutes. Additionally, the bobbins are inexpensive (although their exact cost was not known to the group onboard). Participants observed that with this configuration, there would be little incentive for vessels not to replace the gear once it becomes worn down.

Research has shown that there should not be any impact to the catchability of target fish when using the modified sweeps that create 3 inches of clearance, and minimal impact with modifications that create 4 inches of clearance (necessary for use of spacings greater than 60 ft). Using the modified gear also provides a benefit to the vessels, by reducing wear on the sweep itself. Combination wire, of which many sweeps are made, is very expensive, and Mr Gauvin noted that raising it off the seafloor with elevating devices is expected to as much as double the life of the sweeps from what he has heard from fishermen who have been using the modified sweeps. This savings may provide an encouragement to vessels to comply with the modification requirement. Industry personnel are also aware that preliminary data indicates a reduction in crab mortality may result from the use of elevated sweeps. Dr. Rose is expected to provide information on this finding from the NPRB funded research he is doing. Lastly, vessel personnel suggested that the reduced seabed contact achieved by raising the sweeps from the bottom may result in incremental savings in fuel.

Penalties for non-compliance and requirements for at-sea enforcement

The demonstration showed that for vessels buying a gear configuration similar to that used by the Vaerdal, the agency could be fairly confident in the likelihood of compliance with the regulation (see above). There are, however, other vessels which may choose to manufacture their own gear. The question arose about how to have confidence that the gear that is installed on these vessels meets the regulatory standard. Agency enforcement personnel agreed that there need to be two additional aspects to the implementation of the regulation in order for it to be credible: a well-defined penalty schedule, and a rigorous enforcement of the standard, especially in the first year.

Penalty schedule

It was suggested that prior to the implementation of this regulation, NOAA GC-Enforcement and NOAA Enforcement should meet and come up with a clear penalty schedule for this action, which should then be thoroughly communicated to the BSAI flatfish fleet. In general, any infractions of the regulations that compromise the effectiveness of the gear (i.e., failure to meet individual elevating device clearance specifications and/or failure to meet spacing requirements along the sweep) would be treated seriously and would likely result in a significant penalty. For example, this might occur if all of the bobbins have wear indicators showing upon inspection, or were out of compliance with the regulatory standard, or if an elevating device was absent. Making a legal case would be made more simple by the fact that, if necessary, the bobbins in question could be physically removed from the boat and produced in any court case that might ensue.

Such a strict approach would also encourage all vessels to select the most effective gear for complying with the regulation. By only requiring that modified trawl gear meet a few specified design standards (i.e., clearance and spacing standards), the agency is providing the industry with the flexibility to manufacture the gear, meeting those standards, that works best on any particular trawl vessel. Correspondingly, by setting relatively high penalties for a failure to comply with these few regulatory specifications, there is a built-in incentive for the regulated community to take special care that the gear which they choose to use does in fact comply with the regulation. (A high incentive to use gear that meets the specified design standards may also mean that vessels will be less likely to attempt making their own gear, if they have questions about their ability to meet the specified gear standards throughout the fishing period, and will instead prefer to purchase gear from reputable gear manufacturers that is built to meet the standards.)

Rigorous inspection

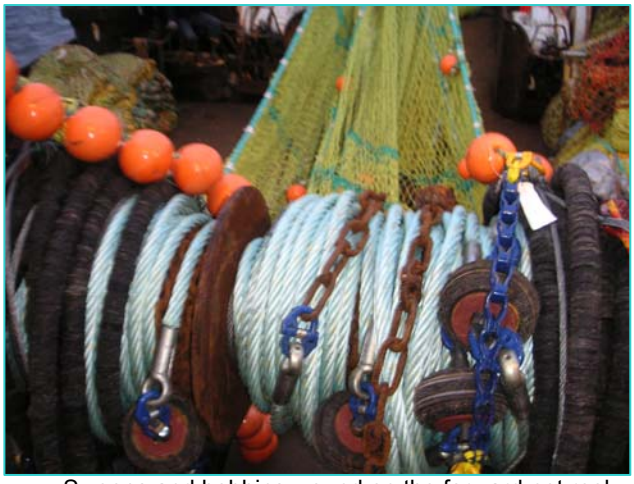
The second aspect of enforcement would be to institute a rigorous inspection program in the first year of implementation, and in subsequent years as deemed necessary, to ensure all vessels are compliant. This could be accomplished, for example, by embarking an enforcement agent on a Coast Guard cutter. The agency could set a target goal representing the proportion of the fleet that would be boarded within the first year of the program. Because the fleet is a small one, likely representing no more than 50 vessels, such a goal is feasible, and, indeed, the ultimate goal may be 100% inspection. This kind of rigorous approach would provide a strong incentive for the fleet to comply with the gear requirement.

SUMMARY

Overall, the at-sea demonstration showed that at-sea inspection and compliance with the standards can be safe and successful. Agency enforcement personnel agreed that the regulation as drafted, which specifies only a minimum clearance and spacing standard for the modified sweeps, would be credible for the agency to implement as long as it is accompanied by a comprehensive enforcement plan addressing both a strict penalty schedule and a plan for at-sea inspection, as described above.

Boarding the vessel for the demonstration

Footrope, net and sweeps wrapped on forward net reel, one bobbin showing in upper center



Sweeps and bobbins wound on the forward net reel once the net is unwound

Setting sweeps and bobbins off the forward net reel

Measuring bobbin clearance off the aft net reel

Excerpt from Enforcement Committee Minutes
February 3, 2009
Renaissance Madison Hotel, Seattle, Washington

Committee present: Roy Hyder (Chair), Sue Salveson, LCDR Lisa Ragone, Herman Savikko, Matt Brown, Martin Loefflad, Ken Hanson, Susan Auer, and Jon McCracken (staff)

Other present: Jason Anderson, John Gauvin, LTJG Josh Boyle, Diana Evans (NPFMC), Melanie Brown (NMFS), Chris Oliver (NPFMC), and Jeannie Heltzel (NPFMC)

I. BSAI Trawl Gear Modification Update

Ken Hanson presented a video of an at-sea demonstration of modified trawl sweeps that took place on the afternoon of January 9, 2009 onboard the F/V Vaerdal. The at-sea demonstration was determined to be the best way to resolve outstanding enforcement questions regarding enforceability of the proposed gear modifications. A report on the at-sea demonstration was prepared by Diana Evans, NPFMC staff and is included as an attachment to this agenda item.

Based on the results from the January 9, 2009 at-sea demonstration, the Enforcement Committee has revised their October 2008 recommendations concerning the enforcement of the modified trawl sweeps. These revised recommendations are presented below:

1. For the purposes of enforcement, modified trawl sweeps should be of "standard" design, and such gear should be commercially manufactured by certified companies.

Following the at-sea demonstrations and discussions internally and with industry, the Committee believes the desired goals of the program can be achieved by specifying clear spacing and elevation requirements for the gear in regulations. At-sea enforcement of these standards appears straightforward. Compliance monitoring of the required devices would not be enhanced by requiring a standard design or certification requirements. Requiring a standard design and/or a certification process is cumbersome and would likely result in delay, greatly increased complexity, costs and resultant increased enforcement obligations, with uncertain upside gain.

2. Further, given the difficulty in checking bobbin spacing, it maybe necessary to have several manufactured types of modified trawl sweep "units" (i.e., bobbins and sweep sold as a unit and intended for deployment as an integral unit) certified by NMFS.

The demonstration revealed that at-sea compliance monitoring of the use of compliant modified trawl sweeps was not particularly problematic. There is a likelihood that gear manufactures and vessel owners will respond by manufacturing and purchasing gear of "standard" designs that comply with regulatory requirements, but the Committee does not feel enforcement of the regulations is enhanced by requiring a certification process.

3. Regulations should **require** the vessel to conduct visual inspections of the modified gear for any wear on deployment and hauling of each set.

Vessel operators and owners are expected to be knowledgeable about and comply with all regulations applicable to their operations. The regulatory requirements for use of modified trawl gear are relatively straightforward and objective. Vessel operators and crew will have an opportunity to observe their gear at every deployment and haulback for compliance with required standards. As such, the Committee feels

there exists a relatively high expectation on the part of the vessel operator to insure their gear is in compliance with required specifications. As such, a specific requirement to inspect the gear for compliance is unnecessary.

As with many new regulatory programs, NOAA Enforcement and USCG recognize there may be a learning period associated with the use of new gear. Industry has expressed concerns regarding the occurrence of gear that is damaged or otherwise out of compliance due to events immediately preceding the documentation by NOAA Enforcement or USCG authorized officers, or an observer. As with any other investigation, such an incident would be evaluated on a fact-specific basis.

Vessels using modified gear should be "endorsed" on their FFP (or other appropriate permit that is issued to them by NMFS) for such use.

After discussion, the Committee did not feel an endorsement on the FFP was necessary to effectively enforce this program. As stated, the Committee believes the proposed regulations are straightforward, and did not identify any substantive obstacles to compliance. The Committee notes the positive collaborations with industry on development of this program, and feels it is important to note that given the general reduction in compliance related elements recommended in this program, monetary penalty recommendations for egregious violations are expected to be high.

Finally, the Enforcement Committee recommends that the Council send a letter to the owner of Jubilee Fisheries, Bill Hayes, Captain of the F/V Vaerdal, and John Gauvin showing its appreciation for hosting the at-sea demonstration in addition to their time and effort in making the demonstration a total success. With these efforts, the Enforcement Committee was able determine that at-sea inspection and compliance with the standards can be achieved safely and successfully.