Revisions to the Steller Sea Lion Protection Measures for the Bering Sea and Aleutian Islands Management Area Groundfish Fisheries

Environmental Assessment/Regulatory Impact Review

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Abstract: This environmental assessment/regulatory impact review provides decision-makers and the public with an evaluation of the environmental, social, and economic effects of alternatives to the Steller sea lion protection measures for the Bering Sea and Aleutian Islands Management Area groundfish fisheries, in particular the Atka mackerel and Pacific cod fisheries. The western distinct population segment (WDPS) of Steller sea lion is listed as endangered under the Endangered Species Act, and the species population in the Aleutian Islands is declining. Atka mackerel and Pacific cod are principal prey species for Steller sea lions in the Aleutian Islands. This proposed action would revise management of the Atka mackerel and Pacific cod fisheries to ensure the effects of these fisheries are not likely to result in jeopardy of extinction or adverse modification or destruction of critical habitat for the WDPS of Steller sea lions. This document addresses the requirements of the National Environmental Policy Act and Executive Order 12866.

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Executive Summary

In April 2006, National Marine Fisheries Service (NMFS) Alaska Region, Sustainable Fisheries Division (SFD, action agency), reinitiated Endangered Species Act (ESA) Section 7 consultation with NMFS Alaska Region, Protected Resources Division (PRD, consulting agency), on the potential effects of the Alaska groundfish fisheries on ESA-listed species and their designated critical habitat. Consultation was reinitiated in consideration of new scientific information and changes to the fisheries since the last biological opinion on the groundfish fisheries was supplemented in 2003. After reviewing all ESA-listed species within NMFS's jurisdiction that may be affected by the Alaska groundfish fisheries and after consulting with PRD, SFD determined that the Alaska groundfish fisheries were likely to adversely affect Steller sea lions and their designated critical habitat, humpback whales, and sperm whales; therefore, formal consultation was required. In formal Section 7 consultations, PRD reviews the status information for the species and designated habitat, environmental baseline information, and the potential effects of the action on the species and develops a biological opinion. If the biological opinion concludes that the action is likely to jeopardize the continued existence or adversely destroy or modify designated critical habitat (JAM) for an ESA-listed species, the opinion would include a reasonable and prudent alternative (RPA) that must be implemented to avoid JAM.

In August 2010, PRD released a draft biological opinion on the Alaska groundfish fisheries (FMP biop). The FMP biop found that additional changes to the Pacific cod and Atka mackerel fisheries in the Aleutian Islands are necessary to avoid the likelihood of JAM for the western distinct population segment (WDPS) of Steller sea lions and their designated critical habitat. The RPA to mitigate the effects of the groundfish fisheries on the WDPS of Steller sea lions is specific to the Atka mackerel and Pacific cod fisheries in Areas 543, 542, and 541 of the Aleutian Islands. After a 30 day public review period and the consideration of all public comments, NMFS completed the FMP biop in November 2010, including a revised RPA.

The proposed action is based on the RPA contained in the FMP biop. The RPA is focused on the locations in the Aleutian Islands with declining population growth rates, which may be due to declining survival or decreasing birth rates. The features of the RPA were developed considering the evidence of potential impacts of the groundfish fisheries on Steller sea lions, including Steller sea lion foraging behavior, fish removals, prey energetic density, and available prey biomass. Based on the information in the FMP biop, the action is focused in the location where Steller sea lions are experiencing the greatest population growth rate decline and where the groundfish fisheries are likely to be adversely impacting the animals.

Purpose and Need

The purpose of this action is to implement revisions to the management of Aleutian Islands Atka mackerel and Pacific cod fisheries to ensure these fisheries are not likely to cause JAM for the WDPS of Steller sea lions and their critical habitat. As revisions were being developed, existing fishery management programs were considered. Consideration of the existing fishery management programs will ensure that any revisions implemented would provide the most efficient and effective solutions to meeting the requirements of the ESA. If more than one alternative accomplishes the primary purpose of this action, a secondary objective of the action would be to modify the fisheries in a way that minimizes the economic and social costs that would be imposed on the commercial fishing industry and associated coastal communities.

The need for this federal action stems from several sources. First, under the ESA, NMFS has a responsibility to insure that fishing activities authorized under the groundfish fishery management plans (FMPs) and implementing regulations are not likely to jeopardize the continued existence of any ESA-listed species or adversely modify or destroy its critical habitat. Second, in order for the Pacific cod and Atka mackerel fisheries to commence on January 1, 2011, NMFS must implement revisions to the fisheries that avoid the likelihood of JAM. The commencement of a new fishing year and implementation of new harvest specifications must be done in compliance with the ESA. Without any action by NMFS, the Aleutian Islands Pacific cod and Atka mackerel fisheries prosecuted under the current Steller sea lion protection measures are likely to result in JAM, as determined by the FMP biop.

Finally, this action also is needed to meet the North Pacific Fishery Management Council's (Council's) objective in its groundfish FMPs to maintain or adjust current protection measures as appropriate to avoid jeopardy of extinction or adverse modification to critical habitat for ESA-listed Steller sea lions. New information about potential interaction between Steller sea lions and the groundfish fisheries and new trend information have been taken into account in the FMP biop. The FMP biop provides an RPA to avoid the likelihood of JAM and an adaptive management strategy to inform the agency of the efficacy of its protection measures.

Alternatives

The alternatives for the proposed action are described in detail in chapter 2.

Alternative 1: Status quo

Under this alternative, no changes would be made to the current groundfish fisheries management in the Aleutian Islands as implemented by 50 CFR part 679. This includes the continuing implementation of the Steller sea lion protection measures, Amendment 80, habitat protection and conservation areas, and the Atka mackerel Harvest Limit Area (HLA) management programs.

Alternative 2: Enhanced Conservation Approach

This alternative would use management measures for the Aleutian Islands Atka mackerel and Pacific cod fisheries to remove most of the potential adverse effects on Steller sea lions and their critical habitat and ensure the groundfish fisheries are not likely to result in JAM. Alternative 2 would provide protection measures for Steller sea lions and their critical habitat no less stringent than currently implemented and provide additional measures at least as protective as the RPA in the FMP biop. The protection is greater in the areas where population growth has been the most negative (Areas 543 and 542 compared to Area 541). The enhanced conservation approach would facilitate NMFS's implementation by simplifying the area closures and seasonal management measures in Area 542 and 541 compared to critical habitat zone specific measures described in Alternative 3. Except for the changes described below, the current Steller sea lion protection measures (e.g., Pacific cod trawl season dates, no Atka mackerel directed fishing in critical habitat in Area 541) would remain unchanged. Federally permitted vessels participating in the State-manage Pacific cod fishery under 5 AAC 28.647 (State GHL fishery) would be exempt from the Atka mackerel and Pacific cod closures. The State implements the 2003 Steller sea lion protection measures for the State GHL fishery under state regulations.

Alternative 2 would—

In Areas 542 and 543:

- Prohibit retention of Atka mackerel and Pacific cod by federally permitted vessels, including those operating in State waters 0–3 nm.
- Establish TACs for Atka mackerel sufficient to support incidental discarded catch that may occur in other targeted groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA (Area 543 and western portion of Area 542).
- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

In Area 541 and the Bering Sea:

- Close critical habitat in Area 541 to directed fishing for Pacific cod by federally permitted vessels.
- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.
- Prohibit Pacific cod directed fishing in Area 541 November 1 through December 31. (This extends the current trawl season restriction to the nontrawl fishery.)

Under this alternative, the TAC for Atka mackerel in Areas 543 and 542 would be set at a level sufficient to support incidental catch in other directed groundfish fisheries (e.g., Pacific ocean perch). Pacific cod in Areas 543 and 542 would be placed on prohibited species status and closed to directed fishing. Currently, Pacific cod is managed under a single TAC for the BSAI; therefore, no area specific TAC to support incidental catch can be specified. Any retention of Atka mackerel or Pacific cod would be prohibited to remove any incentive to retain these species by operators of vessels targeting other groundfish species. Because no directed fishery for Atka mackerel would be allowed in Areas 543 and 542, the HLA program would be removed from the regulations.

Alternative 3: July 2010 Draft RPA Specific Approach

Alternative 3 is a more specific application of fishery restrictions based on the management of the fisheries and Steller sea lion foraging behavior, population trends, and the potential competition between the Atka mackerel and Pacific cod fisheries and Steller sea lions. This alternative is the same as the RPA described in the July 2010 draft FMP biop. It provides only the level of fishery restrictions necessary to ensure that JAM is not likely to occur for Steller sea lions and their designated critical habitat. Development of Alternative 3 considered current management of vessels under Amendment 80, historical harvest activities, and gear specific area closures and seasonal apportionments to disperse fishing over area and time. Unless otherwise specified in the alternative, all current Steller sea lion protection measures would continue to be implemented in the Aleutian Islands (e.g., Pacific cod seasonal apportionments; and pollock, Pacific cod, and Atka mackerel closures around rookeries and haulouts and in the Seguam foraging areas). Restrictions in State waters from 0–3 nm apply to federally permitted vessels participating in the federal and State parallel groundfish fisheries. State-managed Pacific cod fisheries for vessels not federally permitted may occur in waters 0–3 nm unless otherwise restricted by the State. Federally permitted vessels participating in the State GHL fishery would be exempt from the Atka mackerel and Pacific cod closures. The State implements the 2003 Steller sea lion protection measures for the State GHL fishery under state regulations.

Alternative 3 would—

In Area 543:

- Prohibit retention of Atka mackerel and Pacific cod.
- Establish a TAC for Atka mackerel sufficient to support the incidental discarded catch that may occur in other targeted groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA.

In Area 542:

Groundfish
- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

Pacific cod
- Close 0–10 nm zone of critical habitat to directed fishing by federally permitted vessels using nontrawl gear year round. Close critical habitat 10–20 nm to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels January 1 through June 10.
- Close 0–20 nm zone of critical habitat year round to directed fishing by federally permitted vessels using trawl gear.
- Prohibit Pacific cod fishing November 1 through December 31 in Area 542. (This extends this trawl gear restriction to nontrawl gear.)

Atka mackerel
- Set TAC for Area 542 to no more than 47 percent of acceptable biological catch (ABC).
- Close 0–20 nm critical habitat to directed fishing by federally permitted vessels year round.
- Change the Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.
- Eliminate the Atka mackerel platoon management system in the HLA.

In Area 541 and the Bering Sea:

Pacific cod
- Close 0–10 nm of critical habitat to directed fishing for Pacific cod by all federally permitted vessels year round.
- Limit the amount of catch that can be taken in the 10–20 nm area of critical habitat based on gear type used:
  - Close critical habitat 10–20 nm to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels January 1 through June 10.
  - Close critical habitat 10–20 nm to directed fishing by for Pacific cod using trawl gear by federally permitted vessels June 10 through November 1.
- Prohibit Pacific cod fishing November 1 through December 31 in Area 541. (This extends this trawl gear restriction to nontrawl gear.)

Atka mackerel

- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.

Alternative 4: Preferred Alternative – Final RPA

Alternative 4 is the RPA in the final FMP biop. The final RPA is a revision of the July 2010 draft RPA based on public comment received by the agency, recommended changes to the draft RPA by the Council, and consideration of these comments and recommended changes. No changes were made that would affect the ability of the RPA to avoid JAM for Steller sea lions. These changes would provide additional relief to the Atka mackerel and Pacific cod fisheries. The protection measures in Area 543 remain unchanged from Alternative 3. Alternative 4 differs from Alternative 3 by the protection measures in Areas 542 and 541, by providing additional opportunity for fishing inside critical habitat for the Atka mackerel and Pacific cod fisheries while meeting the performance criteria specified in the FMP biop to avoid JAM. Federally permitted vessels participating in the State GHL fishery would be exempt from the Atka mackerel and Pacific cod closures. The State implements the 2003 Steller sea lion protection measures for the State GHL fishery under state regulations.

The features of Alternative 4 are—

In Area 543:

- Prohibit retention of Atka mackerel and Pacific cod by all federally permitted vessels.
- Establish a TAC for Atka mackerel sufficient to support the incidental discarded catch that may occur in other target groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA.

In Area 542:

Groundfish

- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

Pacific cod

- Close 0–6 nm zone of critical habitat year round to directed fishing for Pacific cod by federally permitted vessels using nontrawl gear. For vessels 60 ft or greater, close critical habitat from 6–20 nm January 1 to March 1, to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
- Between 177 E to 178 W longitude, close critical habitat from 0–20 nm year round to directed fishing for Pacific cod by federally permitted vessels using trawl gear.
- Between 178 W to 177 W longitude, close critical habitat from 0–10 nm year round to directed fishing by federally permitted vessels using trawl gear. Between 178 W to177 W longitude, close critical habitat 10–20 nm June 10 to November 1, to directed fishing for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit directed fishing for Pacific cod by all federally permitted vessels from November 1 to January 1. (This extends the trawl gear restriction to nontrawl gear.)

- Reinitiate ESA consultation if the nontrawl harvest of Pacific cod exceeds 1.5 percent of the BSAI Pacific cod acceptable biological catch (ABC) (equivalent to the Area 542 maximum annual harvest amount from 2007 through 2009). Similarly, reinitiate ESA consultation if the trawl harvest of Pacific cod exceeds 2 percent of the BSAI Pacific cod ABC (equivalent to the Area 542 maximum annual harvest amount from 2007 through 2009).

Atka mackerel

- Set TAC for Area 542 to no more than 47 percent of the ABC amount apportioned to Area 542 by the Council's SSC.
- Between 177 E to 179 W longitude and 178 W to 177 W longitude, close critical habitat from 0–20 nm year round to directed fishing for Atka mackerel by federally permitted vessels.
- Between 179 W to 178 W longitude, close critical habitat from 0–10 nm year round to directed fishing for Atka mackerel by federally permitted vessels. Between 179 W and 178 W longitude, close critical habitat from 10–20 nm to directed fishing for Atka mackerel by federally permitted vessels not participating in a harvest cooperative or fishing a CDQ allocation.
- Add a 50:50 seasonal apportionment to the CDQ Atka mackerel allocation to mirror seasonal apportionments for Atka mackerel harvest cooperatives.
- Limit the amount of Atka mackerel harvest allowed inside critical habitat to no more than 10 percent of the annual allocation for each harvest cooperative or CDQ group. Evenly divide the annual critical habitat harvest limit between the A and B seasons.
- Change the Atka mackerel seasons to January 20 to June 10, for the A season and June 10 to November 1, for the B season.
- Eliminate the Atka mackerel platoon management system in the HLA.

<u>In Area 541</u>:

Pacific cod

- Close 0–10 nm of critical habitat year round to directed fishing for Pacific cod by all federally permitted vessels.
- Limit the amount of catch that can be taken in the 10 nm–20 nm area of critical habitat based on gear type used:
    - Close critical habitat 10–20 nm January 1 to March 1, to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
    - Close critical habitat 10–20 nm June 10 to November 1, to directed fishing by for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit directed fishing for Pacific cod by federally permitted vessels November 1 to January 1. (This extends this trawl gear restriction to nontrawl gear.)
- Reinitiate ESA consultation if the nontrawl harvest of Pacific cod exceeds 1.5 percent of the BSAI Pacific cod ABC (equivalent to the Area 541 maximum annual harvest amount from 2007 through 2009). Similarly, reinitiate ESA consultation if the trawl harvest of

Pacific cod exceeds 11.5 percent of the BSAI Pacific cod ABC (equivalent to the Area 541 maximum annual harvest amount from 2007 through 2009).

Atka mackerel

- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 to June 10, for the A season and June 10 to November 1, for the B season.
- Close the Bering Sea subarea year round to directed fishing for Atka mackerel.

Comparison of alternatives.

		Alternative 1			Alternative 2		Alternative 3			Alternative 4 (Preferred)		
		Atka mackerel	Pacific cod		Atka mackerel	Pacific cod	Atka mackerel	Pacific cod		Atka mackerel	Pacific cod	
			trawl	nontrawl				trawl	nontrawl		Trawl	Nontrawl
Area 543	**Inside CH**	HLA Fishery	After HLA, mostly 10 nm closures	Mostly 3 nm closures	No retention	No retention	No retention	No retention		No retention	No retention	
	Outside CH	Directed fishing 1/20–4/15, 9/1–11/1	3 seasons inside and outside CH, 1/20–4/1, 4/1–6/10, 6/10–11/1	Hook-and-line and pot 2 seasons, jig 3 seasons inside and outside CH								
Area 542	**0–10 nautical miles**	HLA Fishery	Western 542, After HLA, mostly 10 nm closures	3 nm closures			No directed fishing	No directed fishing		No directed fishing	No directed fishing	No directed fishing 0-6 nm
	10–20 nautical miles		Eastern 542, 3–10 nm closures,	Open to directed fishing				No directed fishing.	No directed fishing 1/1 to 6/10	No directed fishing except in 179W to 178W, limit to coops and CDQ, limit to 10 % of annual allocation, 50:50 seasonal apportionment	No directed fishing, except in 178W to 177W. Close 178W to 177W June 10-Nov. 1.	No directed fishing 6-20 nm for vessels > 60 feet: 1/1-3/1.
	Outside CH	Directed fishing 1/20–4/15, 9/1–11/1	3 seasons inside and outside CH, 1/20–4/1, 4/1–6/10, 6/10–11/1	Hook-and-line and pot 2 seasons, through 12/31, jig 3 seasons inside and outside CH			Set Area 542 TAC to 47% of ABC.	No directed fishing 11/1–12/31		Set Area 542 TAC to 47% of ABC.	No directed fishing 11/1–12/31	
							Extend seasons to 1/20–6/10 and 6/10–11/1.			Extend seasons to 1/20–6/10 and 6/10–11/1.	Area 542 Consultation trigger 2% BSAI ABC	Area 542 Consultation Trigger 1.5% BSAI ABC

		Alternative 1			Alternative 2		Alternative 3			Alternative 4 (Preferred)		
		Atka mackerel	**Pacific cod**		**Atka mackerel**	**Pacific cod**	**Atka mackerel**	**Pacific cod**		**Atka mackerel**	**Pacific cod**	
			trawl	**nontrawl**				**trawl**	**nontrawl**		**Trawl**	**Nontrawl**
Area 541	**0–10 nautical miles**	No directed fishing	0–3 nm and 0–10 nm closures	3 nm closures west of Seguam, closed east of Seguam.	No directed fishing	No directed fishing	No directed fishing	Closed to directed fishing		No directed fishing	Closed to directed fishing	
	10–20 nautical miles		Open except 0–20 nm at Agligadak	Open to directed fishing west of Seguam, closed east of Seguam				No directed fishing 6/10 to 11/1.	No directed fishing 1/1 to 6/10.		No directed fishing 6/10 to 11/1.	No directed fishing 1/1 to 3/1.
	Outside CH	Directed fishing 1/20–4/15, 9/1–11/1	3 seasons inside and outside CH, 1/20–4/1, 4/1–6/10, 6/10–11/1	Hook-and-line and pot 2 seasons, jig 3 seasons through 12/31, inside and outside CH	Extend Area 541/BS seasons 1/20–6/10 and 6/10–11/1	No nontrawl directed fishing 11/1–12/31	Extend Area 541/BS seasons 1/20–6/10 and 6/10–11/1	No directed fishing 11/1–12/31.		Extend Area 541/BS seasons 1/ 20–6/10 and 6/10–11/1. No directed fishing in the Bering Sea subarea.	No directed fishing 11/1–12/ 31.	
											Area 541 Consultation trigger 11.5% BSAI ABC	Area 541 Consultation trigger 1.5% BSAI ABC

CH = critical habitat

Summary of the Environmental Consequences of the Alternatives

Target Species

The impacts of the alternatives on target species are described in detail in chapter 3. Under all alternatives, the stock biomass of all target species is expected to be above their MSST. The probability that overfishing would occur is low for all of the stocks. The expected changes that would result from harvest at the levels proposed are not substantial enough to expect that the genetic diversity or reproductive success of these stocks would change. None of the alternatives would allow overfishing of the spawning stock. Therefore, the genetic integrity and reproductive potential of the stocks should be preserved.

The alternatives are not expected to (1) jeopardize the capacity of the stock to produce maximum sustainable yield on a continuing basis; (2) alter the genetic sub-population structure such that it jeopardizes the ability of the stock to sustain itself at or above the minimum stock size threshold or become susceptible to overfishing; (3) decrease reproductive success in a way that jeopardizes the ability of the stock to sustain itself at or above the minimum stock size threshold; (4) alter harvest levels or distribution of harvest such that prey availability would jeopardize the ability of the stock to sustain itself at or above the minimum stock size threshold or become susceptible to overfishing, and (5) disturb habitat at a level that would alter spawning or rearing success such that it would jeopardize the ability of the stock to sustain itself at or above the minimum stock size threshold or become susceptible to overfishing. For these reasons, impacts to target species stocks, species, or species groups, are predicted to be insignificant for all target fish evaluated under Alternatives 1, 2, 3, and 4.

Nontarget Species

The impacts of the alternatives on nontarget species are described in detail in chapter 4. Incidental catch of the forage, non-specified, and prohibited species occur in the Aleutian Islands groundfish fisheries. Salmon, forage fish, and non-specified species are rarely encountered in Aleutian Islands fisheries. The incidental catch of crab and halibut (PSC species) are subject to operational constraints under PSC management measures in the Aleutian Islands and Bering Sea subareas. The direct, indirect, and cumulative effects of the alternatives are not expected to cause overfishing for halibut and crab due to the low rates of incidental catch in the groundfish fisheries in the Aleutian Islands and Bering Sea subareas. For these reasons, impacts to forage, non-specified, and PSC species stocks, species, or species groups, are predicted to be insignificant for all target fish evaluated under Alternatives 1, 2, 3, and 4.

Marine Mammals

The impacts of the alternatives on marine mammals are described in detail in chapter 5. The groundfish fisheries may impact marine mammals through incidental take, reductions in prey availability, and disturbance. Of the marine mammals and alternatives analyzed, only Steller sea lions are likely to experience significant adverse impacts from the Aleutian Islands Pacific cod and Atka mackerel fisheries under Alternative 1 through the reduction of prey availability. The impacts of Alternatives 2, 3, and 4 on marine mammals are not likely to result in adverse population level effects, and therefore were determined to be insignificant.

Seabirds

The impacts of the alternatives on seabirds are described in detail in chapter 6. Many seabird species use the marine habitat of the Aleutian Islands, including several species of conservation concern. Some species are taken by hook-and-line gear, some 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 pelagic and non-pelagic trawling. However, the Alaska Fisheries Science Center estimates that seabird takes are few and infrequent in relation to seabird population total estimates. 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. Although Alternatives 2, 3, and 4 may affect seabirds, all effects (both positive and negative) would be insignificant.

Habitat

The impacts of the alternatives on habitat are described in detail in chapter 7. Previous analyses of the Alaska groundfish fisheries found no substantial adverse effects to habitat in the Aleutian Islands due to fishing activities; Alternatives 2, 3, and 4 would remove a substantial portion of any localized effects that were occurring under the status quo alternative. The potential effects on an area to which fishing may shift would be constrained by the amount of TAC available (particularly for Atka mackerel) and by the existing habitat conservation and protection measures. It is possible that impacts may increase slightly in other areas due to displaced fishing effort, but in context of the entire Aleutian Islands and Bering Sea, the effects of Alternatives 2, 3, or 4 on habitat are beneficial in the Aleutian Islands subarea, but not substantially so. Alternatives 3 and 4 would result in more potential for bottom habitat impacts in Areas 542 and 541 as more fishing would be allowed under these alternatives compared to Alternative 2. For these reasons, effects to habitat complexity for both living and non-living substrates, benthic biodiversity, and habitat suitability are predicted to be insignificant for all habitat types evaluated under Alternatives 2, 3, and 4.

Ecosystem

The impacts of the alternatives on the ecosystem are described in detail in chapter 8. The Aleutian Islands Fishery Ecosystem Plan (AI FEP) identifies the categories AI ecosystem indicators: the Climate, Fisheries, and Predator-prey interactions. A risk assessment of alternatives, as described in the AI FEP, is beyond the scope of what can be accomplished with the current information. However, to understand whether the alternatives are likely to have a significant impact on the Aleutian Islands ecosystem, it is important to identify whether the alternatives have the potential to change the identified ecological impacts to the ecosystem indicators. Thus, the significance criteria for impacts on the AI ecosystem are measurable changes to the ecological impacts identified for each indicator.

Due to the nature of the action, the Atka mackerel and Pacific cod fisheries as modified by the proposed action are not predicted to have additional ecological impacts beyond those identified in the AI FEP or to change the identified ecological impact on the indicators. Based on the analysis presented in the AI FEP and summarized in chapter 8, NMFS concludes that the Atka mackerel and Pacific cod fisheries, as prosecuted under Alternative 1, are not likely to change the ecological impacts to the ecosystem indicators. Alternatives 2, 3, and 4, to the extent that they reduce fishing effort and redistribute remaining effort further from shore, would reduce the Pacific cod and Atka mackerel fishery's impacts from status quo, but not to the extent that it would change the identified ecological impact. Therefore, the impacts of the alternatives on the Aleutian Island ecosystem are insignificant.

Social and Economic

The economic and socioeconomic impacts of the alternatives are described in detail in chapter 10. Atka mackerel and Pacific cod harvests from federal fisheries in the Aleutian Islands have had an average wholesale value of about $83 million in recent years. In 2009, there were 10 trawl catcher/processors harvesting Atka mackerel and 5 harvesting Pacific cod (there is some overlap in these two groups). Seven of the trawl catcher/processors could be considered to target Atka mackerel. In addition, 7 hook-and-line catcher/processors, 3 pot catcher/processors, and 34 catcher vessels participated in the harvest. In recent years, catcher vessels have fished these species with trawl, jig, hook-and-line, and pot gears.

Four fleets were defined for the analysis: the trawler catcher/processors, fixed gear (hook-and-line and pot) catcher/processors, catcher vessels (including vessels using jig, pot, hook-and-line, and trawl gear), and vessels fishing in the state waters fishery.

Impacts on fishing fleets

The trawler catcher/processor sector is estimated to see its Atka mackerel production drop to about 45 percent of its status quo catch level (based on the mean of the sector’s estimated experience during the years 2004 through 2009). The actual drop would vary significantly from year to year, depending on year-specific circumstances. The sector’s Pacific cod production is estimated to drop to about 50 percent of its status quo level. The sector is expected to respond by shifting fishing activity into the rock sole, yellowfin sole, and Pacific cod fisheries in the Bering Sea. Its success in those fisheries is expected to be mixed. Halibut PSC rates are much higher in the Bering Sea than they are in the Aleutian Islands, and this is likely to constrain the sector’s ability to increase its harvests of those species.

The fixed gear catcher/processor sector includes both hook-and-line and pot gear and targets Pacific cod in the Aleutian Islands. This sector is likely to shift to harvesting Pacific cod in the Bering Sea. While this sector is more likely than the trawler fleets to be able to fully offset its Aleutian Islands losses in volume terms, industry sources indicate that Bering Sea Pacific cod are smaller, have a lower product recovery rate, and enter different market channels. These factors make them less valuable, and as a result, the revenues from any given volume of production are likely to be less.

The catcher vessel sector includes trawlers, hook-and-line vessels, pot vessels, and jig vessels. A majority of the vessels are trawlers, and these account for most of the production. This fleet is expected to shift towards more Pacific cod production in the Bering Sea. Halibut PSC rates for this fleet is much higher in the Bering Sea than in the Aleutian Islands, and this is likely to constrain this fleet from fully offsetting its Pacific cod losses.

The three sectors just listed fish in the federal fisheries and in the State’s parallel waters fishery. Another sector fishes in the State’s GHL fishery at times when the federal fishery is closed. This sector would not be directly regulated by this action.

As operators directly regulated by this action redeploy fishing effort into other fisheries in, for example, the Bering Sea, in an effort to reduce their catch reductions and revenues at risk from this action, they may impact other vessels that are already operating in the fisheries there. Interactions may be complex, and may include increased congestion, reduced market prices for some species, and competition for PSC allowances.

Potential benefits

The estimates of the benefits of Steller sea lion protection are discussed in section 10.4, which presents the results of recent survey research into the willingness of U.S. households to pay for an improvement in the population growth rate of the western population of Steller sea lions. The survey research concluded that the potential benefits from recovery of the western population of the Steller sea lion were large. In addition, the section notes that recovery could bring benefits to subsistence hunters, who continue their cultural practices associated with harvesting Steller sea lions from the western Aleutian population.

Because of uncertainty about the level of impact of the Alternative 4, proposed action, on Steller sea lion population trajectories, the RPA does not connect the action to specific population changes. And given that the impact of this action on the Steller sea lion population trajectory is not quantified, neither are net benefits in terms of cost-benefit accounting measures. Nonetheless this action is necessary to ensure the effects of the groundfish fisheries are not likely to result in jeopardy of extinction or adverse modification or destruction of critical habitat, as required by the ESA.

Impacts on other ecosystem elements

Benefits or costs may accrue from this action because of interactions with other elements of the ecosystem (aside from Steller sea lions), such as other marine mammals, seabirds, fish stocks, habitat impacts, and ecosystem impacts. Impacts on these sources are likely to be small in relation to impacts to the industry or the values accruing from sea lion stock health.

Costs to the industry

Sub-section 10.6.2 provides estimates of the potential revenues at risk in the Aleutian Islands associated with this action. Alternative 4, the preferred alternative, represented the smallest revenue at risk, but these were still substantial. In aggregate, the annual Alternative 4 gross fishing revenue placed at risk appears to be on the order of $44 million to $61 million dollars (depending on assumptions about the volume of fish that would have been harvested in the absence of the restrictions). The largest part of this annual gross revenue at risk, on the order of $34 million to $44 million, would be incurred by the trawl catcher/processor sector. The fixed gear catcher/processor sector would face gross revenues at risk on the order of $6 million to $7 million, while the first wholesale gross product value from catcher vessel raw fish deliveries would be on the order of $4 million to $10 million. These estimated gross values do not account for any offsetting effects (e.g., price response, cost reduction, gross earnings from redeployed effort).

The actual potential costs to industry are not gross revenues, but the producers' surplus and factor rents that may be lost because of the area closures and fishing restrictions of the proposed measures. The information that would make it possible to estimate the value of the lost producers' surplus and factor rents is not available.

As discussed above, the industry is likely to respond to the restrictions in the Aleutian Islands by redeploying effort to minimize the losses the restrictions would impose. The success in minimizing losses will almost certainly be met with mixed results. Halibut PSC constraints are likely to prevent the trawl catcher/processor and catcher vessel sectors from fully offsetting Aleutian Islands gross revenue at risk. Both trawl and fixed gear catcher/processor operators indicate that Bering Sea Pacific cod have lower product recovery rates and are traditionally destined for markets in which prices are lower. Despite these factors, the shift into the Bering Sea will allow sectors to offset some of their Aleutian Islands gross revenues at risk. Reductions in Atka mackerel and Aleutian Island Pacific cod harvests are likely to lead to increased prices for these products, and this may also partially offset revenue losses.

Employment and income impacts

The fleets, and associated processing operations, participating in the three different federal fisheries that are the subject of this action provide about 1,500 jobs. In addition, jobs and income would be affected in industries supporting the fishery and induced in businesses serving the personal needs of persons directly and indirectly employed. None of the proposed actions would lead to the loss of all of these jobs; some fishing would continue in the Aleutian Islands for Atka mackerel and Pacific cod, and fleets would be able to redeploy into target fisheries in the Bering Sea, although the ability to offset losses is not likely.

Of the three action alternatives, Alternative 4, the Council's preferred alternative, is likely to have the smallest potential adverse impacts on employment. A range of potential job losses on the order of about 250 persons to about 750 persons was identified, depending on the assumptions that were made about the ability of fleets to redeploy. These losses include direct losses in the fishing and processing industries, indirect losses in businesses servicing the fishing and processing industries, and in businesses depending on incomes earned by persons directly and indirectly employed.

The available models do not allow for the allocation of job losses among regions or communities. Job losses are most likely to occur in Alaskan coastal communities in the Aleutian Islands, in small communities spread along Alaska's Gulf of Alaska coast, in communities in Western Alaska served by CDQ groups, and throughout the west coast of the United States, especially in the Puget Sound region of the Pacific Northwest. Adak is likely to be particularly vulnerable, given its small size, limited economy, and multifaceted dependence on the Atka mackerel and Pacific cod fisheries. It should be noted, however, that present and near-term adverse employment and income impacts in Adak are not principally associated with, nor attributable to, the proposed Steller sea lion action, but stem from more fundamental structural difficulties with the community's economic base (e.g., bankruptcy of local seafood processing plant, lack of economic diversity, physical remoteness and aging physical plant, global recession-caused transportation cost increased and general demand weakness).

Consumers

Almost all of the Atka mackerel, and a significant part of the large Pacific cod from the Aleutian Islands, are exported to Asian markets. Consumer welfare effects, deriving from supply changes in these markets, are not considered in a standard cost-benefit analysis. Parts of the Aleutian Pacific cod production are consumed in the United States, where the large fish are used to produce premium products. The reduction in the supply of this product, and the need for firms to find substitutes, will create welfare losses for U.S. consumers, although the magnitude cannot be estimated at present.

Additional issues

The analysis examined a number of additional issues. The action does not result in significant changes in the workload for NMFS inseason management staff. It may ease demands on enforcement staff as activity in the western Aleutians is reduced. Safety could be affected by a number of factors: a shift in the fleet's center of activity to the east brings it closer to U.S. Coast Guard search and rescue resources and to potential "good Samaritan" assistance; if profits are reduced, there may be reduced investments in safety; it may be that relatively greater congestion on fishing grounds will encourage a derby fishery mentality, increasing the opportunity costs of safe operation; the action may cause vessels shifting out of the Aleutian Islands to spend more time in the high traffic Unimak Pass area. Scientific information may be lost as observer information obtained from commercial fishing operations is reduced. The action may affect entities receiving federal grants and subsidies as fishing activity and revenue opportunities are affected. Given its small size, and the large number of other relevant factors, it is likely to have little discernable impact on the U.S. balance of trade.

A part of this action that closes waters within three miles of Kanaga Island to groundfish fishing should have small costs to industry. Elimination of the HLA will have little impact, given other measures to restrict fishing in the HLA areas. The emergence of cooperatives under Amendment 80 provides an alternative to the HLA for slowing harvest.

Conclusions

This action will impose relatively heavy costs on the fishing and processing industry that targets Atka mackerel and Pacific cod in the Aleutian Islands. The reduction in industry gross revenues—even after taking account of actions by firms to minimize their losses, shifting target fisheries, and potential increases in prices of species whose production has declined—are likely to be measured in millions of dollars. The analysis identified, for the preferred action, potential job losses of from about 250 to about 750 positions, depending on the success of the industry in finding new target fisheries. The preferred alternative is likely to have a substantial impact on the community of Adak, and to adversely affect Unalaska, and, to a greater or lesser extent, other communities in coastal Alaska. Some communities in Western Alaska participating in the CDQ program are also likely to be adversely impacted, depending upon their CDQ group's allocation of Atka mackerel and Pacific cod TACs.

Based on survey research, it is possible that this action, by contributing to improved growth of the western stock of the Steller sea lion, and by helping to address other criteria for down-listing identified in the Revised Recovery Plan, may create benefits that exceed the losses. However, the uncertainty of the impact of this action on western stock growth is sufficient that the FMP biop and RPA do not quantify the improvement in population growth as a result of the protection measures. However, this action is legally necessary under the provisions of the ESA. The Secretary cannot take action to authorize fishing in the Atka mackerel and Pacific cod fisheries in the Aleutian Islands under the status quo if, that action is likely to jeopardize the continued existence of the Steller sea lion stock or adversely modify its critical habitat.

The action alternatives discussed here would permit a fishery to proceed without creating these unacceptable risks. As discussed in the analysis, the preferred alternative disrupts fishing and reduces fishery gross revenues the least, reduces the number of jobs the least, and, consequently, imposes the least adverse impact on affected communities, all else equal.

Table of Contents

List of Figures

List of Tables

1.0 INTRODUCTION

National Marine Fisheries Service (NMFS) is responsible for implementing the requirements of the Endangered Species Act (ESA) for most ESA-listed marine mammals, including Steller sea lions. The western distinct population segment (WDPS) of Steller sea lions is listed as endangered. Each federal agency, in consultation with NMFS, is required to "insure that any action authorized, funded, or carried out by that agency is not likely to jeopardize the continued existence of [endangered Steller sea lions] or result in the destruction or adverse modification of [Steller sea lion critical] habitat."

In April 2006, NMFS Alaska Region, Sustainable Fisheries Division (SFD, action agency), reinitiated ESA Section 7 consultation with NMFS Alaska Region, Protected Resources Division (PRD, consulting agency), on the potential effects of the Alaska groundfish fisheries on ESA-listed species and their designated critical habitat (NMFS 2006a). Consultation was reinitiated in consideration of new scientific information and changes to the fisheries since the last biological opinion on the groundfish fisheries was supplemented in 2003 (NMFS 2003). After reviewing all ESA-listed species within NMFS's jurisdiction that may be affected by the Alaska groundfish fisheries and after consulting with PRD, SFD determined that the Alaska groundfish fisheries were likely to adversely affect Steller sea lions and their designated critical habitat, humpback whales, and sperm whales; therefore, formal consultation was required. In formal Section 7 consultations, PRD reviews the status information for the species and designated habitat, environmental baseline information, and the potential effects of the action on the species and develops a biological opinion. If the biological opinion concludes that the action is likely to jeopardize the continued existence or adversely destroy or modify designated critical habitat (JAM) for an ESA-listed species, the opinion would include a reasonable and prudent alternative (RPA) that must be implemented to avoid JAM.

In August 2010, NMFS released a draft biological opinion on the Alaska groundfish fisheries that was used to develop alternatives and start the analysis of the impacts of the alternatives. In November 2010, NMFS finalized the biological opinion (FMP biop) (NMFS 2010). The FMP biop found that the Alaska groundfish fisheries that are likely to result in JAM are located in the Western and Central sub-regions of the Aleutian Islands, based on the population trends of the animals in sub-regions, as identified in the Steller sea lion Revised Recovery Plan (NMFS 2008). The Revised Recovery Plan divides Alaska waters into sub-regions for purposes of determining recovery. Area 543 is the Western Aleutian Islands sub-region and Areas 542 and 541 are the Central Aleutian Islands sub-regions. The Revised Recovery Plan concluded that to achieve recovery, no two adjacent subareas may have significantly declining population trends for non-pups (NMFS 2008).

The FMP biop concluded that changes to the Pacific cod and Atka mackerel fisheries in the Aleutian Islands are necessary to avoid the likelihood of JAM for the WDPS of Steller sea lions and their designated critical habitat. This finding is based on the biological information of the WDPS of Steller sea lions and the potential effects of the groundfish fisheries on the WDPS of Steller sea lions and their critical habitat. The FMP biop includes an RPA to mitigate the effects of the groundfish fisheries on the WDPS of Steller sea lions that is specific to the Atka mackerel and Pacific cod fisheries in Areas 543, 542, and 541 of the Aleutian Islands. This RPA provides the baseline for consideration of changes that could be implemented to ensure the WDPS of Steller sea lions are not likely to experience JAM because of the groundfish fisheries.

The remaining statistical areas for the groundfish fisheries in the Bering Sea and Gulf of Alaska (GOA) have population trends that are consistent with the recovery criteria. Therefore, additional Steller sea lion protection measures for the groundfish fisheries in the Bering Sea and GOA are not required to insure effects from the remaining groundfish fisheries are not likely to result in JAM for Steller sea lions and their designated critical habitat.

This Environmental Assessment/Regulatory Impact Review (EA/RIR) provides decision-makers and the public with an evaluation of the predicted effects of the alternatives to change to the Aleutian Islands Pacific cod and Atka mackerel fisheries that are necessary to avoid the likelihood of JAM for the WDPS of Steller sea lions and their designated critical habitat. This EA/RIR complies with the National Environmental Policy Act (NEPA), Executive Order 12866, and other applicable law.

1.1 Proposed Action

The proposed action would implement management measures that control the location, gear type, and timing of fishing for Atka mackerel and Pacific cod in the Aleutian Islands and for groundfish fishing near a new Steller sea lion rookery. Three alternatives to status quo were developed for this proposed action. The preferred alternative is the RPA contained in the FMP biop (NMFS 2010). This RPA is built on the indicators of Steller sea lion population trends and the reproductive capacity of Steller sea lions in sub-regions identified in the Steller sea lion Revised Recovery Plan (NMFS 2008) and in response to recommendations for revisions to the draft RPA presented to the North Pacific Fishery Management Council (Council). The RPA, and its alternatives, are focused on those sub-regions with declining populations, which may be due to declining survival or decreasing birth rates. The features of the RPA, and its alternatives, were developed considering the evidence of potential impacts of the groundfish fisheries on Steller sea lions, including Steller sea lion foraging behavior, fish removals, prey energetic density, and available prey biomass. This evidence is detailed in chapter 8 of the FMP biop (NMFS 2010) and is adopted here by reference.

Additionally, because of the overlap of Atka mackerel management between the Aleutian Islands and Bering Sea subareas, a minor change to the seasonal harvest of Atka mackerel in the Bering Sea subarea is included in the RPA and its alternatives. The total allowable catch for Atka mackerel in Area 541 is combined with the Bering Sea subarea so that this allocation is managed as a unit. Any harvest limit or seasonal apportionment applied to the Atka mackerel fishery management in Area 541 potentially would need to be applied to the Bering Sea subarea. This concurrent change in the Bering Sea subarea is not necessary to prevent JAM, but is necessary to facilitate management. Because this seasonal change in the Bering Sea for Atka mackerel harvest could further distribute fishing effort in a manner beneficial to Steller sea lions and involves only a minor component of the Atka mackerel fishery, it is not considered a substantial change with discernable environmental effects.

1.2 Purpose and Need

Steller sea lions occurring in the Aleutian Islands have experienced negative population trends (NMFS 2010). The negative population trends for non-pups in Areas 543 and 542 would prevent the population from meeting the recovery criterion in the Revised Recovery Plan (NMFS 2008). The negative growth rates and counts in Areas 543 and 542 indicate that the Steller sea lions in these areas are having difficulty maintaining or increasing their populations, and removal of potential fisheries effects is needed to insure that federally authorized fisheries are not likely to result in JAM. Protection measures also are recommended for Area 541 to ensure the continued improvement in population trends in this area by limiting the continued groundfish fishery effects on Steller sea lion prey.

The proposed action would modify the Aleutian Islands Pacific cod and Atka mackerel fisheries to insure that these fisheries are not likely to jeopardize the continued existence of Steller sea lions or adversely modify or destroy their designated critical habitat. As revisions were being developed, existing fishery management programs were considered. Consideration of the existing fishery management programs will ensure that any revisions implemented would provide the most efficient and effective solutions to meet the requirements of the ESA. If more than one alternative accomplishes the primary purpose of this action, a secondary objective would be to modify the fisheries in a way that minimizes the economic and social costs that would be imposed on the commercial fishing industry and associated coastal communities.

1.2.1 Meeting ESA Requirements

The need for this federal action stems from several sources. First, NMFS has a responsibility to insure that fishing activities authorized under the groundfish fishery management plans (FMPs) and implementing regulations are not likely to jeopardize the continued existence of any ESA-listed species or adversely modify or destroy its critical habitat. Consultation was reinitiated by NMFS in 2006 on the groundfish fisheries off Alaska (NMFS 2006a). In the FMP biop (NMFS 2010), NMFS determined that the groundfish fisheries, when considered with aggregate effects of the factors analyzed under the environmental baseline and the cumulative effects, are likely to jeopardize the continued existence of endangered Steller sea lions and result in destruction or adverse modification of critical habitat. Based on that determination, and consistent with requirements of the ESA, NMFS has provided an RPA that would insure the groundfish fisheries would not violate the ESA. Therefore, NMFS must manage the groundfish fisheries in a manner that insures that those fisheries are not likely to jeopardize the continued existence of endangered Steller sea lions or result in destruction or adverse modification of designated critical habitat.

Second, in order for the Pacific cod and Atka mackerel fisheries to commence on January 1, 2011, NMFS must implement a suite of Steller sea lion protection measures—the RPA from the 2010 FMP biop or a different alternative that meets the same requirement to avoid the likelihood of JAM. The commencement of a new fishing year and implementation of new harvest specifications must be done in compliance with the ESA. Without any action by NMFS, the Aleutian Islands Pacific cod and Atka mackerel fisheries prosecuted under the current Steller sea lion protection measures are likely to result in JAM, as determined by the FMP biop (NMFS 2010).

Finally, this action also is needed to meet the Council's objective in its groundfish FMPs to maintain or adjust current protection measures as appropriate to avoid the likelihood of jeopardy of extinction or adverse modification to critical habitat for ESA-listed Steller sea lions (section 2.2.1 in NPFMC 2009). New information about potential interaction between Steller sea lions and the groundfish fisheries and new trend information have been taken into account in the FMP biop (NMFS 2010).

1.2.2 Reasonable and Prudent Alternative Objective and Performance Standards

The purpose of the proposed action is to meet the RPA objective and performance standards. The alternatives in this analysis are evaluated considering RPA objective and performance standards, which account for the potential adverse impacts of the groundfish fisheries on Steller sea lions and the types of changes in the fisheries needed to mitigate the potential adverse impacts (NMFS 2010). The objective of the RPA is to:

> conserve the overall forage availability for Steller sea lions and the value of critical habitat by limiting harvest of important prey species at times and in the areas where Steller sea lions forage; focused on sub-regions where the combined sea lion and fishery signals indicate the likelihood of a compromised prey field under the status quo.

The following performance standards are stated in the FMP biop and are used to develop the RPA (NMFS 2010). Fishery management measures should:

- Be commensurate with rate of population declines with more stringent measures in sub-regions, as described in the Steller sea lion Revised Recovery Plan (NMFS 2008), with greater population declines.
- Preserve the conservation value of critical habitat zones and offshore foraging areas that are used most extensively by foraging Steller sea lions.
- Conserve overall forage biomass for Steller sea lions by limiting fishery removals in areas with low forage biomass availability.
- Disperse fishery removals at times and in areas to prevent fishery removals from resulting in local depletion of the prey field.
- Consider distributional effects of time and area closures that are not combined with reductions in total allowable catch such that fishery removals are not concentrated at another time or in another area that may be deleterious to foraging Steller sea lions.
- Conserve prey availability inside trawl exclusion zones in areas where Atka mackerel tagging studies indicate high movement of fish from inside to outside of trawl exclusion zones (e.g., Amchitka North in Area 542).
- Consider fishery removals in State of Alaska (State) waters.
- Maintain or establish 3-nautical-mile (nm) groundfish fishing closures around rookeries in Aleutian Islands.

The objective and performance standards are the foundation of the RPA in the FMP biop. NMFS has determined that considering these performance standards is necessary to modify the groundfish fisheries in a manner that would insure the groundfish fisheries' impacts are not likely to result in JAM for Steller sea lions and their designated critical habitat. These performance measures allow for the focused application of revised Steller sea lion protection measures, particular to area, fishery, and Steller sea lion behavior. Based on the information in the FMP biop (NMFS 2010), the action is focused in the location where Steller sea lions are experiencing the greatest rate of population decline and where the groundfish fisheries are likely to be adversely impacting the animals.

1.3 Action Area

This action predominately occurs in the Aleutian Islands subarea. This area is a subarea of the Bering Sea and Aleutian Islands Management Area (BSAI). The Aleutian Islands Subarea (AI) of the BSAI means that portion of the exclusive economic zone (EEZ) off Alaska contained in Statistical Areas 541, 542, and 543 (Figure 1-1). These waters are 3 nm to 200 nm off Alaska.

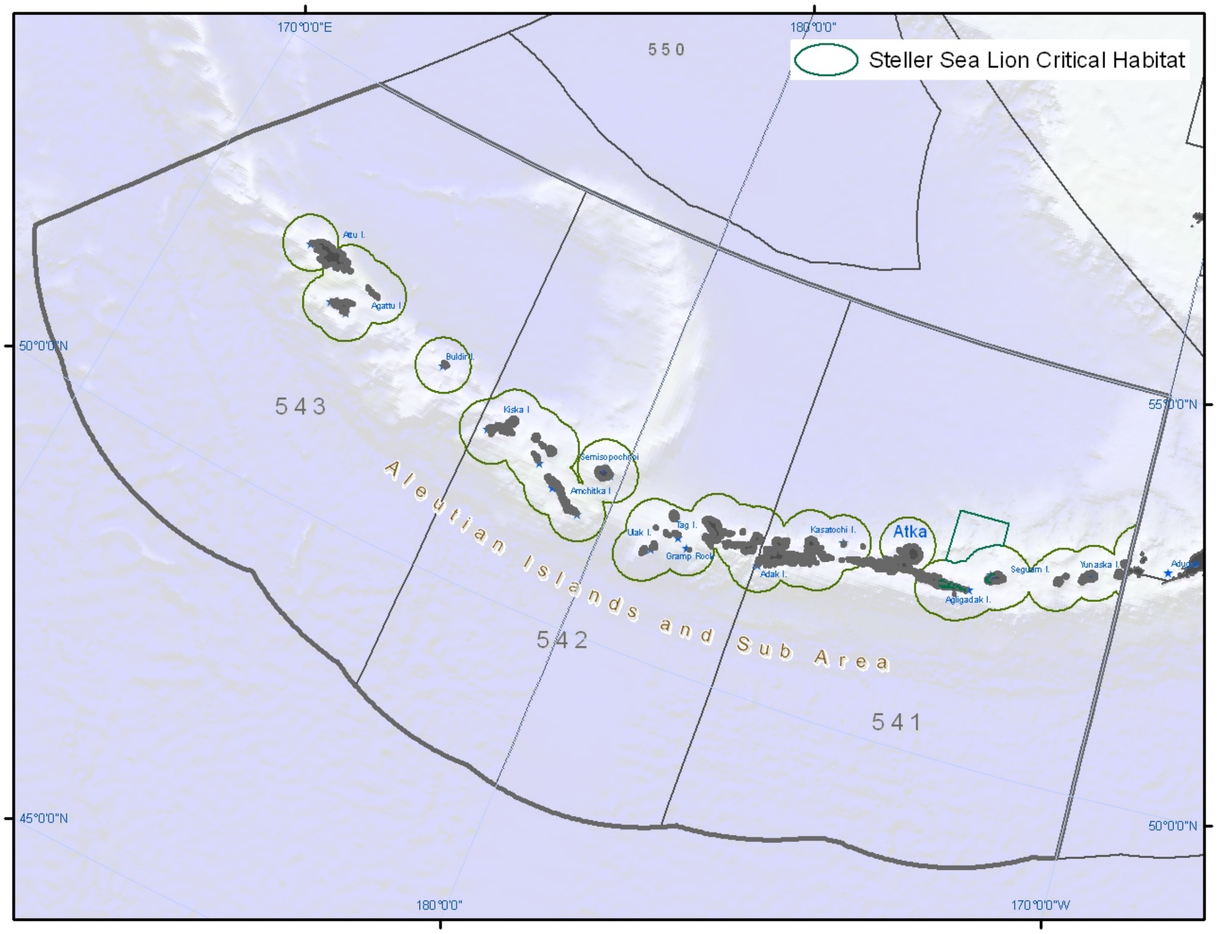

Figure 1-1 **Map of the Aleutian Islands Management Areas (541, 542, and 543) showing designated critical habitat for Steller sea lions. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

The action area also includes State waters 0 nm to 3 nm off Alaska in the AI for federally permitted vessels (those named on a federal fisheries permit, as defined at 50 CFR 679.2). Federally permitted vessels participating in the Aleutian Islands State-managed Pacific cod fishery under authority of 5 AAC 28.647 would not be required to comply with protection measures implemented by this proposed action. The State of Alaska applies the 2003 Steller sea lion protection measures to this fishery.

1.4 Statutory Authority and Relationship of this Action to Federal Law

NMFS manages the U.S. groundfish fisheries of the BSAI in the EEZ under the FMP for Groundfish of the BSAI (NPFMC 2009). The Council prepared, and the Secretary of Commerce (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 (Magnuson-Stevens Act), including Sustainable Fisheries Act of 1996, and the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006
- National Environmental Policy Act
- Endangered Species Act
- Marine Mammal Protection Act
- Administrative Procedure Act
- Information Quality Act
- E.O. 12866

The Alaska Groundfish Harvest Specifications Final Environmental Impact Statement (FEIS) provides details on the laws and executive orders directing this analysis (NMFS 2007). Additional information related to the ESA and the Magnuson-Stevens Act is provided in the following sections.

1.4.1 Endangered Species Act Consultation History

A history of recent, relevant consultations and actions leading up to this action is presented in the 2010 FMP biop (NMFS 2010). The most recent previous biological opinions on the effects of the Alaska groundfish fisheries on Steller sea lions were issued in 2000 (NMFS 2000 [FMP-level biological opinion]), in 2001 (Appendix A [project-level biological opinion] in NMFS 2001), and supplemented in 2003 (NMFS 2003). The 2001 biological opinion and its supplement implemented Steller sea lion protection measures for the GOA and the BSAI groundfish fisheries. The protection measures implemented in the BSAI have remained unchanged since the 2001 biological opinion. The 2006 reinitiation of ESA Section 7 consultation on the Alaska groundfish fisheries and major activities following this reinitiation are described below.

On October 18, 2005, the Council requested that NMFS SFD reinitiate consultation on the BSAI and GOA groundfish FMPs. The Council's request was based on the recognition that a substantial amount of new research on Steller sea lions had been published since NMFS completed the biological opinion in 2000 (NMFS 2000), such that an evaluation of the FMPs, in light of that new information, would be prudent.

On March 7, 2006, NMFS notified Alaska Department of Fish and Game (ADF&G) that the Council had recommended that NMFS reinitiate formal consultation on the effects of the FMPs for groundfish under Section 7 of the ESA. NMFS requested that the State respond regarding its intention to participate in the consultation. Participation in the consultation would allow the State an opportunity to ensure that any decisions in the opinion that may affect State fisheries are based on the most recent information regarding the action and potential effects.

On March 31, 2006, ADF&G notified NMFS of its desire to participate in the consultation and to have the State parallel groundfish fisheries included in the consultation.

On April 19, 2006, SFD sent PRD a written request to re-initiate formal ESA Section 7 consultation on the Alaska groundfish FMPs. The request specified that the purpose of this reinitiation was to evaluate the effects of current fisheries actions and management measures on listed species, in light of any new information gained since completion of the previous consultations in 2000 and 2001. The request for re-initiation was accompanied by a biological assessment (NMFS 2006a). PRD concurred with this request and formally re-initiated consultation on June 21, 2006. Because of the complexity of the analysis, the consulting agency and the action agency agreed to an extended timeline beyond the statutory deadline of 135 days for completion of the consultation.

On April 9, 2009, following receipt of a letter from the Marine Conservation Alliance (MCA), public comment at the Council meeting, and the Council's concurrence with issues raised in the MCA letter, the Council requested that NMFS incorporate specific new information, including Steller sea lion survey information, which had yet to be collected, into the draft biological opinion before its release. The new information which the Council recommended be included in the opinion was (1) information from Steller sea lion pup surveys that were scheduled to be conducted in the summer of 2009; (2) information from Steller sea lion non-pup surveys that were to be conducted in the summer of 2009; and (3) new information on reproductive rates, with reference to a recently released report from researchers at the Alaska SeaLife Center. The Council wrote that it believed "…strongly that it is critical to include this new information in the biological opinion as it has the potential to significantly affect the findings within that BiOp…The Council recognizes that incorporation of this information could potentially delay release of the draft BiOp…" and it requested that NMFS provide the Council with its best indication of how the biological opinion schedule might be affected.

NMFS determined that the new surveys could potentially reduce uncertainty and controversy about important elements in the analysis in the biological opinion. On May 6, 2009, NMFS notified the Council that NMFS was extending the schedule for release of the biological opinion to allow for incorporation of this information (NMFS 2009). NMFS informed the Council that it planned to have the biological opinion available for Council consideration in March of 2010.

On January 25, 2010, SFD sent a memo to PRD requesting a change in the description of the action for the FMP biop that would expand the parallel State fisheries to include all groundfish species (Salveson 2010). This change was requested because the original description of the action limited consideration of the State parallel fisheries to pollock, Pacific cod, and Atka mackerel. Because the action is the program-wide management of the federal groundfish fisheries, it is important to include all of the State parallel groundfish fisheries. The State-managed parallel groundfish fisheries are managed under the federal total allowable catch (TAC) inside State waters consistent with the federal fisheries management for the same groundfish in the adjacent EEZ. These parallel fisheries are managed through an emergency order issued each year by ADF&G. Except for sector allocations, State management of the parallel fisheries applies the same requirements as used for federal fisheries management, including applying State water harvests against the federal TACs, federal seasons, bycatch and PSC limits, allowable gear types, and closure areas for Steller sea lion and habitat protection.

The release of the draft FMP biop was further postponed to August 2010, to provide sufficient time for review and incorporation of agency comments on the draft document, as the leadership at NMFS headquarters and at the Alaska Region changed in March 2010. The Council conducted a special meeting in August 2010 to review the draft FMP biop and to provide recommendations to NMFS on alternatives for the RPA. NMFS provided a public review and comment period on the draft FMP biop and on this EA/RIR, ending September 3, 2010. Further information on the public process is in section 1.5. In November 2010, NMFS issued the final FMP biop (NMFS 2010).

1.4.2 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Act is the primary domestic legislation governing management of marine fishing activities in federal waters (those waters extending seaward from the edge of coastal state waters to the 200-mile limit). This area became known as the EEZ in 1983. First passed in 1976, the Magnuson-Stevens Act was reauthorized in 1996 by the U.S. Congress to include, among other things, a new emphasis on the precautionary approach in U.S. fishery management policy.

The Magnuson-Stevens Act created eight regional fishery management councils that are primarily charged with preparing FMPs and plan amendments. The Councils are authorized to prepare and submit to the Secretary for approval, disapproval or partial approval, FMPs and any necessary amendments, for each fishery under their authority that require conservation and management. The Councils conduct public meetings so as to allow all interested persons an opportunity to be heard in the development of FMPs and amendments, and review and revise, as appropriate, the assessments and specifications with respect to the optimum yield from each fishery (16 U.S.C. 1852(h)). The Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006 amended the Magnuson-Stevens Act to include requirements for annual catch limits, accountability measures, and other provisions related to both ending and preventing overfishing as well as rebuilding fisheries. To date, the Council has prepared, and NMFS has approved and implemented, six FMPs, most now with numerous amendments. These FMPs must comply with the Magnuson-Stevens Act and with the requirements of other federal laws, such as the ESA.

The Magnuson-Stevens Act contains provisions for taking into account the requirements of other laws, as well as provisions related to the protection of marine ecosystems and the environment, some of which are contained in the definitions of optimum yield and "conservation and management":

In the Magnuson-Stevens Act, the term "optimum, with respect to the yield from a fishery, means the amount of fish which—

> (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, taking into account the protection of marine ecosystems;
> (B) is prescribed as such on the basis of the MSY [maximum sustainable yield] from the fishery, as reduced 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 MSY of such fishery" (16 U.S.C. 1802(3)(33)).

The term "conservation and management" in the Magnuson-Stevens Act "refers to all of the rules, regulations, conditions, methods, and other measures (A) which are required to rebuild, restore, or maintain, and which are useful in rebuilding, restoring, or maintaining, any fishery resources and the marine environment; and (B) which are designed to assure that—

> (i) a supply of food and other products may be taken, and that recreational benefits may be obtained, on a continuing basis;
> (ii) irreversible or long-term adverse effects on fishery resources and the marine environment are avoided; and
> (iii) there will be a multiplicity of options available with respect to future uses of these resources" (16 U.S.C 1802(3)(5)).

Fishery management councils have considerable autonomy but must prepare FMPs, recommend regulations, and generally make decisions that are consistent with the provisions of the Magnuson-Stevens Act (Goodman et al. 2002). Section 301(a) of the Magnuson-Stevens Act sets forth national standards for conservation and management with which FMPs and regulations must be consistent. In addition, NMFS established guidelines based on the national standards to assist in the development and review of FMPs, amendments, and regulations prepared by the fishery management councils and the Secretary (50 CFR 600 subpart D). The national standards are as follows:

1. Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the OY [optimum yield] from each fishery for the U.S. fishing industry.
2. Conservation and management measures shall be based upon the best scientific information available.

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.
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 manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.
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.
6. Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.
7. Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.
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.
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.
10. Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

All fisheries management actions need to be developed with consideration of the Magnuson-Stevens Act national standards, including the proposed action analyzed in this EA.

1.5 Public Process

The initial draft of this EA/RIR was provided, along with a draft FMP biop, to the Council for review by its Scientific and Statistical Committee (SSC), by its Advisory Panel (AP), and by the Council at a special August 2010 meeting. The Council, SSC, and AP provided opportunity for public comment during their review of the documents, and these comments were considered as each body developed their recommendations for NMFS's consideration. The Council recommended an alternative RPA for NMFS consideration in August 2010.

A public comment period was provided for the draft FMP biop from August 2 to September 3, 2010. Comments on the draft EA/RIR were also accepted during this time. NMFS reviewed and incorporated relevant comments on the draft FMP biop into the final FMP biop (NMFS 2010). NMFS received approximately 10,600 comments on the draft FMP biop and approximately 5 letters that included comments on the draft EA/RIR. Nearly all the comments were form letters supporting the draft FMP biop and RPA. Detailed comments were also received from the State of Alaska, fishing industry and environmental organizations. NMFS reviewed all comments received on the analyses and incorporated relevant comments into this final EA/RIR.

NMFS analyzed the Council's recommended alternative and considered other alternatives received from the public during the public comment period and during the October 2010 Council meeting. A final RPA was developed based on the performance standards in the FMP biop, on the alternatives analyzed in the draft EA/RIR, and on the recommendations received from the Council and the public. The preferred alternative in this EA/RIR is the RPA in the FMP biop that was developed through this public process. Additional information on the public suggestions for the RPA is in chapter 2 of this EA/RIR.

1.6 Related Documents

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

This EA analyzes alternatives to avoid the likelihood of JAM for Steller sea lions and their designated critical habitat in the AI. This proposed action derives from the policy established in the preferred alternative in the Alaska groundfish programmatic supplemental EIS (PSEIS) (NMFS 2004). The supplemental EIS for Steller sea lion protection measures (NMFS 2001) contains detailed information regarding the protection measures used in the groundfish fisheries to spatially, temporally, and globally protect Steller sea lions and their designated critical habitat. This action would modify some of these protection measures, primarily in the AI.

Two ESA documents also contain detailed information that supports this EA/RIR. The final Revised Recovery Plan for the Steller sea lion (NMFS 2008) and the FMP biop (NMFS 2010) contain recent biological and fisheries interaction information that is crucial to this analysis. This EA incorporates, by reference, information from the NEPA and ESA documents described below, when applicable, to focus the analysis on the issues ripe for decision, and to eliminate repetitive discussions.

Alaska Groundfish Programmatic Supplemental EIS (PSEIS)

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

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

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

Alaska Groundfish Harvest Specifications EIS

In January 2007, NMFS completed the EIS analyzing the impacts of various harvest strategies for the Alaska groundfish fisheries (NMFS 2007). Except for the no action alternative, the alternatives analyzed would implement the preferred management strategy contained in the PSEIS. This document contains an analysis of the effects of the alternative harvest strategies on target groundfish species, non-target species, prohibited species, marine mammals, seabirds, habitat, ecosystem relationships, and social and economic concerns. The analysis is based on the latest information at that time regarding the status of each of these environmental components and provides the most recent consideration of reasonably foreseeable future actions to consider in the cumulative effects analysis of other NEPA documents. This EIS provides the latest overall analysis of the impacts of the groundfish fisheries on the environment and provides a substantial amount of reference material for this EA/RIR. The final EIS may be found on the NMFS Alaska Region website at http://www.alaskafisheries.noaa.gov/analyses/specs/eis/default.htm.

Essential Fish Habitat EIS

In 2005, NMFS and the Council completed the EIS for Essential Fish Habitat Identification and Conservation in Alaska (EFH EIS) (NMFS 2005). The EFH EIS provided a thorough analysis of alternatives and environmental consequences for amending the Council's FMPs to include EFH information pursuant to section 303(a)(7) of the Magnuson-Stevens Act and 50 CFR 600.815(a). Specifically, the EFH EIS examined three actions: (1) describing and identifying EFH for Council managed fisheries, (2) adopting an approach to identify habitat areas of particular concern (HAPC) within EFH, and (3) minimizing to the extent practicable the adverse effects of fishing on EFH. The Council's preferred alternatives from the EFH EIS are implemented through Amendments 78/65 to the BSAI groundfish FMP. A Record of Decision was issued on August 8, 2005. NMFS approved the amendments on May 3, 2006. Regulations implementing the EFH/HAPC protection measures were effective July 28, 2006 (71 FR 36694, June 28, 2006). The final EIS may be found on the NMFS Alaska Region website at http://alaskafisheries.noaa.gov/habitat/seis/efheis.htm.

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

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

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

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

Because the proposed action analyzed in this EA may change fishing locations, the information in the EFH EIS may be used to identify potential impacts to EFH and bottom habitat. Information specific to gear types and locations can be used to characterize potential impacts. Extensive habitat area closures currently exist in the Aleutian Islands (50 CFR 679.22). The EFH EIS contains recent information on fishing effects on habitat and may be referenced to describe the potential impacts on habitat by the proposed action analyzed in this EA.

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

Harvest specifications for the Alaska groundfish fisheries for 2006 and 2007 were analyzed in an EA to determine significance of the potential effects of alternative harvest strategies (NMFS 2006b). This EA/FRFA provided recent, applicable methods of determining significance of effects of groundfish fisheries on environmental components. These significance criteria will be incorporated in whole or in part in this EA to provide the basis for the significance conclusions for each environmental component, where appropriate.

2008 Revised Recovery Plan for the Steller Sea Lion (*Eumetopias jubatus*)

Section 4(f) of the ESA directs the responsible agency to develop and implement a recovery plan, unless such a plan will not promote the conservation of a species. NMFS determined that a recovery plan would promote the conservation of the eastern DPS and WDPS of Steller sea lions. NMFS released the Revised Recovery Plan in 2008 (NMFS 2008). The Revised Recovery Plan contains a description of the eastern DPS and WDPS of Steller sea lions, including population status and trends, habitat, vital rates, feeding ecology, conservation measures, factors influencing the populations, threats, and the recovery criteria needed to remove the DPSs from the ESA list. Information in the Revised Recovery Plan informed the 2010 draft FMP biop, particularly the aspect of recovery. Information in the Revised Recovery Plan will be incorporated by reference in this EA in the section on Steller sea lions (chapter 5) and in the description of the alternatives (chapter 2).

2010 Biological Opinion on the Effects of the Alaska Groundfish Fisheries on ESA-listed Species

The FMP biop details the groundfish fisheries management, status of the eastern DPS and WDPS of Steller sea lions and their designated critical habitat, human and natural effects on Steller sea lions and their habitat, response of Steller sea lions and their habitat to the environmental baseline and to human effects, and non-federal cumulative impacts (NMFS 2010). The incidental take statement describes the amount of take of Steller sea lions expected by the action and the amount of take of Steller sea lions that would require reinitiation of Section 7 formal consultation.

Because the FMP biop determined that the groundfish fisheries are likely to result in JAM for the WDPS of Steller sea lions and their designated critical habitat, an RPA is included, which must be implemented to avoid JAM for Steller sea lions. The criteria supporting the RPA are the basis for the alternatives in this EA/RIR. This EA/RIR also references much of the Steller sea lion biological and status information and fisheries effects descriptions provided in the FMP biop. These sections of the FMP biop are the best available scientific information regarding Steller sea lions, their critical habitat, and fisheries interactions. This information is incorporated by reference as appropriate throughout the EA/RIR.

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1.8 Preparers and Persons Consulted

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2.0 ALTERNATIVES

This analysis is focused on alternative management measures that control the location, gear type, and timing of fishing for Atka mackerel and Pacific cod in the Aleutian Islands. This chapter provides a detailed description of the following four alternatives:

Alternative 1: Status Quo (No Action)
Alternative 2: Enhanced Conservation Approach
Alternative 3: July 2010 Draft RPA Specific Approach
Alternative 4: Preferred Alternative – Final RPA

2.1 Description of Alternatives

2.1.1 Alternative 1: Status quo

Under this alternative, no changes would be made to current groundfish fisheries management in the Aleutian Islands. The following sections describe the management measures for those portions of the groundfish fisheries that are proposed to be changed by this action (primarily the Atka mackerel and Pacific cod fisheries in the Aleutian Islands). A recent, detailed description of the entire Alaska groundfish fisheries management program is in the biological opinion on the Alaska groundfish fisheries (FMP biop) (NMFS 2010a) and is incorporated by reference. Management measures that extend into State of Alaska (State) waters from 0–3 nautical miles (nm) apply to federally permitted vessels. For the groundfish fisheries, federally permitted vessels are vessels named on a federal fisheries permit (50 CFR 679.2).

2.1.1.1 General Aleutian Islands Groundfish Fisheries Management

The current Steller sea lion protection measures apply to the pollock, Atka mackerel, and Pacific cod fisheries in the Aleutian Islands subarea. The details of the Steller sea lion protection measures in the Aleutian Islands are in the environmental impact statement (EIS) for that action (NMFS 2001) and are incorporated here by reference. A summary of the management measures and changes to fisheries management since 2003 are further described below. The protection measures are intended to spatially, temporally, and globally disperse fishing to mitigate potential competition for prey resources between the Pacific cod, pollock, and Atka mackerel fisheries and Steller sea lions. Groundfish fishery closures from 0 nm to 3 nm around rookeries are the only protection measures that apply to the entire suite of groundfish fisheries (Figure 2-1). These closures prevent disturbance and potential competition for prey in the near shore area, where young and reproductive female Steller sea lions may forage.

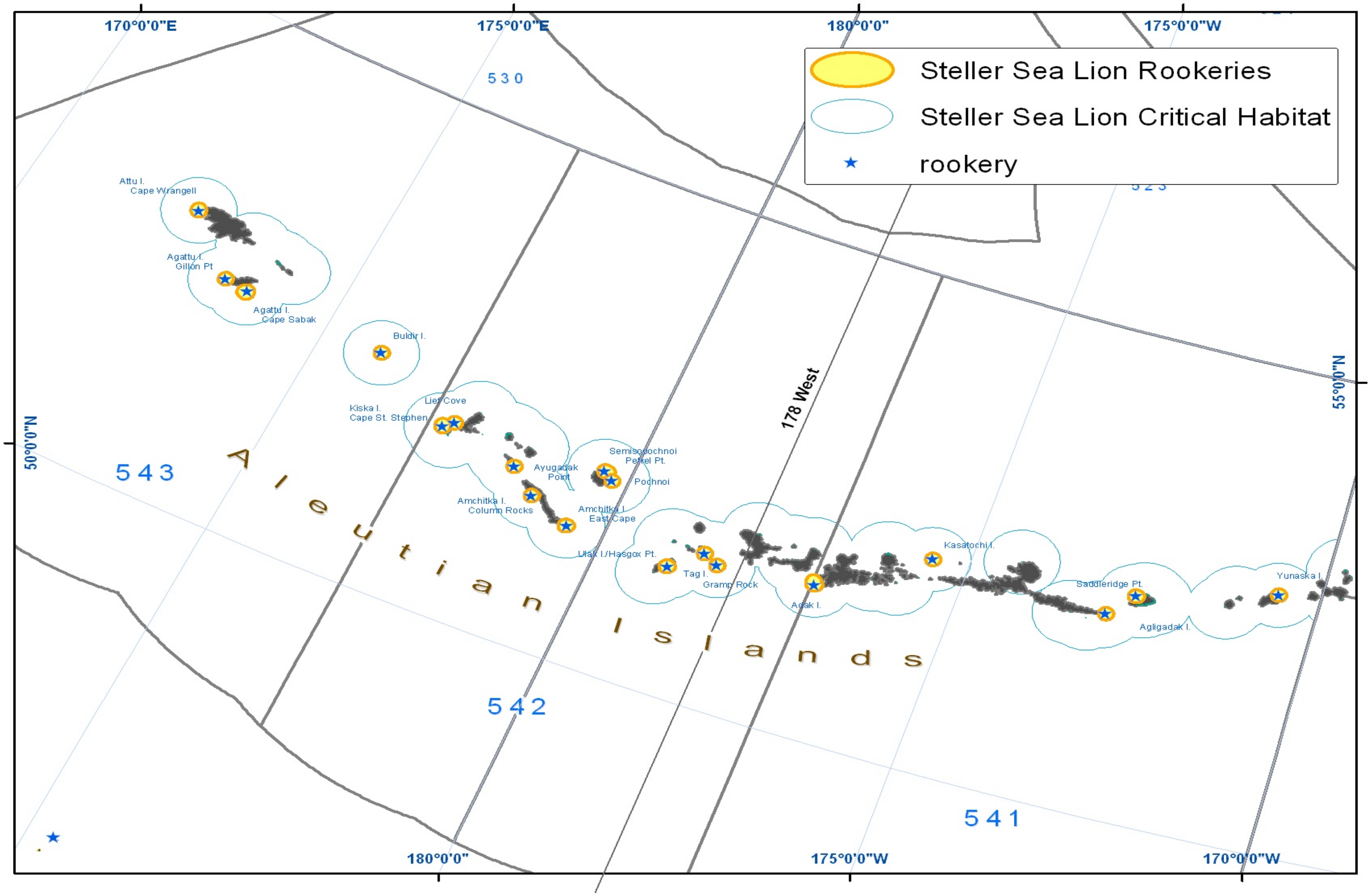

Figure 2-1 **Aleutian Islands rookeries with 3-nm groundfish fishing closures. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

Because directed pollock fishing in the Aleutian Islands is currently prohibited in critical habitat and little of the Aleutian Islands pollock total allowable catch (TAC) is harvested, management of this fishery does not need to be changed to provide additional protection to Steller sea lions (NMFS 2010a). The description of the status quo and the action analyzed in this environmental assessment/regulatory impact review (EA/RIR) focuses on the Pacific cod and Atka mackerel fisheries—the target fisheries that are included in the reasonable and prudent alternative (RPA).

The pollock, Pacific cod, and Atka mackerel harvest is limited globally by prohibiting directed fishing if the projected spawning biomass of the fish stock falls below 20 percent of the unfished spawning biomass (50 CFR 679.20(d)(4)). None of these fisheries have experienced this type of directed fishing closure since this regulation became effective in 2003 (68 FR 204, January 2, 2003). The spatial and temporal dispersal of the Atka mackerel and Pacific cod fisheries is dependent on the target species, location, and gear type. Management measures affecting the spatial and temporal dispersal of the Atka mackerel and Pacific cod fisheries in the Aleutian Islands are explained in the following sections.

2.1.1.2 Amendment 80 Fisheries

The Amendment 80 Program allocates several Bering Sea and Aleutian Islands Management Area (BSAI) non-pollock trawl groundfish species (including Atka mackerel and Pacific cod) among trawl fishery sectors and facilitates the formation of harvesting cooperatives in the non-American Fisheries Act (AFA) trawl catcher/processor sector (72 FR 52668, September 14, 2007 and corrected 72 FR 61214, October 29, 2007). The Program allocates fishery resources among BSAI trawl harvesters in consideration of historical and present harvest patterns and future harvest needs, establishes a limited access privilege program (LAPP) for the non-AFA trawl catcher/processors, authorizes the allocation of groundfish species to harvesting cooperatives to encourage fishing practices with lower discard rates and to improve the opportunity for increasing the value of harvested species while lowering costs; and limits the ability of non-AFA trawl catcher/processors to expand their harvesting capacity into other fisheries not managed under a LAPP.

Each year, the program allocates an amount of Amendment 80 species available for harvest, called the initial total allowable catch (ITAC), and crab and halibut prohibited species catch allowances (PSC) to two defined groups of trawl fishery participants: (1) the Amendment 80 sector, and (2) the BSAI trawl limited access sector. The ITAC is the amount of the TAC remaining after allocations to the Western Alaska Community Development Quota Program (CDQ). The BSAI trawl limited access sector comprises all trawl participants who are not part of the Amendment 80 sector (i.e., AFA trawl catcher/processors, AFA trawl catcher vessels, and non-AFA trawl catcher/vessels). Allocations made to one sector are not subject to harvest by participants in the other fishery sector except under a specific condition: fish that are allocated to the BSAI trawl limited access sector and projected to be unharvested can be reallocated to Amendment 80 cooperatives by National Marine Fisheries Service (NMFS) throughout the year to ensure a more complete harvest of the TAC.

The amount of ITAC assigned to the Amendment 80 and the BSAI trawl limited access sectors was based on a review of historic catch patterns from 1998 through 2004, with consideration given to various socioeconomic factors. One exception to this rule applies to Pacific cod. Pacific cod ITAC is allocated to the Amendment 80 sector under the criteria that the North Pacific Fishery Management Council (Council) adopted for Amendment 85 in April 2006. NMFS published a final rule implementing Amendment 85 in September 2007 (72 FR 50788), and Amendment 85 and Amendment 80 were fully implemented in 2008. The rationale for Pacific cod allocation to the Amendment 80 sector is described under the analysis prepared for Amendment 85 (NPFMC 2007) and is not repeated here.

Annually, NMFS determines the division of the Amendment 80 sector's ITAC within the sector, based on quota share (QS) holdings of sector members. NMFS could issue QS for up to 28 permits for the originally qualifying vessels. Depending on a QS holder's choice, the portion of the TAC associated with that person's QS is assigned to either a cooperative or a limited access fishery. A vessel owner may choose to assign a vessel to either a cooperative or the limited access fishery, but owners of multiple vessels may choose to assign each vessel independently to a cooperative or to the limited access fishery depending on the perceived benefits of those choices for each specific vessel. In general, if a person who holds one percent of the Amendment 80 QS for a given species assigns that QS to a cooperative, one percent of that species TAC would be assigned to that cooperative for that year. Crab and halibut PSC limits in the BSAI are apportioned to the Amendment 80 and BSAI trawl limited access sectors and within the Amendment 80 sector in a similar manner. The PSC limits assigned to the Amendment 80 sector are lowered in a stepwise fashion over a period of years to provide additional reductions in PSC use over time.[1]

2.1.1.3 Aleutian Islands Atka Mackerel Harvest Limit Area and Seasons

Atka mackerel is harvested in the Aleutian Islands with nonpelagic trawl gear. The harvest of Atka mackerel is evenly divided between an A season (January 20 through April 15) and a B season (September 1 through November 1). These seasonal apportionments are applied for the TACs in Area 543, Area 542, and in the combined Area 541/Bering Sea. Directed fishing for Atka mackerel with trawl gear in critical habitat is prohibited in Area 541 and the eastern portion of Area 542 (Figure 2-2). In Area 543 and the western portion of Area 542, Atka mackerel trawling may occur in critical habitat under the Harvest Limit Area (HLA) platoon system, which is intended to distribute and disperse fishing effort and was implemented by final rule in 2003 (68 FR 204, January 2, 2003).

[1] See Tables 35 and 36 to 50 CFR 679 at alaskafisheries.noaa.gov/regs/default.htm

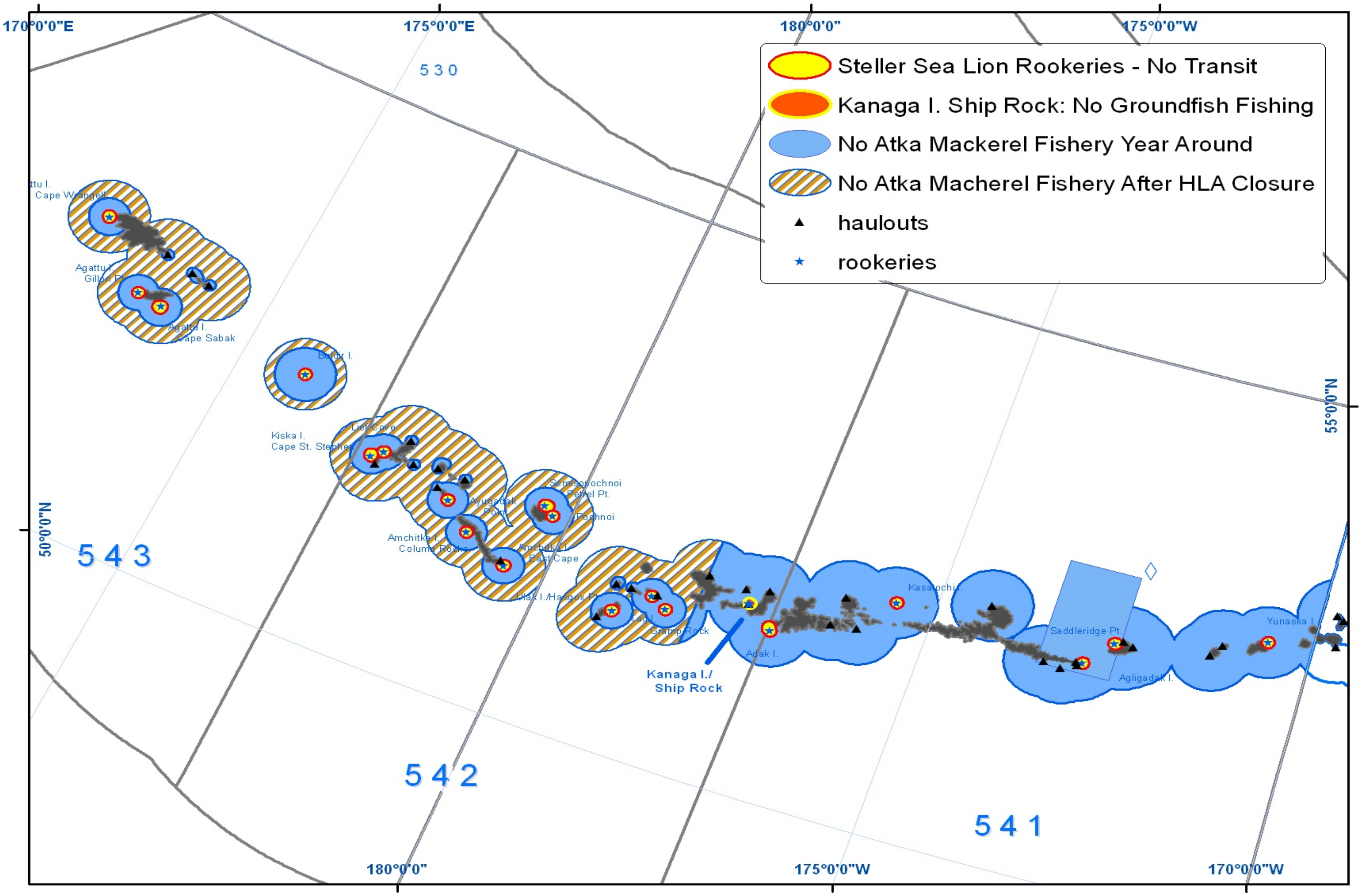

Figure 2-2 **Alternative 1 Aleutian Islands Atka mackerel trawl closures. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

The HLA is 20-nm areas around Steller sea lion rookeries and haulouts in Area 543 and the western portion of Area 542 (Figure 2-3). The HLA includes critical habitat and additional 20-nm areas around haulouts that were identified in the 2001 biological opinion (NMFS 2001). The amount of Atka mackerel harvest in the HLA is limited to no more than 60 percent of the seasonal apportionment. The harvest of Atka mackerel in the HLA is further dispersed by dividing the Atka mackerel fleet into platoons that are limited to fishing in one area (either 543 or 542) at a time. Vessels in a platoon fish in their assigned area for the estimated number of days for the vessels to take the available TAC and then switch to the other HLA area. Because Pacific cod trawling is prohibited in the HLA when the HLA is open to Atka mackerel trawling, the HLA fishery is limited to 14 days. Since the implementation of Amendment 80, the fleet has demonstrated an ability to modify their fishing patterns to reduce catch rates. The ability to tailor fishing operations to the specific allocation of quota allows vessel operators to avoid the concentration of harvests that may occur under a race for fish. The HLA fishery, however, requires Atka mackerel to be harvested during discrete time period. HLA management may result in a greater concentration of Atka mackerel harvest than would be likely under cooperative management without the HLA.

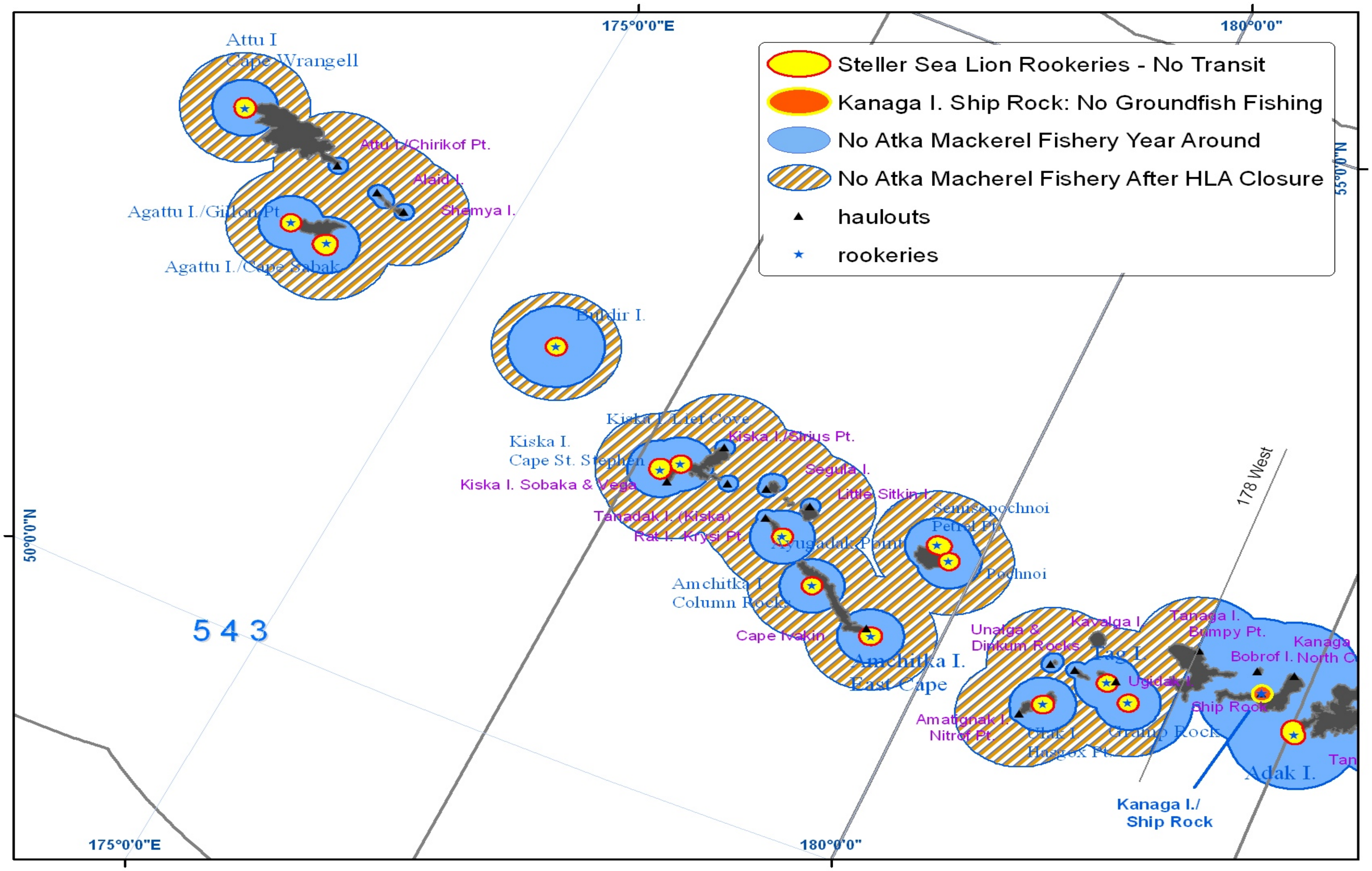

Figure 2-3 **Harvest Limit Area for Atka mackerel trawling in Area 543 and western portion of Area 542. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

2.1.1.4 Pacific Cod Fisheries Management

Pacific cod is harvested in the Aleutian Islands subarea by nontrawl gears. The nontrawl gears are jig, pot, and hook-and-line. The Steller sea lion protection measures implemented seasonal apportionments for the BSAI Pacific cod fishery specific to gear types. The seasonal apportionments and gear allocations are annually established in the harvest specifications, as shown in Table 2-1 for 2010 (75 FR 11778, March 12, 2010). The allocations and seasonal apportionments are BSAI-wide.

Table 2-1 Final 2010 gear shares and seasonal allowances of the BSAI Pacific cod TAC. (75 FR 11778, March 12, 2010)

[Amounts are in metric tons]

Gear sector	Percent	2010 share of gear sector total	2010 share of sector total	2010 seasonal apportionment	
				Dates	Amount
Total TAC	100	168,780	n/a	n/a	n/a
CDQ	10.7	18,059	n/a	see § 679.20(a)(7)(i)(B)	n/a
Total hook-and-line/pot gear	60.8	91,638	n/a	n/a	n/a
Hook-and-line/pot ICA[1]	n/a	500	n/a	see § 679.20(a)(7)(ii)(B)	n/a
Hook-and-line/pot sub-total	n/a	91,138	n/a	n/a	n/a
Hook-and-line catcher/processor	48.7	n/a	73,000	Jan 1–Jun 10	37,230
				Jun 10–Dec 31	35,770
Hook-and-line catcher vessel ≥ 60 ft length overall (LOA)	0.2	n/a	300	Jan 1–Jun 10	153
				Jun 10–Dec 31	147
Pot catcher/processor	1.5	n/a	2,248	Jan 1–Jun 10	1,147
				Sept 1–Dec 31	1,102
Pot catcher vessel ≥ 60 ft LOA	8.4	n/a	12,591	Jan 1–Jun 10	6,422
				Sept 1–Dec 31	6,170
Catcher vessel < 60 ft LOA using hook-and-line or pot gear	2	n/a	2,998	n/a	n/a
Trawl catcher vessel	22.1	33,309	n/a	Jan 20–Apr 1	24,649
				Apr 1–Jun 10	3,664
				Jun 10–Nov 1	4,996
AFA trawl catcher/processor	2.3	3,467	n/a	Jan 20–Apr 1	2,600
				Apr 1– Jun 10	867
				Jun 10–Nov 1	0
Amendment 80	13.4	20,197	n/a	Jan 20–Apr 1	15,147
				Apr 1– Jun 10	5,049
				Jun 10–Nov 1	0
Amendment 80 limited access	n/a	n/a	3,319	Jan 20–Apr 1	2,489
				Apr 1– Jun 10	830
				Jun 10–Nov 1	0
Amendment 80 cooperatives	n/a	n/a	16,878	Jan 20–Apr 1	12,658
				Apr 1– Jun 10	4,219
				Jun 10–Nov 1	0
Jig	1.4	2,110	n/a	Jan 1–Apr 30	1,266
				Apr 30–Aug 31	422
				Aug 31–Dec 31	422

[1] The incidental catch allowance (ICA) for the hook-and-line and pot sectors will be deducted from the aggregate portion of Pacific cod TAC allocated to the hook-and-line and pot sectors. The Regional Administrator approved an ICA of 500 mt for 2010 based on anticipated incidental catch in these fisheries.

The Aleutian Islands Pacific cod fishery is spatially dispersed by the Steller sea lion protection measures by closing habitat areas depending on the gear type used to harvest the Pacific cod, whether or not the HLA Atka mackerel fishery is open, and the location. Figure 2-4 and Figure 2-5 show the trawl and nontrawl closures for Pacific cod in the Aleutian Islands subarea. Most of the nontrawl Pacific cod fishing in the Aleutian Islands is with pot and hook-and-line gear. There was increased effort from jig gear in the Aleutian Islands in 2008, but most of the jig effort in the BSAI is in Area 519 of the Bering Sea. In 2009, and to date in 2010, most of the jig effort is in the Gulf of Alaska State waters guideline harvest level fisheries (Mary Furuness, NMFS Inseason Management, July 10, 2010).

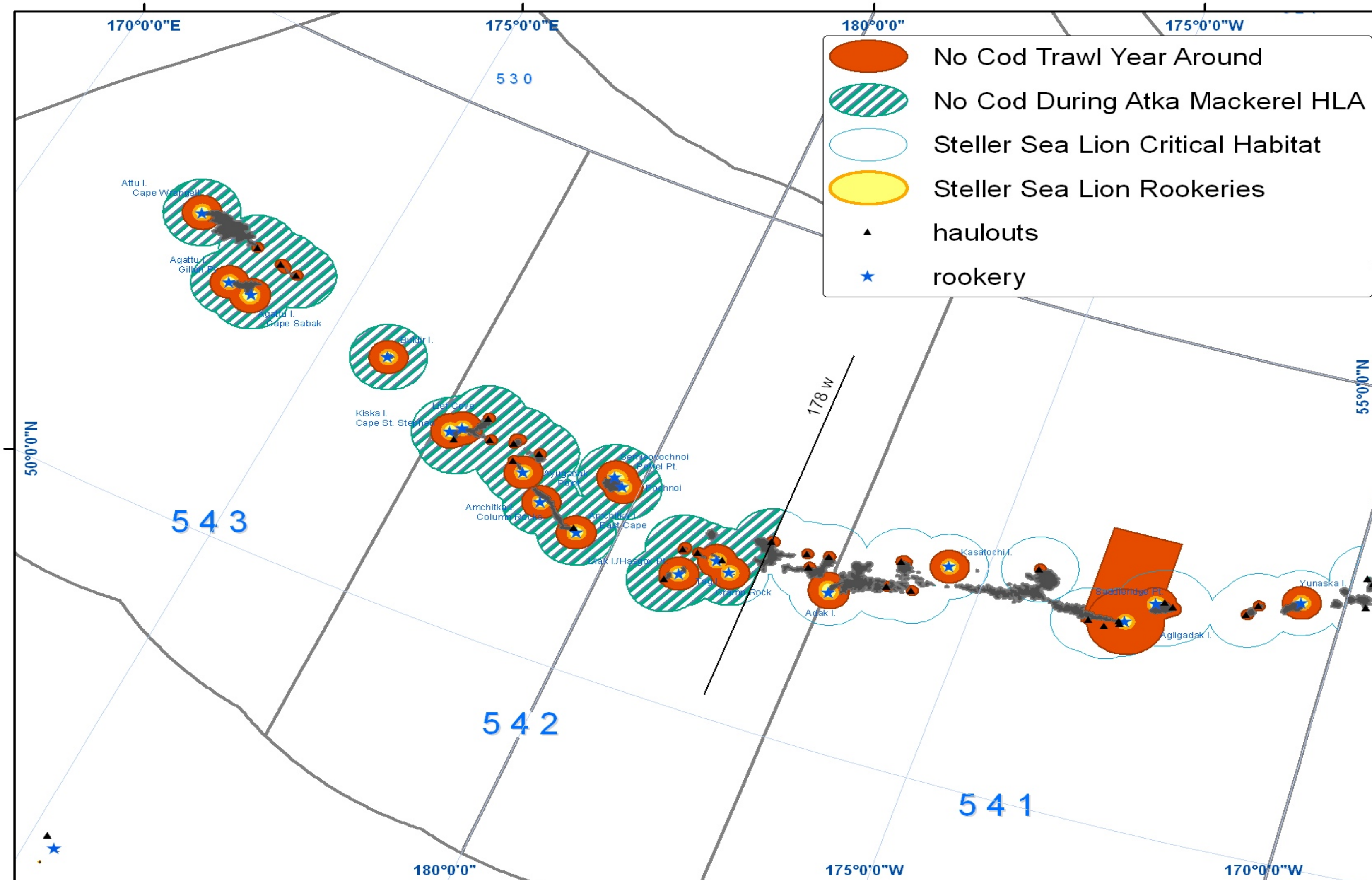

Figure 2-4 **Aleutian Islands Pacific cod trawl closures. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

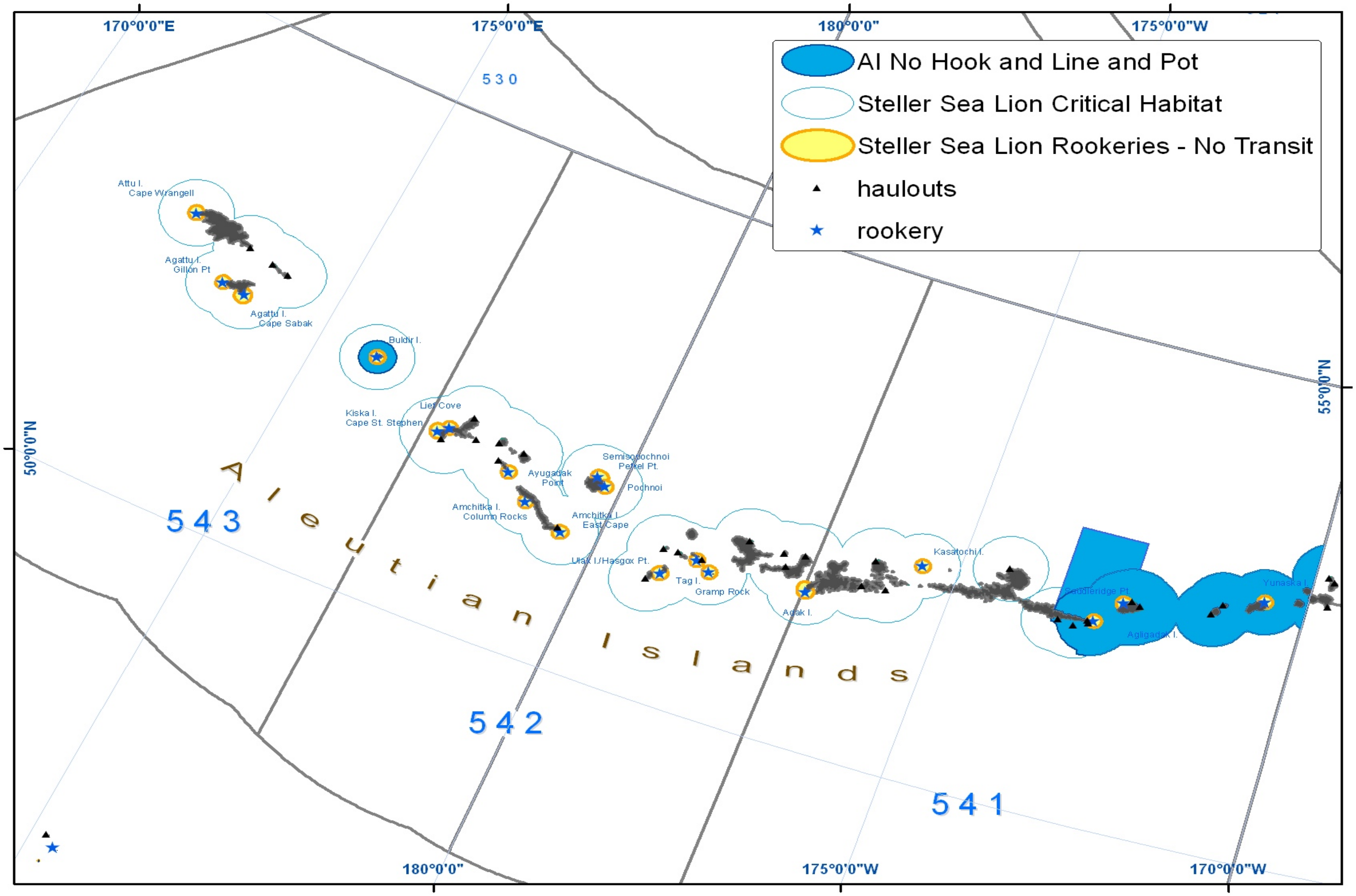

Figure 2-5 Aleutian Islands Pacific cod nontrawl closures. (Steve Lewis, NMFS Alaska Region, Analytical Team)

2.1.1.5 Aleutian Islands Habitat Protection and Conservation Areas

A large portion of the Aleutian Islands subarea is closed to nonpelagic trawling. Nonpelagic trawl gear is used for harvesting Atka mackerel and Pacific cod. The closures to nonpelagic trawling include the Aleutian Islands Habitat Conservation Area (AIHCA), which is nearly the entire Aleutian Islands subarea; the Aleutian Islands Coral Habitat Protection Areas and the Bowers Ridge Habitat Conservation Zone, located in the northern portion of Area 542 and 543 (Figure 2-6 and available at: http://www.alaskafisheries.noaa.gov/habitat/efh/aihca.pdf). These closures areas were implemented on July 28, 2006 (71 FR 36694, June 28, 2006) and revised March 20, 2008 (73 FR 9035, February 19, 2008). The AIHCA closed most of the Aleutian Islands subarea to nonpelagic trawling (279,114 nm^2), while most fishing areas that have been trawled repeatedly in the past remain open. The Bowers Ridge Habitat Conservation Zone is closed to mobile bottom contact gear, including nonpelagic trawling. The Aleutian Islands Coral Habitat Protection Areas are relatively small, discrete areas closed to bottom contact gear. Even though an area may be open to nonpelagic trawling, the area may be closed to Atka mackerel or Pacific cod trawling based on Steller sea lion protection measures, leaving discrete locations throughout the Aleutian Islands subarea that are open to nonpelagic trawl fishing, as shown on Figure 2-6.

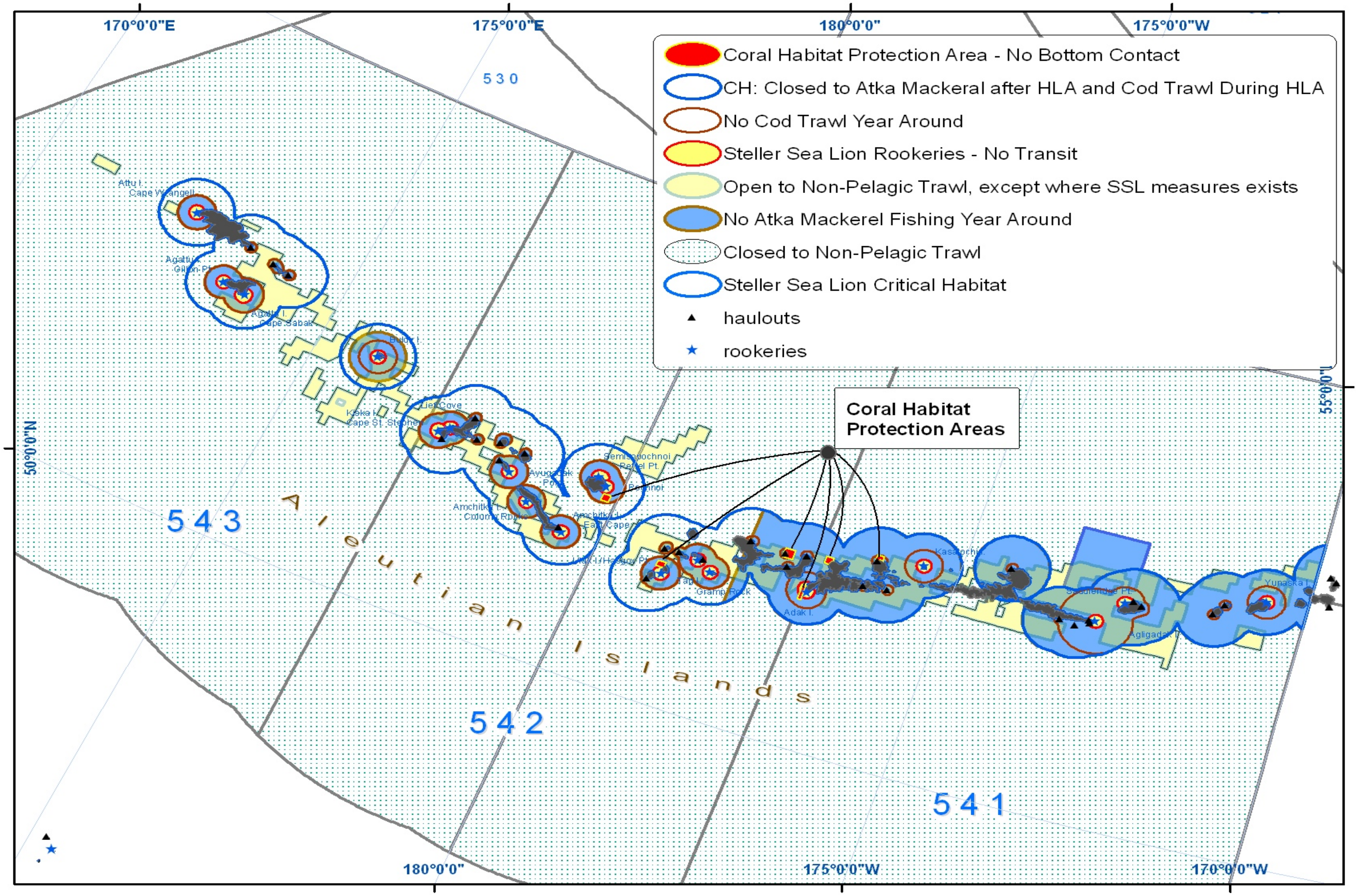

Figure 2-6 **Aleutian Islands Habitat Conservation Area and Aleutian Island Coral Habitat Protection Areas in relation to Steller sea lion critical habitat closures. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

2.1.2 Alternative 2: Enhanced Conservation Approach

This alternative would use management measures for the Aleutian Islands Atka mackerel and Pacific cod fisheries to remove most of the potential adverse effects on Steller sea lions and their critical habitat and insure the groundfish fisheries are not likely to result in jeopardy of extinction or adverse modification or destruction of designated critical habitat. Alternative 2 would provide protection measures for Steller sea lions and their critical habitat no less stringent than currently implemented and provide additional measures at least as protective as the RPA in the FMP biop (NMFS 2010a). The protection is greater in the areas where population growth has been the most negative (Areas 543 and 542 compared to Area 541). The enhanced conservation approach would facilitate NMFS's implementation by simplifying the area closures and seasonal management measures in Area 542 and 541 compared to critical habitat zone specific measures described in Alternative 3. Except for the changes described below, the current Steller sea lion protection measures (e.g., Pacific cod trawl season dates, no Atka mackerel directed fishing in critical habitat in Area 541) would remain unchanged.

Alternative 2 would—

<u>In Areas 542 and 543</u>:

- Prohibit retention of Atka mackerel and Pacific cod by federally permitted vessels, including those operating in State waters 0–3 nm.
- Establish TACs for Atka mackerel sufficient to support incidental discarded catch that may occur in other targeted groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA (Area 543 and western portion of Area 542) (Figure 2-3).
- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

<u>In Area 541 and the Bering Sea</u>:

- Close critical habitat in Area 541 to directed fishing for Pacific cod by federally permitted vessels.
- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.
- Prohibit Pacific cod directed fishing in Area 541 November 1 through December 31. (This extends the current trawl season restriction to the nontrawl fishery.)

Under this alternative, the TAC for Atka mackerel in Areas 543 and 542 would be set at a level sufficient to support incidental catch in other directed groundfish fisheries (e.g., Pacific ocean perch). Pacific cod in Areas 543 and 542 would be closed to directed fishing and placed on prohibited species status. Currently, Pacific cod is managed under a single TAC for the BSAI; therefore, no area specific TAC to support incidental catch can be specified. Any retention of Atka mackerel or Pacific cod would be prohibited to remove any incentive to retain these species by operators of vessels targeting other groundfish species. Because no directed fishery for Atka mackerel would be allowed in Areas 543 and 542, the platoon management system and HLA would be removed from the regulations. Unless otherwise restricted by the State, vessels not federally permitted may participate in the State-managed guideline harvest level (GHL) Pacific cod fisheries within waters 0–3 nm of areas closed to directed fishing for Pacific cod by federally permitted vessels. Federally permitted vessels in the State-managed (GHL) fisheries would be exempt from the Atka mackerel and Pacific cod closures under this alternative and would continue to comply with the 2003 Steller sea lion protection measures implemented under State regulations at 5 AAC 28.647.

Table 2-2 Incidental catch of Atka mackerel in other groundfish fisheries. (NMFS Catch Accounting System, July 12, 2010)

542/543 Atka Mackerel Catch by Target Fishery

Year	Atka mackerel harvest in Atka mackerel target fishery (mt)	% of total Atka mackerel harvest	Atka mackerel harvest in Pacific cod target fishery (mt)	% of total Atka mackerel harvest	Atka mackerel harvest in Pacific Ocean Perch fishery (mt)	% of Total Atka mackerel Harvest
2003	42,683	83.6%	497	5.2%	139	1.7%
2004	49,406	83.0%	138	1.4%	179	2.5%
2005	54,610	85.7%	134	2.1%	68	1.3%
2006	54,318	86.5%	123	1.7%	32	0.5%
2007	35,513	83.2%	216	2.4%	91	0.8%
2008	37,430	83.1%	109	1.0%	1,431	12.6%
2009	43,926	83.5%	441	3.3%	2,022	19.8%

Other targets combined account for less than 1 mt of Atka Mackerel in all years

542 Atka Mackerel catch by Target

Year	Atka mackerel harvest in Atka mackerel target fishery (mt)	% of total Atka mackerel harvest	Atka mackerel harvest in Pacific cod target fishery (mt)	% of total Atka mackerel harvest	Atka mackerel harvest in Pacific Ocean Perch fishery (mt)	% of Total Atka mackerel Harvest
2003	25,197	86.1%	206	3.0%	32	1.3%
2004	29,892	83.5%	135	2.3%	143	4.9%
2005	34,928	89.6%	84	2.9%	58	2.8%
2006	39,715	88.2%	114	4.2%	6	0.3%
2007	26,625	84.3%	78	2.1%	20	0.5%
2008	22,041	84.1%	92	2.5%	337	8.2%
2009	29,430	84.2%	64	1.4%	576	17.1%

Other targets combined account for less than 1 mt of Atka Mackerel in all years

543 Atka Mackerel catch by Target

	Atka Mackerel Target		Pacific Cod Target		Pacific Ocean Perch Target	
Year	Atka mackerel harvest in Atka mackerel target fishery (mt)	% of total Atka mackerel harvest	Atka mackerel harvest in Pacific cod target fishery (mt)	% of total Atka mackerel harvest	Atka mackerel harvest in Pacific Ocean Perch fishery (mt)	% of Total Atka mackerel Harvest
2003	17,486	80.2%	291	10.5%	107	1.9%
2004	19,514	82.3%	4	0.1%	36	0.8%
2005	19,682	79.5%	51	1.4%	11	0.3%
2006	14,603	81.9%	9	0.2%	26	0.6%
2007	8,888	80.3%	138	2.6%	71	0.9%
2008	15,389	81.7%	17	0.2%	1,094	15.0%
2009	14,496	82.1%	377	4.3%	1,445	21.1%

Other targets combined account for less than 1 mt of Atka Mackerel in all years

Critical habitat sites for purposes of fisheries management measures include sites designated as critical habitat under the ESA (50 CFR 226.202) and sites identified as important for Steller sea lion use based on the FMP biop (Table 3.31 in NMFS 2010a). Steller sea lion use of Alaska terrestrial sites has changed since designation of critical habitat over 10 years ago (Figure 2-7). In the 2003 Steller sea lion protection measures (68 FR 204, January 2, 2003), all rookeries were protected 0–3 nm from directed fishing for groundfish. This protection was applied regardless of whether the rookery was designated as critical habitat under 50 CFR 226.202. Kanaga Island/Ship Rock was used as a haulout at the time the 2003 protection measures were implemented and presently does not have a 3-nm groundfish fishing closure. Based on new information in the 2010 FMP biop, this site meets the criteria to be a Steller sea lion rookery (Table 3.31 in NMFS 2010a). To ensure all sites currently used as rookeries are provided the same level of protection from the potential effects of groundfish fishing, Alternative 2 would include a 0–3-nm directed groundfish fishing closure around Kanaga Island/Ship Rock (Figure 2-8). This closure would ensure this new rookery is protected from disturbance and potential competition for prey in waters 0–3 nm around this site. Sites on Figure 2-7 that have changed from rookeries to haulouts will continue to have 3-nm groundfish closures because these sites already have 3-nm no transit closures under 50 CFR 223.202, ESA regulations for critical habitat restrictions. Therefore, groundfish fishing cannot take place in these areas regardless of the 50 CFR 679.22 closures, which are under the authority of the Magnuson-Stevens Act. Even with the groundfish fishing closures under Alternative 2, federally permitted vessels will continue to be able to transit waters 0–3 nm from Kanaga Island/Ship Rock.

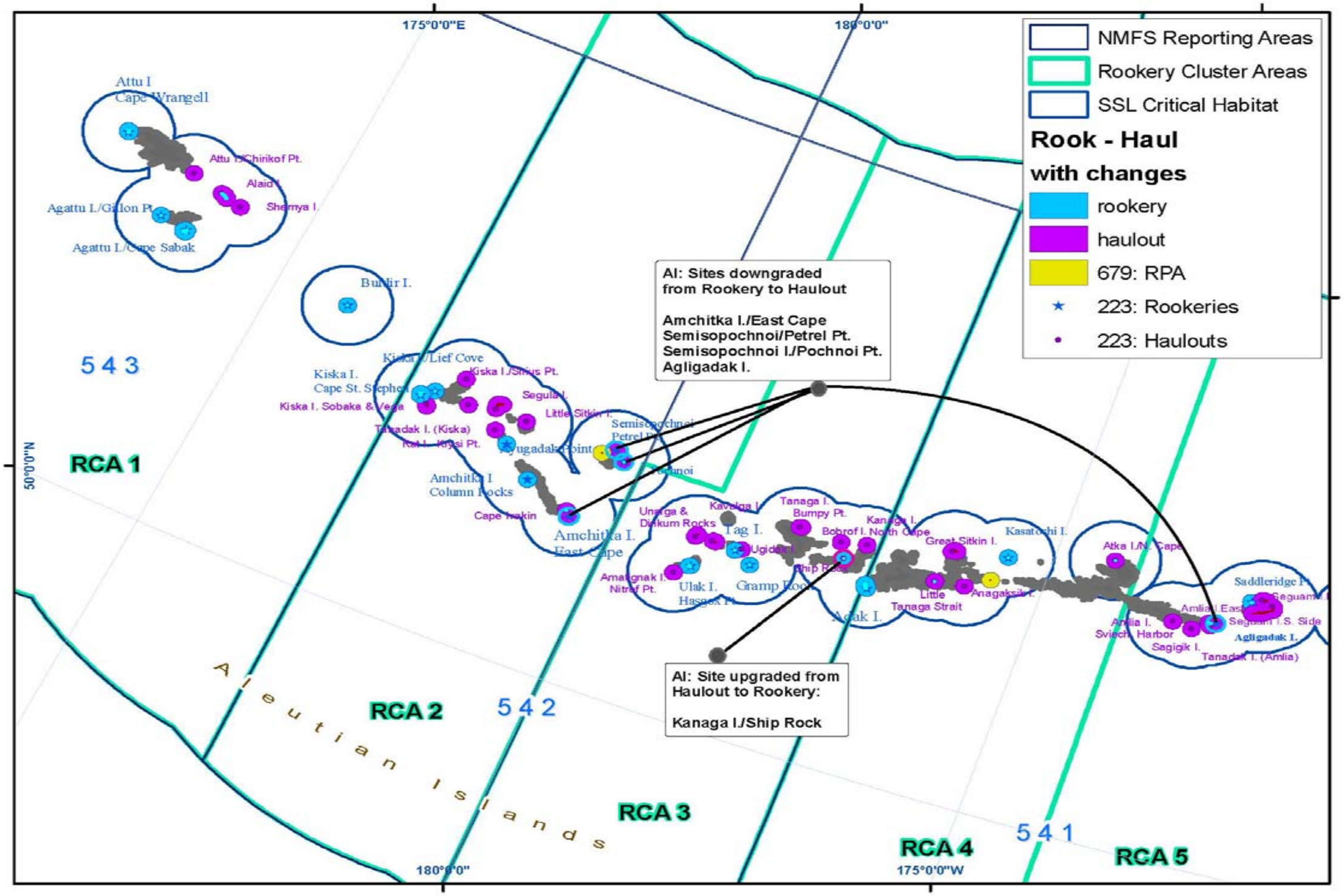

Figure 2-7 Changes in the use of Steller sea lion rookeries and haulouts in the Aleutian Islands. (Steve Lewis, NMFS Alaska Region, Analytical Team)

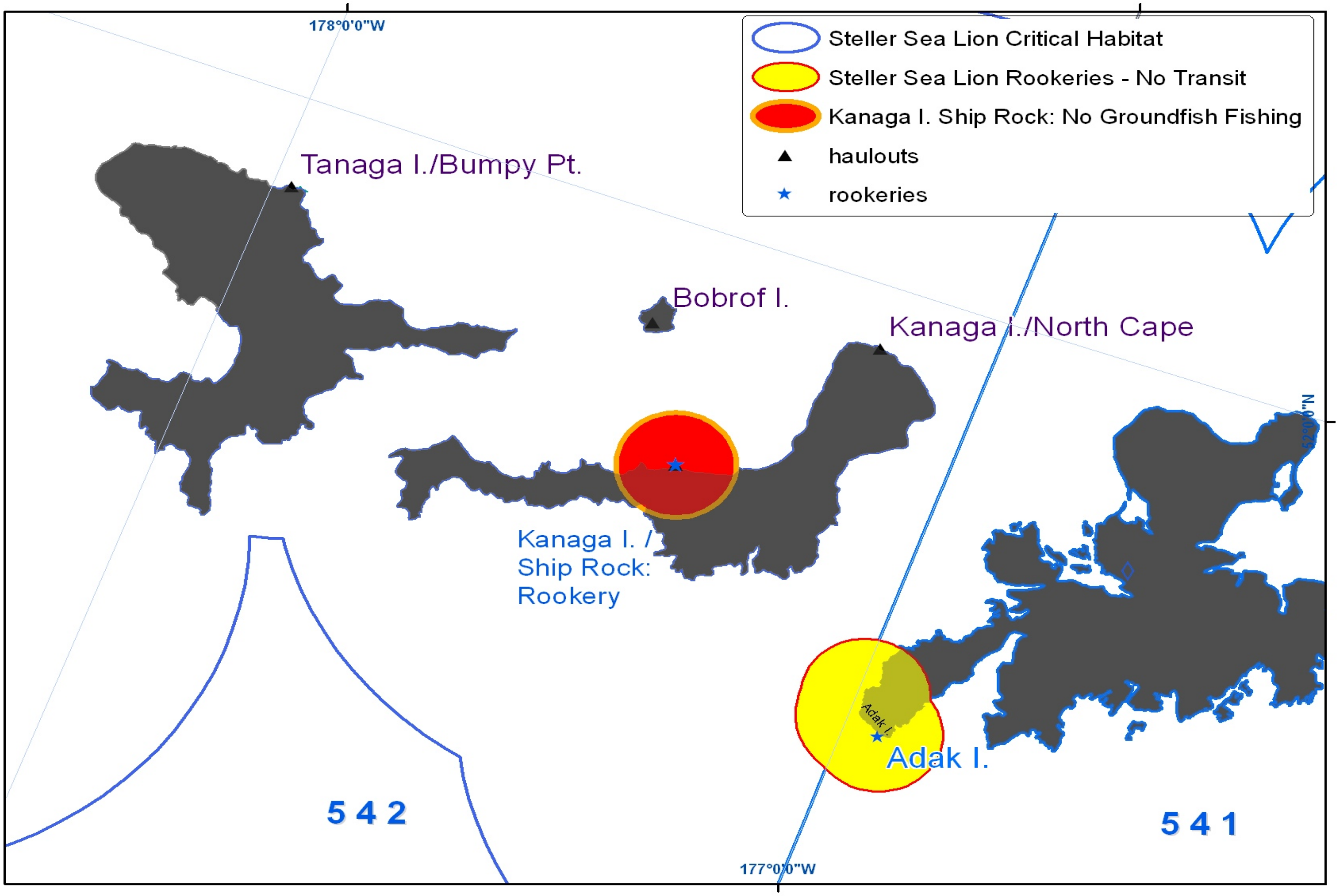

Figure 2-8 **Steller sea lion new rookery at Kanaga Island/Ship Rock. Note the proposed 3-nm groundfish directed fishery closure. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

All gear types are treated the same under Alternative 2. The protection measures are intended to protect overall available biomass, prevent the potential for localized depletion, and prevent disturbance of Steller sea lions by all types of vessels that may harvest Atka mackerel or Pacific cod. Even though a gear type may harvest at a slower rate, the presence of the vessel may cause disturbance, and the vessel would be removing prey species. The Atka mackerel closures would apply to trawl and jig gears. Jig fishing for Atka mackerel primarily occurs in the Bering Sea, and extending the closures to jig gear would prevent an increase in jig harvesting in Areas 542 and 543. Prohibiting Pacific cod directed fishing and retention also applies to all gear types to meet the Alternative 2 objective to remove most of the potential adverse effects on Steller sea lions in Areas 542 and 543 and insure the action is not likely to result in jeopardy of extinction or adverse modification or destruction of designated critical habitat. This level of protection is indicated based on the severity of decline and the limited prey availability in Areas 542 and 543 (chapter 8 in NMFS 2010a). Even though the gear types harvest with different methods, the levels of hook-and-line or pot fishing harvests can be similar to trawl fishing (based on information from the NMFS Catch Accounting System). These prohibitions would remove effects and prevent future expansion of Pacific cod fishing into Areas 542 and 543, regardless of gear types.

Alternative 2 would extend the Atka mackerel fishing season in Area 541 and in the Bering Sea. Seasonal dates for Atka mackerel in Area 541 also are applied to the Bering Sea because the TAC is allocated as a combined Area 541/Bering Sea for this area (75 FR 11778, March 12, 2010). Extending the Atka mackerel season would allow for harvest to be dispersed over time and allow the Amendment 80 cooperatives to make full use of their management system to efficiently harvest Atka mackerel. This dispersal of harvests over time would be more protective of the Atka mackerel prey field for Steller sea lions. In addition, the Pacific cod nontrawl fishery would be ended November 1, which is the same date that the trawl fishery closes (50 CFR 679.23). This would provide additional time for the Pacific cod prey field to recover from any potential fishing effects and remove potential disturbance of Steller sea lions by nontrawl vessels in the November 1 through December 31 time period.

The changes applied to the fisheries in Areas 543 and 542 under this alternative are not needed for Area 541. The no retention requirements applied to the Atka mackerel and Pacific cod fisheries in Areas 543 and 542 are more stringent than the no directed fishing for these species in critical habitat in Area 541. This is based on the more severe decline of Steller sea lions in Areas 543 and 542 compared to Area 541, which indicates that more protection of prey species may be warranted. Critical habitat in Area 541 is already closed to directed fishing for Atka mackerel, and the annual growth rate for pup counts in Area 541 is increasing. Some additional protection from status quo is warranted in Area 541 because the non-pup population trend in the western portion of Area 541 is negative, and the Pacific cod fishery occurs primarily inside critical habitat. The closure of critical habitat to directed fishing for Pacific cod would remove potential effects of the Pacific cod directed fishery inside critical habitat, providing more protection from the potential effects of federally permitted vessels in waters 0–20 nm from Steller sea lion sites.

The protection measures under Alternative 2 apply to all areas that have experienced negative annual growth rates for non-pups, with more restrictive measures applied to areas with larger declines and pup and non-pup declines. Compared to the other alternatives in this analysis, this alternative would provide the greatest amount of protection to Steller sea lions and their critical habitat inside and outside critical habitat in areas with the most severe decline (Areas 543 and 542). This alternative would provide additional protection to critical habitat in Area 541, which, based on non-pup and pup annual growth rates, has not experienced as severe a decline in population as Areas 542 and 543 (NMFS 2010a). Reductions in the potential fisheries interaction and competition for prey species with Steller sea lions in each area are commensurate with the severity of decline in non-pup and pup population.

2.1.3 Alternative 3: July 2010 Draft RPA Specific Approach

Alternative 3 is a more specific application of fishery restrictions based upon the management of the fisheries and Steller sea lion foraging behavior, population trends, and the potential competition between the Atka mackerel and Pacific cod fisheries and Steller sea lions. This alternative is the same as the draft RPA described in the July 2010 draft FMP biop (NMFS 2010b), providing a level of fishery restrictions necessary to insure that JAM is not likely to occur for Steller sea lions and their designated critical habitat. Development of Alternative 3 considered current management of vessels under Amendment 80, historical harvest activities, and gear specific area closures and seasonal apportionments to disperse fishing over area and time. Unless otherwise specified in the alternative, all current Steller sea lion protection measures would continue to be implemented in the Aleutian Islands (e.g., Pacific cod seasonal apportionments; and pollock, Pacific cod, and Atka mackerel closures around rookeries and haulouts and in the Seguam foraging areas). Restrictions in State waters from 0–3 nm apply to federally permitted vessels. State-managed Guideline Harvest Level (GHL) Pacific cod fisheries for vessels not federally permitted may occur in waters from 0–3 nm unless otherwise restricted by the State. Federally permitted vessels in the State-managed (GHL) fisheries would be exempt from the Atka mackerel and Pacific cod closures under this alternative and would continue to comply with the 2003 Steller sea lion protection measures implemented under State regulations at 5 AAC 28.647.

Alternative 3 would—

<u>In Area 543</u>:

- Prohibit retention of Atka mackerel and Pacific cod.
- Establish a TAC for Atka mackerel sufficient to support the incidental discarded catch that may occur in other target groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA (Figure 2-3).

<u>In Area 542</u>:

Groundfish

- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

Pacific cod

- Close 0–10 nm zone of critical habitat year round to directed fishing by federally permitted vessels using nontrawl gear. Close critical habitat 10 nm–20 nm to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels January 1 through June 10.
- Close 0–20 nm zone of critical habitat year round to directed fishing by federally permitted vessels using trawl gear.
- Prohibit Pacific cod fishing November 1 through December 31 in Area 542. (This extends this trawl gear restriction to nontrawl gear.)

Atka mackerel

- Set TAC for Area 542 to no more than 47 percent of acceptable biological catch (ABC).
- Close 0–20 nm critical habitat to directed fishing by federally permitted vessels year round.
- Change the Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.

- Eliminate the Atka mackerel platoon management system in the HLA (Figure 2-3).

<u>In Area 541 and the Bering Sea</u>:

Pacific cod

- Close 0–10 nm of critical habitat to directed fishing for Pacific cod by all federally permitted vessels year round.
- Limit the amount of catch that can be taken in the 10 nm–20 nm area of critical habitat based on gear type used:
  - Close critical habitat 10 nm–20 nm January 1 through June 10 to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
  - Close critical habitat 10 nm–20 nm June 10 through November 1 to directed fishing for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit Pacific cod fishing November 1 through December 31 in Area 541. (This extends this trawl gear restriction to nontrawl gear.)

Atka mackerel

- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.

Figure 2-9, Figure 2-10, and Figure 2-11 show the Atka mackerel and Pacific cod area closures under Alternative 3. Note that the prohibition on retention for Pacific cod in Area 543 is shown in Figure 2-9 for the Atka mackerel fishery.

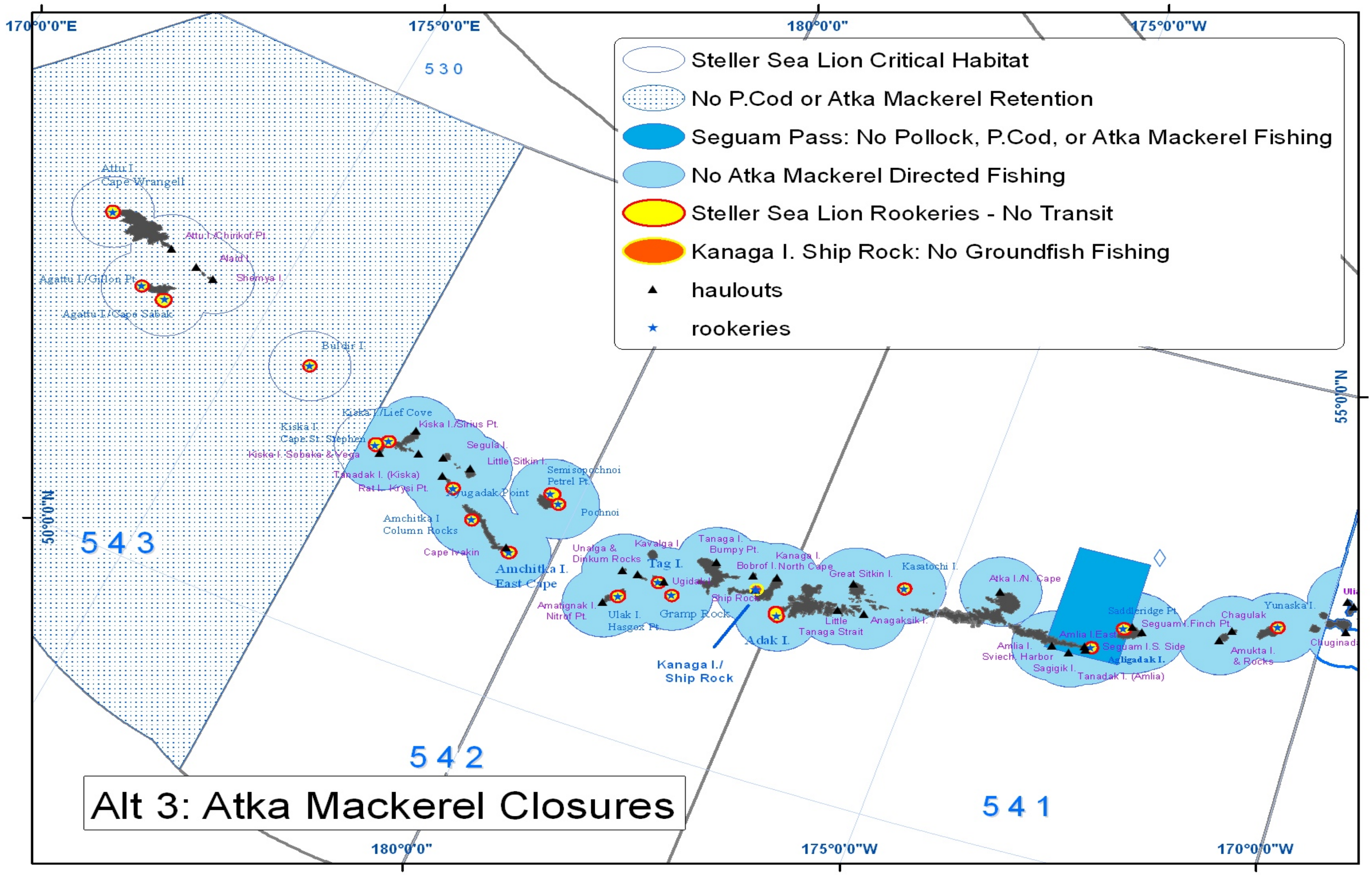

Figure 2-9 **Atka mackerel fishery area closures in the Aleutian Islands under Alternative 3. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

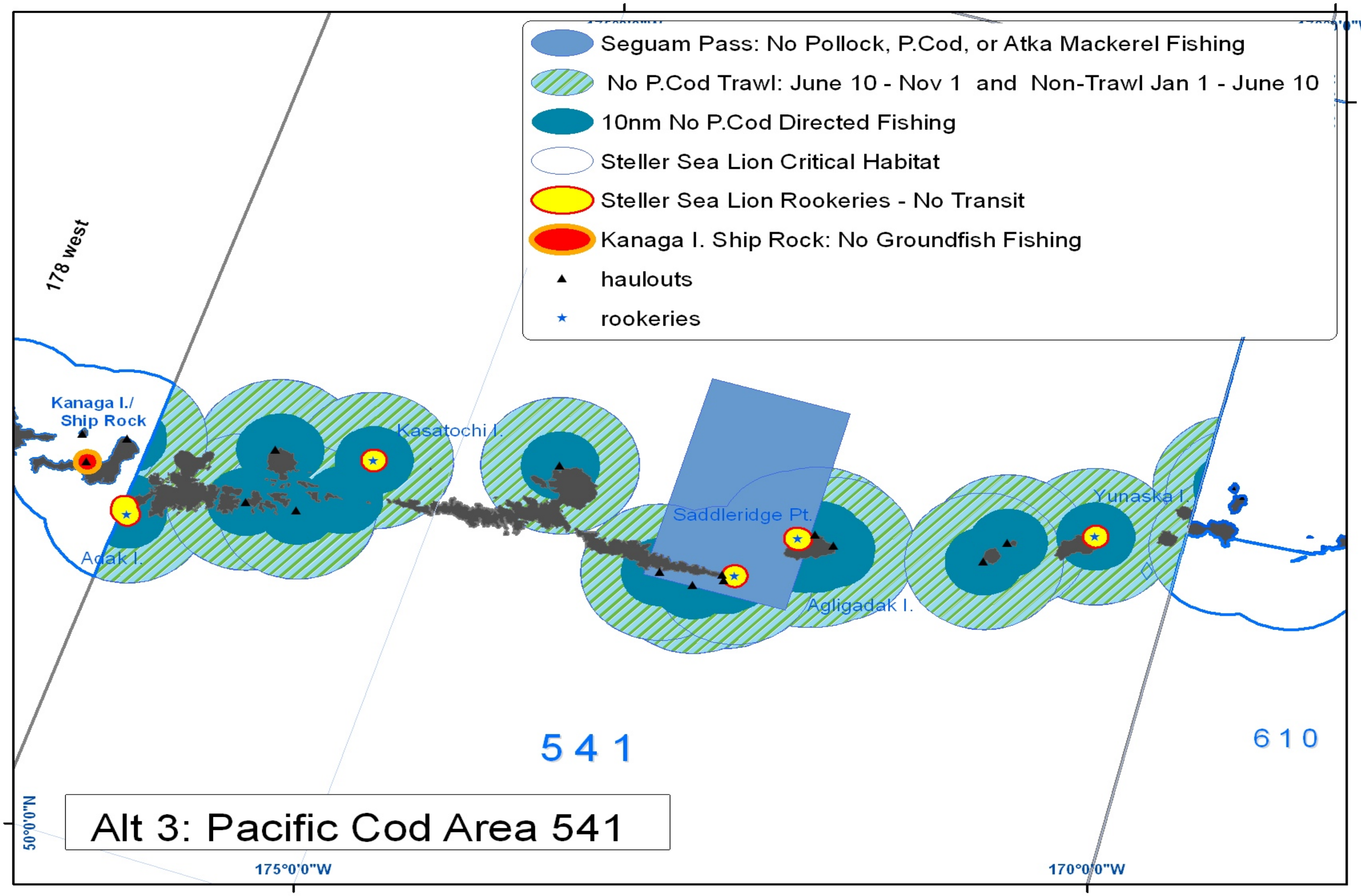

Figure 2-10 **Pacific cod fishery closures in Area 541 under Alternative 3. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

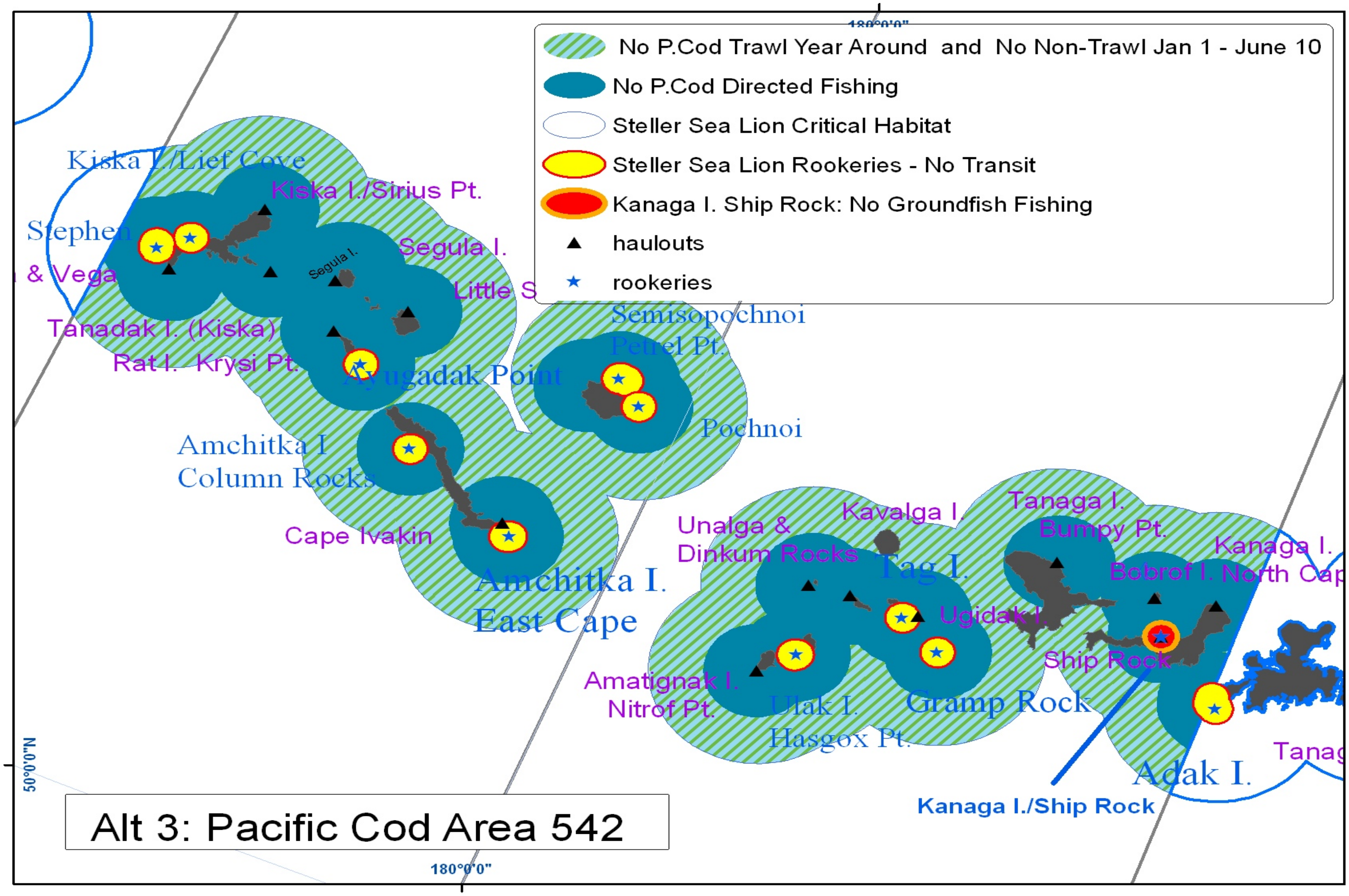

Figure 2-11 **Pacific cod fishery closures in Area 542 under Alternative 3. (Steve Lewis, NMFS Alaska Region, Analytical Team)**

Alternative 3 differs from Alternative 2 in how specific fisheries are managed in time and place. Because Alternative 2 is at least as restrictive as Alternative 3, several features of these alternatives are the same. The reasons for these same features are detailed in section 2.1.2. As in Alternative 2, Alternative 3 would eliminate the platoon management of Atka mackerel harvest in the HLA (Area 543 and western portion of Area 542 (Figure 2-3). This type of management of Atka mackerel harvest no longer would be needed based on the changes to harvest management under Amendment 80 and because of the Atka mackerel fishery management revisions under Alternative 3. Alternative 3 also would establish a 0–3 nm groundfish fishing closure around Kanaga Island/Ship Rock. The protection measures under Alternatives 2 and 3 are the same for Area 543 because this area is experiencing the largest declines in pup and non-pup annual growth rates and counts, warranting greater restrictions on the fisheries to ensure the groundfish fisheries would not be the cause of continued population declines. The November 1 through December 31 restriction on Pacific cod fishing also is part of Alternative 3. The extension of the Atka mackerel seasons in Area 541/Bering Sea under Alternative 2 also is applied to Area 542 under Alternative 3. Directed fishing for Atka mackerel would be allowed in Area 542 outside of critical habitat under Alternative 3, and the application of the seasonal extension to Area 542 would provide consistent seasonal management of Atka mackerel harvest in the Aleutian Islands. A comparison of all alternatives in this EA/RIR is in section 2.2.

In the draft FMP biop, information on annual growth rates and counts for pups and non-pups from 2000 to 2008 were considered in determining which areas needed further protection from the potential effects of fisheries (NMFS 2010b). This information was applied to Rookery Cluster Areas (RCAs) (Figure 2-12), which are explained in the draft FMP biop (NMFS 2010b) and are used to determine fisheries effects and potential Steller sea lion responses at a smaller spatial scale than the sub-regions used in the Steller sea lion recovery plan (NMFS 2008). Compared to other RCAs, Area 543 (RCA 1) has the steepest declines in pup and non-pup growth rate trends, and the greatest drop in Steller sea lion counts from 2000 to 2008 (Tables 5.1a, Table 3.1B, and Table 3.2 in NMFS 2010b). Area 542 (RCAs 2 and 3) has less declining growth rate trends for pups and non-pups and for Steller sea lion counts from 2000 to 2008 compared to Area 541 (Table 5.1a, Table 3.1B, and Table 3.2 in NMFS 2010b). Because the annual growth rates and counts in Areas 543 and 542 are negative for both pups and non-pups, the types of protection measures are similar for each area, with more protective measures applied to Area 543, where the largest declines are seen. Negative non-pup annual growth rates also have occurred in Area 541 (RCA 4), but the annual pup growth rates are positive in this area.

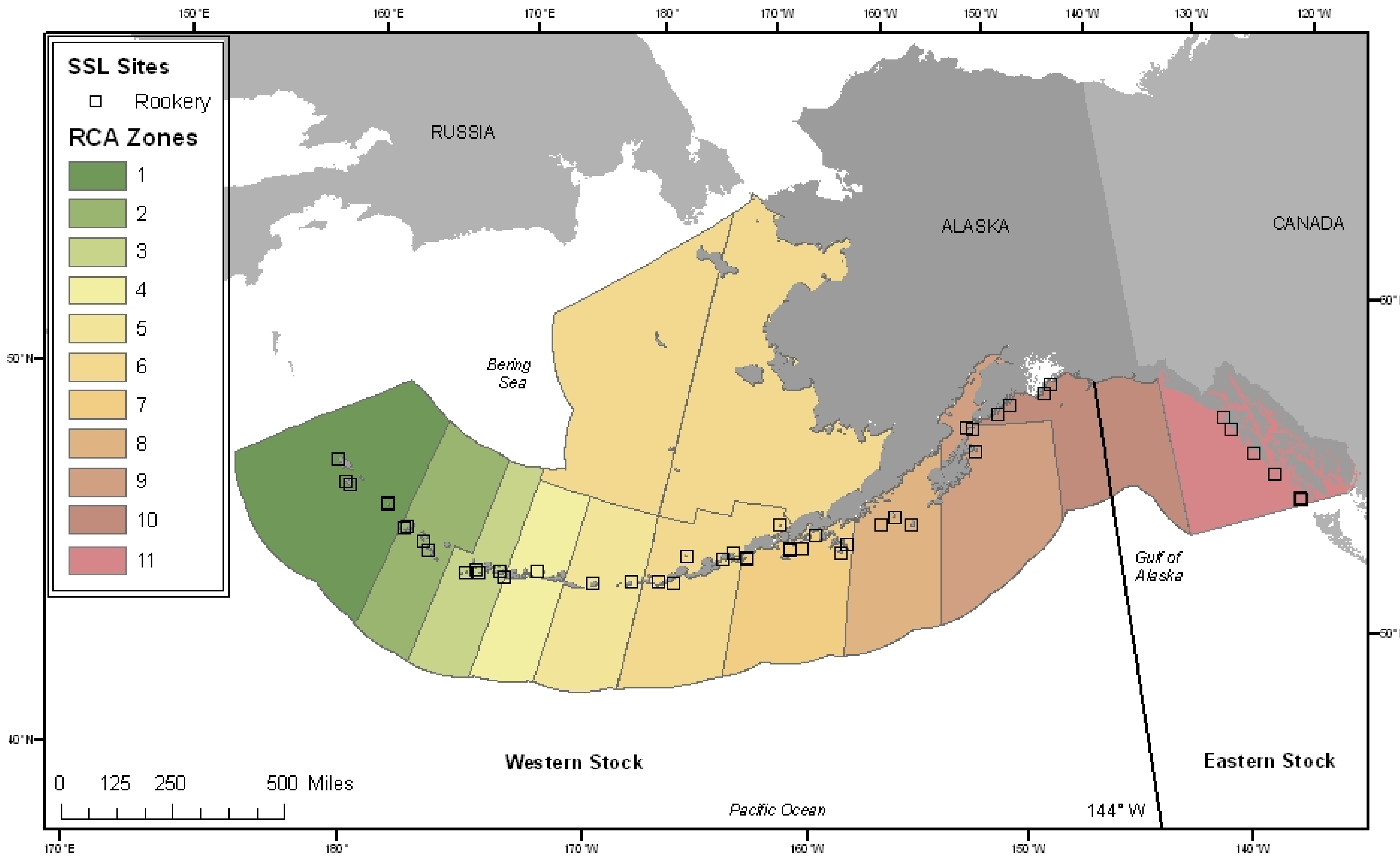

Figure 2-12 Rookery cluster zones. (Steve Lewis, NMFS Alaska Region Analytical Team)

Directed fishing for Atka mackerel inside of critical habitat would be prohibited in Area 542 under Alternative 3. This would provide protection to Atka mackerel prey fields for Steller sea lions foraging within the 0–20 nm areas around rookeries and haulouts. Directed fishing for Atka mackerel would be allowed outside of critical habitat in Area 542 in limited amounts. Reducing the Area 542 TAC to 47 percent of the Area 542 ABC would allow for continued fishing outside of critical habitat at an amount similar to the harvest in RCA 2 outside of critical habitat.

The proposed reduction approximates the relative proportion of the total catch in Area 542 outside RCA 2 critical habitat since the implementation of Amendment 80 in 2008. The implementation of Amendment 80 has drastically changed the nature of the Atka mackerel fishery allocations and provided the fleet additional tools to manage catch. Comparisons of catch inside and outside of critical habitat prior to the implementation of Amendment 80 do not reflect current operational patterns. In 2008, 38 percent of Area 542 total catch was taken in RCA 2 critical habitat. In 2009, 55 percent of the total catch was taken in RCA 2 critical habitat. On average, 47.6 percent of the Area 542 catch has been taken in RCA 2 critical habitat. In combination with the first proposed measure to close RCA 2 critical habitat, the fleet would have the same proportion of the overall TAC available for harvest outside of critical habitat as it had on average in 2008 and 2009 (NMFS Catch Accounting System, June 2010).

Time and area closures in Area 542 for directed fishing for Pacific cod by nontrawl and trawl gear categories are intended to conserve the value of critical habitat for Steller sea lions. In 2008, 78 percent of the Pacific cod harvested by nontrawl gear vessels was harvested within the 3 nm–10 nm zone of Steller sea lion critical habitat and approximately 20 percent was harvested within the 10 nm–20 nm zone (2008 fixed gear harvest = 3,357 mt). Trawl gear fisheries harvested 36 percent and 42 percent of Pacific cod within 3 nm–10 nm, and 10 nm–20 nm zones, respectively. Closing the 0–10 nm zone year-round to Pacific cod nontrawl gear vessels, and the 0–20 nm zone year-round to Pacific cod trawl gear vessels, is intended to reduce the amount of catch that has historically been taken within Steller sea lion critical habitat.

Seasonal closures will protect the prey field by ensuring that fisheries do not expand into seasons they have not typically fished in order to offset harvest foregone by area closures. For example, the 10 nm–20 nm zone of critical habitat will be closed to nontrawl gear in the A season. The nontrawl gear fishery is traditionally a B season fishery. Preventing fishing by nontrawl gear in the A season will preclude an intensification of fishing effort in times and areas the fishery has not historically operated. Fishing intensity is not expected to increase to a large extent in the 10 nm–20 nm zone critical habitat when it is open to nontrawl gear in the B season as gear types (pot and hook-and-line) are expected to be self-limiting in the small area of remaining fishable habitat available to nontrawl gear in Area 542. Moreover, Pacific cod are not as important a prey species for Steller sea lions in the B season (June 10 through September 30), so that the effects from harvest at this time is not as critical to Steller sea lions.

The Pacific cod trawl fishery in Area 542 occurs in the A season, which coincides with the time of year in which Steller sea lion energetic needs are high. The 10 nm–20 nm zone of critical habitat would be closed to trawl gear in the B season to prevent the trawl fishery from expanding into a season they have not traditionally fished in Area 542. Therefore, a year-round closure of 0–20 nm to trawl gear is intended to conserve the value of critical habitat and prevent an intensification of harvest, especially in the 10 nm–20 nm zone of critical habitat.

In Area 541, directed fishing for Atka mackerel is already prohibited in critical habitat, and the overall harvest of Atka mackerel in this area is a very small fraction of available biomass (.09 percent to .01 percent) (Table IV-12 in NMFS 2010b). Atka mackerel is harvested in the eastern portion of Area 541, which corresponds with RCA 5. Steller sea lions have been increasing in abundance in this RCA (NMFS 2010b), harvests are a small portion of available biomass, and critical habitat is protected from the potential effects of Atka mackerel harvest inside critical habitat. For these reasons, no additional restrictions are needed on the Atka mackerel fishery in Area 541 to reduce potential effects on Steller sea lions.

In 2008, 84 percent of the Pacific cod harvested in Area 541 by trawl gear was caught inside of critical habitat (13,768 mt); the majority of the trawl catch in critical habitat was taken within the 10 nm–20 nm zone. Nontrawl gear fisheries harvested 73 percent of their Pacific cod inside critical habitat (1,506 mt) with approximately equal proportions in the 3 nm–10 nm and 10 nm–20 nm zones. Though Steller sea lion annual growth rates are positive in RCA 5, they are not experiencing the same level of growth in RCA 4 (Table 5.1(a) in NMFS 2010b); and Pacific cod harvest has largely been from critical habitat. For these reasons, Alternative 3 would prohibit fishing for Pacific cod with all gear types within the 0–10 nm zone around all rookeries and haulouts to preserve the prey field for Steller sea lions foraging in this area.

Available telemetry data indicate that sea lions may utilize the nearshore zone of critical habitat in Area 541 to a greater extent than to the west of Area 541 (AFSC 2010); however, recent analyses of the Platform of Opportunity database show extensive sightings of Steller sea lions outside of 20 nm in the Aleutian Basin in winter (Boor 2010). Based on these sources of information, it appears that Steller sea lions in Area 541 are likely to use critical habitat and areas outside of critical habitat for foraging. Alternative 3 protects prey resources inside the nearshore zone of critical habitat as the primary objective, ensuring foraging resources may be available with less energetic costs to travel longer distances.

Gear-specific seasonal closures in critical habitat are designed to prevent fisheries from expanding into seasons that have not been fished historically. This would prevent intensification of fishing effort to harvest TAC displaced from closures in Areas 543 and 542 because the BSAI Pacific cod TAC is not allocated to specific fishery management areas.

2.1.4 Alternative 4: Preferred Alternative – Final RPA

Alternative 4 is the RPA in the final FMP biop (NMFS 2010a). The final RPA is a revision of the July 2010 draft RPA based on public comment received by the agency and consideration of recommended changes to the draft RPA that would avoid JAM for Steller sea lions and provide additional relief to the Atka mackerel and Pacific cod fisheries. The protection measures in Area 543 remain unchanged from Alternative 3. Alternative 4 differs from Alternative 3 by the protection measures in Areas 542 and 541, providing additional opportunity for fishing inside critical habitat for the Atka mackerel and Pacific cod fisheries while meeting the performance criteria specified in the FMP biop to avoid JAM. The features of Alternative 4 are—

<u>In Area 543</u>:

- Prohibit retention of Atka mackerel and Pacific cod by all federally permitted vessels.
- Establish a TAC for Atka mackerel sufficient to support the incidental discarded catch that may occur in other target groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA.

In Area 542:

Groundfish

- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

Pacific cod

- Close 0–6 nm zone of critical habitat year round to directed fishing for Pacific cod by federally permitted vessels using nontrawl gear. For vessels 60 ft or greater, close critical habitat from 6 nm–20 nm January 1 to March 1, to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
- Between 177 E to 178 W longitude, close critical habitat from 0–20 nm year round to directed fishing for Pacific cod by federally permitted vessels using trawl gear.
- Between 178 W to 177 W longitude, close critical habitat from 0–10 nm year round to directed fishing by federally permitted vessels using trawl gear. Between 178 W to 177 W longitude, close critical habitat 10 nm–20 nm June 10 to November 1, to directed fishing for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit directed fishing for Pacific cod by all federally permitted vessels from November 1 to January 1. (This extends the trawl gear restriction to nontrawl gear.)
- Reinitiate ESA consultation if the nontrawl harvest of Pacific cod exceeds 1.5 percent of the BSAI Pacific cod acceptable biological catch (ABC) (equivalent to the Area 542 maximum annual harvest amount from 2007 through 2009). Similarly, reinitiate ESA consultation if the trawl harvest of Pacific cod exceeds 2 percent of the BSAI Pacific cod ABC (equivalent to the Area 542 maximum annual harvest amount from 2007 through 2009).

Atka mackerel

- Set TAC for Area 542 to no more than 47 percent of the ABC amount apportioned to Area 542 by the Council's SSC.
- Between 177 E to 179 W longitude and 178 W to 177 W longitude, close critical habitat from 0–20 nm year round to directed fishing for Atka mackerel by federally permitted vessels.
- Between 179 W to 178 W longitude, close critical habitat from 0-10 nm year round to directed fishing for Atka mackerel by federally permitted vessels. Between 179 W and 178 W longitude, close critical habitat from 10 nm–20 nm to directed fishing for Atka mackerel by federally permitted vessels not participating in a harvest cooperative or fishing a CDQ allocation.
- Add a 50:50 seasonal apportionment to the CDQ Atka mackerel allocation to mirror seasonal apportionments for Atka mackerel harvest cooperatives.
- Limit the amount of Atka mackerel harvest allowed inside critical habitat to no more than 10 percent of the annual allocation for each harvest cooperative or CDQ group. Evenly divide the annual critical habitat harvest limit between the A and B seasons.
- Change the Atka mackerel seasons to January 20 to June 10, for the A season and June 10, to November 1, for the B season.
- Eliminate the Atka mackerel platoon management system in the HLA.

In Area 541:

Pacific cod

- Close 0–10 nm of critical habitat year round to directed fishing for Pacific cod by all federally permitted vessels.
- Limit the amount of catch that can be taken in the 10 nm–20 nm area of critical habitat based on gear type used:
    - Close critical habitat 10 nm–20 nm January 1 to March 1to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
    - Close critical habitat 10 nm–20 nm June 10 to November 1, to directed fishing by for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit directed fishing for Pacific cod by federally permitted vessels November 1, to January 1. (This extends this trawl gear restriction to nontrawl gear.)
- Reinitiate ESA consultation if the nontrawl harvest of Pacific cod exceeds 1.5 percent of the BSAI Pacific cod ABC (equivalent to the Area 541 maximum annual harvest amount from 2007 through 2009). Similarly, reinitiate ESA consultation if the trawl harvest of Pacific cod exceeds 11.5 percent of the BSAI Pacific cod ABC (equivalent to the Area 541 maximum annual harvest amount from 2007 through 2009).

Atka mackerel

- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 to June 10, for the A season and June 10 to November 1, for the B season.
- Close the Bering Sea subarea year round to directed fishing for Atka mackerel.

Season openings and closings are generally done at 12:00 noon for easier implementation in the daylight, rather than at the end of a calendar day at midnight. Figure 2-13 shows the Pacific cod and Atka mackerel trawl fishery closures in the Aleutian Islands. Alternative 4 provides each fishery a one degree area in the eastern portion of Area 542 for fishing inside the 10 nm to 20 nm zone of critical habitat.

Federally permitted vessels participating in the State-managed GHL fishery (5 AAC 28.647) would be exempt from the Atka mackerel and Pacific cod closures under this alternative. NMFS is developing rulemaking that would prevent Federal Fisheries Permits from being relinquished and easily reissued, which may reduce opportunities to participate in the State-managed GHL fishery without complying with all federal fisheries management measures. The State applies the 2003 Steller sea lion protection measures to this fishery. This would provide for continued harvest in this fishery, as analyzed in the cumulative effects of the FMP biop (NMFS 2010a).

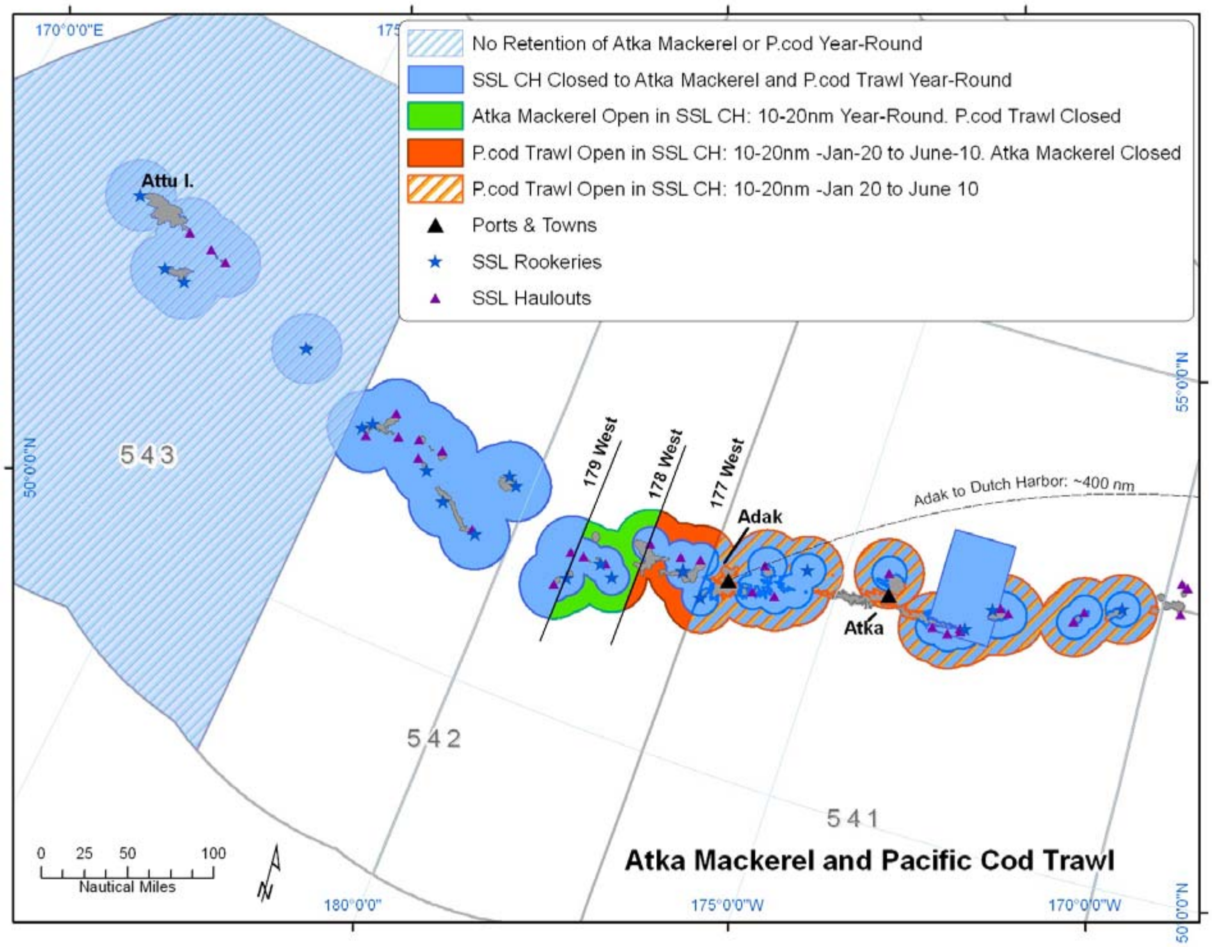

Figure 2-13 **Atka mackerel and Pacific cod trawl fisheries Steller sea lion protection measures under Alternative 4. (Source: Steve Lewis, NMFS Alaska Region Analytical Team)**

Trawl harvests of Atka mackerel and Pacific cod inside critical habitat are limited to a one degree longitude zone of 10 nm to 20 nm of critical habitat. Because of the existing Aleutian Island Habitat Conservation Area, the actual fishable area is much less than the entire 10 nm to 20 nm zone of critical habitat in these one degree longitude zones (Figure 2-14).

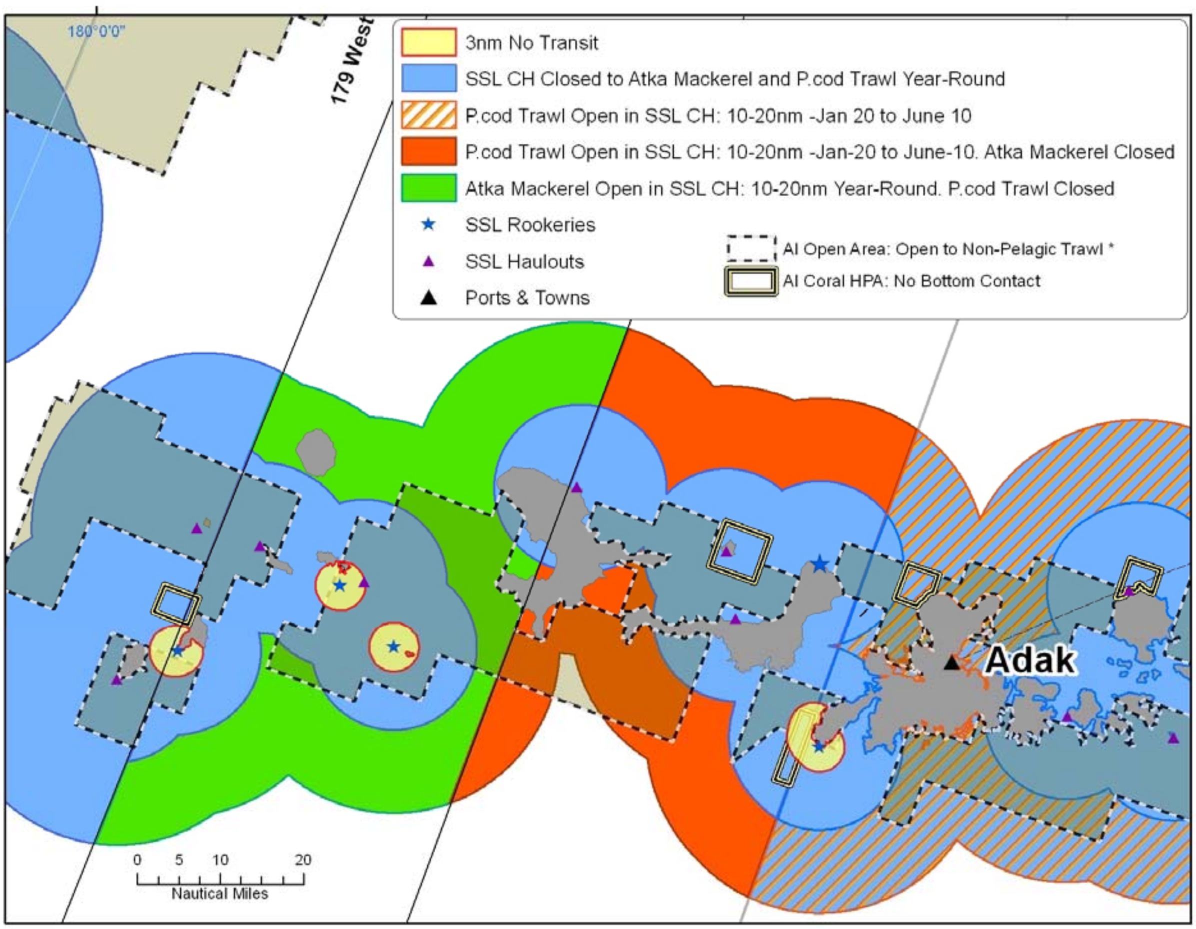

Figure 2-14 Alternative 4 Atka mackerel and Pacific cod trawl areas in Area 542 critical habitat and open areas under the Aleutian Islands Habitat Conservation Area. (Source: Steve Lewis, NMFS Alaska Region Analytical Team)

The additional harvest of Atka mackerel and Pacific cod in Area 542 under Alternative 4 compared to Alternative 3 still provides for an overall increase in foraging biomass over time compared to status quo. It is estimated that the prey field in Areas 543 and 542 will increase 40 percent and 8 percent, respectively (Ianelli et al. 2010).

Atka mackerel fishing inside of critical habitat in Area 542 would be limited to participants in a cooperative or in CDQ fishing. Under Alternative 4, the Atka mackerel fishery inside critical habitat in Area 542 is limited to no more than 10 percent of a cooperative or CDQ group's annual allocation. The 10 percent allocation would be evenly divided between the A and B seasons. Requiring participation in a cooperative or in CDQ fishing is necessary to facilitate the management of fishing within the 10 percent and seasonal limits under the RPA, as these participants are able to work together to harvest within their cooperative or CDQ allocations and the regulations would prohibit exceeding the 10 percent limit.

Alternative 4 allows additional critical habitat area to be available to the nontrawl Pacific cod fishery compared to Alternative 3 (Figure 2-15). Hook-and-line vessels are restricted to shallower areas with long distances for setting gear. Most of the available habitat for this gear type is within 7 nm of shore in Area 542. Allowing fishing in critical habitat from 6 nm to 20 nm provides access to fishable area but still provides protection to the0 nm to 6 nm areas of critical habitat, which are more likely to be used by Steller sea lions (NMFS 2010a)

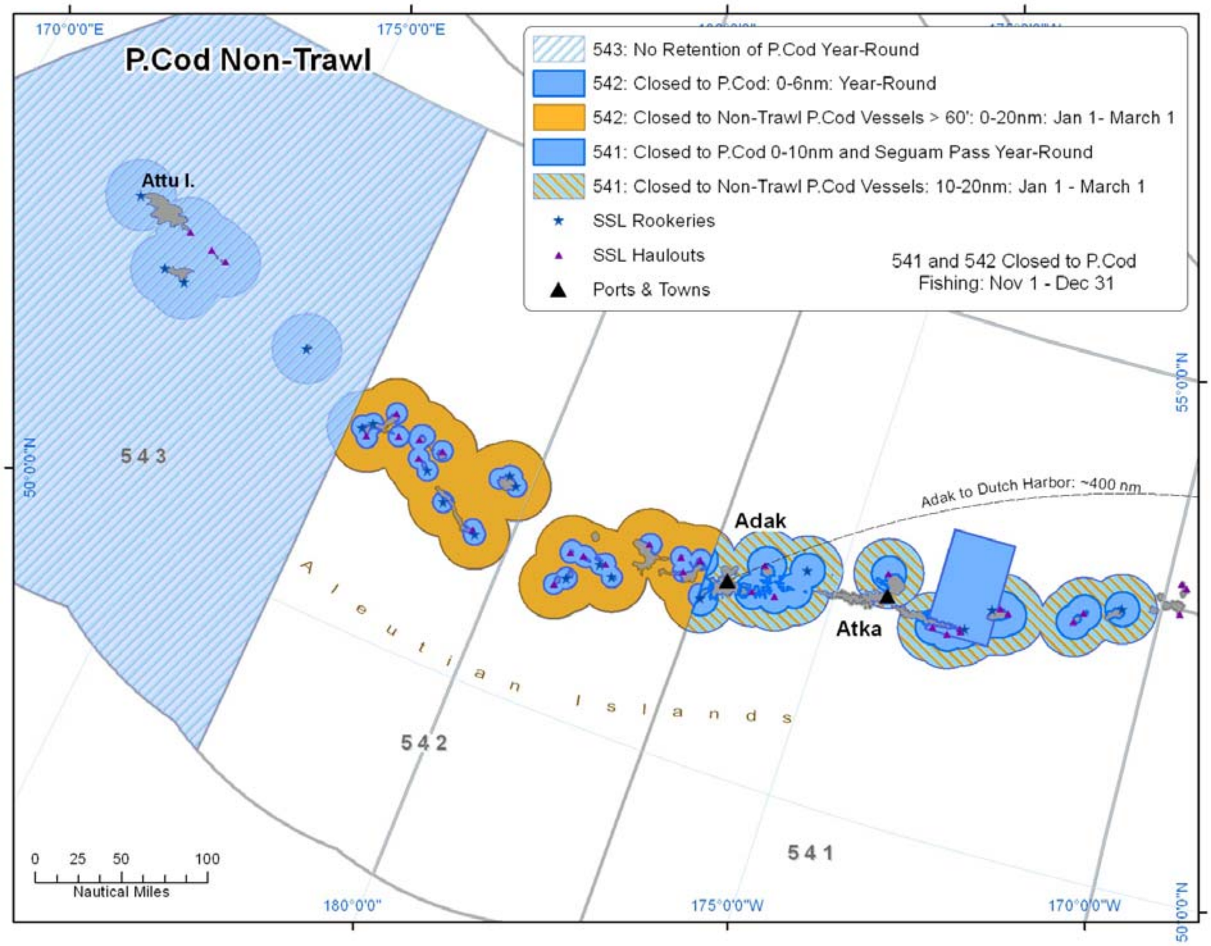

Figure 2-15 Alternative 4 Pacific Cod Non-trawl Fisheries Steller Sea Lion Protection Measures (Source: Steve Lewis, NMFS Alaska Region Analytical Team)

Areas 542 and 541 have reinitiation triggers for the annual harvest of Pacific cod in each area. Because Pacific cod is specified BSAI wide and is allocated to various sectors (Table 2-1), it is not possible to establish area and sector specific limits on Pacific cod harvest in the regulations. These reinitiation triggers are necessary to ensure that future harvest in excess of historical Pacific cod harvest would be examined under an ESA consultation to determine if the increase harvest is of a concern to ESA-listed species. The industry will be aware of these reinitiation triggers and will likely fish in a manner not to exceed these values for the nontrawl and trawl sectors so that reinitiation of consultation will not be needed. These triggers are intended to address any potential shift in fishing resulting from the closure of Area 543, discouraging the concentration of Pacific cod harvest in Areas 542 and 541.

The closure of the Bering Sea subarea to Atka mackerel directed fishing is necessary to allow for continued harvest of Atka mackerel in a manner similar to historical practices. A portion of the Area 541/Bering Sea apportionment of Atka mackerel is harvested inside critical habitat in the Bering Sea subarea. It is not possible to harvest Atka mackerel outside of critical habitat in the Bering Sea subarea because of where Atka mackerel occurs (Table 2-3). Groundfish species likely to be harvested concurrent with Atka mackerel are Arrowtooth flounder, Pacific cod, Greenland turbot, rock sole and yellowfin sole. These groundfish do not occur inside Bering Sea critical habitat in sufficient quantities to support harvest of basis species and of Atka mackerel up to the maximum retainable amount (MRA) for that basis species (NMFS Catch Accounting System, October 21, 2010). Alternative 4 would provide for limited fishing for Atka mackerel inside critical habitat using another groundfish species (e.g., yellowfin sole) as the basis species for allowing retention of Atka mackerel up to the MRA specified in Table 11 of 50 CFR part 679. The retention of an incidentally caught species is dependent on the basis species and the directed fishery closures that trigger a trip and resetting of the basis species. It is necessary to close the entire Bering Sea subarea to Atka mackerel directed fishing to prevent the triggering of a trip and the resetting of the basis species for purposes of the Atka mackerel MRAs. If the Bering Sea subarea is left open to Atka mackerel directed fishing, a vessel crossing into critical habitat where directed fishing for Atka mackerel is closed would be experiencing a new trip and the resetting of the basis species for determining MRAs during that trip. Because groundfish other than Atka mackerel do not occur in large quantities inside critical habitat, any harvest inside critical habitat is likely to be primarily Atka mackerel, which would violate the Atka mackerel directed fishing closure.

Table 2-3 Atka mackerel harvest 2007–2009 in the Bering Sea subarea. (Source: Steve Lewis, NMFS Alaska Region, Analytical Team)

Year	Atka mackerel Harvested Outside Areas Closed to Atka Mackerel Fishing in mt	AM Harvest Inside Areas Closed to Atka Mackerel Harvest in mt	Percent of Total Harvested outside Atka Mackerel Closure Areas
2007	653	2383	21
2008	33	365	8
2009	11	233	4

2.2 Comparison of Alternatives

Table 2-4 shows the features of the alternatives that are different for the Atka mackerel and Pacific cod fisheries. These differences are primarily management measures based on the location, gear type, and timing of fishing for Atka mackerel and Pacific cod. Unless otherwise stated, the current protection measures (closures and seasons) under status quo apply to Alternatives 2, 3, and 4.

Table 2-4 Comparison of alternatives.

<table>
<tr><th colspan="2" rowspan="3"></th><th colspan="3">Alternative 1</th><th colspan="2">Alternative 2</th><th colspan="3">Alternative 3</th><th colspan="3">Alternative 4 (Preferred)</th></tr>
<tr><th rowspan="2">Atka mackerel</th><th colspan="2">Pacific cod</th><th rowspan="2">Atka mackerel</th><th rowspan="2">Pacific cod</th><th rowspan="2">Atka mackerel</th><th colspan="2">Pacific cod</th><th rowspan="2">Atka mackerel</th><th colspan="2">Pacific cod</th></tr>
<tr><th>trawl</th><th>nontrawl</th><th>trawl</th><th>nontrawl</th><th>Trawl</th><th>Nontrawl</th></tr>
<tr><td rowspan="2">Area 543</td><td>Inside CH</td><td>HLA Fishery</td><td>After HLA, mostly 10 nm closures</td><td>Mostly 3 nm closures</td><td rowspan="6">No retention</td><td rowspan="6">No retention</td><td rowspan="2">No retention</td><td colspan="2" rowspan="2">No retention</td><td rowspan="2">No retention</td><td colspan="2" rowspan="2">No retention</td></tr>
<tr><td>Outside CH</td><td>Directed fishing 1/20–4/15, 9/1–11/1</td><td>3 seasons inside and outside CH, 1/20–4/1, 4/1–6/10, 6/10–11/1</td><td>Hook-and-line and pot 2 seasons, jig 3 seasons inside and outside CH</td></tr>
<tr><td rowspan="4">Area 542</td><td>0–10 nautical miles</td><td rowspan="2">HLA Fishery</td><td>Western 542, After HLA, mostly 10 nm closures</td><td>3 nm closures</td><td rowspan="2">No directed fishing</td><td colspan="2">No directed fishing</td><td>No directed fishing</td><td>No directed fishing</td><td>No directed fishing 0-6 nm</td></tr>
<tr><td>10–20 nautical miles</td><td>Eastern 542, 3–10 nm closures,</td><td>Open to directed fishing</td><td>No directed fishing.</td><td>No directed fishing 1/1 to 6/10</td><td>No directed fishing except in 179W to 178W, limit to coops and CDQ, limit to 10% of annual allocation, 50:50 seasonal apportionment</td><td>No directed fishing, except in 178W to 177W. Close 178W to 177W June 10–Nov. 1.</td><td>No directed fishing 6-20 nm for vessels > 60 feet: 1/1–3/10.</td></tr>
<tr><td rowspan="2">Outside CH</td><td rowspan="2">Directed fishing 1/20–4/15, 9/1–11/1</td><td rowspan="2">3 seasons inside and outside CH, 1/20–4/1, 4/1–6/10, 6/10–11/1</td><td rowspan="2">Hook-and-line and pot 2 seasons, through 12/31, jig 3 seasons inside and outside CH</td><td>Set Area 542 TAC to 47% of ABC.</td><td colspan="2" rowspan="2">No directed fishing 11/1–12/31</td><td>Set Area 542 TAC to 47% of ABC.</td><td colspan="2">No directed fishing 11/1–12/31</td></tr>
<tr><td>Extend seasons to 1/20–6/10 and 6/10–11/1.</td><td>Extend seasons to 1/20–6/10 and 6/10–11/1.</td><td>Area 542 Consultation trigger 2% BSAI ABC</td><td>Area 542 Consultation Trigger 1.5% BSAI ABC</td></tr>
</table>

<table>
<tr><th colspan="2" rowspan="3"></th><th colspan="3">Alternative 1</th><th colspan="2">Alternative 2</th><th colspan="3">Alternative 3</th><th colspan="3">Alternative 4 (Preferred)</th></tr>
<tr><th rowspan="2">Atka mackerel</th><th colspan="2">Pacific cod</th><th rowspan="2">Atka mackerel</th><th rowspan="2">Pacific cod</th><th rowspan="2">Atka mackerel</th><th colspan="2">Pacific cod</th><th rowspan="2">Atka mackerel</th><th colspan="2">Pacific cod</th></tr>
<tr><th>trawl</th><th>nontrawl</th><th>trawl</th><th>nontrawl</th><th>Trawl</th><th>Nontrawl</th></tr>
<tr><td rowspan="4">Area 541</td><td>0–10 nautical miles</td><td rowspan="2">No directed fishing</td><td>0–3 nm and 0–10 nm closures</td><td>3 nm closures west of Seguam, closed east of Seguam.</td><td rowspan="2">No directed fishing</td><td rowspan="2">No directed fishing</td><td rowspan="2">No directed fishing</td><td colspan="2">Closed to directed fishing</td><td rowspan="2">No directed fishing</td><td colspan="2">Closed to directed fishing</td></tr>
<tr><td>10–20 nautical miles</td><td>Open except 0–20 nm at Agligadak</td><td>Open to directed fishing west of Seguam, closed east of Seguam</td><td>No directed fishing 6/10 to 11/1.</td><td>No directed fishing 1/1 to 6/10.</td><td>No directed fishing 6/10 to 11/1.</td><td>No directed fishing 1/1 to 3/10.</td></tr>
<tr><td rowspan="2">Outside CH</td><td rowspan="2">Directed fishing 1/20–4/15, 9/1–11/1</td><td rowspan="2">3 seasons inside and outside CH, 1/20–4/1, 4/1–6/10, 6/10–11/1</td><td rowspan="2">Hook-and-line and pot 2 seasons, jig 3 seasons through 12/31, inside and outside CH</td><td rowspan="2">Extend Area 541/BS seasons 1/20–6/10 and 6/10–11/1</td><td rowspan="2">No nontrawl directed fishing 11/1–12/31</td><td rowspan="2">Extend Area 541/BS seasons 1/20–6/10 and 6/10–11/1</td><td colspan="2" rowspan="2">No directed fishing 11/1–12/31.</td><td rowspan="2">Extend Area 541/BS seasons 1/ 20–6/10 and 6/10–11/1. No directed fishing in the Bering Sea subarea.</td><td colspan="2">No directed fishing 11/1–12/ 31.</td></tr>
<tr><td>Area 541 Consultation trigger 11.5% BSAI ABC</td><td>Area 541 Consultation trigger 1.5% BSAI ABC</td></tr>
</table>

CH = critical habitat

2.3 Alternatives Considered and Not Further Analyzed

NMFS received recommendations from the public and the Council on the July 2010 draft RPA. Each recommendation was considered in relation to the performance standards in the FMP biop. The following recommendations were not further analyzed for the reasons provided below.

Council's August 2010 Motion

In August 2010, the Council recommended that NMFS consider the following as an RPA and use this as Alternative 4 in the EA/RIR and title the alternative "SSL protection with sustainable fisheries and communities."

Unless otherwise stated, the existing protection measures in 50 CFR 679 remain in place.

Atka mackerel
Remove existing "platoon" system in areas 542 and 543
Area 543:

- No fishing inside critical habitat
- Fishing outside critical habitat east of 174 degrees – 30 minutes East longitude
- TAC not to exceed 65% of ABC
- A season Jan 20 to June 10, B season June 10 to Nov 1
- No more than 50% of TAC harvested in A or B season
- No rollover between A and B seasons

Area 542:

- No fishing inside critical habitat from 178 degrees – 0 minutes East longitude to 180 degrees – 0 minutes longitude.
- TAC not to exceed 65% of ABC
- Catch inside critical habitat (outside Trawl Exclusion Zones) not to exceed 50% of TAC
- A season Jan 20 to June 10, B season June 10 to Nov 1
- No more than 50% of TAC harvested in A or B season
- No rollover between A and B seasons

Area 541:

- Status quo, except A season January 20 to June 10, B season June 10 to November 1

Pacific cod trawl
Area 543:

- No cod trawling in critical habitat east of 174 degrees 30 minutes East longitude
- Cod trawling in critical habitat west of 174 degrees 30 minutes from 10 nm and out from February 15 to March 15
- Cod trawl harvest limited to no more than 2.5% of BS/AI ABC

Area 541 and Area 542 east of 178 degrees West Longitude:

- Trawl cod fishery is A Season only (January 20 to June 10)
- Trawl cod fishery inside critical habitat is only east of 178 degrees W to 541 management border
- No inside critical habitat cod fishing west of 178 degrees W to 177 degrees E
- Increase haulout closures to 10 nm for cod trawl between 170 degrees W to 174 W
- Status quo West of 174 W to 178 W

Pacific cod fixed gear
No additional restrictions on vessels under 60' using fixed gear
Area 543:
- Prohibit directed fishery for Pacific cod.

Area- **542**
- Cod fishery is limited to B season only (June 10 to November 1)
- Critical habitat open outside 4 nm from rookeries and haulouts

Area 541/Bering Sea:
- No new 541 restrictions on fixed gear cod fishing

NMFS reviewed the Council recommendations and adopted several features of the Council's recommendations are part of Alternative 4. These include:

Atka mackerel
Remove existing "platoon"' system in areas 542 and 543
Area 543:
- No fishing inside critical habitat

Area 542:
- No fishing inside critical habitat from 178 degrees – 0 minutes East longitude to 180 degrees – 0 minutes longitude.
- A season Jan 20 to June 10, B season June 10 to Nov 1
- No more than 50% of TAC harvested in A or B season

Area 541:
- Status quo, except A season January 20 to June 10, B season June 10 to November 1

Pacific cod trawl
Area 541 and Area 542 east of 178 degrees West Longitude:
- Trawl cod fishery is A season only (January 20 to June 10)
- No inside critical habitat cod fishing west of 178 degrees W
- Increase haulout closures to 10 nm for cod trawl between 170 degrees W to 174 W

Pacific cod fixed gear
Area- **542**
- Cod fishery is limited to B season only (June 10 to November 1) (NMFS expanded this to March 1 through November 1 to provide additional opportunity for fishing in the A season based on public request)

The remaining features of the Council recommendations were found to not meet the performance standards of the final FMP biop (NMFS 2010a). The primary reasons for not meeting the performance standards is that the Council recommendation would allow amounts of Atka mackerel and Pacific cod harvests in a manner similar to historical practices or at amounts greater than allowed by the performance standards (NMFS 2010a).

The Council also recommended a 2-year sunset provision for the rule implementing their recommended action. NMFS will not implement the revised Steller sea lion protection measures with a 2-year sunset date. The regulations would remain in effect until replaced by other management measures. These measures could be developed through the Council process, in a manner and time chosen by the Council. The sunset date would create a burden on NMFS to do additional rulemaking outside of the Council process, if alternative measures could not be developed, analyzed, consulted on, and implemented before the 2-year expiration requested by the Council.

Hook-and-line Catcher/processors Recommendation

Several representatives of the hook-and-line catcher/processor sector recommended that no additional restrictions were required for the Pacific cod hook-and-line fishery based on the potential effects of this fishery on Steller sea lions. They felt that the current restrictions on the fishery meet the performance standards for the draft FMP biop (NMFS 2010b). A limit on harvests was a possible consideration to prevent additional effects on Steller sea lions beyond status quo. Even though they believe that the hook-and-line fisheries should have no more restrictions, they offered the following changes to Alternative 3 for NMFS consideration:

In Area 542—

- Close critical habitat from 0–4 nm for nontrawl fisheries year round.
- Close critical habitat from 4 nm–20 nm for nontrawl fisheries January 1 through June 10.

In Area 541, make no changes to the current Steller sea lion protection measures for nontrawl fisheries.

NMFS considered the size of the closures in Area 542 to nontrawl gear and reduced the closure from 10 nm to 6 nm. Hook-and-line vessels need more extensive areas in shallower waters for setting their gear compared to trawl vessels. In reviewing catch history and locations available for hook-and-line fishing, a substantial portion of hook-and-line catch has occurred outside of 7 nm in critical habitat. To allow for potential drift of gear, a buffer of an extra 1 nm was provided with the 6-nm closure in Alternative 4. The amount of harvests of nontrawl gear is low and dispersed compared to trawl harvests. Telemetry data indicates that the majority of the Steller sea lion critical habitat use would be inside the closure area from 0–6 nm, but the area from 4 nm to 6 nm is used to a large extent by Steller sea lions and should be protected from fishery impacts (NMFS 2010a).

Environmental Non-governmental Organizations Recommendations

Several environmental NGOs provided comments to NMFS on the RPA. They requested that NMFS base restrictions on the types of gear used to harvest Steller sea lion prey species, since different gears have different potential effects. In addition, they recommended that NMFS strive for reductions in overall biomass removal in proportion to Steller sea lion needs. In Alternative 4, NMFS did take into consideration the different methods of harvest used in trawl and nontrawl fisheries and developed management measures that are specific to the gear types. For instance, the closures in Area 542 are less for nontrawl gear than for trawl gear because of how and where these gears are used to harvest Pacific cod. NMFS is unable to quantify the Steller sea lion needs and the management of harvest to achieve the proportional reductions in biomass removal with specificity based on current information available. However, in the areas where Steller sea lions are declining, NMFS has applied gear specific management to respond to those declines.

Recommendations for Protection Measures in the Bering Sea Subarea

NMFS received recommendations to close waters within 20 nm of Dalnoi Point to trawling. The FMP biop (NMFS 2010a) did not determine that additional protection measures in the Bering Sea were necessary to avoid the likelihood of JAM for Steller sea lions. This recommendation does not meet the purpose and need of this action and, therefore, is not further analyzed.

Marine Mammal Commission Recommendation

The Marine Mammal Commission recommended that NMFS develop an adaptive, experimental approach to fisheries management to provide better insight on the effects of the fisheries on the ecosystem and on

Steller sea lions. NMFS has received this recommendation previously in the review of past Steller sea lion protection measures (NRC 2003). Even though the RPA is not currently designed as an experiment, NMFS will continue to monitor the trends of Steller sea lions and study the interactions of Steller sea lions and fisheries to obtain a better understanding of the potential effects of the fisheries on Steller sea lions and their critical habitat. An adaptive management strategy has been recommended in the FMP biop (NMFS 2010a) and will be implemented by NMFS to evaluate the efficacy of the RPA.

Recommendations Regarding Adak Processing

Two commentors recommended that NMFS include an onshore processing quota of 70 percent of AI catch of Pacific cod to an Adak processor. The RPA does not address allocation of processing as the location of processing is not an issue for removing the likelihood of JAM for Steller sea lions and their critical habitat. Allocation decisions are best made through the Council process, rather than through NMFS action and, therefore, this recommendation was not included in the preferred alternative.

Recommendations from Tribal Entities

NMFS received recommendations from an environmental NGO and several tribal entities regarding the need for closures to fisheries near Kodiak Island. The tribal entities also requested that additional pollock fishing restrictions be included in the RPA. The FMP biop (NMFS 2010a) did not identify any additional protection measures near Kodiak Island or for the pollock fishery to insure the Alaska groundfish fisheries were not likely to cause JAM for Steller sea lions. Because these recommendations do not meet the purpose and need of this action, these recommendations were not included in the preferred alternative.

Recommendation for a Marine Park

One commentor recommended the establishment of marine parks to protect Steller sea lions from the effects of the groundfish fisheries. The FMP biop (NMFS 2010a) did not identify marine parks as necessary to insure the Alaska groundfish fisheries were not likely to cause JAM for Steller sea lions. This action is intended to provide enough protection to avoid the likelihood of JAM for Steller sea lions while reducing the potential economic impacts on the fisheries as much as possible using existing methods of fisheries management. Establishing a marine park would restrict fisheries beyond what has been identified by the FMP biop as necessary and, therefore, is not further considered in this analysis.

Recommendations for PSC Management and GOA Atka Mackerel Harvest

One commentor recommended that the future PSC allocation reductions should not be implemented and that the PSC allocations since implementation of Amendment 80 should be restored. There was concern that the restrictions on Pacific cod and Atka mackerel harvest in Areas 543, 542, and 541 would result in fishing in areas with higher PSC bycatch and less efficient harvest of target species. The higher PSC bycatch may result in constraints on harvest as the PSC allocations are reached, particularly for halibut encountered in the Bering Sea. Even though the RPA may result in higher halibut harvest that may constrain fishing in the Bering Sea, the adjustments of PSC allocations is an issue that may have broad reaching effects and should be addressed through the Council process.

The commentor also recommended opening the western GOA to Atka mackerel fishing. NMFS stock assessment of Atka mackerel in the GOA does not indicate that a directed fishery is sustainable, and the Council has not recommended establishing a directed fishery for Atka mackerel in the GOA. Directed fishing for Atka mackerel in the GOA was prohibited under the 2003 Steller sea lion protection measures (68 FR 204, January 2, 2003). This action is intended to maintain the current Steller sea lion protection measures in the GOA, and, therefore, opening the western GOA to directed fishing for Atka mackerel is not further analyzed.

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2.5 Preparers and Persons Consulted

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3.0 TARGET SPECIES

3.1 Target Species Status

In the Aleutian Islands subarea of the BSAI there are five major targeted fisheries—Atka mackerel, Pacific cod, Pacific ocean perch, IFQ sablefish and halibut, Greenland turbot—and a developing arrowtooth flounder fishery. Atka mackerel is the largest targeted fishery in the Aleutian Islands, accounting for approximately 60 percent of all groundfish catch (average yearly amount from 2004 to 2009). The next largest fishery is Pacific cod. Though effort varies among the three subareas, overall the Pacific cod fishery accounts for 25 percent of all groundfish catch in the Aleutian Islands. The Pacific ocean perch fishery accounts for an average of 11 percent of the groundfish catch per year. The remaining targeted fisheries, including IFQ sablefish and halibut, Greenland turbot, arrowtooth flounder, and a small pollock fishery, account for the remaining 4 percent of groundfish catch (NMFS Catch Accounting System).

3.2 Atka mackerel

Atka mackerel (*Pleurogrammus monopterygius*) are widely distributed along the continental shelf across the North Pacific Ocean and Bering Sea from Asia to North America. In the BSAI, Atka mackerel is only targeted in the Aleutian Islands.

3.2.1 Atka mackerel stock status

The Atka mackerel biomass increased from 1977 to a peak in 1992. Prior to 1992, ABCs were allocated to the entire Aleutian management district with no additional spatial management. However, because of increases in the ABC, beginning in 1992, the Council recognized the need to disperse fishing effort throughout the range of the stock to minimize the likelihood of localized depletions. In mid-1993, Amendment 28 to the Bering Sea and Aleutian Islands (BSAI) Fishery Management Plan (FMP) became effective, dividing the Aleutian Islands subarea into three districts for the purposes of spatially apportioning TACs. Since 1994, the BSAI Atka mackerel TAC has been allocated to the three districts based on the average distribution of biomass estimated from the Aleutian Islands bottom trawl surveys. Table 3-1 gives the time series of BSAI Atka mackerel catches, and corresponding ABC and TAC by region (NPFMC 2009).

Table 3-1 BSAI Atka mackerel ABC, TAC, and catch by area (NPFMC 2009 and NMFS Catch Accounting System).

	Eastern (541 & EBS)			Central (542)			Western (543)		
	ABC	TAC	Catch	ABC	TAC	Catch	ABC	TAC	Catch
1994	13,475	13,475	15,106	55,125	44,525	28,871	53,900	10,000	21,383
1995	13,500	13,500	14,201	55,900	50,000	50,386	55,600	16,500	16,967
1996	26,700	26,700	28,173	33,600	33,600	33,523	55,700	45,857	42,246
1997	15,000	15,000	16,315	19,500	19,500	19,990	32,200	32,200	29,537
1998	14,900	14,900	12,271	22,400	22,400	20,209	27,000	27,000	24,617
1999	17,000	17,000	17,453	25,600	22,400	22,419	30,700	27,000	16,366
2000	16,400	16,400	14,344	24,700	24,700	22,383	29,700	29,700	10,503
2001	7,800	7,800	8,424	33,600	33,600	32,829	27,900	27,900	20,309
2002	5,500	5,500	4,920	23,800	23,800	22,291	19,700	19,700	18,077
2003	10,650	10,650	10,725	29,360	29,360	25,435	22,990	19,990	17,885
2004	11,240	11,240	10,838	31,100	31,100	30,169	24,360	20,660	19,554
2005	24,550	7,500	7,200	52,830	35,500	35,069	46,620	20,000	19,743
2006	21,780	7,500	7,421	46,860	40,000	39,836	41,360	15,500	14,637
2007	23,800	23,800	22,943	29,600	29,600	26,723	20,600	9,600	9,097
2008	19,500	19,500	19,118	24,300	24,300	22,329	16,900	16,900	16,643
2009	27,000	27,000	26,417	33,500	32,500	30,071	23,300	16,900	16,319

A recent study assesses the population structure of Atka mackerel using microsatellite and mitochondrial DNA (mt DNA) data (Canino et al. 2010). They found no geographic population structure in Atka mackerel, with either marker class. There was a strong discordance in diversity levels between microsatellites and mtDNA. The results suggest that recent demographic processes are responsible for the effect, and that Atka mackerel population are likely to be too evolutionarily "recent" in inhabiting their current range for genetic data to be useful in stock discrimination.

Atka mackerel are an important prey for Steller sea lions, and management measures have been taken to reduce the impacts of an Atka mackerel fishery on Steller sea lions. Since June 1998, the Atka mackerel fishery has been dispersed, both temporally and spatially, to reduce localized depletions of Atka mackerel. The TAC is now equally split into two seasons, and the amount taken within sea lion critical habitat is limited (NPFMC 2009). Atka mackerel is preyed on by Pacific cod but information is not available that would indicate the effect of this predation on Atka mackerel or Pacific cod biomass

(NPFMC 2010). The interaction between Atka mackerel and Pacific cod is not strong enough to warrant adjustments to the TACs for these species (further discussed in chapter 8.1.4)

Amendment 80 to the BSAI groundfish FMP was adopted by the Council in June 2006 and implemented for the 2008 fishing year. This action allocates several BSAI non-pollock trawl groundfish species among trawl fishery sectors, and facilitates the formation of harvesting cooperatives in the non-American Fisheries Act (non-AFA) trawl catcher/processor sector. BSAI Atka mackerel is one of the groundfish species directly affected by Amendment 80 (NPFMC 2009).

The Atka mackerel fishery takes place primarily with bottom trawl gear at depths of less than 200 m. The fishery is highly localized and takes place in the same few locations each year (Lowe et al. 2004). Atka mackerel are not commonly caught as bycatch in other targeted fisheries; however, small amounts occur in the trawl Pacific cod and Pacific ocean perch fisheries in the Aleutian Islands (NMFS Catch Accounting System).

Model predictions indicate that this stock is neither overfished nor approaching an overfished condition. Further information on Atka mackerel may be found in the Atka mackerel chapter of the annual *Stock Assessment and Fishery Evaluation* report (Lowe et al. 2004), and in the Groundfish PSEIS (NMFS 2004) and the EFH EIS (NMFS 2005).

3.2.2 Atka mackerel biomass distribution

The center of abundance for Atka mackerel is in the Aleutian Islands, with a geographical range extending to the waters off Kamchatka, the eastern Bering Sea, and the Gulf of Alaska (Table 3-2). Tag capture information from Alaska suggests that Atka mackerel populations are localized and do not travel long distances (NPFMC 2009).

Amendment 28 of the BSAI groundfish FMP divided the Aleutian Islands subarea into three districts at 177° E and 177° W longitude, providing the mechanism to apportion the Aleutian Islands Atka mackerel TACs. The Council uses survey data from the biennial Aleutian Islands bottom trawl surveys to apportion the ABC. This is done using a weighted average of the past four surveys. In 2009, the Council used the 2000, 2002, 2004, and 2006 surveys to apportion the 2010 ABC. The data used to derive the percentages for the weighting scheme are in Table 3-2 (NPFMC 2009).

Table 3-2 2009 Atka mackerel biomass distribution.

Area	2000	2002	2004	2006	2009 and recommended 2010 and 2011 ABC apportionment
541	0.20%	24.70%	27.50%	48.04%	32.20%
542	64.60%	42.30%	30.40%	38.14%	40.00%
543	35.20%	33.00%	42.00%	13.81%	27.80%
Weights	8	12	18	27	

3.3 Pacific cod

Pacific cod (*Gadus macrocephalus*) is a transoceanic species, occurring at depths from shoreline to 500 m. Pacific cod is distributed widely over the eastern Bering Sea as well as in the Aleutian Islands. The Pacific cod stock in these two areas of the BSAI is managed as a single unit (NPFMC 2009).

3.3.1 Pacific cod stock status

The stock assessment model for Pacific cod is configured to represent the portion of the Pacific cod population inhabiting the Bering Sea survey area. The model projections are then adjusted to include biomass in the Aleutian Islands survey area. The best estimate of long-term average biomass distribution is 84 percent in the Bering Sea and 16 percent in the Aleutian Islands. Model predictions indicate that this stock is neither overfished nor approaching an overfished condition (NPFMC 2009).

From 1980 through 2009, TAC averaged about 80 percent of ABC and aggregate commercial catch averaged about 90 percent of TAC. The history of acceptable biological catch (ABC) and total allowable catch (TAC) levels is summarized and compared with the time series of aggregate (i.e., all-gear, combined area) commercial catches in Table 3-3 (NPFMC 2009).

Table 3-3 BSAI Pacific cod ABC, TAC, and total catch 1981 to current. (in mt)

Year	ABC	TAC	Catch	Year	ABC	TAC	Catch
1981	160,000	78,700	63,941	1996	305,000	270,000	240,676
1982	168,000	78,700	69,501	1997	306,000	270,000	257,765
1983	298,200	120,000	103,231	1998	210,000	210,000	193,256
1984	291,300	210,000	133,084	1999	177,000	177,000	173,998
1985	347,400	220,000	150,384	2000	193,000	193,000	191,060
1986	249,300	229,000	142,511	2001	188,000	188,000	176,749
1987	400,000	280,000	163,110	2002	223,000	200,000	197,356
1988	385,300	200,000	208,236	2003	223,000	207,500	196,495
1989	370,600	230,681	182,865	2004	223,000	215,500	212,155
1990	417,000	227,000	179,608	2005	206,000	206,000	205,632
1991	229,000	229,000	220,038	2006	194,000	194,000	193,019
1992	182,000	182,000	207,272	2007	176,000	170,720	174,145
1993	164,500	164,500	167,362	2008	176,000	170,720	170,619
1994	191,000	191,000	193,802	2009	182,000	176,540	175,728
1995	328,000	250,000	245,033				

Source: NPFMC 2009 and NMFS catch accounting system

Presently, the Pacific cod stock is exploited by a multiple-gear fishery, including trawl, longline, pot, and jig components. Beginning in 2006, the Pacific cod TAC is set after three percent is subtracted from the ABC to account for the State of Alaska's (State) guideline harvest level fishery in State waters of the Aleutian Islands. The BSAI Pacific cod TAC is then allocated by regulation according to harvesting sector, gear type, and season. Typically as the harvest year progresses, it becomes apparent that one or more gear types will be unable to harvest their full allocation by the end of the year. This is addressed by reallocating TAC between harvest sectors and gear types in the second half of each year, typically October through December. In general, NMFS reallocates projected unused amounts in any catcher vessel (CV) sector primarily to other CV sectors before reallocating that amount to any catcher/processor (C/P) sector and, secondarily, within a gear type before reallocating that amount to another gear type.

3.3.2 Pacific cod biomass distribution

Tagging studies (e.g., Shimada and Kimura 1994) have demonstrated significant migration both within and between the Bering Sea, Aleutian Islands, and Gulf of Alaska (GOA). Although at least one previous genetic study (Grant et al. 1987) failed to show significant evidence of stock structure within these areas, current genetic research underway at the Alaska Fisheries Science Center (AFSC) is providing additional information on the issue of stock structure of Pacific cod within the BSAI (M. Canino, AFSC, personal communication). Pacific cod is not known to exhibit any special life history characteristics that would require it to be assessed or managed differently from other groundfish stocks in the Bering Sea or Aleutian Islands. The best estimate of long-term average biomass distribution is 84 percent in the Bering Sea and 16 percent in the Aleutian Islands (NPFMC 2009). The BSAI Plan Team and SSC have recommended separate ABC for the Bering Sea and Aleutian Islands subareas. The Council is tentatively scheduled to discuss this topic at its February 2010 meeting.

3.4 Other Target Species

3.4.1 Pacific ocean perch

Pacific ocean perch (POP), and four other associated species of rockfish (northern rockfish, rougheye rockfish, shortraker rockfish, and sharpchin rockfish) were managed as the POP complex in separate Bering Sea and Aleutian Islands subareas from 1979 to 1990. In 1991, the Council separated POP from the other red rockfish to provide protection from possible overfishing. Of the five species in the former POP complex, POP has historically been the most abundant rockfish in this region and has contributed most of the commercial rockfish catch. Starting in 1996, the POP ABC and TAC were subdivided into the three Aleutian Island districts in proportion to the estimated biomass from the biennial Aleutian Islands trawl survey. Model predictions indicate that this stock is neither overfished nor approaching an overfished condition. Further information on POP may be found in the POP chapter of the annual *Stock Assessment and Fishery Evaluation* report (NPFMC 2009).

POP is commonly caught while directed fishing for Atka mackerel. Approximately 4.9 percent of the total groundfish caught in the Atka mackerel fishery is POP.

3.4.2 Greenland turbot

Greenland turbot (*Reinhardtius hippoglossoides*) within the U.S. 200-mile exclusive economic zone are mainly distributed in the eastern Bering Sea and Aleutian Islands. Prior to 1985, Greenland turbot and arrowtooth flounder were managed together. Since then, the Council has recognized the need for separate management quotas given large differences in the market value between these species. Furthermore, the abundance trends for these two species are clearly distinct (e.g., Wilderbuer and Sample 1992 in NPFMC 2009).

Greenland turbot is targeted by longline and trawl gear. From 1990 to 1995, the Council set the ABCs (and TACs) to 7,000 mt as an added conservation measure citing concerns about recruitment. Since 1996, the ABC levels have varied but averaged 7,660 mt (with catch for that period averaging 4,550 mt). In 2008 and 2009, trawl-caught Greenland turbot exceeded the level of catch by longline vessels. This shift in the proportion of catch by sector is due to changes arising from Amendment 80. Model predictions indicate that this stock is neither overfished nor approaching an overfished condition. Further information on Greenland turbot may be found in the Greenland turbot chapter of the annual *Stock Assessment and Fishery Evaluation* report (Ianelli, Wilderbuer, and Nichol 2009).

3.4.3 Arrowtooth Flounder

Arrowtooth flounder (*Atheresthes stomias*) is a relatively large flatfish which occupies continental shelf waters almost exclusively until age four, but at older ages occupies both shelf and slope waters. Two species of Atheresthes occur in the Bering Sea. Arrowtooth flounder and Kamchatka flounder (*A. evermanni*) are very similar in appearance and are not always distinguished in the commercial catches.

Arrowtooth flounder are found throughout the BSAI management area; however, their abundance in the Aleutian Islands is lower than in the Bering Sea. The resource in the Bering Sea and Aleutian Islands are managed as a single stock although the stock structure has not been studied.

Historically in the Bering Sea and Aleutian Islands, arrowtooth flounder was mostly caught while pursuing other high value species and discarded. With the development of marketable products and Amendment 80 fishing practices in 2008, the percentage of arrowtooth flounder catch retained has increased to 73 percent of the total catch. The largest discard amounts still occur in the Pacific cod fishery and the various flatfish fisheries. An increasing trend of catch and retention is expected in the near future due to Amendment 80. Model predictions indicate that this stock is neither overfished nor approaching an overfished condition.

Although the standard sampling trawl changed in 1982 to a more efficient trawl, which may have caused an overestimate of the biomass increase in the pre-1982 part of the time-series, biomass estimates from AFSC surveys on the continental shelf have shown a consistent increasing trend since 1975. Since 1982, biomass point-estimates indicate that arrowtooth flounder abundance has increased eight-fold to a high of 570,600 mt in 1994. The population biomass remained at a high level from 1992 to 1997. Results from the 1997 to 2000 bottom trawl surveys indicate the Bering Sea shelf population biomass had declined to 340,000 mt, 60 percent of the peak 1994 biomass point estimate. Beginning in 2002 the shelf survey estimate increased further and peaked in 2005 at a biomass of 757,685 mt. In 2006 to 2008 the estimates declined slightly but were still at high levels. The 2009 survey point estimate is lower at 453,559 mt.

Arrowtooth flounder absolute abundance estimates are based on "area-swept" bottom trawl survey methods. These methods require several assumptions that can add to the uncertainty of the estimates. For example, it is assumed that the sampling plan covers the distribution of the species and that all fish in the path of the trawl are captured (no losses due to escape, or gains due to herding). Due to sampling variability alone, the 95 percent confidence intervals for the 2009 point estimate are 370,742 mt to 536,377 mt.

The combined arrowtooth/Kamchatka flounder abundance estimated from the 2006 Aleutian Islands trawl survey is 229,205 mt, the highest estimate observed in the Aleutian Islands since surveys began in 1980. Results from trawl surveys in Areas 541, 542, and 543 indicate that approximately 15 percent to 20 percent of the arrowtooth/Kamchatka flounder biomass is located in the Aleutian Islands in any year. Until 2009 the stock assessment model did not consider the Aleutian Islands portion of the biomass to model stock abundance and was therefore a conservative estimate of the stock size. In the 2009 assessment, the 10 surveys conducted in the Aleutian Islands are included in the base model.

Further information on arrowtooth flounder may be found in the arrowtooth flounder chapter of the annual *Stock Assessment and Fishery Evaluation* report (Wilderbuer, Nichol, and Aydin 2009).

3.4.4 Sablefish

Sablefish (*Anoplopoma fimbria*) inhabit the northeastern Pacific Ocean from northern Mexico to the Gulf of Alaska, westward to the Aleutian Islands, and into the Bering Sea (Wolotira et al. 1993). Adult sablefish occur along the continental slope, shelf gullies, and in deep fjords, generally at depths greater than 200 m. Sablefish observed from a manned submersible were found on or within 1 m of the bottom (Krieger 1997). In contrast to the adult distribution, juvenile sablefish (less than 40 cm) spend their first two to three years on the continental shelf of the Gulf of Alaska, and occasionally on the shelf of the southeast Bering Sea. The Bering Sea shelf is utilized significantly in some years and little used during other years (Shotwell 2007).

The U.S. longline fishery began expanding in 1982 in the Gulf of Alaska and in 1988, harvested all sablefish taken in Alaska except minor joint venture catches. Following domestication of the fishery, the previously year-round season in the Gulf of Alaska began to shorten in 1984. By the late 1980s, the average season length decreased to one month to two months. In some areas, this open-access fishery was as short as 10 days, warranting the label “derby” fishery.

Season length continued to decrease until Individual Fishery Quotas (IFQ) were implemented for hook-and-line vessels in 1995 along with an 8-month season. From 1995 to 2002 the season ran from approximately March 15 to November 15. Starting in 2003 the season was extended by moving the start date to approximately March 1. The sablefish IFQ fishery is concurrent with the halibut IFQ fishery. The expansion of the U.S. fishery was helped by exceptional recruitment during the late 1970s. This exceptional recruitment fueled an increase in abundance for the population during the 1980s. Increased abundance led to increased quotas and catches peaked again in 1988 at about 70 percent of the 1972 peak. Abundance has since fallen as the exceptional late 1970s year classes have dissipated. Catches fell again in 2000 to approximately 42 percent of the 1988 peak. Catches since 2000 have increased modestly, largely due to a strong 1997 year class.

IFQ management has increased fishery catch rates and decreased the harvest of immature fish (Sigler and Lunsford 2001). Catching efficiency (the average catch rate per hook for sablefish) increased 1.8 times with the change from an open-access to an IFQ fishery. The improved catching efficiency of the IFQ fishery reduced the variable costs incurred in attaining the quota from eight percent to five percent of landed value, a savings averaging U.S. $3.1 million annually (U.S. dollars). Decreased harvest of immature fish improved the chance that individual fish will reproduce at least once. Spawning potential of sablefish, expressed as spawning biomass per recruit, increased nine percent for the IFQ fishery. The directed fishery is primarily a hook-and-line fishery, and also includes pot gear in the BSAI. Sablefish also are caught during directed trawl fisheries for other species groups such as Greenland turbot, arrowtooth flounder, rockfish, and deepwater flatfish. Model predictions indicate that this stock is neither overfished nor approaching an overfished condition. Further information on sablefish may be found in the sablefish chapter of the annual *Stock Assessment and Fishery Evaluation* report (Hanselman, Fujioka, Lunsford, and Rodgveller 2009).

3.4.5 IFQ Program

The halibut and sablefish IFQ program was implemented in 1995. Quota Share (QS) was initially issued to persons who owned or leased vessels that made legal commercial fixed-gear landings of Pacific halibut or sablefish during 1988 to 1990 off Alaska. QS is transferable to other initial issuees or to those who have become eligible for transfers on NMFS's approval of an application for a Transfer Eligibility Certificate. Once issued to a person, QS is held by that person until it is transferred, suspended, or revoked. An IFQ permit authorizes participation in fixed-gear harvests of Pacific halibut off Alaska, and most sablefish fisheries off Alaska. Permits are issued annually to persons holding fishable Pacific halibut and sablefish QS, or to those who are recipients of IFQ-only transfers from QS holders. Authorized pounds for annual IFQ permits are determined by the number of QS units held, the total number of QS units in the "pool" for a species and area, and the total amount of halibut or sablefish allocated for IFQ fisheries in a particular year. More information on the IFQ program may be found on the Alaska Region website at http://alaskafisheries.noaa.gov/ram/ifq.htm.

3.5 Target Species Significant Criteria

For direct and indirect impacts, the baseline is the fishery and resource status as they were in 2009. This is the fishery status quo. In instances where 2009 information is unavailable or incomplete, the 2009 baseline has been approximated with the most recent appropriate information available. The direct and indirect impact analysis examines the significance of impacts on resource components by comparing the incremental impacts of the preferred alternative, and of each reasonable alternative, to the condition of the resource components in 2009. Past actions, such as past harvest specifications, actions placing spatial or temporal restrictions on fishing activity, actions restricting the types and characteristics of allowable fishing gear, actions specifying prohibited species catch (PSC) limits, and other actions, are accounted for, since they are incorporated into the 2009 baseline for the fishery.

The significance criteria used to evaluate the effects of the action on target species is in Table 3-4. These criteria are adopted from the significance criteria used in the 2006–2007 Groundfish Harvest Specifications EA (NMFS 2006b). The ratings use a minimum stock size threshold (MSST) as a basis for beneficial or adverse impacts of each alternative.

Table 3-4 Criteria used to estimate the significance of effects on the FMP managed target stocks.

	Level of mortality	Genetic structure	Reproductive success	Prey availability	Habitat
		Genetic structure and reproductive success provide indicators of the effect of the alternative on spatial and temporal concentration of the species.			
No impact	No change in sustainable target fishery biomass.	No fishery induced changes in genetic structure of the stock.	No fishing impact on level of recruitment success or adult fecundity.	No fishing impact on prey availability for target species.	No fishing impact on target fishery habitat.
Adverse impact	Substantial reduction in the level of the sustainable biomass because of fishing activity.	Fishing activity has differential impact on substocks in the population.	Reduced level of recruitment success due to fishing related disturbance of fish stocks during life cycle stages important to recruitment or to dispensatory impacts of fishing activity.	Current harvest levels and distribution of harvest reduce prey available for target stocks.	Fishing activity will have an adverse impact on sustainable target fishery biomass because of its impact on habitat.
Beneficial impact	There is no beneficial impact from this action.	There is no beneficial impact from this action.	Increased level of recruitment success associated with density dependent or compensatory mechanisms.	Current harvest levels and distribution of harvest increase prey available to target stocks.	There is no beneficial impact from this action.
Significantly adverse impact	Level of mortality likely to exceed the maximum fishing mortality threshold	Evidence of genetic subpopulation structure and evidence that the distribution of	Evidence that the distribution of harvest leads to a detectable decrease in reproductive	Evidence that current harvest levels and distribution of harvest lead to a change in prey	Evidence that current levels of habitat disturbance are sufficient to lead to a decrease in

	Level of mortality	Genetic structure	Reproductive success	Prey availability	Habitat
		Genetic structure and reproductive success provide indicators of the effect of the alternative on spatial and temporal concentration of the species.			
	(MFMT or OFL) or to decrease abundance below minimum stock size threshold (MSST).	harvest leads to a detectible reduction in genetic diversity that jeopardizes the ability of the stock to sustain itself at or above the MSST or increases the potential for overfishing.	success such that it jeopardizes the ability of the stock to sustain itself at or above MSST or increases the potential for overfishing.	availability that jeopardizes the ability of the target stock to sustain itself at or above MSST or increases the potential for overfishing.	spawning or rearing success such that it jeopardizes the ability of the stock to sustain itself at or above the MSST or increases the potential for overfishing.
Significantly beneficial impact	Not applicable.	Not applicable.	Not applicable. Increased recruitment success due to fishing activity can only be sustained with beneficial fishing activity, and biomass below unfished levels.	Evidence that current harvest levels and distribution of harvest lead to a change in prey availability such that it enhances the ability of the stock to sustain itself at or above the MSST or increases the potential for overfishing.	Not applicable.
Unknown impact	Unknown fishing mortality rate	OFL or MSST and genetic structure are unknown, therefore no information to evaluate whether distribution of the catch changes the genetic structure of the population such that it jeopardizes or enhances the ability of the stock to sustain itself at or above the MSST or increases the potential for overfishing.	OFL or MSST are unknown therefore no information regarding the potential impact of the distribution of the catch on reproductive success such that it jeopardizes or enhances the ability of the stock to sustain itself at or above the MSST or increases the potential for overfishing.	OFL or MSST are unknown therefore no information that current harvest levels and distribution of harvest lead to a change in prey availability such that it enhances or jeopardizes the ability of the stock to sustain itself at or above the MSST or increases the potential for overfishing.	OFL or MSST are unknown therefore no information that current levels of habitat disturbance are sufficient to lead to a detectable change in spawning or rearing success such that it enhances or jeopardizes the ability of the stock to sustain itself at or above the MSST or increases the potential for overfishing.

3.5.1 Effects on Atka mackerel

3.5.1.1 Alternative 1 effects on Atka mackerel

Alternative 1 is status quo and therefore would have no change from the current stock status discussed in 3.2.1. Under status quo it is expected that fisheries would largely continue to operate as they have in the past and effects would be the same as those described in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The impacts of Alternative 1 are not expected to reduce the Atka mackerel stock to below its MSST. The Atka mackerel stock is not overfished or experiencing overfishing. Impacts on prey availability and habitat are not likely to affect the sustainability of the stock. The impacts of Alternative 1 on Atka mackerel are therefore insignificant.

3.5.1.2 Alternative 2 effects on Atka mackerel

Prohibiting directed fishing or retention of Atka mackerel in Areas 542 and 543 would reduce overall fishing mortality by approximately 68 percent of current levels. Therefore the biomass of Atka mackerel is expected to increase in Areas 542 and 543. Using the method of apportioning biomass as described in section 3.2.2 could result in further reducing fishing mortality. As Atka mackerel biomass increases in Areas 542 and 543 the allocation to each area would be shifted into those areas where fishing is prohibited. In Area 541, directed fishing inside critical habitat would remain closed and would result in no change from the status quo.

An increase in the Pacific cod biomass may increase predation on Atka mackerel. Food habits data show that Pacific cod have an extremely varied diet. In the Bering Sea, pollock are a major diet item for Pacific cod (26 percent of diet), but in the Aleutian Islands Atka mackerel and sculpins are the predominant fish prey for Pacific cod (15 percent of diet each), with pollock comprising less than five percent of the diet.

An increase in the arrowtooth flounder biomass may increase predation on Atka mackerel. Arrowtooth flounder are an important ecosystem component as predators. This is particularly relevant as the 2009 assessment indicates that they are now increasing rapidly in abundance. In the Aleutian Islands, arrowtooth flounder feed on the range of available forage fishes, including myctophids, Atka mackerel, and pollock. They are an important predator on Atka mackerel juveniles, making up 23 percent of the assumed natural mortality of this species.

The impacts of Alternative 2 are not expected to reduce the Atka mackerel stock to below its MSST. The Atka mackerel stock would not be overfished or experience overfishing because the current harvest specifications practices for setting TACs and managing harvests within the limits would continue. The shifting of the fishery is not likely to impact prey availability and habitat in a way that would affect the sustainability of the Atka mackerel stock. The impacts of Alternative 2 on Atka mackerel are therefore insignificant.

3.5.1.3 Alternatives 3 and 4 Effects on Atka Mackerel

Prohibiting directed fishing or retention of Atka mackerel in 543 and a reduction of the 542 TAC would reduce overall fishing mortality by approximately 55 percent of current levels. In Area 542, the only area open to directed fishing will be the Petrel Bank area under Alternative 3 and an additional one degree portion of critical habitat under Alternative 4. The concentration of fishing effort in the Petrel Bank under Alternative 3 may result in some localized depletion; however, the intensity is somewhat mitigated by the reduction in overall TAC. Fishing effort under Alternative 4 in the one degree portion of critical habitat is further restrained by the 10 percent harvest limit for cooperative and CDQ fishing, further preventing potential localized depletion. In Area 541, directed fishing inside critical habitat would remain closed and would result in no change from the status quo.

The impacts of Alternatives 3 and 4 are not expected to reduce the Atka mackerel stock to below its MSST. The Atka mackerel stock would not be overfished or experience overfishing because the current harvest specifications practices for setting TACs and managing harvests within the limits would continue. The shifting of the fishery is not likely to impact prey availability and habitat in a way that would affect the sustainability of the Atka mackerel stock. The impacts of Alternatives 3 and 4 on Atka mackerel are therefore insignificant.

3.6 Pacific cod

Pacific cod (*Gadus macrocephalus*) is distributed widely in the North Pacific, including the eastern Bering Sea and Aleutian Islands, and occur at depths from shoreline to 500 m.

3.6.1 Effects on Pacific cod

3.6.1.1 Alternative 1

Alternative 1 is status quo and therefore would have no change from the current stock status discussed in 3.4. Under status quo it is expected that fisheries would largely continue to operate as they have in the past and effects would be the same as those described in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The impacts of Alternative 1 are not expected to reduce the Pacific cod stock to below its MSST. The Pacific cod stock is not overfished or experiencing overfishing. Impacts on prey availability and habitat are not likely to affect the sustainability of the stock. The impacts of Alternative 1 on Pacific cod are therefore insignificant.

3.6.1.2 Alternative 2

Prohibiting directed fishing or retention of Pacific cod in Areas 542 and 543 may reduce overall fishing mortality of the BSAI Pacific cod stock. NMFS expects amounts of Pacific cod that would have been harvested in Areas 542 and 543 by trawl catcher vessels, hook-and-line catcher/processors, and pot catcher/processors are likely to be harvested in the Bering Sea or outside critical habitat in Area 541. Pacific cod allocations that are projected to remain unharvested will be reallocated to sectors that can harvest it. Unlike other sectors, due to the nature of the Amendment 80 catch shares program, unused amounts of Pacific cod will remain unharvested. This may result in a small reduction of fishing mortality of the BSAI Pacific cod stock. Because of the management of Pacific cod under the Amendment 80 catch share program, Pacific cod not harvested by Amendment 80 vessels will not be reallocated and will remain unharvested.

The impacts of Alternative 2 are not expected to reduce the Pacific cod stock to below its MSST. The Pacific cod stock would not be overfished or experience overfishing because the current harvest specifications practices for setting TACs and managing harvests within the limits would continue. The shifting of the fishery is not likely to impact prey availability and habitat in a way that would affect the sustainability of the Pacific cod stock. The impacts of Alternative 2 on Pacific cod are therefore insignificant.

3.6.1.3 Alternatives 3 and 4

The overall effects of Alternatives 3 and 4 on Pacific cod are very similar to those effects listed under Alternative 2 (section 3.6.1.2). NMFS expects that it will be easier for current fleets to maintain current

Pacific cod catch and that the overall reduction of fishing mortality of the BSAI Pacific cod stock will be less. The removal of Pacific cod in Areas 542 and 541 under Alternative 4 is likely to be constrained by the reinitiation triggers for the nontrawl and trawl fisheries, preventing more removals than historical amounts, even with the shifting of fishing effort out of Area 543.

The impacts of Alternatives 3 and 4 are not expected to reduce the Pacific cod stock to below its MSST. The Pacific cod stock would not be overfished or experience overfishing because the current harvest specifications practices for setting TACs and managing harvests within the limits would continue. The shifting of the fishery is not likely to impact prey availability and habitat in a way that would affect the sustainability of the Pacific cod stock. The impacts of Alternatives 3 and 4 on Pacific cod are therefore insignificant.

3.7 Other Target Species

3.7.1 Effects on Other Target Species

Detailed information on the potential shifting of harvest and economic effects to the other target species fisheries can be found in chapter 10, the Regulatory Impact Review (RIR).

3.7.1.1 Alternative 1 Effects on Other Target Species

Alternative 1 is status quo and therefore would have no change from the current stock status discussed in 3.5. Under status quo it is expected that fisheries would largely continue to operate as they have in the past and effects would be the same as those described in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The impacts of Alternative 1 are not expected to reduce the other target groundfish species stocks to below their MSSTs. The other target species stock are not overfished or experiencing overfishing. Impacts on prey availability and habitat are not likely to affect the sustainability of the other target species stocks. The impacts of Alternative 1 on other species stocks are therefore insignificant.

3.7.1.2 Alternatives 2, 3, and 4 Effects on Other Target Species

Alternative 2 would close two major fisheries in Areas 543 and 542 in the Aleutian Islands; however, it would not implement any direct changes to other target species. Therefore any effects to other target species are incidental to changes in behavior by fleets that fish in the Atka mackerel fishery and to a small extent the Pacific cod fishery. Some additional harvests of yellowfin sole and rock sole in the Bering Sea is expected as the Atka mackerel fishery is closed in Area 543 under Alternatives 2, 3, and 4. This harvest would be done within the limits established under the harvest specifications so no additional impact on these other species is expected beyond status quo.

With exception to Pacific ocean perch (POP), incidental catch of other target species occur at low levels, and there are no anticipated effects. As noted in section 3.4.1, the incidental catch rate of POP in the Atka mackerel target is approximately 4.9 percent. This is equal to approximately 2,500 mt of POP caught when vessels are targeting Atka mackerel. With the closure of Atka mackerel in 542 and 543, less POP would be caught incidentally. However since POP is a commercially important species to the Amendment 80 fleet, it is likely to be fully harvested, though targeted and not incidentally. There is also potential for some effort to shift to Greenland turbot and arrowtooth flounder fisheries. The total amount of Greenland turbot harvested is likely to remain the same, as the TAC constrains the Aleutian Islands Greenland turbot catch. However, if effort increases, then the catch rate of Greenland turbot may increase.

The impacts of Alternatives 2, 3, and 4 are not expected to reduce the other target species stocks to below their MSSTs. The other target species stocks would not be overfished or experience overfishing because the current harvest specifications practices for setting TACs and managing harvests within the limits would continue. The shifting of the fishery is not likely to impact prey availability and habitat in a way that would affect the sustainability of the other species stock. The impacts of Alternatives 2, 3, and 4 on other target species are therefore insignificant.

3.8 Cumulative Effect

A discussion of the cumulative effects of the groundfish fisheries is in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The past and current cumulative effects are discussed in the PSEIS (NMFS 2004). Both of these discussions are incorporated by reference.

For target species, several future actions were identified as reasonably foreseeable future effects. These actions are described in section 3.3 of the Harvest Specifications EIS (NMFS 2007). The reasonably foreseeable future actions that may impact target species are—

- ecosystem-sensitive management;
- fisheries rationalization;
- traditional management tools;
- actions by other state, federal, and international agencies; and
- private actions.

The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the direct and indirect effects of the alternatives on target species. This analysis builds on the analysis of the impacts of each of these actions on target species in section 4.1.3 of Harvest Specifications EIS (NMFS 2007).

Ecosystem-sensitive management

Ecosystem-sensitive management is likely to benefit target species. The specific actions that will be taken to implement an ecosystem policy for fisheries management are unknown at this time; therefore, the significance of cumulative effects of ecosystem policy implementation on mortality, spatial and temporal distribution of the fisheries, changes in prey availability, and changes in habitat suitability are unclear. However, these actions may enhance the ability of stocks to sustain themselves at or above MSST, as ways are found to introduce ecosystem considerations into the management process.

As noted in section 3.3.1 of the Harvest Specifications EIS (NMFS 2007), an increased understanding of interactions between ecosystem components is reasonably foreseeable. This coupled with another reasonably foreseeable action, increased integration of ecosystem considerations into fisheries decision-making, is likely to result in fishery management that reduces potential adverse impacts of the proposed action on target stocks. An example of the ways new information may change our perspectives was suggested at a workshop on multi-species and ecosystem-based management held at the February 2005 Council meeting. Multi-species and ecosystem projections of biomass impacts from eliminating fishing mortality for 20 years were compared to similar estimates made with single-species models. A report of the discussions noted that, “Results… were similar for top predators such as Pacific cod and Greenland turbot. However, results for walleye pollock, a key forage species, were different when predator/prey interactions were included. Both the multi-species and ecosystem models predicted much more modest increases in pollock biomass than did the single-species model, as predation increased to compensate for the increase in food supply" (NMFS 2005:23). Predation here refers to cannibalism of juvenile pollock by larger adult pollock.

The Council has been investigating and taking steps to implement measures to provide more protection to non-target species. In 1998, the State recommended that the Council revise management of sharks and skates in the exclusive economic zone off Alaska to prevent development of directed fisheries on these long-lived, slow recruiting species. The Council expanded this initiative, first in 2002 to all components of the "other species" category, and then to all non-target species in 2003, but would limit directed fishing on non-target species until sufficient information is available to estimate the OFL. The Council's Non-target Species Committee was formed in October 2003 to develop improved measures to manage non-target species.

In 2005, the AFSC prepared separate SAFE chapters for the species in the "other species" complex in the BSAI. In 2006, the AFSC updated these, and prepared separate SAFE chapters for the individual species in the GOA "other species" complex (Hollowed and Rigby 2006). In 2006, the groundfish plan teams also "rehearsed" the preparation of OFLs and ABCs for the individual species in the other species complexes.

In 2010, the Council recommended Amendments 96 and 87 to the groundfish FMPs. These amendments remove the other species categories from the FMPs and provide for separate OFL, ABC, and TACs for the other species groups in the GOA and BSAI. The 2011 and 2012 harvest specifications will include separate OFLs, ABCs, and TACs for these groups, providing for enhanced management to prevent the potential for overfishing of these groups (75 FR 41424, July 16, 2010). The FMPs were also reorganized to have two categories of species listing: target species and ecosystem component species. Target species must have OFL, ABC, and TAC specified for each stock. Ecosystem component species contain the prohibited species and forage fish species and have management measures associated with them to mitigate the impacts of the groundfish fisheries on these stocks.

The Council's Non-target Species Committee will continue to identify species harvested in the groundfish fisheries that may need to be placed in the target or ecosystem component species groups in the FMPs to ensure the capability of managing the harvest of these species in the groundfish fisheries. The continued improvement of target species management is beneficial to target species as it mitigates potential adverse impacts of the fisheries on these stocks.

Rationalization

Fisheries rationalization makes large changes to the way the fisheries are managed and primarily affects the allocation of harvest amounts. The future effects on target species are minimal because rationalization would not change the setting of TACs, which control the impacts of the fisheries on fishing mortality. However, to the extent rationalization improves fishing practices and the manageability of the fisheries, it could reduce the adverse effects of the proposed action on target species. The GOA Rockfish Pilot Program and the rationalization of the non-AFA C/P trawl fishery increased observer coverage and improved the use of scales, leading to better estimates of catch in these fisheries.

Traditional management tools

Future harvest specifications will primarily affect fishing mortality, as the other significance criteria for target species (temporal and spatial harvest, prey availability, and habitat suitability) are primarily controlled through regulations in 50 CFR part 679. The setting of harvest levels each year is controlled to ensure the stock can produce maximum sustainable yield (MSY) on a continuing basis and to prevent overfishing. Each year's setting of harvest specifications include the consideration of past harvests and future harvests based on available biomass estimates. In-season managers close species to directed fishing as fishermen approach TACs, prohibit retention of species when a TAC has been reached, and introduce fishing restrictions, or actual fishery closures, in fisheries in which harvests approach OFL. The 2 million mt optimum yield cap in the BSAI also contributes significantly to preventing overharvests. The controls on fishing mortality in setting harvest specifications ensure the stocks are able to produce MSY on a continuing basis.

A large proportion of the groundfish fleet now carries vessel monitoring systems (VMS) due to VMS requirements introduced in connection with the Steller sea lion protection measures, EFH/HAPC protection measures, and the Crab Rationalization Program. In-season managers currently use VMS intensively to manage fisheries so that harvests are as close to TACs as possible. VMS has also become a valuable diagnostic tool for addressing situations with unexpected harvests. It was used as a diagnostic tool in July 2006 to investigate the sources of a sudden and unexpected bycatch of squid in the pollock fishery. As agency experience with VMS grows, it should allow in-season managers to more precisely match harvests to TACs, reducing potential overages, and maximizing the value of TACs to industry. Extension of VMS will be associated with larger costs for vessels that will adopt it.

The Council recommended Amendment 83 to the Gulf of Alaska groundfish FMP, which would split the GOA Pacific cod TAC among sectors and include a restriction on the surrender of a federal fisheries permit (FFP). The Council's action precludes federally permitted vessels that do not have LLP licenses from participating in the GOA Pacific cod parallel fishery to prevent an encroachment to the catches of historic participants who contributed catch history to the sector allocations and depend on the GOA Pacific cod resource. In the Aleutian Islands, the Council recommended a requirement that operators of any federally permitted pot or hook-and-line C/P used to catch Pacific cod in the parallel fishery would also be required to comply with the same seasonal and operational closures of Pacific cod that apply in the federal fishery. This recommendation also requires that CVs and C/Ps surrendering an FFP could not obtain a new FFP for three years. This restriction would result in potentially less harvest of Pacific cod inside State waters of the Aleutian Islands. This would not be an issue for federally permitted vessels participating in the State Pacific cod guideline harvest level (GHL) fishery, as these vessels would be exempt from the federal Steller sea lion protection measures in the Aleutian Islands.

At its December 2008 meeting, the Council received a discussion paper on dividing BSAI Pacific cod sector allocations between the Bering Sea and Aleutian Islands. The discussion paper reviewed three primary action alternatives originally proposed in Amendment 85 Part II.[1] The intent of the action is to provide direction to NMFS regarding how to establish sector allocations in the Bering Sea and Aleutian Islands management areas if separate TACs were issued in a future harvest specifications process. The Council decided to delay this action after receiving the draft FMP biop (NMFS 2010b), since it would be very difficult to simultaneously propose changes to Pacific cod management and continue development of the FMP biop.

[1] The discussion paper is on the Council's website at http://alaskafisheries.noaa.gov/npfmc/current_issues/pcod/BSAIPcodsplit1208.pdf.

Other government actions

Alaska may expand State-managed GHL or State parallel groundfish fisheries. While the State sets its GHLs in its State-managed GHL fisheries, adjustments are typically made to federal TACs to keep combined state and federal harvests of the relevant species below the ABC and OFL for that species. State parallel fisheries are conducted within the federal TACs. Since 2006, the Council and NMFS have set the BSAI Pacific cod TAC to accommodate the State Pacific cod GHL fishery in the Aleutian Islands within the overall ABC for the BSAI.

Private actions

Fishing activities by private fishing operations, carried out under the authority of the annual harvest specifications, are an important class of private action. The impact of these actions has been considered under traditional management tools.

A private action not treated above is the Marine Stewardship Council (MSC) environmental certification of fisheries. The MSC developed standards for sustainable fishing and seafood traceability. They ensure that MSC-labeled seafood comes from, and can be traced back to, a sustainable fishery. The MSC certified BSAI and GOA pollock, Pacific cod, flatfish, halibut, and sablefish. Certification will have to be renewed in the future. If the MSC environmental certification has important marketing benefits, this will increase industry incentives to address the environmental issues connected with the fishery. In this context, it may tend to lengthen industry's time horizon, and increase its interest in target stock sustainability. More information on the MSC certification program may be found at http://eng.msc.org/.

Increasing economic activity in and off Alaska may affect future fisheries. The high levels of traffic between the West coast and East Asia raise concerns about pollution incidents or the introduction of invasive species from ballast water. Pollution issues were highlighted in December 2004 when the M/V *Selendang Ayu* wrecked on Unalaska Island and again in July 2006 with the M/V *Cougar Ace* accident. Alaskan economic development can affect the coastal zone and species that depend on the zone. However, Alaska remains relatively lightly developed compared to other states in the nation. Marine transportation associated with that development may be more of a concern than in other states, due to the relatively greater importance of marine transportation to Alaska's economy.

The development of aquaculture may affect prices for, and the harvest of, some species. For example, the development of sablefish aquaculture may reduce wild sablefish prices and reduce interest in sablefish harvests in high-operating-cost areas in the BSAI where sablefish TACs are currently not fully harvested. More direct impacts, through development of finfish aquaculture in waters off Alaska, do not appear to be likely at this time.

3.9 Summary of Effects

Under all alternatives, the stock biomass of all target species is expected to be above their MSST. The probability that overfishing would occur is low for all of the stocks. The expected changes that would result from harvest at the levels proposed are not substantial enough to expect that the genetic diversity or reproductive success of these stocks would change. None of the alternatives would allow overfishing of the spawning stock. Therefore, the genetic integrity and reproductive potential of the stocks should be preserved.

The direct, indirect, and cumulative effects of the alternatives are not expected to (1) jeopardize the capacity of the stock to produce maximum sustainable yield on a continuing basis; (2) alter the genetic sub-population structure such that it jeopardizes the ability of the stock to sustain itself at or above the minimum stock size threshold or experience overfishing; (3) decrease reproductive success in a way that jeopardizes the ability of the stock to sustain itself at or above the minimum stock size threshold; (4) alter harvest levels or distribution of harvest such that prey availability would jeopardize the ability of the stock to sustain itself at or above the minimum stock size threshold or experience overfishing, and (5) disturb habitat at a level that would alter spawning or rearing success such that it would jeopardize the ability of the stock to sustain itself at or above the minimum stock size threshold or experience overfishing. **For these reasons, impacts to target species stocks, species, or species groups, are predicted to be insignificant for all target fish evaluated under Alternatives 1, 2, 3, and 4.** Detailed information on each stock may be found in the SAFE documents (NPFMC 2009) and chapter 10, the RIR.

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3.11 Preparers and Persons Consulted

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4.0 NON-TARGET SPECIES

Non-target species are those species that the industry does not target and are only caught incidentally to the target species listed in chapter 3. These species include forage fish, prohibited species (e.g., salmon and halibut), and non-specified species. Forage fish and prohibited species are part of the ecosystem component in the BSAI groundfish FMP and have management measures to minimize the catch of these species. The harvest of these species may be managed through quotas (e.g., halibut prohibited species catch limit and forage species maximum retainable amount [Table 11 to 50 CFR part 679]), closure areas (e.g., salmon savings areas), prohibitions on directed fishing, or not managed (e.g., non-specified species). The status of the non-target species is described in the Alaska Groundfish Harvest Specifications EIS and is incorporated by reference (NMFS 2007). For those with stock information (e.g., halibut, crab), none are experiencing overfishing due to the incidental catch in the groundfish fisheries in the Aleutian Islands. The following sections describe the management of non-target species and potential effects on non-target species that may be impacted by the proposed action.

4.1 BSAI Halibut Prohibited Species Catch Limits

4.1.1 Halibut Prohibited Species Catch Management

The BSAI halibut PSC limits are 900 mt for the non-trawl fisheries and 3,675 mt for trawl fisheries. These limits are then apportioned to multiple sectors. The first allocation is for the prohibited species quota (PSQ) reserve for use by the groundfish CDQ program. This PSQ allowance is 326 mt of the trawl halibut mortality limit and 7.5 percent, or 67 mt, of the non-trawl halibut mortality limit.

4.1.1.1 Non-Trawl Halibut PSC

The total remaining amount of non-trawl halibut PSC limit for the non-CDQ fisheries is 832 mt. The 832 mt is then apportioned between Pacific cod hook-and-line sectors and other non-trawl fisheries during the annual harvest specifications process. Generally, 775 mt is apportioned to hook-and-line Pacific cod fisheries and 58 mt to other non-trawl. The halibut PSC amount apportioned to the non-trawl Pacific cod fishery is further divided between the hook-and-line C/P sector and hook-and-line CV sector (for CVs ≥60’ and CVs <60’ combined) and by season. For 2010 and 2011 the sector and seasonal apportionments for the non-trawl gear Pacific cod fishery are in **Table** 4-1.

Table 4-1 Pacific cod fishery non-trawl sector halibut PSC apportionments by season in metric tons.

Pacific cod	C/P	CV
January 1–June 10	314	10
June 10–August 15	0	3
August 15–December 31	446	2
Total	760	15

The non-trawl sector is not typically limited by halibut PSC when prosecuting non-trawl fisheries. The non-trawl sector typically uses about 66 percent of its halibut PSC apportionment (Table 4-2).

Table 4-2 2004–2009 non-trawl halibut PSC use in metric tons (not including CDQ).

Year	Non-trawl Halibut PSC	Percentage used
2004	467	56%
2005	559	67%
2006	411	49%
2007	488	59%
2008	712	86%
2009	644	77%
Average	547	66%

NMFS, Alaska Region catch accounting system

4.1.1.2 Trawl Halibut PSC

The trawl halibut PSC is apportioned to two trawl sectors. The amounts of the PSC limits assigned to the Amendment 80 and BSAI trawl limited access sectors are specified in Table 35 to part 679. The Amendment 80 program reduces the amount of halibut PSC allotted to the Amendment 80 sector by 200 mt over four years starting in 2009. The amount of halibut PSC allotted to the Amendment 80 sector is 2,375 mt in 2011 and 2,325 mt in 2012 and each year after. The allowance of halibut PSC to the trawl limited access group is fixed at 875 mt.

Historically, the non-pelagic trawl sector has been limited by halibut PSC when prosecuting non-pelagic trawl fisheries. With the advent of Amendment 80, vessels in Amendment 80 cooperatives were given more tools and flexibility to control halibut PSC. Cooperatives increase incentives for individual halibut PSC accountability and optimal use of halibut PSC limits. Amendment 80 cooperative vessels now have a direct relationship between careful utilization of halibut PSC and how much of their allocated and non-allocated target species are harvested. Therefore, Amendment 80 cooperative companies have begun discussing how to optimally utilize halibut excluders, reduce halibut PSC through data sharing, and reduce halibut mortality rates through improved fishing practices and halibut handling procedures. Even with these tools, it is still possible that halibut PSC could be a limiting factor (Table 4-3).

Table 4-3 2004–2009 trawl halibut PSC use in metric tons (not including CDQ).

Year	Trawl Halibut PSC	Percentage used
2004	3,308	97%
2005	3,465	102%
2006	3,378	99%
2007	3,353	99%
2008	2,705	80%
2009	2,801	84%
Average	3,168	93%

NMFS, Alaska Region catch accounting system

4.2 BSAI Crab

Crab PSC limits for trawl gear are specified annually based on abundance and spawning biomass. The apportionment of the crab PSQ reserve for use by the groundfish CDQ program is 10.7 percent from each trawl gear PSC limit specified for crab. The crab PSC apportioned to the Amendment 80 sector is reduced to 80 percent of the initial apportionment. This reduction is 5 percent per year starting in 2009 for a total of four years to phase in the PSC apportionment reduction. The PSC apportioned to the Amendment 80 sector is further divided between the cooperatives and the vessels not in cooperatives. The allowances of crab PSC to the BSAI trawl limited access are fixed percentages in Table 35 to part 679.

PSC limits assigned to Amendment 80 cooperatives are not allocated to specific fishery categories. The participants in a cooperative may choose which fisheries to use their portion of the cooperative PSC apportionment. The trawl PSC apportionments assigned to the Amendment 80 limited access sector and the BSAI trawl limited access sector are assigned as PSC bycatch allowances for seven specified fishery categories. The two categories for the Atka mackerel, Pacific cod, and pollock bycatch allowances are Pacific cod and pollock/Atka mackerel/"other species." The amounts and any seasonal PSC allowances for the seven fishery categories are listed in the annual harvest specifications. For the most recent PSC limits, see Table 8 of the final 2010 and 2011 harvest specifications for groundfish of the BSAI. [1]

In the Aleutian Islands, crab PSC occurs in both the Atka mackerel and Pacific cod targets (Table 4-1).

[1] http://alaskafisheries.noaa.gov/sustainablefisheries/specs10_11/bsaitable8.pdf

Table 4-4 Crab PSC in the Aleutian Islands in number of animals.

Opilio Tanner Crab

Year	Atka Mackerel	Pacific Cod	Total
2003	-	228	228
2004	-	31	31
2005	-	373	373
2006	0	7,614	7,614
2007	-	50,762	50,762
2008	-	102,680	102,680
2009	-	125,759	125,759
Average	**0**	**41,064**	**41,064**

Red King Crab

Year	Atka Mackerel	Pacific Cod	Total
2003	366	7,094	7,460
2004	23	768	790
2005	53	3,050	3,103
2006	-	41	41
2007	312	1,637	1,949
2008	1,571	5,578	7,149
2009	1,124	689	1,813
Average	**493**	**2,694**	**3,186**

Bairdi Tanner Crab

Year	Atka Mackerel	Pacific Cod	Total
2003	-	10,841	10,841
2004	18	7,759	7,777
2005	-	2,694	2,694
2006	-	6,475	6,475
2007	-	19,756	19,756
2008	0	189,359	189,359
2009	-	41,463	41,463
Average	**3**	**39,764**	**39,766**

Golden King Crab

Year	Atka Mackerel	Pacific Cod	Total
2003	216	114	330
2004	8	-	8
2005	177	36	213
2006	4,417	389	4,806
2007	1,528	602	2,130
2008	21,718	689	22,408
2009	3,752	1,193	4,945
Average	**4,545**	**432**	**4,977**

NMFS, Alaska Region catch accounting system

4.3 BSAI Salmon

Salmon are rarely encountered in non-pollock fisheries. Though there has been a pollock quota and opening in the Aleutian Islands, there has been no significant effort in this fishery for several years. Therefore salmon PSC in the Aleutian Islands has historically been low (Table 4-5).

Table 4-5 2004–2009 Salmon PSC use by gear in the Aleutian Islands (not including CDQ).

Chinook salmon in number of fish					
Year	Hook-and-line	Non-pelagic trawl	Pot	Pelagic trawl	Total
2004	-	990	-	-	990
2005	0	794	-	43	838
2006	3	743	-	99	845
2007	-	1,548	-	260	1,808
2008	-	1,727	-	66	1,793
2009	0	1,056	-	5	1,061
Average	0	1,143	-	79	1,222
Non-Chinook salmon in number of fish					
Year	Hook-and-line	Non-pelagic trawl	Pot	Pelagic trawl	Total
2004	11	159	-	-	170
2005	0	2,342	-	17	2,360
2006	13	659	-	2	675
2007	10	1,677	-	14	1,701
2008	8	342	-	0	350
2009	1	349	-	10	359
Average	7	921	-	7	936

NMFS, Alaska Region catch accounting system

4.4 Forage Fish Description

Forage fish are part of the ecosystem component category and identified in the BSAI groundfish FMP as:

Osmeridae family (eulachon, capelin, and other smelts)
Myctophidae family (lanternfishes)
Bathylagidae family (deep-sea smelts)
Ammodytidae family (Pacific sand lance)
Trichodontidae family (Pacific sand fish)
Pholidae family (gunnels)
Stichaeidae family (pricklebacks, warbonnets, eelblennys, cockscombs, and shannys)
Gonostomatidae family (bristlemouths, lightfishes, and anglemouths)

For forage fish, the maximum retainable allowance means that no more than 2 percent of catch onboard may consist of these species. There is little interaction between the Atka mackerel and Pacific cod fisheries and forage fish species. The role of the Atka mackerel and Pacific cod as predators or prey of the forage fish species will not be affected, as the total removals are not likely to change under the proposed action. Further information on these fish species, including abundance trends and stock assessments, may be found in the Ecosystems Considerations chapter of the *Stock Assessment and Fishery Evaluation* report (NPFMC 2009). Forage fish descriptions are also in the Alaska Groundfish PSEIS (NMFS 2004), the EFH EIS (NMFS 2005a) and in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The amount of incidental catch of forage fish in the groundfish fisheries is a very small percentage of the available biomass.

4.5 Non-specified Species Description

Non-specified species are not included in the BSAI groundfish FMP, are species of no commercial value, and are generally discarded. The non-specified species include all species of finfish and marine invertebrates not listed in the target category or in the ecosystem component category (75 FR 61639, October 6, 2010). There may be many hundreds of these species.

4.6 Effects on Non-target Species

4.6.1 Significant Criteria for Non-target species

The non-target fish (including invertebrates) and prohibited species catch (PSC) species may be affected by this action. The PSC species most likely to be impacted by this action are halibut and crab based on the incidental catch of these species in the Atka mackerel and Pacific cod fisheries in the Aleutian Islands. Salmon, forage fish, and non-specified species are rarely encountered in Aleutian Islands fisheries; therefore, this section focuses on the potential effects on halibut and crab from the alternatives. The significance criteria used to evaluate the effects of the action on non-target species and PSC species is in Table 4-6. These criteria are adopted from the significance criteria used in the HAPC EA (NMFS 2006a).

Table 4-6 Criteria used to estimate the significance of impacts on non-target and prohibited species.

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

4.6.2 Effects on halibut, salmon, and crab

Halibut, salmon, and crab are taken in Atka mackerel and Pacific cod fisheries in the Aleutian Islands. Under all of the alternatives, halibut, salmon, and crab PSC will continue to occur in the Aleutian Islands, though at a lower rate primarily due to less harvest of groundfish. It is expected that there may be an increase in halibut and crab PSC in the Bering Sea as vessels shift effort from the Aleutian Islands to the Bering Sea under Alternatives 2, 3, and 4; however, the vessels will still be constrained by the PSC limits in place for their sector. More fishing in the Aleutian Islands is provided under Alternative 4 so that less shifting of harvest to the Bering Sea and less potential for halibut and crab PSC in the Bering Sea may occur under this alternative compared to Alternatives 2 and 3. For more detailed information see chapter 10.

Under the criteria in Table 4-6, the impact of all alternatives would be adverse. However, under all of the alternatives, the fisheries will still be under PSC management measures currently in place and a substantial increase in the catch of PSC species is not expected. Therefore, the impact on PSC species is not significant under any of the alternatives.

4.6.3 Effects on Non-specified Species

The effects of the groundfish fisheries on non-specified species is described in the EA for Amendments 96 and 87, and this description is incorporated by reference (NMFS 2010). There is not enough information available about these species to determine appropriate management measures for these species taken in the groundfish fisheries. NMFS continues to collect non-specified species information (observer and survey data) and will work with the Council to address conservation concerns for individual non-specified species as these concerns are identified. Grenadiers are one non-specified species that is being evaluated for potential inclusion in the BSAI groundfish FMP if management measures are warranted based on fisheries catch and survey information. The Council's Non-target Species Committee continues to review current management practices for non-target species and is including grenadiers in the review process.[2]

The effects of Alternatives 2, 3, and 4 on non-specified species are expected to be similar to status quo. The level of incidental take of non-specified species under Alternatives 2, 3, and 4 is expected to be less than the amount of incidental take under Alternative 1 because of the reduced harvest in the Atka mackerel and Pacific cod fisheries, with more reduction under Alternative 2 compared to Alternative 3 and the least reduction under Alternative 4. Because the alternatives are not likely to substantially increase the incidental catch of non-specified species, it is likely that the alternatives would have an insignificant impact on non-specified species.

4.6.4 Effects on Forage Fish

For the forage fish species that are caught incidentally in the primary target species fisheries, the majority are assessed annually, and are managed using conservative catch quotas. The Groundfish PSEIS (NMFS 2004), and the Harvest Specifications Environmental Assessment (NMFS 2006b) both conclude that these species are at sustainable population levels, and are unlikely to be subject to overfishing under the current, risk-averse management program. Minimal interaction occurs between the primary target species fisheries and forage fish (Table 4-7). As a result, impacts on these species under Alternative 1 are not significant. Cooperatives result in longer seasons, and may change the patterns of incidental catch as cooperatives with a fixed allocation have more flexibility to respond to environmental conditions. Such changes will not be of such a degree as to impact the sustainability of managed species, however, as long as the species are managed under conservative quotas or maximum retainable amounts. A substantial increase in the amount of forage fish catch is not expected under any of the action alternatives. Therefore the effects of Alternatives 2, 3, and 4 are insignificant.

Table 4-7 2004–2009 catch of forage fish in the Aleutian Islands by target fishery (in kilograms).

	Atka Mackerel	Pacific Cod	Total
2004	0	0	0
2005	39.83	0.69	40.52
2006	0	1.21	1.21
2007	0	<0.1	< 0.1
2008	8.54	0.49	9.03
2009	77.79	0.18	77.97

NMFS, Alaska Region catch accounting system

[2] http://alaskafisheries.noaa.gov/npfmc/current_issues/non_target/NonTargetMinutes310.pdf

4.7 Cumulative Effect

A discussion of the cumulative effects of the groundfish fisheries is in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The past and current cumulative effects are discussed in the PSEIS (NMFS 2004). Both of these discussions are incorporated by reference.

For nontarget species, several future actions were identified as reasonably foreseeable future effects. These actions are described in section 3.2 of the Harvest Specifications EIS (NMFS 2007). The reasonably foreseeable future actions that may impact nontarget species are—

- ecosystem-sensitive management;
- fisheries rationalization;
- traditional management tools;
- actions by other state, federal, and international agencies; and
- private actions.

The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the direct and indirect effects of the alternatives on nontarget species. This analysis builds on the analysis of the impacts of each of these actions on nontarget species in section 7.3 of the Harvest Specifications EIS (NMFS 2007).

Ecosystems approaches to management

As noted in section 3.3.1 of NMFS 2007, an increased understanding of interactions between ecosystem components is reasonably foreseeable. This coupled with another reasonably foreseeable action, increased integration of ecosystem considerations into fisheries decision-making, is likely to result in fishery management that reduces potential adverse impacts of the proposed action on target and nontarget stocks. An example of the ways new information may change our perspectives was suggested at a workshop on multi-species and ecosystem-based management held at the February 2005 Council meeting. Multi-species and ecosystem projections of biomass impacts from eliminating fishing mortality for 20 years were compared to similar estimates made with single-species models. A report of the discussions noted that, "Results…were similar for top predators such as Pacific cod and Greenland turbot. However, results for walleye pollock, a key forage species, showed different results when predator/prey interactions were included. Both the multi-species and ecosystem models predicted much more modest increases in pollock biomass than did the single-species model, as predation increased to compensate for the increase in food supply" (NMFS 2005b). Predation here refers to cannibalism of juvenile pollock by larger adult pollock.

The Council has been investigating and taking steps to implement measures to provide more protection to non-target species. The Council's Non-target Species Committee was formed in October 2003 to develop improved measures to manage non-target species. They continue to examine the catch of nontarget species in the groundfish fisheries and set priorities for addressing such catch based on the nature of the catch and the biology of the species caught.

Ecosystem research, and increasing attention to ecosystem issues, should lead to increased attention to the impact of fishing activity on non-target resource components, including prohibited species. This is likely to result in reduced adverse impacts. The North Pacific Groundfish Observer Program and Alaska Fisheries Science Center's Auke Bay Lab collection and analysis of salmon tissue samples will help identify the natal streams of origin of bycaught salmon, and help clarify the dimensions of the environmental impact.

Rationalization

The rationalization programs currently under consideration in both the BSAI and GOA will consider methods to reduce the incidental catch of prohibited species in the groundfish fisheries affected. Fisheries rationalization may allow for better incidental catch controls and monitoring in the groundfish fisheries. To the extent rationalization improves fishing practices and reduces incidental catch, it would reduce the adverse effects on prohibited species. Prohibited species caps may be established for salmon and crab under GOA rationalization programs. In all areas, rationalization programs may include individual or cooperative incidental catch accounts for PSC, which could encourage fishermen to reduce their incidental catch of prohibited species.

Traditional management tools

Annual harvest specifications will authorize annual groundfish fishing activity and associated annual incidental catch of PSC species. The improvement of the Catch Accounting System has made it possible for NMFS to maintain more timely and accurate information regarding the incidental catch of prohibited species. This information can be used by NMFS and the industry to reduce incidental catch of prohibited species by tracking when and where it is occurring and react quickly to reduce the potential for additional incidental catch. Ongoing and new research on the modification of fishing gear (both pot and trawl gear) to reduce the incidental catch of prohibited species could prove economically efficient for the fleet to adopt. The testing of modified or novel fishing gear is often carried out under the terms of an exempted fishery permit. Testing of salmon and halibut excluder devices are currently being conducted under EFPs issued by NMFS (NMFS 2005b, 2005c).

The Council's Non-target Species Committee will continue to identify species harvested in the groundfish fisheries that may need to be placed in the target or ecosystem component species groups in the FMPs to ensure the capability of managing the harvest of these species in the groundfish fisheries. The continued improvement of nontarget species management is beneficial to nontarget species as it mitigates potential adverse impacts of the fisheries on these stocks.

Private sector actions

Fishing activity will continue in future years as constrained by fishing regulations and the ABCs and TACs set by the Council in each year. This fishing activity is expected to result in annual incidental catch of the prohibited species and forage fish, subject to the FMPs and regulatory measures that constrain groundfish fishery PSC. The Marine Stewardship Council's certification of the pollock fishery may add to pollock industry incentives to minimize Chinook and chum salmon bycatch. Additionally, the current development and future use of salmon and halibut excluder devices for trawl vessels may result in decreases of Chinook and chum salmon, and halibut incidental catch. The initial reports of the prototype excluder resulted in up to 43 percent escapement of Chinook salmon and 9 percent for chum salmon. Further improvements to the excluder device in 2011 may increase the escapement rates and benefit species, especially chum salmon.

Increasing economic activity in and off Alaska may affect future fisheries. The high levels of traffic between the West coast of the United States and East Asia raise concerns about pollution incidents or the introduction of invasive species from ballast water. Pollution issues were highlighted in December 2004 when the M/V *Selendang Ayu* wrecked on Unalaska Island and again in July 2006 with the M/V *Cougar Ace* accident. Alaskan economic development can affect the coastal zone and the species that depend on the zone. However, Alaska remains relatively lightly developed compared to other states in the nation. Marine transportation associated with that development may be more of a concern than in other states, due to the relatively greater importance of marine transportation to Alaska's economy.

The development of aquaculture may affect prices for, and the harvest of, some species. For example, the development of sablefish aquaculture may reduce wild sablefish prices and reduce interest in sablefish harvests in high-operating-cost areas in the BSAI where sablefish TACs are currently not fully harvested. As noted in section 3.3 of NMFS 2007, more direct impacts, through development of finfish aquaculture in waters off Alaska, do not appear to be likely at this time. Any increase in aquaculture production that may lead to decreases in wild fish harvest is likely to reduce fishing mortality on nontarget species.

4.8 Summary of Effects

There are incidental catch of the forage, non-specified, and prohibited species in the Aleutian Islands and Bering Sea subareas. Salmon, forage fish, and non-specified species are rarely encountered in Aleutian Islands fisheries. Under all of the alternatives, halibut, salmon, and crab PSC will continue to occur in the Aleutian Islands, though at a lower rate primarily due to less harvest of groundfish. The level of incidental take in the Aleutian Islands of halibut and crab PSC under Alternatives 2, 3, and 4 is expected to be less than the amount of incidental take under Alternative 1 because of the reduced harvest in the Atka mackerel and Pacific cod fisheries, with more reduction under Alternative 2 compared to Alternatives 3 and 4. It is expected that there may be an increase in halibut and crab PSC in the Bering Sea as vessels shift effort from the Aleutian Islands to the Bering Sea; however, the vessels will still be constrained by the PSC limits in place for their sector.

The direct, indirect, and cumulative effects of the alternatives are not expected to cause overfishing for halibut and crab due to the low rates of incidental catch in the Atka mackerel and Pacific cod fisheries in the Aleutian Islands. **For this reason, impacts to forage, non-specified, and PSC species stocks, species, or species groups, are predicted to be insignificant for these species evaluated under Alternatives 1, 2, 3, and 4.**

4.9 References

NMFS. 2004. Final Programmatic Supplemental Environmental Impact Statement on the Alaska Groundfish Fisheries. U.S. Dep. Commerce, NOAA, NMFS, Alaska Region, Juneau, Alaska.

NMFS. 2005a. Environmental impact statement for essential fish habitat identification and conservation in Alaska. April 2005, U.S.DOC, NOAA, NMFS; Alaska Region, P.O. Box 21668, Juneau, AK 99802-1668.

NMFS. 2005b. Environmental assessment for issuing an exempted fishing permit for the purpose of testing salmon excluder devices in the Eastern Bering Sea pollock fishery, U. S. Dep. Of Commerce, Juneau, Alaska. April.

NMFS. 2005c. Environmental assessment for issuance of an exempted fishing permit to test a trawl gear modification to reduce bycatch rates for Pacific halibut in the Central Gulf of Alaska Pacific cod trawl fishery. NMFS Alaska Regional Office, PO Box 21668, Juneau, Alaska, April.

NMFS. 2006a. Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis for Amendments 65/65/12/7/8 to the BSAI Groundfish FMP (#65), GOA Groundfish FMP (#65), BSAI Crab FMP (#12), Scallop FMP (#7), and the Salmon FMP (#8) and regulatory amendments to provide Habitat Areas of Particular Concern. April 2006, U.S. DOC, NOAA, NMFS Alaska Region, P.O. Box 21668, Juneau, AK 99802-1668.

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NMFS. 2010. Environmental Assessment for Amendment 96 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and Amendment 87 to the Fishery Management Plan for Groundfish of the Gulf of Alaska to Comply with Annual Catch Limit Requirements. September 2010. U.S. DOC, NOAA, NMFS Alaska Region, P.O. Box 21668, Juneau, AK 99802-1668. Available: http://alaskafisheries.noaa.gov/sustainablefisheries/amds/95-96-87/secrev_ea_amd96-87_0510.pdf

4.10 Preparers and Persons Consulted

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5.0 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 Endangered Species Act (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 fishery management plans (FMPs) of the North Pacific Fishery Management Council (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 environmental impact statement (EIS) (NMFS 2007a) and the environmental assessment/regulatory impact review/initial regulatory flexibility analysis (EA/RIR/IRFA) for the Arctic FMP (NMFS 2009) provide the most recent status information on marine mammals that may be impacted by the action. Several marine mammal species occur in the Aleutian Islands and in the Arctic (e.g., ribbon seals). The status descriptions in this EIS and EA are incorporated 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 5-1. These species include great whales and pinnipeds. National Marine Fisheries Service (NMFS) is the expert agency for ESA-listed marine mammals, except for northern sea otters. The U.S. Fish and Wildlife Service (USFWS) is the expert agency for northern sea otters. 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 2006a).

Table 5-1 Marine mammals likely to occur in the Aleutian Islands subarea.

Common Name	Scientific Name	ESA Status
North Pacific Right Whale[2]	*Balaena glacialis*	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
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
Northern Sea Otter[3]	*Enhydra lutris*	Threatened
Ribbon Seal	*Phoca fasciata*	None

[1] Steller sea lions 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] Northern sea otters are under the jurisdiction of the USFWS.

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 (NMFS 2000). 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 supplemental EIS (NMFS 2001). Additional information on all endangered or threatened species in the BSAI can be found in the Programmatic Supplemental Environmental Impact Statement (PSEIS) (NMFS 2004) and in sections 3.4 and 8.2 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a).

Because of new information regarding Steller sea lions and fisheries management since the last FMP-level consultation, NMFS reinitiated FMP-level section 7 formal consultation on the effect of the groundfish fisheries on Steller sea lions, humpback whales, and sperm whales (NMFS 2006a). A draft FMP biop was released in July 2010 (NMFS 2010b). This draft opinion found that the effects of the groundfish fisheries may be likely to cause jeopardy of extinction or adverse modification or destruction of designated critical habitat (JAM) for Steller sea lions. The draft FMP biop also found that the groundfish fisheries were not likely to jeopardize the continued existence of humpback or sperm whales. Subsequent to reinitiating consultation, a fin whale was taken incidentally in the BSAI pollock trawl fishery. Thus, fin whales were included in the formal section 7 consultation and in the final FMP biop. Critical habitat is not designated for humpback, fin, and sperm whales. Because the draft FMP biop found that the groundfish fisheries may cause JAM for Steller sea lions, a reasonable and prudent alternative (RPA) was included. The proposed action analyzed in this EA/RIR would implement measures for the groundfish fisheries consistent with the RPA in the final FMP biop (NMFS 2010a).

5.1 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 Bering Sea and Aleutian Islands Management Area (BSAI) marine mammals stocks (Steller sea lions, northern fur seals, harbor porpoise, North Pacific right whales, humpback whales, sperm whales, and fin whales) were based on review of information available in 2008 and 2009 (Allen and Angliss 2010). Northern sea otters were assessed in 2008 (Allen and Angliss 2010). The information from NMFS (2004) and Allen and Angliss (2010) are incorporated by reference. The SARs provide population estimates, population trends, and estimates of the potential biological removal (PBR) levels for each stock.[1] The SARs also identify potential causes of mortality and whether the stock is considered a strategic stock under the MMPA.

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 with or be affected by the Atka mackerel and Pacific cod fisheries in the Aleutian Islands subarea. These species are listed in Table 5-2 and Table 5-3.

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 distinct population segment (WDPS), it was listed as endangered on May 5, 1997 (62 FR 30772), while the eastern distinct population segment (EDPS) remained under threatened status. The WDPS 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, haulouts, and some offshore foraging areas affected commercial harvest of pollock, Pacific cod, and Atka mackerel—important components of the WDPS 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 or adversely modify its designated 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 Final Supplemental EIS* (NMFS 2001).

[1]The SARs are available on the NMFS Protected Resources Division website at http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2009.pdf.

The Aleutian Islands subarea has extensive closures in place for Steller sea lions including no transit zones and closures of critical habitat around rookeries and haulouts. Pacific cod and Atka mackerel are important prey species for Steller sea lions (NMFS 2010). The harvest of Pacific cod in the Aleutian Islands 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 were intended to decrease the likelihood of disturbance, incidental take, and competition for prey to ensure the groundfish fisheries would not be likely to cause JAM for Steller sea lions (NMFS 2000, 2001). Based on the new draft FMP biop, more restrictions on the spatial and temporal harvests of Atka mackerel and Pacific cod in the Aleutian Islands are required to insure the effects of the groundfish fisheries are not likely to result in JAM for Steller sea lions (NMFS 2010).

An informal consultation with the USFWS on the effects of the groundfish fisheries on the southwest Alaska DPS of northern sea otters was completed in 2006 (Mecum 2006). The southwest Alaska DPS of northern sea otter is listed as threatened under the ESA (70 FR 46366, August 9, 2005). Overall, this DPS has declined by more than half since the 1980s and by 90 percent in some locations. The USFWS is developing a recovery plan for the southwest Alaska DPS of northern sea otters under the ESA. On December 19, 2006, the Center for Biological Diversity sued the USFWS for violation of Section 4 of the ESA for failure to designate critical habitat for the southwest Alaska DPS of northern sea otters. Since 2006, the sea otter recovery team has been developing a recovery plan including identifying the areas and features needed for critical habitat for northern sea otters. The recovery team forwarded the recovery plan to the USFWS for review in April 2010 (Douglas Burns, USFWS, Marine Mammals Management Office, personal communication, July 14, 2010).

The informal consultation concluded that the groundfish fisheries were not likely to adversely affect northern sea otters (Mecum 2006). The USFWS has determined that, based on available data, northern sea otter abundance is not likely to be significantly affected by commercial fishery interaction at present (Allen and Angliss 2010), and commercial fishing is not likely a factor in the population decline (70 FR 46366, August 9, 2005). Northern sea otters are not likely to interact with groundfish fisheries in the Alaska exclusive economic zone (EEZ) 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). Trawl closures where sea otters feed reduce potential interaction between trawl vessels and sea otters and ensures the clam habitat used by sea otters is not disturbed.

Table 5-2 Status of Pinnipedia and Carnivora stocks potentially affected by the action.

Pinnipedia and Carnivora species and stock	*Status under the ESA*	*Status under the MMPA*	*Population trends*	*Distribution in action area*
Steller sea lion – Western (W) and Eastern (E) Distinct Population Segment (DPS)	Endangered (W) Threatened (E)	Depleted & a strategic stock	For the WDPS, 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 WDPS appears to have stabilized (Fritz et al. 2008). The EDPS is steadily increasing and has been recommended for delisting consideration (NMFS 2008).	WDPS inhabits Alaska waters from Prince William Sound westward to the end of the Aleutian Island chain and into Russian waters. EDPS inhabit waters east of Prince William Sound to Dixon Entrance. Occur throughout AK waters, terrestrial haulouts and rookeries on Pribilof Islands, Aleutian Islands, St. Lawrence Island, and off the mainland. Use marine areas for foraging. Critical habitat designated around major rookeries, 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 St. 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 2007b). 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 and spring in the N. Pacific.
Harbor seal – Gulf of Alaska	None	None	A moderate to large population decline has occurred in the GOA stock.	GOA stock found primarily in the coastal waters and may cross over into the Bering Sea coastal waters between islands.
Ribbon seal – Alaska	None*	None	Reliable data on population trends are unavailable.	Widely dispersed throughout the Bering Sea and Aleutian Islands in the summer and fall. Associated with ice in spring and winter and may be associated with ice in summer and fall.
Northern sea otters – SW Alaska	Threatened	Depleted & a strategic stock	The overall population trend for the southwest Alaska stock is believed to be declining, particularly in the Aleutian Islands.	Coastal waters along the Aleutians within the 40 m depth contour.

Source: Allen and Angliss 2010; Draft List of Fisheries for 2011 (75 FR 36318, June 25, 2010).

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

*NMFS determined that ribbon seals were not to be listed on September 23, 2008. The Center for Biological Diversity and Greenpeace filed suit against NMFS regarding this decision on September 3, 2009.

Northern sea otter information from http://www.nmfs.noaa.gov/pr/pdfs/sars/seaotter2008_ak_sw.pdf.

Table 5-3 Status of Cetacea stocks potentially affected by the action.

Cetacea species and stock	*Status under the ESA*	*Status under the MMPA*	*Population trends*	*Distribution in action area*
Killer whale – Eastern North Pacific GOA, AI, and BS transient; and Alaska Resident	None	None	Unknown abundance for the Alaska resident; and Eastern North Pacific GOA, Aleutian Islands, and Bering Sea transient stocks. The minimum abundance estimate for the Eastern North Pacific Alaska Resident stock is 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 GOA transients. Killer whales are seen in the northern Bering Sea and Beaufort Sea, but little is known about these whales. Alaska resident killer whales occur in the Aleutian Islands.
Dall's porpoise – Alaska	None	None	Reliable data on population trends are unavailable.	Found in the offshore waters from coastal western Alaska throughout Aleutian Islands.
Pacific white-sided dolphin	None	None	Reliable data on population trends are unavailable.	Found throughout the Aleutian Islands subarea.
Harbor porpoise – Bering Sea	None	Strategic	Reliable data on population trends are unavailable.	Primarily in coastal waters, including the Aleutian Islands, usually less than 100 m.
Humpback whale – Western and Central North Pacific	Endangered and under status review	Depleted & a strategic stock	Increasing. The Structure of Populations, Levels of Abundance, and Status of Humpbacks (SPLASH) abundance estimate for the total North Pacific represents an annual increase of 4.9% over the most complete estimate for the North Pacific from 1991–93. Comparisons of SPLASH abundance estimates for Hawaii to estimates from 1991–93 gave estimates of annual increase that ranged from 5.5 % to 6.0% (Calambokidis et al. 2008).	W. Pacific and C. North Pacific stocks occur in Aleutian Island 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. High densities of humpback whales are found in the eastern Aleutian Islands, particularly along the north side of Unalaska Island.
North Pacific right whale Eastern North Pacific	Endangered	Depleted & a strategic stock	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. A reliable estimate of trend in abundance is currently not available.	Before commercial whaling on right whales, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, south-central Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). During 1965–99, following large illegal catches by the U.S.S.R., there were only 82 sightings of right whales in the entire eastern North Pacific, with the majority of these occurring in the Bering Sea and adjacent areas of the Aleutian Islands (Brownell et al. 2001).
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. 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.

Cetacea species and stock	*Status under the ESA*	*Status under the MMPA*	*Population trends*	*Distribution in action area*
Minke whale – Alaska	None	None	There are no data on trends in Minke whale abundance in Alaska waters.	Common in the Bering and Chukchi Seas and in the inshore waters of the GOA. Not common in the Aleutian Islands.
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. Feed in the Aleutian Islands.
Baird's, Cuvier's, and Stejneger's beaked whale	None	None	Reliable data on population trends are unavailable.	Occurs throughout the Aleutian Islands subarea

Sources: Allen and Angliss 2010; Draft List of Fisheries for 2011 (75 FR 31618, June 25, 2010); http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm.

North Pacific right whale included based on NMFS (2006a) and Salveson (2008).

5.2 Steller Sea Lions

5.2.1 Western Distinct Population Segment Population Trend

A detailed discussion on the population trend of the Steller sea lions is in chapter 3 of the FMP biop (NMFS 2010a) and is incorporated by reference. Based on non-pup counts of Steller sea lions on trend sites throughout the Gulf of Alaska (GOA) and Aleutian Islands, the overall population trend for the WDPS of Steller sea lions is stable and may be insignificantly increasing. The number of non-pups counted at trend sites between 2000 and 2008 increased 12 percent. The increase in counts between 2004 and 2008 is 1 percent (Demaster 2009). Pup production in the Aleutian Islands has the following trends:

- In the eastern Aleutian Islands increased at rates of +4.2 percent (P=0.004) per year from 1998 through 2009, respectively;
- In the western Aleutian Islands decreased at a rate of -10.4 percent (P=0.001) per year from 1997 through 2008; this includes the 2005 count from Attu/Cape Wrangell;
- In the central Aleutian Islands decreased at a rate of -1.6 percent (P=0.006) per year from 1994 through 2009

Non-pup counts have declined in the Aleutian Islands with the decline being most severe in the west and becoming less of a decline towards the east (-7 percent in Area 543, -1 to -4 percent in Areas 542 and 541) (Table 5.1(a) in NMFS 2010a). Pup and non-pup counts in the remainder of the WDPS Steller sea lion range is either stable or increasing, ranging from 0 percent to 5 percent increased population growth from 2000 to 2008 (Table 5.1(a) in NMFS 2010a).

5.2.2 Terrestrial Sites and Usage

Steller sea lions use terrestrial sites for resting and reproductive activities. These sites may be classified as a haulout or rookery (or both) depending on how the site is used and when. A haulout is a terrestrial area used by adult Steller sea lions during times other than the breeding season (May through August) and by non-breeding adults and subadults throughout the year (NMFS 2010a). Sites used as rookeries in the breeding season may also be used as haulouts during other times of year. Some haulouts are used year-around while others only on a seasonal basis. Sites identified as rookeries have more than 200 non-pups present during the breeding season.

As shown in Figure 5-1, Steller sea lions have changed their use of several Aleutian Island sites since the designation of critical habitat in 1993 (58 FR 45278, August 27, 1993). The use of Kanaga Island/Ship Rock has increased in the breeding season sufficient to now consider this site a rookery. The following sites are designated in 50 CFR 226.202 as rookeries, but they now meet the use criteria only for haulouts: Agligadak Island, Semisopochnoi Island/Pochnoi Point, Amchitka East Cape, and Semisopochnoi Island/Petrel Point.

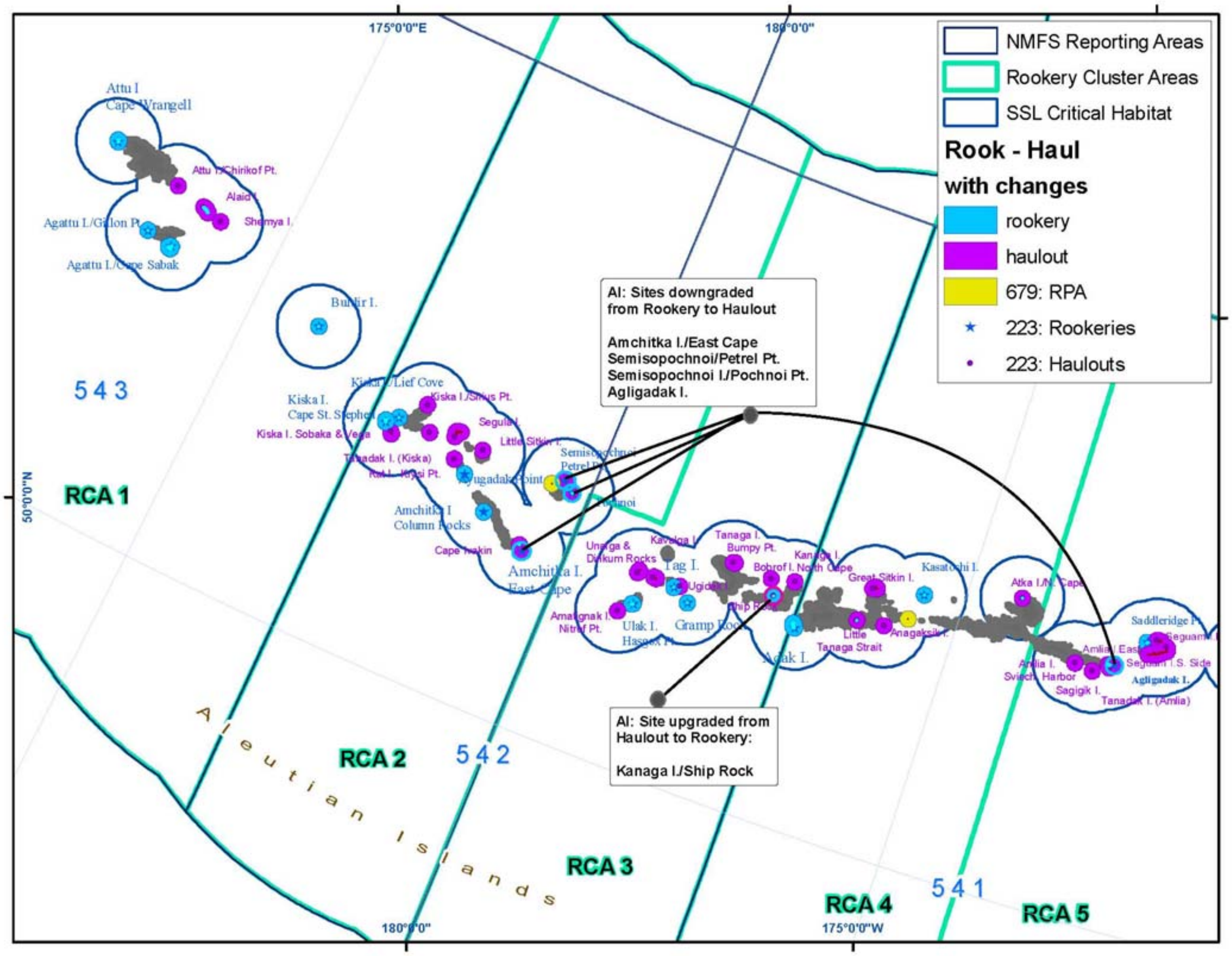

Figure 5-1 **Steller sea lion terrestrial sites with changed usage. (Steve Lewis, NMFS Alaska Region Analytical Team)**

5.3 Effects on Marine Mammals

5.3.1 Significant Criteria for Marine Mammals

Table 5-4 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 environmental assessment/final regulatory flexibility analysis (EA/FRFA) (NMFS 2006b). 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. That 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. The first criterion under the prey species column and the third criterion under the disturbance column in the table were further refined for this analysis from NMFS (2006b) to address impacts on prey species by both harvesting and potential impacts on the habitat that support prey species. Significantly beneficial impacts are not possible with the management of groundfish fisheries as no beneficial impacts to marine mammals are likely with groundfish harvest. Generally, changes to the fisheries do not benefit marine mammals in relation to incidental take, prey availability, and disturbances; changes increase or decrease potential adverse impacts. The only exception to this may be in instances when marine mammals target prey from fishing gear, as seen with killer whales and sperm whales removing fish from hook-and-line gear. In this example, the prey availability is enhanced for these animals because they need less energy for foraging.

Table 5-4 Criteria for determining significance of impacts to marine mammals.

	Incidental take and entanglement in marine debris	Prey availability	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.	Generally, there are no beneficial impacts.	There is no beneficial impact.
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 is 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.

5.3.2 Incidental Take Effects

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the incidental take effects of the groundfish fisheries on marine mammals (chapter 8 in NMFS 2007a) and is incorporated by reference. Marine mammals can be taken in groundfish fisheries by entanglement in gear (e.g., trawl, longline, and pot) and, rarely, by ship strikes for some cetaceans. Table 5-5 lists the species of marine mammals taken in the BSAI Pacific cod longline and trawl fisheries and the BSAI Atka mackerel trawl fishery as published in the List of Fisheries for 2011 (75 FR 68468, November 8, 2010).

Table 5-5 Documented takes for marine mammals that may occur in the Aleutian Islands from the List of Fisheries for 2011 for the Atka mackerel and Pacific cod fisheries.

Fishery		Marine Mammal Stocks Taken
Category II	AK Bering Sea, Aleutian Islands Pacific Cod Longline	Killer whale, AK resident Steller sea lions, western U.S.
Category III	AK Bering Sea, Aleutian Islands Atka mackerel trawl	Steller sea lion, western U.S.
	AK Bering Sea, Aleutian Islands Pacific Cod Trawl	Steller sea lion, western U.S. Harbor seals, Bering Sea

Source: 75 FR 68468, November 8, 2010.

Marine mammals that are not listed in Table 5-5 are assumed to be unlikely to be incidentally taken by any of the alternatives due to the absence of incidental take and entanglement records. No records exist of Alaska groundfish fisheries takes of North Pacific right whales.

An analysis of the groundfish fisheries risks of incidental takes of humpback and sperm whales is in the FMP biop (NMFS 2010a) and is incorporated by reference. Sperm whales are known to pick fish from longline fishing gear primarily in GOA waters, and this depredation has been increasing throughout the last decade (NMFS 2010a). Entanglements have occurred in the GOA, although available evidence does not indicate sperm whales are being killed or seriously injured as a result of these interactions although it is possible that whales may break through or carry off trailing gear and become debilitated, injured, or die as a result, with no observation of the event. The incidence of sperm whale entanglement in Alaska appears to be low, and would not be expected to rise to a level that would have a population level consequence for sperm whales. While possible, the incidence of ship strikes and/or serious injury from ship strikes involved in the groundfish fisheries to sperm whales are likely to be minimal and not expected to result in an adverse population level effect for sperm whales in Alaska.

Gear entanglements are not uncommon for humpback whales, and are associated with unidentified pot gear fisheries (NMFS 2010a). It is unclear to what extent entanglements reported to the stranding network in Alaska involve groundfish fishing gear. Overall, the number of entanglements that might result from interactions with groundfish fisheries appears to be low in contrast to other gear types. For such events that do occur with individual whales, the extent of entanglement from groundfish fisheries is not expected to have negative consequences for humpback whales in the North Pacific. The incidence of ship strikes and/or serious injury from vessels involved in the groundfish fisheries are likely to be negligible, and unlikely to have population level consequences for humpback whales in the North Pacific.

Potential take in the Aleutian Islands Atka mackerel and Pacific cod fisheries is well below the PBR for all marine mammals which have a PBR determined (Table 5-6). 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 5-6 provides more detail on the levels of take based on the most recent SAR (Allen and Angliss 2010). The BSAI Pacific cod longline fishery is a Category II fishery because it has annual mortality and serious injury of a marine mammal stock greater than 1 percent and less than 50 percent of the PBR level (75 FR 68468, November 8, 2010). The BSAI Pacific cod and Atka mackerel trawl fisheries are Category III fisheries based on annual mortality and serious injury of a stock being less than or equal to 1 percent of the PBR level. More marine mammals are taken in the BSAI Pacific cod longline fishery than in the Pacific cod and Atka mackerel trawl fisheries. Steller sea lions have the highest mean annual incidental take in the Pacific cod longline fishery compared to other marine mammals. Overall, very few marine mammals are reported taken in the BSAI longline and trawl fisheries. The data is not reported in a manner that allows separating takes in the Aleutian Islands from takes in the Bering Sea. Considering the amount of marine mammals taken incidentally in the Atka mackerel and Pacific cod fisheries in relation to the PBR, it is unlikely the incidental takes would impact the subsistence harvest of marine mammals.

Table 5-6 Estimated mean annual mortality of marine mammals from observed BSAI nonpelagic trawl flatfish and Pacific cod fisheries 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 Atka mackerel trawl fisheries	Mean annual mortality from BSAI Pacific cod trawl fisheries	Mean annual mortality from BSAI Pacific cod longline fisheries	Total mean annual human-caused mortality*	Potential biological removal
Steller sea lions (western)	2002–2006	0.25	0.85	1.98	232.8	247
Northern fur seal	2002–2006	0	0	1.08	596	14,543
Harbor seal (Bering Sea)	2002–2006	0	1.33	0	99.5	603
Killer whale Eastern North Pacific AK resident	2000–2004	0	0	0.84	1.5	11.2

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

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 Allen and Angliss (2010).

Minke whale have been taken in the BSAI groundfish trawl fishery in 2000, but it is not known which groundfish trawl fishery and whether the take was in the Bering Sea subarea or Aleutian Islands subarea (Allen and Angliss 2010). Mean annual mortality is 0.32 for this stock and PBR is undetermined. No human caused serious injury or mortality have been observed in the Aleutian Islands Atka mackerel and Pacific cod fisheries for beaked whales, blue whales, fin whales, humpback whales, sperm whales, North Pacific right whales, ribbon seals, harbor porpoise, Dall's porpoise, and Pacific white-sided dolphins (NMFS 2007a; Allen and Angliss 2010).

Killer whales also are known to remove fish from hook-and-line gear in the Aleutian Islands (Kenneth Hansen, NOAA Office of Law Enforcement, personal communication, July 29, 2010). It is likely that this behavior leads to an increased potential of entanglement by increasing the interaction of the animals with the gear.

NMFS observers monitored marine mammal incidental take in the 1990 through 2000 groundfish trawl, longline, and pot fisheries. No mortality or serious injuries to northern sea otters were observed in the EEZ. In 1992, a total of eight sea otters were observed caught in the Pacific cod pot fishery in the Aleutian Islands. Observer records indicate that those takes occurred in nearshore waters that had been closed to fishing, which explains why no additional take of sea otters was observed in pot fisheries through 2006 (Perez 2006, 2007). 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).

5.3.2.1 Effects on Steller Sea lions

5.3.2.1.1 Incidental Take Effects on Steller Sea Lions under Alternative 2

The potential for incidental takes of Steller sea lions under Alternative 2 in Areas 543 and 542 is expected to be reduced with the prohibition on Pacific cod and Atka mackerel retention. The potential for Atka mackerel and Pacific cod vessels to incidentally take Steller sea lions inside critical habitat in Area 541 also would be reduced under Alternative 2 by prohibiting the Atka mackerel and Pacific cod fisheries in this location.

Assuming the level of incidental takes is in proportion to the amount of Pacific cod and Atka mackerel harvest over all, the reduction of overall harvests described in section 10.3 of this EA/RIR may result in reduced overall incidental takes of Steller sea lions. The overall reduction in potential incidental takes is less likely for the Pacific cod fishery as much of the forgone harvests in the Aleutian Islands for the hook-and-line and pot fisheries is likely to be harvested in the Bering Sea subarea (section 10.3) and the mean annual mortality in the Pacific cod fishery for Steller sea lions is higher than for the trawl Atka mackerel fishery (Table 5-6). The occurrence of Steller sea lions in the Bering Sea is less than in the Aleutian Islands and the Pacific cod fishery is more likely to be dispersed over larger areas so that the overall incidental take is likely to be less than if the Pacific cod were harvested in the Aleutian Islands.

The Pacific cod hook-and-line (longline) fishery has a higher amount of mean annual incidental takes of Steller sea lions than the trawl or pot fisheries (Table 5-6). Alternative 2 would treat hook-and-line and trawl Pacific cod fisheries with the same closures, greatly reducing the amount of area where hook-and-line fishing is permitted in the Aleutian Islands compared to status quo. Much of the Aleutian Islands is currently open to Pacific cod hook-and-line fishing, including in critical habitat where Steller sea lions are more likely to occur.

The groundfish fishing closure at Kanaga Island/Ship Rock rookery would eliminate the potential for incidental takes by fishing vessels, except for the possibility of a vessel strike from vessels transiting the 3-nm area. In January 2011, the Alaska Board of Fisheries is scheduled to consider applying this 3 nm groundfish closure to the State-managed GHL groundfish fisheries so that all vessels either with a state or federal permit would be required to comply with the 3 nm groundfish closure at this site. This action by the State would further reduce the potential for incidental takes for Steller sea lions and for other marine mammals that may occur in these waters and interact with vessels in state and federal fisheries.

Alternative 2 would reduce the potential adverse effects of incidental takes on Steller sea lions compared to status quo. Under status quo, the amount of incidental takes is well below the PBR and is a very small portion of overall total human caused mortality. Because Alternative 2 would further reduce this mortality, it is not likely to cause adverse population level effects for Steller sea lions. **Because Alternative 2 is not likely to result in adverse population level effects from the incidental take of Steller sea lions, the impacts of Alternative 2 on the incidental takes of Steller sea lions is likely insignificant.**

5.3.2.1.2 Incidental Take Effects on Steller Sea Lions under Alternative 3 and Alternative 4

The impacts of Alternative 4 on Steller sea lions incidental take is explained in detail in NMFS (2010a) and is incorporated by reference. A negligible impact determination was made for Steller sea lions under the Marina Mammal Protection Act that supports the issuance of the incidental take statement in the FMP biop (75 FR 68767, November 9, 2010). This determination is based on the review of mortality and serious injury incidental to U.S. commercial fishing and other human related mortality and serious injury, a stable or increasing population trend, limited potential for increases in serious injury and mortality due

to the relevant fisheries, the fact that total human-caused mortality and serious injury is below the estimated PBR and are not expected to delay recovery of the stock by more than 10 percent more than recovery time if these removals did not occur.
.
Alternative 3 and Alternative 4 also would reduce the potential incidental takes of Steller sea lions in the Aleutian Islands compared to status quo by reducing Pacific cod and Atka mackerel harvest in the Aleutian Islands. Alternatives 3 and 4 would allow for more overall Atka mackerel and Pacific cod fishing than Alternative 2 in the Aleutian Islands and allow such fishing in critical habitat in Areas 542 and 541, where Steller sea lions are more likely to be encountered. Alternative 4 allows for slightly more fishing inside critical habitat than Alternative 3 and, therefore, has more potential for encountering marine mammals in waters closer to shore. This potential additional fishing in critical habitat results in more potential for incidental takes of Steller sea lions under Alternatives 3 and 4 compared to Alternative 2.

Alternatives 3 and 4 would reduce the potential adverse effects of incidental takes on Steller sea lions compared to status quo. Under status quo, the amount of incidental takes is well below the PBR and is a very small portion of overall total human caused mortality. Because Alternatives 3 and 4 would further reduce this mortality, it is not likely to cause adverse population level effects for Steller sea lions. **Because Alternatives 3 and 4 are not likely to result in adverse population level effects from the incidental take of Steller sea lions, the impacts of Alternatives 3 and 4 on the incidental takes of Steller sea lions is likely insignificant.**

5.3.2.2 Effects on Other Marine Mammals

5.3.2.2.1 Incidental Take Effects on Other Marine Mammals Under Alternative 2

The incidental takes of other marine mammals occur in the Pacific cod fisheries (Table 5-6). Reducing the Pacific cod trawl harvests in the Aleutian Islands is likely to reduce the potential for incidental takes of harbor seals compared to status quo. Because the forgone trawl harvests in the Aleutian Islands are less likely to be made up for by fishing in the Bering Sea, the overall potential for incidental takes of harbor seals is likely less than that under the status quo. Reducing the Pacific cod hook-and-line harvests may reduce the potential to incidentally take killer whales and northern fur seals. Because the Pacific cod hook-and-line harvest may be made up in the Bering Sea and because killer whales and northern fur seals may be more dispersed in areas where hook-and-line fishing may occur, the overall potential for incidental takes of killer whales and northern fur seals by the Pacific cod hook-and-line fishery is likely the same as status quo.

Alternative 2 would reduce the potential adverse effects of incidental takes on other marine mammals compared to status quo. Under status quo, the amount of incidental takes is well below the PBRs and is a very small portion of overall total human caused mortality. Because Alternative 2 would further reduce this mortality, it is not likely to cause adverse population level effects for other marine mammals. **Because Alternative 2 is not likely to result in adverse population level effects from the incidental take of other marine mammals, the impacts of Alternative 2 on the incidental takes of other marine mammals is likely insignificant.**

5.3.2.2.2 Incidental Take Effects on Other Marine Mammals Under Alternatives 3 and 4

A notice of negligible impact determination under the Marine Mammal Protection Act was published for humpback whales (Central North Pacific and Western North Pacific stocks), fin whales (northeast Pacific stock), and sperm whale (north Pacific stock). This determination supports the issuance of the incidental take statement in the FMP biop (75 FR 68767, November 9, 2010). The current amount of incidental takes for western north Pacific stock of humpback whales and Northeast Pacific fin whales is less than 10 percent of PBR. The amount of incidental takes of sperm whales and the central north Pacific stock of humpback whales is less than 10 percent of a PBR based on the estimated population occurring in the eastern North Pacific and the most recent stock assessment (Allen and Angliss, 2010), respectively. An incidental take statement for each of these stocks is include in the FMP biop (NMFS 2010a).

Alternatives 3 and 4 also would reduce the potential incidental takes of other marine mammals in the Aleutian Islands compared to status quo by reducing Pacific cod harvests in the Aleutian Islands. Alternatives 3 and 4 would allow for more overall Atka mackerel and Pacific cod fishing in the Aleutian Islands than Alternative 2 and allow such fishing in critical habitat in Areas 542 and 541, where harbor seals are more likely to be encountered. Alternative 4 allows for more harvest inside nearshore waters in Area 542 and, therefore, more potential for encounters with harbor seals than Alternative 3. Additional opportunity to fish in nearshore waters provides more potential for incidental takes of harbor seals under Alternatives 3 and 4 compared to Alternative 2. The potential for incidental takes of killer whales and northern fur seals are likely the same under all four alternatives as these species are not as likely to occur primarily in the nearshore waters in the same way as harbor seals.

Alternatives 3 and 4 would reduce the potential adverse effects of incidental takes on other marine mammals compared to status quo based on less overall fishing and restrictions in nearshore waters. Under status quo, the amount of incidental takes is well below the PBRs and is a very small portion of overall total human caused mortality. Because Alternatives 3 and 4 would further reduce this mortality, it is not likely to cause adverse population level effects for other marine mammals. **Because Alternatives 3 and 4 are not likely to result in adverse population level effects from the incidental take of other marine mammals, the impacts of Alternatives 3 and 4 on the incidental takes of other marine mammals are likely insignificant.**

5.3.3 Harvest of Prey Species

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the groundfish fisheries effects on the harvest of prey species and on the disturbance of habitat for prey species for marine mammals (chapter 8 in NMFS 2007a) and is incorporated by reference. BSAI groundfish fisheries' harvests of marine mammal prey species may limit foraging success through localized depletion, overall reduction in prey biomass, and dispersion of prey, making it more energetically costly for foraging marine mammals to obtain necessary prey. Overall reduction in prey biomass may be caused by removal of prey or disturbance of prey habitat. The timing and location of fisheries relative to foraging patterns of marine mammals and the abundance of prey species may be a more relevant management concern than total prey removals. The Aleutian Islands Atka mackerel and Pacific cod fisheries harvest may impact habitat for the key prey species of Steller sea lions, harbor seals, sperm whales, ribbon seals, northern sea otter, and resident killer whales.

Table 5-7 Aleutian Islands marine mammals dependent on benthic habitat or potentially compete with Atka mackerel or Pacific cod fisheries.

Species	Prey	Benthic dependent	Prey competition
Resident killer whale	fish (including herring, halibut, salmon, and cod)		X
Sperm whale	Mostly squid, some fish, shrimp, sharks, skates, and crab (up to 1,000 m depth)	X	
Ribbon seal	Arctic and saffron cods, pollock, capelin, eelpouts, sculpin and flatfish, crustaceans and celphalopods	X	
Harbor seal	crustaceans, squid, fish, and mollusks	X	
Steller sea lion	pollock, Atka mackerel, Pacific herring, Capelin, Pacific sand lance, Pacific cod, and salmon		X
Northern sea otters	Benthic invertebrates including clams, snail, octopus, urchins, crabs, occasionally fish and seabirds	X	

Sources: Lowry et al. 1982; NMFS 2007a; NMFS 2010a; 70 FR 46366, August 9, 2005; http://www.afsc.noaa.gov/nmml/education/cetaceans/sperm.php; and http://www.adfg.state.ak.us/pubs/notebook/marine/orca.php.

Several species listed in Table 5-7 are directly dependent on the benthic habitat for prey even though they do not compete for prey directly with the Atka mackerel and Pacific cod fisheries. For example, harbor seals and sea otters may forage on benthic invertebrates, but generally do not eat Atka mackerel and Pacific cod. 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 sperm whale, northern sea otter, ribbon seal, and harbor seal. Species that may directly compete with the Atka mackerel and Pacific cod fisheries include Steller sea lions (for Atka mackerel and Pacific cod) and resident killer whale (for cod). Northern fur seals appear to eat a very minor amount of Atka mackerel (less than 6 percent and averaging 2.9 percent for the 16 rookeries sampled, based on Table 2 in NMFS 2007b), so substantive competition with the Aleutian Islands Atka mackerel fishery is not likely.

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, whether the marine mammal forages on benthic species in the impacted area, and their dependence on the benthic prey in that area. The essential fish habitat EIS provides a description of the effects of nonpelagic trawl fishing on bottom habitat in Appendix B to the EIS (NMFS 2005), including the effects of the nonpelagic trawl fishery in the Aleutian Islands. Nonpelagic trawl gear is used in contact with the bottom and may impact benthic habitat. The fisheries effects analysis in the essential fish habitat EIS determined that the long-term effects indices for Atka mackerel and Pacific cod trawl fisheries on shallow biostructure hard substrate was 2.5 percent and 4.2 percent, respectively (Table B.2-10 in NMFS 2005).

Table 5-8 shows the marine mammals that may depend on benthic prey and the known depths of diving. Diving activity may be associated with foraging.

Table 5-8 Listing of benthic dependent marine mammals and location and diving depths.

Species	Depth of diving and location
Ribbon seal	Mostly dive < 150 m on shelf, deeper off shore. Primarily in shelf and slope areas.
Harbor seal	Up to 183 m. Generally coastal.
Sperm whale	Up to 1,000 m, but generally in waters > 600 m.
Northern sea otter	Rocky nearshore < 75 m

Sources: Allen and Angliss 2010; Burns et al. 1981; http://www.adfg.state.ak.us/pubs/notebook/marine/rib-seal.php; http://www.afsc.noaa.gov/nmml/species/species_ribbon.php; http://www.adfg.state.ak.us/pubs/notebook/marine/harseal.php; http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm http://alaska.fws.gov/fisheries/mmm/seaotters/pdf/biologue.pdf;

Atka mackerel and Pacific cod fisheries can be conducted in waters up to 1000 m in depth and are generally in waters within the 1000 m contour around the Aleutian Islands (Figure 5-2, Figure 5-3, and Figure 5-4).

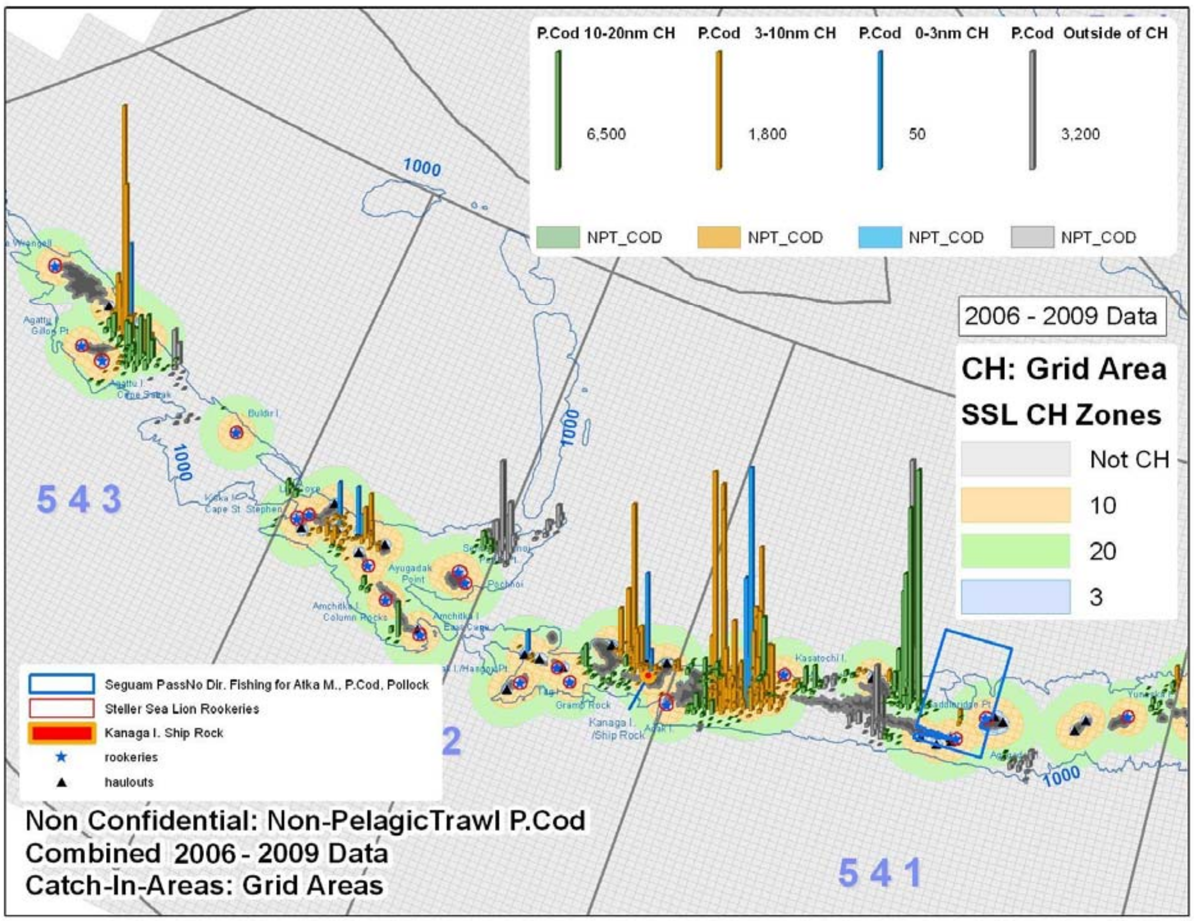

Figure 5-2 2006–2009 Pacific cod nonpelagic trawl locations in the Aleutian Islands subarea (source: Steve Lewis, NMFS Analytical Team, July 2010). The bars shown in the upper right corner represent the amount of harvest within each zone listed. The number next to each bar provides the metric tons represented by the length of the bar.

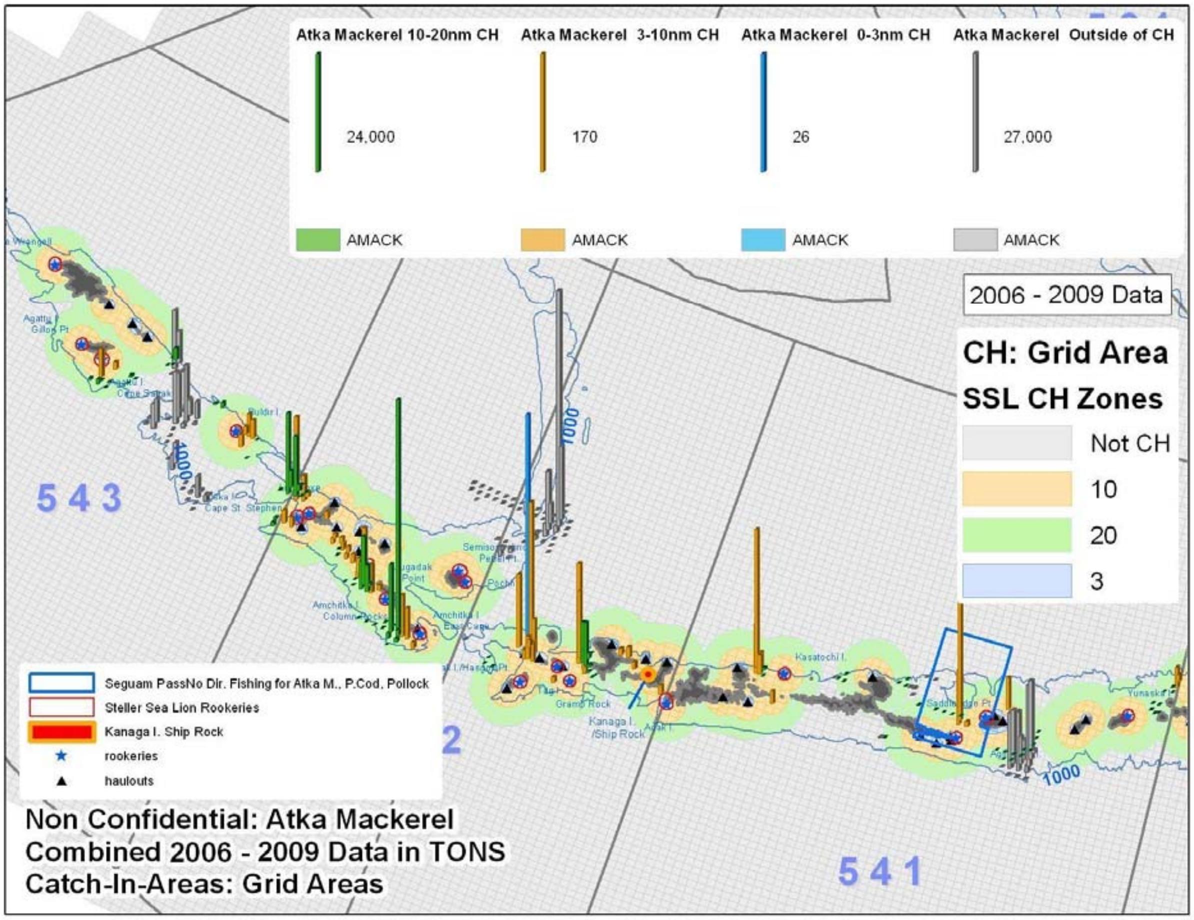

Figure 5-3 **2006–2009 Atka mackerel nonpelagic trawl locations in the Aleutian Islands (Source: Steve Lewis, NMFS Analytical Team, July 2010). The bars shown in the upper right corner represent the amount of harvest within each zone listed. The number next to each bar provides the metric tons represented by the length of the bar.**

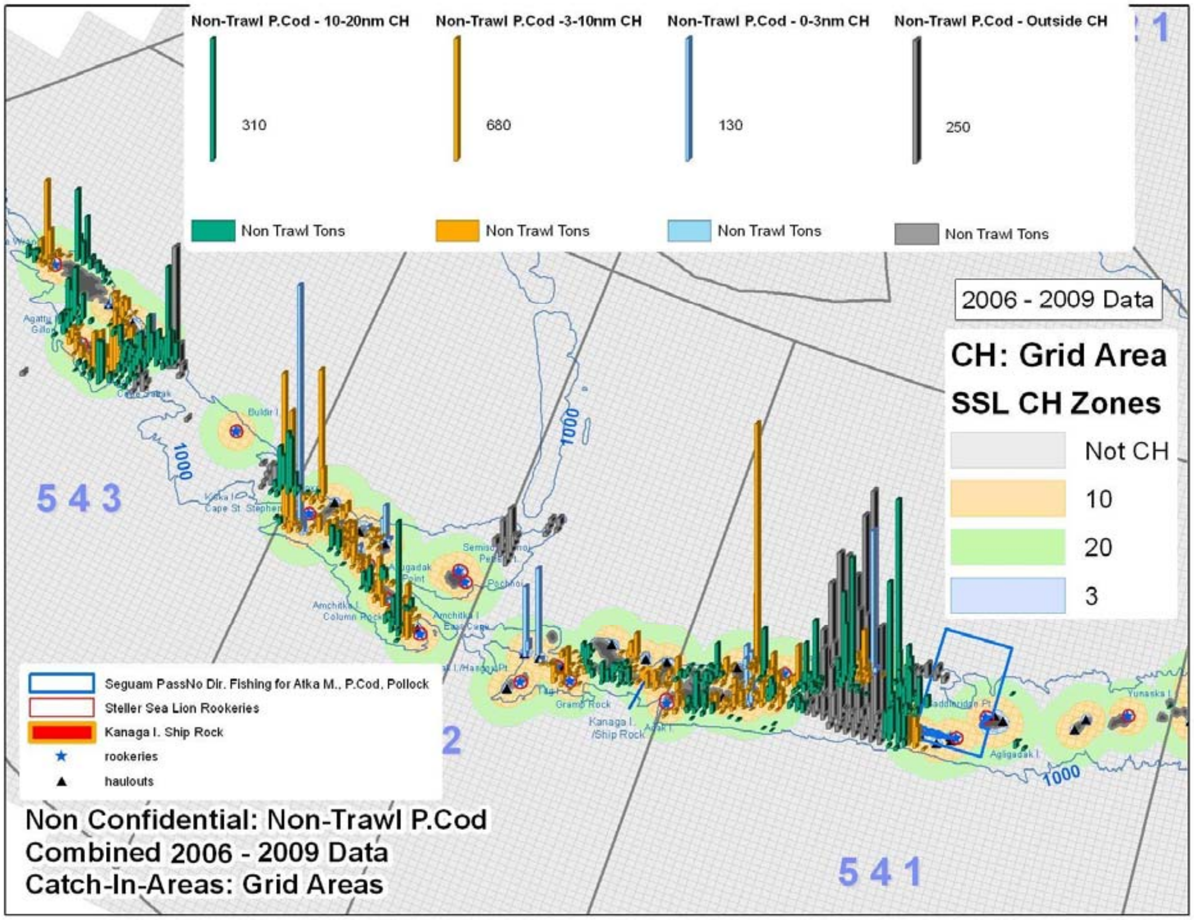

Figure 5-4 **Nontrawl Pacific Cod Harvests in the Aleutian Islands 2006–2009 (Source: Steve Lewis, NMFS Analytical Team, July 2010). The bars shown in the upper right corner represent the amount of harvest within each zone listed. The number next to each bar provides the metric tons represented by the length of the bar.**

Because of the narrow shelf area of the Aleutian Islands, ribbon and harbor seals and sperm whale are likely to have foraging habitat that overlaps with locations for Atka mackerel and Pacific cod trawling.

Sperm whales feed primarily on squid so potential competition with the Atka mackerel and Pacific cod fisheries for prey is not likely. There is potential for competition between sperm whales foraging for prey species and groundfish fisheries in the GOA (hook-and-line sablefish), but this activity has not been observed in the BSAI (NMFS 2010a). While the extent of this impact is currently not well understood, there is no evidence that the groundfish fisheries in Alaska compromise sperm whale diet.

Ribbon seals are more likely to experience indirect competition with the Atka mackerel and Pacific cod nonpelagic trawl fisheries because of the overlap of feeding locations, depths, and fishery locations. It is not known what the effects of nonpelagic trawling may be on the benthic habitat supporting prey and the recovery time for the prey species.

Harbor seals and northern sea otters are much more likely to forage in the nearshore waters around islands in the Aleutian Islands and are not as likely to be feeding in areas where nonpelagic trawling occurs due to Steller sea lion and habitat conservation and protection closures. Therefore, these marine mammals are not likely to have benthic prey disturbances occurring from Pacific cod and Atka mackerel nonpelagic trawl fishing.

The catch of groundfish near Kanaga Island/Ship Rock has been very limited from 2006 through 2009 (Figure 5-4; section 10.3). The harvest in this area has been primarily trawl Pacific cod and a small amount of nontrawl Pacific cod and trawl Atka mackerel. Overall groundfish removals have been in very small quantities (average annual harvest from 2003 through 2009 of 5 mt in the 0–3-nm area) (section 10.3).

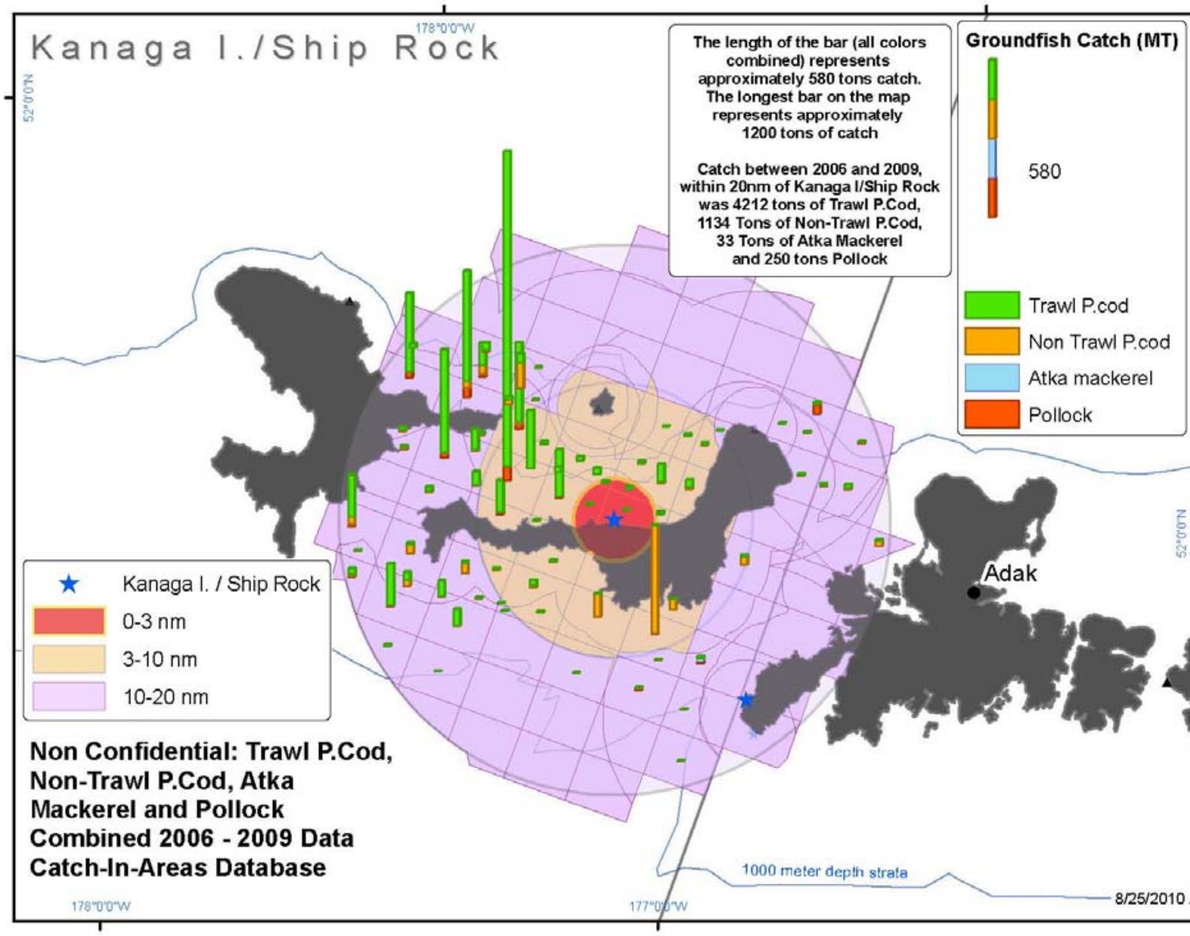

Figure 5-5 **Kanaga Island/Ship Rock area groundfish harvest 2006–2009. (Source: Steve Lewis, NMFS Alaska Region, Analytical Team)**

Steller Sea Lion Diet

The diet of Steller sea lions in the Aleutian Islands is described in Chapter 3 in NMFS (2010a) and is incorporated by reference. Steller sea lion groundfish diet in the Aleutian Islands is primarily Atka mackerel year-round with an average frequency of occurrence in scat samples of 96 percent in the summer and 55 percent in the winter (Table 3.16 in NMFS 2010a). Pacific cod and pollock occur in

Steller sea lion scat samples less frequently than Atka mackerel. Pacific cod and pollock occur in the scat samples more frequently in the winter than in the summer.

Chapter 7 of the FMP biop provides the conclusion for the effects of the current groundfish fisheries on the Steller sea lion population and is incorporated here by reference (NFMS 2010a). The potential response of Steller sea lions to reduced availability of prey in portions of critical habitat left open to fisheries would be nutritional stress (see section 3.1 in NMFS 2010a). Reduced prey availability can lead to physiological responses by Steller sea lions that directly (e.g., reduced natality) or indirectly (e.g., increased mortality from predators due to increased foraging) reduce their population growth. A sustained reduction of prey resources across a broad geographic region, or ecosystem, would thus reduce the carrying capacity of Steller sea lions. These impacts have generally been referred to as nutritional stress (see section 3.1.15 in NMFS 2010a).

The FMP biop concludes that, while fisheries cannot be unequivocally shown to be a causative factor in continued Steller sea lion declines in the western portion of the WDPS of Steller sea lions in Alaska, adverse relationships may exist in the western Aleutian Islands and portions of the central Aleutian Islands sub-region where Atka mackerel and Pacific cod fisheries target important Steller sea lion prey, and where biomass levels of these prey species are low relative to other sub-regions in the range of the WDPS. This competition may sufficiently compromise the availability of food resources of Steller sea lions likely to jeopardize their continued existence or to adversely modify their critical habitat. Fishery removals of prey in the western and central Aleutian Islands sub-region may be adversely affecting the WDPS Steller sea lions in these areas sufficient to stress animals through longer and less successful foraging trips, and foraging trips that require more repetitive dives to acquire prey (NMFS 2010a). The possibility that this interaction may be the primary cause of the observed declines in natality rates cannot be eliminated**. It is likely that the Atka mackerel and Pacific cod fisheries effects on prey resources for Steller sea lions under Alternative 1 result in a population level adverse effect (**Table 5-4**) and therefore Alternative 1 effects on prey availability would be significantly adverse for Steller sea lions. Prey availability effects under Alternative 1 for other marine mammals are not likely to cause population level effects and are therefore insignificant.**

5.3.3.1 Prey Availability Effects on Steller Sea lions

5.3.3.1.1 Prey Availability Effects on Steller Sea Lions under Alternative 2

Alternative 2 would eliminate nearly all of the Atka mackerel and Pacific cod removals in Areas 543 and 542. This would provide protection to these prey resources for Steller sea lions foraging throughout these statistical areas. By prohibiting retention of Atka mackerel in Area 543, the Atka mackerel biomass is projected to increase 48 percent in 11 years (Ianelli et al. 2010). Prohibiting Pacific cod retention is expected to result in doubling Pacific cod biomass in Area 543 in 11 years (Ianelli et al. 2010). Increases in Pacific cod and Atka mackerel biomass in Area 542 are likely greater than those expected under Alternative 3 because of the limited directed fishing allowed in Area 542 for Atka mackerel and Pacific cod under Alternative 3.

The Amendment 80 fleet would be restricted from Atka mackerel and Pacific cod retention in Areas 542 and 543 and is likely to shift fishing effort into Area 541. The Atka mackerel total allowable catch (TAC) for the combined Area 541 and Bering Sea subarea (Area 541/BS) would limit the overall harvest in Area 541, and the fleet has harvested approximately 90 percent of this amount in the past (section 10.3). A portion of the Atka mackerel TAC that had been harvested in the past is expected to not be harvested, potentially leaving more Atka mackerel biomass in the Aleutian Islands subarea, which may improve available foraging biomass. Because of the TAC limit in Area 541 and the critical habitat closure to the Atka mackerel fishery, it is not likely that the shift in harvest would have much impact on the foraging availability for Steller sea lions. The animals most likely to be affected would be those foraging outside of critical habitat. Considering the very small amount of Atka mackerel removed in relation to the foraging biomass in Area 541 (Table IV-12 in NMFS 2010a), the small amount of additional harvest up to the TAC is not likely to have a population level effect on Steller sea lions.

The Amendment 80 vessels may switch target species from Pacific cod and Atka mackerel to flatfish (yellowfin sole and rock sole), arrowtooth flounder, or Greenland turbot in the BSAI fisheries (section 10.3). It is not likely this would have any effect on marine mammals dependent on flatfish species because of the small amount of harvest of these species in relation to the acceptable biological catch (ABC) and TAC, and because of the available halibut mortality limits on the fishery. Portions of the Bering Sea also have habitat conservation areas closed to nonpelagic trawling, especially in areas where marine mammals may be dependent on benthic habitat. The fleet may also more fully harvest Pacific ocean perch, but this species is not known to be a principal prey species of marine mammals.

Nontrawl gear vessels targeting Pacific cod may be able to offset some of the restricted harvest in Areas 542 and 543 in the Bering Sea or Area 541 (section 10.3). It is possible that not all of the harvesting that was done in Areas 542 and 543 could be made up in Area 541 outside of critical habitat and in the Bering Sea. Any unharvested Pacific cod may provide for additional biomass that could be available for foraging marine mammals, including Steller sea lions and resident killer whales. Shifting Pacific cod harvests from Areas 542 and 543, and leaving some Pacific cod unharvested, would remove some of the potential adverse effects of the Pacific cod and Atka mackerel fisheries on marine mammals in Areas 542 and 543 and is not likely to substantially increase adverse effects to where the fisheries relocate. Because of the current protection measures and limits on fishing (TACs, ABC, halibut mortality) it is not likely that the increased fishing for Pacific cod in the Bering Sea or in Area 541 would result in population level effects on marine mammals.

The extension of the Atka mackerel season dates in Area 541 would allow for more temporal dispersion of Atka mackerel harvest compared to Alternative 1. The spreading of Atka mackerel harvest over time would reduce the potential to impact the Atka mackerel prey field for Steller sea lions that may forage outside of critical habitat. If Atka mackerel outside of critical habitat also moved inside critical habitat, the dispersed fishing outside of critical habitat also may protect prey resources inside critical habitat by reducing fishing pressure on fish that may move from outside critical habitat to inside critical habitat.

Closing the nontrawl Pacific cod fishery from November 1 through December 31 in Area 541 would remove the harvesting impact on Pacific cod resources during this time period. This may provide more foraging for Steller sea lions during these winter months.

Little harvest occurs at Kanaga Island/Ship Rock (Figure 5-5; section 10.3), so here the groundfish fishing closure to federally permitted vessels is not likely to make a substantial difference in the amount of groundfish available to foraging Steller sea lions. Closing waters within 3 nm to groundfish fishing would protect the prey field for any marine mammals that may use these waters and prey on groundfish or use benthic habitat that may support prey species that would otherwise be potentially impacted by nonpelagic trawling. These species may include northern sea otters, harbor seals, Steller sea lions, and ribbon seals. This closure is likely to remove potential adverse effects of the federal and state parallel groundfish fisheries on Steller sea lions and on other groundfish or benthic habitat dependent marine mammals in this area.

Overall, the closures and fishery restrictions under Alternative 2 are thought to mitigate the potential adverse effects of the Atka mackerel and Pacific cod fisheries on prey availability. The restrictions and closures are as stringent as the RPA specified in the FMP biop (NMFS 2010a) and, therefore, remove the potential population level effect on Steller sea lions that may be a result of the groundfish fisheries. The effects of Alternative 2 are not likely to cause adverse population level effects as described in the significance criteria (Table 5-4). **Because the effects of the fisheries on prey availability for Steller sea lions are not likely to result in adverse population level effects, Alternative 2 would have insignificant impacts on prey availability.**

5.3.3.1.2 Prey Availability Effects on Steller Sea Lions under Alternatives 3 and 4

The impacts of Alternatives 3 and 4 on Steller sea lion prey is explained in detail in NMFS (2010a) and is incorporated by reference. Alternatives 3 and 4 would have the same effects on prey resources in Area 543 and at Kanaga Island/Ship Rock as Alternative 2. Prey resources for Steller sea lions would be protected by prohibiting Atka mackerel and Pacific cod retention in Area 543 and by closing directed groundfish fishing within 3 nm of Kanaga Island/Ship Rock for the federal and parallel State-managed groundfish fisheries.

In Area 542, Atka mackerel and Pacific cod prey resources would be protected in critical habitat by closing the directed fisheries for these species, except for nontrawl Pacific cod, within the 10-nm to 20-nm area during June 10 through November 1 under Alternative 3. Steller sea lions are not as dependent on Pacific cod during the June through September time period of the year (NMFS 2010a) so opening this 10-nm to 20-nm zone to nontrawl fishing is not expected to have a substantial impact on the foraging capabilities of animals in this area. The Pacific cod restrictions under Alternative 3 in Area 542 are expected to result in an increase in Pacific cod biomass in this area of 59 percent in 11 years after the implementation of these measures (Ianelli et al. 2010).

Alternative 4 has fewer fishing restrictions in critical habitat in Area 542 than Alternative 3. Nontrawl vessels fishing for Pacific cod may fish from 6 nm to 20 nm in critical habitat, and trawl vessels may fish from 10 nm to 20 nm in critical habitat in a one degree section of Area 542. Because there would be more fishing allowed inside of critical habitat under Alternative 4, this alternative has more potential to impact Steller sea lion prey resources than Alternative 3. Trawl fishing for Atka mackerel would also be allowed in a separate one degree portion of critical habitat in Area 542. The Atka mackerel harvest is limited to 10 percent of the cooperatives’ Area 542 allocation or 10 percent of the CDQ allocations. The Pacific cod trawl and nontrawl harvests have reinitiation triggers so that if the harvest exceeds the trigger, Section 7 consultation would be required. Area 541 also has Pacific cod reinitiation triggers for nontrawl and trawl Pacific cod fisheries. The industry would be aware of the reinitiation triggers and could moderate their harvests accordingly to avoid the need for a new Section 7 consultation. The Atka mackerel harvest levels can be controlled by the vessels participating in cooperatives or CDQ fishing so these limits would restrict the overall harvest of Atka mackerel inside critical habitat. The reinitiation triggers for Pacific cod and the critical habitat Atka mackerel limits should constrain the fisheries to prevent competition for prey species with Steller sea lions in critical habitat.

The proposed closure of critical habitat in Area 542 to Atka mackerel directed fishing would protect Atka mackerel prey resources within the critical habitat area. The reduction of the Atka mackerel Area 542 TAC would reduce the overall amount of Atka mackerel taken from Area 542, leaving more prey available, especially for those animals that may forage inside and outside critical habitat. Under Alternatives 3 and 4, the combination of the critical habitat closure, TAC reductions, reinitiation triggers, and harvest limits is likely to provide more prey resources in Area 542 for Steller sea lions than Alternative 1 but less prey than under Alternative 2.

Under Alternatives 3 and 4, the directed fishery closures for Atka mackerel in critical habitat and for Pacific cod inside 10 nm of critical habitat in Area 541 would protect the Atka mackerel and Pacific cod prey resources for Steller sea lions foraging in this area. The limitations on trawl and nontrawl fishing in the 10-nm to 20-nm area of critical habitat during the first and second halves of the year would prevent increased effort in this area and ensure prey resources would not be impacted with the movement of the fleet that might occur with the fishery closures under the RPA.

Under Alternatives 3 and 4, the potential movement of the Atka mackerel and Pacific cod fleets out of Area 543 and to Area 542 and the Bering Sea is described in section 10.3 of this EA/RIR. The impacts on the potential shifting of harvests described under Alternative 2 are expected to be similar under Alternatives 3 and 4. Less forgone harvest of Pacific cod and Atka mackerel are expected under Alternative 3 compared to Alternative 2 because more fishing is allowed in Areas 542 and 541 under Alternative 3. Even less potential for shifting of fishing is expected under Alternative 4 compared to Alternative 3 because more area is open to fishing under Alternative 4 compared to Alternative 3.

Closing the nontrawl Pacific cod fishery from November 1 through December 31 in Areas 542 and 541 would remove the harvesting impact on Pacific cod resources during this time period. This may provide more foraging for Steller sea lions during these winter months.

Under Alternatives 3 and 4, the limit on the Atka mackerel TAC in Area 542 would ensure that fishing shifted out of Area 543 would not be concentrated into Area 542 and would prevent additional harvest of Atka mackerel outside of critical habitat beyond historical harvests. This limit on harvest should preserve the prey availability for Steller sea lions outside of critical habitat.

Overall, the closures, gear restrictions, and seasons established under Alternatives 3 and 4 reduce the potential for the groundfish fisheries, especially Atka mackerel and Pacific cod fisheries, from impacting Steller sea lion prey availability. **Because Alternatives 3 and 4 would remove the potential reduction in prey resources that are likely to cause a population level effect in Steller sea lions (NMFS 2010a) and because the effects of fisheries generally are not beneficial to marine mammals, the effects of Alternatives 3 and 4 on prey availability are insignificant for Steller sea lions.**

5.3.3.2 Prey Availability Effects on Other Marine Mammals

5.3.3.2.1 Prey Availability Effects on Other Marine Mammals under Alternative 2

The potential for prey competition with resident killer whales is likely to be reduced in Areas 542 and 543 with the restriction on retention of Pacific cod (Table 5-7) and with the federal and State-managed parallel groundfish closure around Kanaga Island/Ship Rock for resident killer whales that may occur in this area. As discussed in section 10.3 of this EA/RIR, some of the harvests not occurring in the Aleutian Islands for Atka mackerel and Pacific cod may be shifted into Area 541 and the Bering Sea or shifted to other target species. It is not likely that shifting of these harvests would have a population level effect on resident killer whales by reducing food availability in Area 541 or in the Bering Sea. It also is possible that a shift of fishing effort into Area 541 may provide opportunity for resident killer whales in this area to have more access to fish on hook-and-line gear, reducing the potential adverse effect on prey availability. A number of factors limit the ability of the fleets to shift harvest, including TAC limits and halibut mortality (more so for Atka mackerel than for Pacific cod). **By removing this potentially adverse effect of fishing in Areas 542 and 543 and around Kanaga Island/Ship Rock, and the limited increase in harvests of Pacific cod in Area 541 and the Bering Sea or shifting to other groundfish targets, it is likely that the impact of the Aleutian Islands Pacific cod or Atka mackerel fisheries on prey availability for resident killer whales under Alternative 2 is insignificant.**

Marine mammals dependent on benthic habitat may be impacted by the shift of fishing by nonpelagic trawl gear out of Areas 543 and 542 and into the Area 541 and the Bering Sea (Table 5-8). Harbor seals ribbon seals, and northern sea otters that may forage in waters that are currently trawled in Areas 543 and 542 for Atka mackerel and Pacific cod potentially would have less benthic habitat impact under

Alternative 2 than under Alternative 1. Benthic foragers in areas where fishing is shifted into, as described in section 10.3 of this EA/RIR, potentially would experience more benthic habitat effects than under Alternative 1. It is likely that Alternative 2 would reduce the potential adverse effect on benthic habitat supporting prey for marine mammals in Areas 543 and 542 and in critical habitat in Area 541. Additional adverse effects on benthic habitat where fishing has shifted are likely reduced by the current Steller sea lion protection measure closures and by the limits on the fisheries (halibut mortality, TACs). **Alternative 2 overall is not likely to have an adverse effect on marine mammals dependent on benthic prey and, therefore, is likely to have an insignificant effect on prey availability for other marine mammals.**

5.3.3.2.2 Prey Availability Effects on Other Marine Mammals under Alternatives 3 and 4

The effects described under Alternative 2 for prey availability for other marine mammals in Area 543 and at Kanaga Island/Ship Rock are the same under Alternatives 3 and 4. Killer whales that may forage in Steller sea lion critical habitat from 10 nm to 20 nm in Areas 542 and 541 may encounter prey competition with the Pacific cod fishery. This fishery is limited by season depending on gear type, which is likely to limit the potential prey competition.

More nonpelagic trawling is allowed in Areas 542 and 541 under Alternatives 3 and 4 compared to Alternative 2. This may allow for more potential impact on benthic habitat that supports prey species important to ribbon seals and sperm whales. Harbor seals and northern sea otters are more dependent on the nearshore areas, which are closed to nonpelagic trawling under Alternatives 2, 3, and 4 (0–10-nm critical habitat zones).

Less shifting of fishing effort for Atka mackerel and Pacific cod is likely to occur under Alternatives 3 and 4 than under Alternative 2, as more fishing is allowed in the Aleutian Islands under Alternatives 3 and 4 than under Alternative 2. Because shifting of fishing is less likely under Alternatives 3 and 4, less competition for prey resources between the fisheries and other marine mammals in the Bering Sea and Area 541 is likely to occur under Alternatives 3 and 4 compared to Alternative 2.

The reduction in the Atka mackerel TAC in Area 542 is not likely to affect other marine mammals as Steller sea lions are the only marine mammals identified to be primarily dependent on Atka mackerel in the Aleutian Islands (Table 5-7).

Overall, the prey availability in the Aleutian Islands for other marine mammals is less under Alternatives 3 and 4 than under Alternative 2 because more Atka mackerel and Pacific cod fishing is allowed in the Aleutian Islands under Alternatives 3 and 4. The fishing would be done within the harvest specifications issued each year, and the groundfish fisheries as a whole have not been identified to have a significant impact on other marine mammals (NMFS 2006b). Alternatives 3 and 4 would not change the overall gear types used, amounts of fishing, or locations of fishing in a manner that would cause adverse population level effects for other marine mammals. **Because Alternatives 3 and 4 would not cause adverse population level effects on other marine mammal prey availability, the impacts of Alternatives 3 and 4 on other marine mammal prey availability is likely insignificant.**

5.3.4 Disturbance

The Alaska Groundfish Harvest Specifications EIS contains a detailed description of the disturbance of marine mammals by the groundfish fisheries (chapter 8 in NMFS 2007a) and is incorporated by reference. The disturbance of marine mammals would depend on the timing and location of a 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) and is incorporated by reference. The EIS concluded that the status quo fishery does not cause disturbance to marine mammals that may cause population level effects. Current fishery closures exist to limit the potential interaction between the fishing vessels and marine mammals (e.g., 3-nm no groundfish fishing areas around Steller sea lion rookeries). There is no indication in the draft FMP biop that fishing vessel disturbance is likely to result in population level effects on Steller sea lions (NMFS 2010a).

Alternative 1 would maintain the current closures to Atka mackerel and Pacific cod fishing in the Aleutian Islands under the Steller sea lion protection measures (Figures 2-1 through 2-5; 50 CFR 679.22). The new rookery at Kanaga Island/Ship Rock does not have a 3-nm groundfish fishing closure so federally permitted groundfish fishing vessels operating in this area may disturb Steller sea lions using this rookery (Figure 2-8). Because of the historical occurrence of small amounts of fishing in this area (Figure 5-5; section 10.3) and the increased use of this area by Steller sea lions in the presence of fishing at its current levels, it is not likely that the level of disturbance at Kanaga Island/Ship Rock would cause a population decline.

In Table RCA 1999–2008 Summary in the draft FMP biop, the number of non-pup Steller sea lions in Area 543 is much less than the number of non-pups occurring in Areas 542 and 541 (NMFS 2010b). In 2008, only 895 non-pups were counted in Area 543 compared to 2,668 in Area 542 and 2,996 non-pups in Area 541. Fewer animals present in this statistical area are likely to result in fewer animals disturbed by fishing activities when the three areas are compared, assuming all other aspects of the three areas (e.g., location of fishing in relation to the location of animals) are equal.

Foraging locations for Steller sea lions in Area 543 are likely to occur farther offshore for juvenile animals than in Areas 542 and 541 (section 3.1.6.3 in NMFS 2010a). Vessels fishing inside and outside of critical habitat in Area 543 may be more likely to encounter foraging Steller sea lions compared to fishing activities in Areas 542 and 541 where Steller sea lions appear to use locations inside critical habitat more frequently for foraging.

Humpback whales may be disturbed by noise from fishing vessel engines (NMFS 2010a). Typical measures of a whale’s reaction to the presence of a vessel have been visible changes in behavior, and whales may leave the action area if sufficiently disturbed. However, the effect of such displacement on individual humpback whales, if it were to occur, does not seem likely to compromise the recovery or survival of the species.

Any impact to sperm whales due to disturbance by vessels is uncertain (NMFS 2010a). Given that many individual sperm whales are attracted to the sound of groundfish vessel engines and gear hauling catch, it would appear that they often do not interpret such noise as disturbance. Additionally, as depredation behavior in Alaska is only known to involve male sperm whales, it is unlikely vessel disturbance would present a concern for the species.

Because the disturbance of marine mammals by fishing vessels is not expected to result in population level effects for any marine mammal species, the disturbance of marine mammals by groundfish fishing vessels under the status quo in the Aleutian Islands is likely insignificant.

5.3.4.1 Disturbance Effects on Steller Sea lions

5.3.4.1.1 Disturbance Effects on Steller Sea Lions under Alternative 2

Alternative 2 reduces the potential for disturbance of Steller sea lions by vessels directly fishing for Atka mackerel and Pacific cod in Areas 542 and 543 compared to status quo. By prohibiting retention, it is also less likely that vessels fishing for other groundfish species would encounter Steller sea lions foraging when the vessel targeting other groundfish species may be harvesting Pacific cod or Atka mackerel as incidentally caught species up to the maximum retainable amount. With no retention, there is no incentive for catching any Atka mackerel or Pacific cod up to the MRA and therefore reduced potential for catching these species and encountering Steller sea lions that may be foraging on the same species, in the same location, at the same time. Disturbance is also reduced in Area 541 in critical habitat by prohibiting directed fishing for Atka mackerel and Pacific cod compared to Alternative 1.

Shifting of Atka mackerel and Pacific cod fishing into Area 541 and the Bering Sea is not likely to result in additional disturbance for Steller sea lions because of the directed fishing closures for Atka mackerel and Pacific cod that are already in place in critical habitat. If an Atka mackerel vessel was to target a flatfish species, this fishery could be conducted in Steller sea lion critical habitat, which may lead to more potential for disturbance of Steller sea lions under Alternative 2 compared to Alternative 1.

Shortening the fishing season for Pacific cod nontrawl fisheries under Alternative 2 would reduce the potential for disturbance by these vessels during the November through December time period compared to Alternative 1. Lengthening the Atka mackerel fishery season under Alternative 2 would lengthen the time that fishing vessels may be present, but the number of vessels present at a time is likely reduced as fishing is temporally dispersed. The overall amount of disturbance from lengthening the season is likely to be the same as that under Alternative 1.

Steller sea lions using Kanaga Island/Ship Rock rookery would have less potential for disturbance with the 3-nm no groundfish fishing closure around the area compared to Alternative 1. Removing potential disturbance by federally permitted fishing vessels may be especially important during the reproductive season when females need to forage close to shore and when juveniles are learning to forage and need the near shore waters.

Alternative 2 overall is expected to reduce the potential for Steller sea lion disturbance in the Aleutian Islands subarea and is not expected to result in increased disturbance of Steller sea lions in the Bering Sea from the nontrawl Pacific cod fishery due to the low number of animals relative to the location of fishing activities. **Because the overall level of disturbance is expected to be less than that under Alternative 1, Alternative 2 is not likely to result in disturbance of Steller sea lions that would result in population level effects. For this reason, Alternative 2 disturbance on Steller sea lions is likely insignificant.**

5.3.4.1.2 Disturbance Effects on Steller Sea Lions under Alternatives 3 and 4

Disturbance effects from Alternatives 3 and 4 in Area 543 and at Kanaga Island/Ship Rock rookery are the same as under Alternative 2. By prohibiting retention of Pacific cod and Atka mackerel in Area 543, the potential for disturbance of Steller sea lions in this area from fishing vessels is greatly reduced compared to the status quo and is the same as under Alternative 2. Not as much shifting of Pacific cod nontrawl fishing effort into the Bering Sea is expected under Alternatives 3 and 4 compared to Alternative 2, so animals in the Bering Sea would experience less potential for disturbance by nontrawl vessels than animals in Areas 542 and 541 under Alternatives 3 and 4 compared to Alternative 2 and status quo.

Under Alternative 3 in Area 542, Steller sea lions are more likely to encounter nontrawl Pacific cod fishing vessels in critical habitat outside of 10 nm and encounter Atka mackerel and trawl and nontrawl Pacific cod fishing vessels outside of critical habitat than under Alternative 2. Under Alternative 4 in Area 542, nontrawl vessels would occur in critical habitat outside of 6 nm and, therefore, present more potential for disturbance than under Alternative 3. Under Alternatives 3 and 4 in Area 541, Steller sea lions are more likely to be disturbed by trawl and nontrawl Pacific cod fishing vessels in the 10-nm to 20-nm area of critical habitat compared to Alternative 2.

Alternatives 3 and 4 overall are expected to reduce the potential for Steller sea lion disturbance in the Aleutian Islands subarea and are not expected to result in increased disturbance of Steller sea lions in the Bering Sea from the nontrawl Pacific cod fishery due to the low number of animals relative to the location of fishing activities. **Because the overall level of disturbance is expected to be less than that under Alternative 1, Alternatives 3 and 4 are not likely to result in disturbance of Steller sea lions that would result in population level effects. For this reason, Alternatives 3 and 4 disturbance effects on Steller sea lions are likely insignificant.**

5.3.4.2 Disturbance Effects on Other Marine Mammals

5.3.4.2.1 Disturbance Effects on Other Marine Mammals Under Alternative 2

Alternative 2 would remove the potential for disturbance of other marine mammals in Areas 542 and 543 by prohibiting retention of Atka mackerel and Pacific cod in these areas. Fewer vessels would be fishing in these areas and, therefore, fewer encounters with marine mammals are likely under Alternative 2 compared to Alternative 1. In Area 541, the directed fishing closure in critical habitat for Atka mackerel and Pacific cod would prevent disturbance of marine mammals foraging in this area by these vessels. Marine mammals in this area may be harbor porpoises, harbor seals, northern sea otters, humpback whales, and killer whales.

Shifting the Atka mackerel and Pacific cod fisheries to the east as described in section 10.3 of this EA/RIR is likely to result in more potential disturbance for other marine mammals in Area 541 and in the Bering Sea. The amount of time fishing and the number of vessels may increase, resulting in an increase in the amount of encounters that these vessels have with other marine mammals. This may be more likely with the Pacific cod fleet which is not as constrained by TAC, as the TAC is BSAI-wide and can be fished in other area, as the Atka mackerel fleet, which has an area-specific TAC.

Closing the nontrawl Pacific cod fishery on November 1 would remove the potential for disturbance of marine mammals by these vessels at that time. Extending the Atka mackerel season would allow for a longer time period of vessels being present in the Aleutian Islands and Bering Sea but the harvest is likely to be spread out so that fewer vessels would be fishing at any one time. The overall potential for disturbance of other marine mammals by Atka mackerel vessels with the longer season is likely the same as under Alternative 1.

The 0-nm to 3-nm groundfish closure around Kanaga Island/Ship Rock rookery would prevent disturbance of marine mammals that may occur in this area at the same time groundfish fishing by federally permitted vessels would occur. Animals most likely protected from disturbance in these nearshore waters include northern sea otters, harbor porpoise, humpback whales, and harbor seals.

None of the disturbance effects on other marine mammals under Alternative 2 are expected to result in population level effects on marine mammals. Disturbance effects are likely to be localized and limited to a small portion of any particular marine mammal population**. Because the disturbance under Alternative 2 is not likely to result in population level effects, the impacts of Alternative 2 on the disturbance of other marine mammals is likely insignificant.**

5.3.4.2.2 Disturbance Effects on Other Marine Mammals under Alternatives 3 and 4

The disturbance effects under Alternative 2 for Kanaga Island/Ship Rock rookery, the Pacific cod nontrawl season, and for Area 543 are the same under Alternatives 3 and 4.

Under Alternative 3, Area 542 allows for directed fishing for Pacific cod within the 10-nm to 20-nm zone of critical habitat and outside of critical habitat. Other marine mammals that may use this area may encounter more vessels under Alternative 3 than under Alternative 2, so the potential for disturbance is greater under Alternative 3 than Alternative 2. Under Alternative 4, nontrawl vessels are likely to occur in waters outside of 6 nm miles, presenting more potential to disturb marine mammals that may use nearshore waters compared to Alternatives 3 and 2. In Area 541, Alternatives 3 and 4 allow for Pacific cod directed fishing inside critical habitat, which is more likely to cause disturbance to marine mammals in this area than under Alternative 2. Marine mammals in this area may be harbor porpoises, harbor seals, northern sea otters, humpback whales, and killer whales.

The shifting of fishing effort, described in section 10.3 of this EA/RIR, is not expected to be as great under Alternatives 3 and 4 as under Alternative 2, so other marine mammals in the Bering Sea are less likely to have increased encounters with fishing vessels under Alternatives 3 and 4 compared to Alternative 2.

Overall the disturbance of other marine mammals under Alternatives 3 and 4 would be localized and limited to those species that may occur in the same area and time as fishing vessels. As with Alternative 2, the gear types used, location, number of vessels, seasons, and amounts of fishing are not expected to change in a way that would result in disturbance of other marine mammals to the level of causing an adverse population level effect. **Because the disturbance under Alternatives 3 and 4 is not likely to result in population level effects, the impacts of Alternatives 3 and 4 on the disturbance of other marine mammals are likely insignificant.**

5.3.5 Cumulative Effects

A discussion of the cumulative effects of the groundfish fisheries is in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a). The past and current cumulative effects are discussed in the Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement (NMFS 2004). Both of these discussions are incorporated by reference.

For marine mammals, several future actions were identified as reasonably foreseeable future effects. The discussions for each of these actions are in section 8.4 of NMFS (2007a). The reasonably foreseeable future actions that may impact marine mammals are—

- ecosystem-sensitive management;
- fisheries rationalization;
- traditional management tools;
- actions by other state, federal, and international agencies; and
- private actions.

The Alaska Groundfish Harvest Specifications EIS concluded that continuing fishing activity and continuing subsistence harvest are potentially the most important sources of additional annual adverse impacts on marine mammals (NMFS 2007a). 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. These include the trend towards ecosystem management and fisheries rationalization. Ecosystem-sensitive management and institutionalization of ecosystem considerations into fisheries governance are likely to increase our understanding of marine mammal populations. Fisheries rationalization may lead to reduced interactions to the extent that fewer operations remain in a fishery, and the remaining operations are better able to comply with protection measures. 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.

The FMP biop reviews the future cumulative effects of nonfederal actions (e.g., state or private) on Steller sea lions (section 6 in NMFS 2010a) and is incorporated by reference. The FMP biop uses the 2008 Steller sea lion recovery plan (NMFS 2008) for the potential future threats discussion for Steller sea lions. For the WDPS, the recovery plan threats assessment concluded that the following threats currently pose a relatively minor threat to recovery: (1) Alaska Native subsistence harvest, (2) illegal shooting, (3) entanglement in marine debris, (4) disease, and (5) disturbance from vessel traffic and scientific research. Many factors that have affected Steller sea lions within the action area in the past are likely to continue to affect them in the future (e.g., pollution, disease, predation, competition for prey). However, some factors thought to have contributed to the decline of Steller sea lions have been mitigated so that the level of effects is substantially reduced (e.g., intentional, non-subsistence-related shooting) or eliminated in some cases (e.g., commercial harvests). Given available information, the current level, not the historic level, of effect is that which is anticipated in the foreseeable future.

State-Managed Fisheries

On March 15, 2006, the Alaska Board of Fisheries approved the opening of a new State of Alaska (State) waters Pacific cod fishery in the Aleutian Islands west of 170° W for pot, jig, longline, and non-pelagic trawl gears. This State-managed fishery opens after the parallel trawl catcher vessel fishery closes. The 2008 guideline harvest level (GHL) was 5,280 mt, or 3 percent of the BSAI ABC. The fishery is temporally regulated so that no more than 70 percent of the GHL can be harvested before June 10; however, most of this is taken in March. The remainder of the GHL can be harvested starting June 10. Twenty-six vessels registered for the fishery, including trawlers, pot vessels, and freezer longliners. Two floating processors and two shore-based processors participated. Observer coverage and vessel monitoring systems (VMSs) are not required in this State-waters fishery, but six vessels chose to carry a federal observer, and 23 planned to activate VMSs during the fishery. Steller sea lion rookery closures are enforced.

Sablefish, rockfish, and lingcod are not considered important prey species of Steller sea lions, but fisheries for these species could cause indirect impacts to Steller sea lion foraging behavior through disturbance (NMFS 2010). No specific measures to protect Steller sea lions are included in the State management plans for these species. Sablefish landings occurred inside Steller sea lion critical habitat in Prince William Sound, lower Cook Inlet, and the Aleutian islands in 2008. Landings occurred in March through May and in August in Prince William Sound, in July in Cook Inlet, and primarily May to August in the western Aleutian Islands. Most rockfish harvest occurred around Kodiak, but harvest occurred inside Steller sea lion critical habitat in Prince William Sound, Cook Inlet, Kodiak, Chignik, South Alaska Peninsula, and the Aleutian Islands primarily from March through August.

Soboleff (2005) evaluated State fisheries relative to Steller sea lion trends throughout the range of the WDPS. This study determined that, within 50 nm of rookeries, Steller sea lion counts were both negatively and positively correlated with certain State fisheries, but few were significant. Soboleff (2005) found a negative correlation between State salmon fisheries and the Steller sea lion decline across all regions for all years, which disappeared at a regional scale, and he felt this could be plausible as salmon fisheries occur near Steller sea lion haulouts and rookeries and salmon are important Steller sea lion prey. The study concluded that among other factors, the concentration of State fisheries outside areas where Steller sea lion declines have been most severe may be a factor that indicates a low likelihood of State-managed fisheries adversely affecting Steller sea lions.

Under Alternatives 2, 3, and 4 there would be restrictions on Pacific cod harvest by federally permitted vessels in critical habitat in Areas 543, 542, and 541. There is a potential that the State may provide for more Pacific cod pot fishing within the State waters under a State-managed fisheries. Any potential increase in the State-managed Pacific cod harvest would occur through the State of Alaska Board of Fisheries process. The State of Alaska Board of Fisheries would likely consider the potential impacts on Steller sea lions and the federal groundfish fisheries. If Pacific cod pot fishing were increased inside the 0-nm to 3-nm area of Aleutian Islands critical habitat, there would be an increased potential for incidental takes of northern sea otters and humpback whales. Over 100 humpback whale entanglement incidents have been reported to the NMFS Alaska stranding program over the last 30 years, many involving pot gear and/or gill net gear from fisheries in inside waters in southeast Alaska, and areas around Kodiak, Homer, and Seward. For many of these incidents, when disentanglement is not possible or the animal is not re-sighted, the ultimate fate of the animal remains unknown. State-managed fisheries represent an additional source of anthropogenic impact, beyond those posed by the proposed action, through entanglements to the Central North Pacific and Western North Pacific populations of humpback whales. **The amount of fishing and the rarity of the entanglement and incidental take in the Aleutian Islands are not likely to result in population level effects for northern sea otters, harbor seals, and humpback whales that may occur in these near shore waters.**

In January 2011, the Board of Fisheries is scheduled to consider closing waters from 0 nm to 3 nm from Kanaga Islands/Ship Rock rookery to groundfish fishing. This action would mirror the federal groundfish closures in these waters for state licensed vessels, ensuring all federal and state groundfish fishing would be prohibited in this area. **This action would further reduce the potential for disturbance, prey competition, and incidental takes by fishing vessels for marine mammals occurring in these waters, particularly for Steller sea lions.**

State-managed salmon, invertebrate, and herring fisheries also occur at the same time and locations where Steller sea lions forage, resulting in the potential for incidental takes, disturbance, or competition for prey species. These fisheries occur in the EDPS of Steller sea lions, where the population is increasing. **Considering the amount of incidental takes (**Table 5-6**) and the location of these fisheries in relation to where Steller sea lion counts are doing fairly well (locations other than Area 543), it is likely that these fisheries in combination with direct and indirect effects of the Atka mackerel and Pacific cod fisheries in the Aleutian Islands would have an insignificant effect on disturbance, incidental takes, and competition for prey under Alternatives 2, 3, and 4.**

Private Actions

Private actions that may have an effect on marine mammals in the Aleutian Islands subarea include shipping and transportation activities. Shipping routes from Pacific Northwest ports to Asia run across the GOA and through the BSAI, and pass near or through important fishing areas. The key transportation route from West coast ports in Washington, Oregon, and British Columbia to East Asia (and back) passes from the GOA into the Eastern Bering Sea at Unimak Pass, and then returns to the Pacific Ocean in the area of Buldir Island. An estimate is that 3,100 large vessels used this route in the year ending September 30, 2006. An estimated 853 of these were bulk carriers, and an estimated 916 were container ships. (Nuka Research 2006:12). The direct routes from California ports to East Asia pass just south of the Aleutian Islands. Continued globalization, growth of the Chinese economy, and associated growth in other parts of the Far East may lead to increasing volumes of commercial cargo vessel traffic through Alaska waters. United States agricultural exports to China, for example, doubled between 2002, and 2004; 41 percent of the increase, by value, was soybeans and 13 percent was wheat (USDA 2005). In future years, this may be an important route for Canadian oil exports to China (Zweig and Jianhai 2005).

The significance of this traffic for the regional environment and for fisheries is highlighted by recent shipping accidents, including the December 2004 grounding of the M/V *Selendang Ayu* and the July 2006 incapacitation of the M/V *Cougar Ace*. The M/V *Selendang Ayu* dumped the vessel's cargo of soybeans and as much as 320,000 gallons of bunker oil, on the shores of Unalaska Island.[2] On July 23, the M/V *Cougar Ace*, a 654-foot car carrier homeported in Singapore, contacted the U.S. Coast Guard and reported that the vessel was listing at 80 degrees and taking on water. The M/V *Cougar Ace* was towed to Dutch Harbor where the listing problem was corrected. The vessel was then towed to Portland, Oregon.[3]

Shipping activities can result in incidental takes of marine mammals through vessel strikes and disturbance of marine mammals by vessel activities and pollution. It is not likely that these types of adverse effects occur at a level that may affect the sustainability of any marine mammal stock when combined with the direct and indirect effects of alternatives.

In summary, none of the reasonably foreseeable future actions identified in the FMP biop (NMFS 2010) or in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007a) in combination with the direct and indirect impacts of this action are expected to result in population level adverse effects on marine mammals.

5.3.6 Summary of Effects

Table 5-9 summarizes the alternatives and their effects on Steller sea lions and other marine mammals. These results are based on the review of the potential direct and indirect effects of the alternatives and cumulative effects on Steller sea lions and other marine mammals. Except for Alternative 1 effects on prey availability for Steller sea lions, all of the potential effects on marine mammals from the alternatives are insignificant.

Table 5-9 Summary of alternatives and effects on marine mammals.

	Incidental take and entanglement in marine debris	Prey Availability	Disturbance
Alternative 1 Steller sea lions	**Insignificant effect.** Steller sea lions are taken by fisheries at an amount well below the PBR.	**Significant Adverse effect.** Prey availability in the Aleutian Islands is likely reduced by the Atka mackerel and Pacific cod fisheries to result in population level adverse effects for Steller sea lions	**Insignificant effect.** Fishing operations are not likely to disturb Steller sea lions to the point of causing population level effects.
Alternative 1 Other marine mammals	**Insignificant effect.** Marine mammals are taken by fisheries at an amount well below the PBR or in a minor amount compared to population.	**Insignificant effect.** Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects for other marine mammals in the Aleutian Islands.	**Insignificant effect.** Fishing operations are not likely to disturb other marine mammals to the point of causing population level effects.
Alternative 2 Steller sea lions	**Insignificant effect.** Steller sea lions potentially taken by fisheries at an amount well below the PBR. Potential for incidental takes are less than Alternatives 1, 3, and 4.	**Insignificant effect.** Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects for Steller sea lions occurring in the Aleutian Islands. Effects on prey availability are less than Alternatives 1, 3, and 4.	**Insignificant effect.** Fishing operations are not likely to disturb Steller sea lions at a level that causes population level effects. Disturbance effects are likely less than Alternatives 1, 3, and 4.
Alternative 2	**Insignificant effect.** Other marine	**Insignificant effect.** Overall prey	**Insignificant effect.**

[2] U.S. Coast Guard, M/V *Selendang Ayu* grounding Unified Command press release, April 23, 2005.

[3] Alaska Department of Conservation Final situation report, September 1, 2006, available at: http://www.dec.state.ak.us/spar/perp/response/sum_fy07/060728201/sitreps/060728201_sr_10.pdf.

Other marine mammals	mammals are taken by fisheries at an amount well below the PBR or in a minor amount compared to population. Incidental takes are likely less for harbor seals compared to Alternatives 1, 3, and 4.	availability is not affected by the groundfish fisheries at a level resulting in population level effects for other marine mammals in the Aleutian Islands. Potential effects on prey availability likely less than Alternatives 1, 3, and 4.	Fishing operations are not likely to disturb other marine mammals to the point of causing population level effects. Disturbance of near shore mammals (e.g., harbor seals) is less likely than under Alternatives 1, 3, and 4.
Alternative 3 Steller sea lions	**Insignificant effect.** Steller sea lions potentially taken by fisheries at an amount well below the PBR. Potential for incidental takes are less than Alternatives 1 and 4, and more than Alternative 2.	**Insignificant effect.** Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects for Steller sea lions occurring in the Aleutian Islands. Effects on prey availability are less than Alternatives 1and 4 and more than Alternative 2.	**Insignificant effect.** Fishing operations are not likely to disturb Steller sea lions at a level that causes population level effects. Disturbance effects are less likely than under Alternatives 1 and 4 and more likely than under Alternative 2.
Alternative 3 Other marine mammals	**Insignificant effect.** Other marine mammals are taken by fisheries at an amount well below the PBR or in a minor amount compared to population. Incidental takes are likely less for harbor seals compared to Alternatives 1 and 4 and more than Alternative 2.	**Insignificant effect.** Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects for other marine mammals in the Aleutian Islands. Potential effects on prey availability are less likely than under Alternatives 1 and 4, and are more likely than Alternative 2.	**Insignificant effect.** Fishing operations are not likely to disturb other marine mammals to the point of causing population level effects. Disturbance of nearshore mammals (e.g., harbor seals) is less likely than under Alternatives 1 and 4 and more likely than under Alternative 2.
Alternative 4 Steller sea lions	**Insignificant effect.** Steller sea lions potentially taken by fisheries at an amount well below the PBR. Potential for incidental takes are less than Alternative 1, more than Alternative 2, and slightly more than Alternative 3.	**Insignificant effect.** Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects for Steller sea lions occurring in the Aleutian Islands. Effects on prey availability are less than Alternative 1, more than Alternative 2, and slightly more than Alternative 3.	**Insignificant effect.** Fishing operations are not likely to disturb Steller sea lions at a level that causes population level effects. Disturbance effects are less likely than under Alternative 1, more likely than under Alternative 2, and slightly more than under Alternative 3.
Alternative 4 Other marine mammals	**Insignificant effect.** Other marine mammals are taken by fisheries at an amount well below the PBR or in a minor amount compared to population. Incidental takes are likely less for harbor seals compared to Alternative 1, more than Alternative 2, and slightly more than Alternative 3.	**Insignificant effect.** Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects for other marine mammals in the Aleutian Islands. Potential effects on prey availability are less likely than under Alternative 1, more likely than Alternative 2, and slightly more likely than Alternative 3.	**Insignificant effect.** Fishing operations are not likely to disturb other marine mammals to the point of causing population level effects. Disturbance of nearshore mammals (e.g., harbor seals) is less likely than under Alternative 1, more likely than under Alternative 2, and slightly more likely than under Alternative 3.

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6.0 SEABIRDS

6.1 Seabird Species and Status

The passes between islands in the Aleutian Island chain are areas of strong upwelling that bring nutrients to the surface and, therefore, attract many species of seabirds. Seabird colonies in the Aleutian Islands and Bering Sea are shown in Figure 6-1 Colonies of the Beringian Seabird Colony Catalog. (USFWS 1999). Species at colonies in the Aleutian Islands include pelagic cormorant, red-faced cormorant, glaucous gull, black-legged and red-legged kittiwakes, common murre, thick-billed murre, ancient murrelet, pigeon guillemot, parakeet auklet, least auklet, Cassin's auklet, crested auklet, whiskered auklet, and horned and tufted puffins.

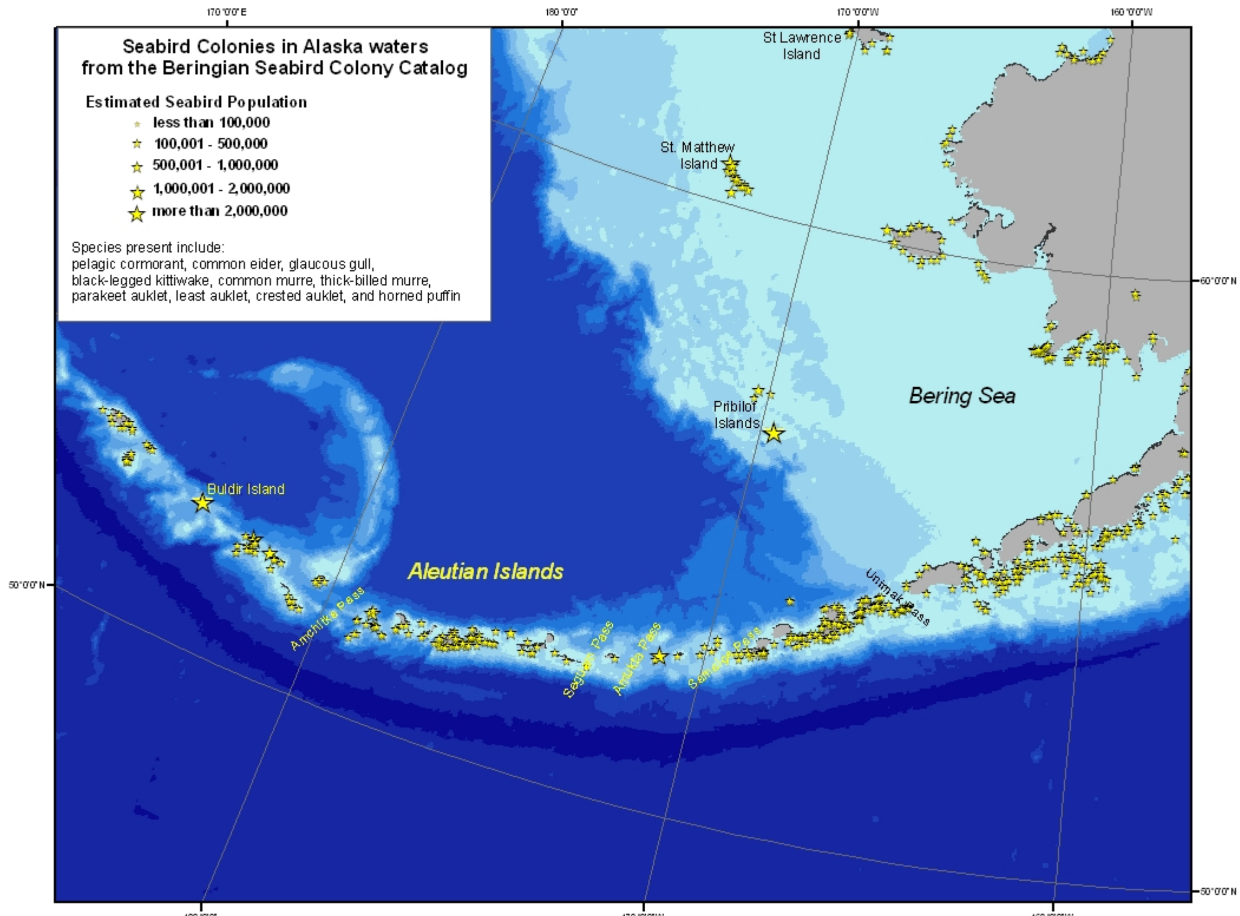

Figure 6-1 Colonies of the Beringian Seabird Colony Catalog. (USFWS 1999)

6.1.1 ESA-Listed Seabirds in the Aleutian Islands

Three species of seabirds that range into the Aleutian Islands are listed under the Endangered Species Act (ESA): the endangered short-tailed albatross (*Phoebastria albatrus*), the threatened spectacled eider (*Somateria fischeri*), and the threatened Steller's eider (*Polysticta stelleri*).

Short-tailed albatross 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 percent to 8 percent rate based on egg counts from 1990 to 1998. The world population of the endangered short-tailed albatross in 2009 was at about 3,000 according to the Short-tailed Albatross Recovery Team that met recently at the World Seabird Conference in Victoria, British Columbia. On Torishima Island, an active volcano in Japan, 80 percent to 85 percent of nesting occurs at a colony subject to erosion and mudslides, and smaller numbers nest in the Senkaku Islands where political uncertainty and the potential for oil development exist (USFWS 2008). Short-tailed albatross chicks have been translocated from Torishima Island to a new breeding colony without the volcanic threat. No critical habitat has been designated for the short-tailed albatross in the United States, since the population growth rate does not appear to be limited by marine habitat loss (NMFS 2004b).

Short-tailed albatross feeding grounds are continental shelf breaks and areas of upwelling and high productivity. Recent reliable diet information is not available; however, 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, Oregon State University, personal communication, Jan 2007).

Spectacled and Steller's eiders are both currently listed as threatened under the ESA. While designated critical habitat for Spectacled and Steller's eiders does overlap with fishing grounds, there has never been an observed take of these species off Alaska (USFWS 2003a and 2003b). Spectacled eider observations are reported in the North Pacific Pelagic Seabird Database (NPPSD 2004) around Unimak Pass in the Aleutian Islands (Figure 6.2), but the species is unlikely to interact with the fisheries in this area. Therefore, impacts to these species are not analyzed in this document.

Tables 6-1 and 6-2 show seabird species that occur in the Aleutian Islands and those with conservation status under the ESA. Figures 6.2 and 6.3 show locations of observations of these species.

Table 6-1 Seabird species in the BSAI. (NMFS 2004a)

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

* These species are additionally listed in Table 6-2.

Table 6-2 Seabirds with conservation status under the ESA occurring in the Aleutian Islands.

Short-tailed Albatross [1]	*Phoebastria albatrus*	Endangered
Steller's Eider [1]	*Polysticta stelleri*	Threatened
Spectacled Eider[1]	*Somateria fischeri*	Threatened
Kittlitz's Murrelet[1]	*Brachyramphus brevirostris*	Candidate
Yellow-billed Loon[1]	*Gavia adamsii*	Candidate

[1]These species are under the jurisdiction of USFWS.

6.1.2 Status of Endangered Species Act Consultations on Groundfish and Halibut Fisheries

In 2000, USFWS listed the short-tailed albatross as an endangered species under the ESA throughout its range in the United States (65 FR 46643, July 31, 2000). Although critical habitat has not been established for the short-tailed albatross, USFWS 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). 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 2004a).

In 1997, NMFS initiated a Section 7 consultation with USFWS on the effects of the Pacific halibut fishery off Alaska on the short-tailed albatross. USFWS 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. USFWS issued an Incidental Take Statement of two short-tailed albatross in a 2-year period (e.g., 1998/1999, 2000/2001, 2002/2003), reflecting what the agency anticipated the incidental take could be from the fishery action. Under the authority of ESA, USFWS identified non-discretionary reasonable and prudent measures that NMFS must implement to minimize the impacts of any incidental take.

Two updated USFWS biological opinions were published in 2003:

- Section 7 Consultation - Biological Opinion on the Effects of the Total Allowable Catch-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*) (USFWS 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*) (USFWS 2003a).

Although USFWS has determined that the short-tailed albatross is adversely affected by hook-and-line Pacific halibut and groundfish fisheries off Alaska, both USFWS opinions concurred with NMFS and concluded that the Gulf of Alaska (GOA) and Bering Sea and Aleutian Islands Management Area (BSAI) fishery actions are not likely to jeopardize the continued existence of the short-tailed albatross or Steller's eider or result in adverse modification of Steller's eider critical habitat. USFWS 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 to—

- four short-tailed albatross taken every 2 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 biological opinion is in effect (approximately 5 years).

These incidental take limits are in addition to the previous take limit set in 1998 for the Pacific halibut hook-and-line fishery off Alaska of two short-tailed albatross in a 2-year period.

The 2003 biological opinion on the TAC-setting process also included mandatory terms and conditions that NMFS must follow in order to be in compliance with the ESA. One term and condition is the implementation of seabird deterrent measures that preceded this analysis. Additionally, NMFS must continue outreach and training of fishing crews on 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.

USFWS also released a short-tailed albatross recovery plan in September of 2008 (USFWS 2008). This recovery plan describes 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. Because the primary threat to the species recovery is the possibility of an eruption of Torishima Island, the most important recovery actions include monitoring the population and managing habitat on Torishima Island, establishing two or more breeding colonies on non-volcanic islands, monitoring the Senkaku population, and conducting telemetry and other research and outreach. Translocation of chicks to new colonies has begun. USFWS estimates that short-tailed albatross may be delisted in the year 2030, if new colony establishment is successful.

6.1.3 Seabird Distribution in the Aleutian Islands

Piatt et al. (2006) discuss oceanic areas of seabird concentrations and explain that short-tailed albatross hotspots are characterized by vertical mixing and upwelling caused by currents and bathymetric relief and that persist over time. The continual upwelling brings food to the surface, which draws predators back for repeated foraging, especially albatross species which forage at the surface due to their limited diving ability (Hyrenbach et al. 2002). Sightings data were compiled from the following sources: from 1988 to 2004 records from seabird observers on USFWS's research vessel M/V *Tiglax*; from incidental sightings by biologists, fishermen, seamen, fisheries observers and birdwatchers provided to USFWS; from the Alaska Natural Heritage Program; historical sightings documented in published literature; and from the North Pacific Pelagic Seabird Database. Researchers analyzed over 1,400 sightings, the majority of which were located on the continental shelf edge of Alaska, abundance being greatly diminished along the east GOA coast and south to Southeast Alaska. Researchers concluded that the short-tailed albatross most recently is associated consistently with upwelling in Aleutian passes and along continental shelf margins in Alaska. The opportunistic sightings data suggest that the albatrosses appear persistently and predictably in some marine "hotspots." They were closely associated with shelf-edge habitats throughout the northern GOA and Bering Sea. In addition to Ingenstrem Rocks and Seguam Pass, important hotspots for short-tailed albatross in the Aleutians included Near Strait, Samalga Pass, and the shelf-edge south of Umnak/Unalaska Islands. In the Bering Sea, hotspots were located along margins of Zhemchug, St. Matthew, and Pervenets Canyons (Piatt et al. 2006). 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.

Figure 6-2 depicts the observed distributions of several seabird species from the NPPSD (2004). There are many observations of black-footed and Laysan albatrosses in the Aleutian Islands and some Kittlitz's murrelets. Of these species, albatrosses have been incidentally taken in the hook-and-line and trawl fisheries.

Figure 6-3 shows observations of the short-tailed albatross, which is the only endangered seabird (under the ESA) occurring in the Aleutian Islands. Each of the data sources is described below.

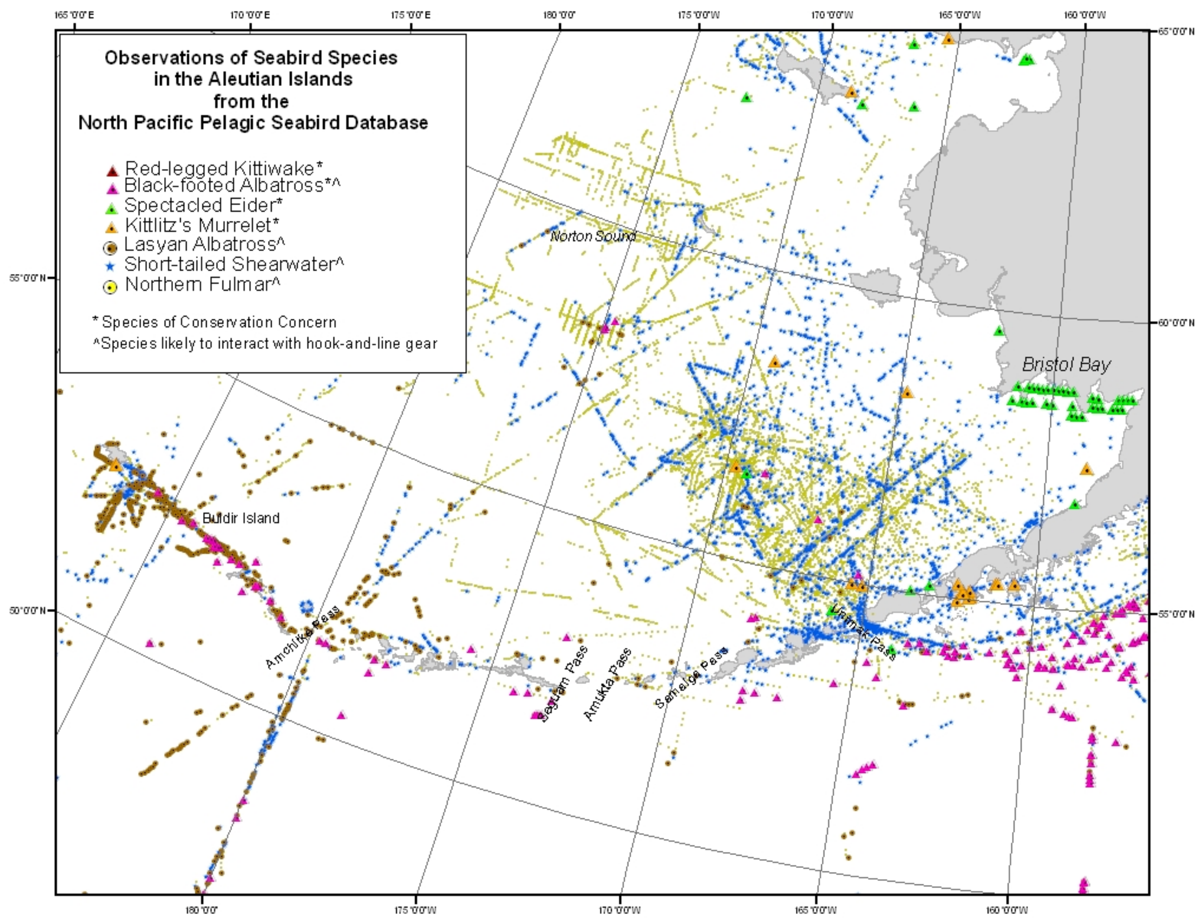

Figure 6-2 **Observations of seabird species with conservation status and/or likely to interact with hook-and-line gear in the Aleutian Islands. (NPPSD 2004)**

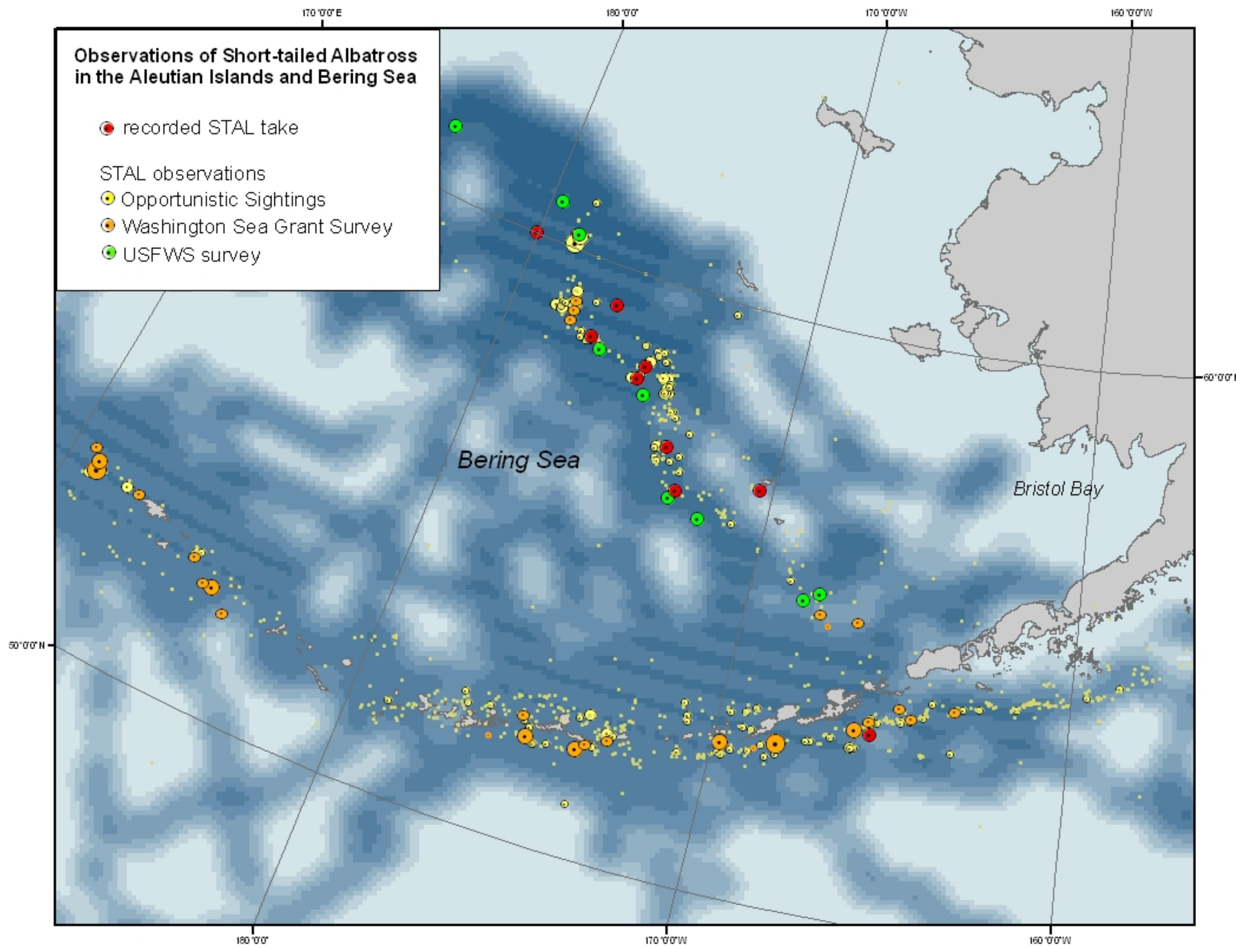

Figure 6-3 **Observations and takes of short-tailed albatrosses in the Aleutian Islands and Bering Sea. Blue shaded background shows results from interpolation of satellite tagging data. Darker blue areas are where short-tailed albatross spent more time than lighter blue areas.**

Washington Sea Grant Survey Data

Melvin et al. (2006) provide the most current and comprehensive data of seabird distribution patterns in the U.S. exclusive economic zone off Alaska's coast, based on an inter-agency collaborative program that collected seabird distribution data during stock assessment surveys on hook-and-line vessels in the summers of 2002, 2003, and 2004. Seabird data were collected from four summer hook-and-line stock assessment surveys: International Pacific Halibut Commission (IPHC) halibut surveys, NMFS sablefish surveys, Alaska Department of Fish and Game (ADF&G) Southeast Inside sablefish surveys, and ADF&G Prince William Sound sablefish surveys (see Melvin et al. [2006] for survey protocol and description).

Researchers observed a total of 230,452 birds over three years at an average of 1,456 stations surveyed each year. Of all birds sighted, 85 percent were tubenose seabirds, and of these, most were northern fulmars (71 percent of all birds sighted) or albatrosses (13 percent of all birds sighted). Albatrosses occurred throughout the fishing grounds in outside waters. Sightings of the endangered short-tailed albatrosses (Figure 6-3) were extremely rare (0.03 percent of all sightings) and had a similar distribution to Laysan albatrosses: rare or absent east and south of the Western GOA and most abundant in the Aleutian Islands. Black-footed albatrosses were observed in all outside waters.

North Pacific Pelagic Seabird Observer Program

Between February 1 and October 31, 2007, seabird observers conducted surveys onboard ships of opportunity for a total of 275 days in the Bering, Chukchi, and Beaufort Seas, including some parts of IPHC Area 4E. While short-tailed, black-footed, and Laysan albatrosses were observed in the Bering Sea by surveyors, their distributions were mostly limited to the Bering Sea shelf break.

Short-tailed Albatross Takes in Alaska Fisheries

Table 6-3 details the short-tailed albatrosses reported taken in Alaska fisheries since 1983. Their locations are shown in Figure 6-3. Except for the second 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. See Figure 6-3 for a map of the take locations, and note that except for one bird, all takes occurred along the shelf break in the Bering Sea. Because this analysis focuses on the Aleutian Islands, the albatross that was taken in the hook-and-line fishery on August 28, 1995, south of Krenitizin Islands, west of Unimak Island is denoted with * in table. It was a sub-adult, banded on April 16, 1994.

While the incidental take statement take limits have never been met or exceeded, two short-tailed albatrosses were taken in the BSAI hook-and-line Pacific cod fishery in 2010. The first bird was taken on August 27, 2010, at 56 37' N and 172 57' W in NMFS reporting area 523. The bird had an identifying leg band from its natal breeding colony in Japan. It was a subadult at 7 years and 10 months old. The second bird was also taken in the BSAI, on September 14, 2010, at 59 20' N and 176 33' W in NMFS reporting area 521. This bird also had an identifying legband and was 3 years and 10 months. The last short-tailed albatross take, previous to these two, occurred in 1998. NMFS is working closely with industry and the observer program to understand the specific circumstances of these incidents, and to help prevent future take.

Table 6-3 Reported takes of short-tailed albatross in Alaska fisheries. (NPPSD 2004)

Date of take	Location	Fishery	Age when taken
July 1983	BS	brown crab	juvenile (4 mos)
1 Oct 87	GOA	halibut	juvenile (6 mos)
28 Aug 95*	EAI	hook-and-line	sub-adult (16 mos)
8 Oct 95	BS	hook-and-line	sub-adult
27 Sept 96	BS	hook-and-line	sub-adult (5 yrs)
21 Sept 98	BS	Pacific cod hook-and-line	adult (8 yrs)
28 Sept 98	BS	Pacific cod hook-and-line	sub-adult
27 Aug 2010	BS	Pacific cod hook-and-line	Sub-adult (7 yrs 10 mos)
14 Sept 2010	BS	Pacific cod hook-and-line	Sub-adult (3 yrs 10 mos)

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Opportunistic Sightings of Short-tailed Albatross

Balogh et al. (2006) report opportunistic sightings of short-tailed albatrosses in the Bering Sea and Aleutian Islands. These reported sightings are shown in Figure 6-3. Similar to other reports, more opportunistic sightings occurred over shelf-break areas than on the shelf. This pattern partially reflects where fishing effort occurred and short-tailed albatross observed, and does not equally represent sightings in areas where fishing effort is less common. Large numbers of short-tailed albatross were observed near the Bering Sea canyons.

North Pacific Pelagic Seabird Database (NPPSD)

The NPPSD represents a consolidation of pelagic seabird data collected from the Central and North Pacific Ocean, the Bering Sea, the Chukchi Sea, and the Beaufort Sea. The NPPSD was created to synthesize numerous disparate datasets including at-sea boat based surveys, stations, land-based observations, and fixed-wing and helicopter aerial surveys collected since 1972 (Drew and Piatt 2004).

Satellite Tracking of Short-tailed Albatross (Suryan 2006a and 2006b)

USFWS and Oregon State University have placed 52 satellite tags on Laysan, black-footed, and short-tailed albatrosses in the central Aleutian Islands over the past 4 years (USFWS 2006) to study movement patterns of the birds in relation to commercial fishing activity and other environmental variables. The tagging study has been a collaborative project with Japan. Japanese researchers tag birds at the main breeding colony on Torishima Island. From 2002 to 2006, 21 individual short-tailed albatrosses (representing about 1 percent of the entire population) were tagged, including adults, sub-adults, and hatch-year birds. The data suggest that they move north after the breeding season to the southern tip of the Kamchatka Peninsula, and then east to the western Aleutian Islands.

During 2002 and 2003, satellite transmitters were deployed on birds immediately prior to their departure from a breeding colony at Torishima (n = 11), or at-sea in the Aleutian Islands (n = 3) (Suryan et al. 2006b). Tracking durations ranged from 51 to 138 days for a total of 6,709 locations. The ages of 11 of 14 albatrosses (three were unbanded) tracked during this study ranged from less than 1 year to 18 years, with an unequal sex ratio of nine males to four females, and one individual of undetermined gender. Individuals were tracked from May to November and engaged during area-restricted search patterns along flight paths primarily over shelf break and slope regions. During the non-breeding season, short-tailed albatross ranged along the Pacific Rim from southern Japan through Alaska and Russia to northern California, primarily along continental shelf margins (Suryan et al. 2006a).

Movement patterns differed between gender and age classes. Upon leaving Torishima, females spent more time offshore of Japan and the Kurile Islands and Kamchatka Peninsula, Russia, compared to males, which spent more time within the Aleutian Islands and Bering Sea. Age-specific differences in movement patterns were evident for birds less than 1 year old. These two individuals traveled nearly twice the distance per day and total distance on average than all older albatrosses (Suryan et al. 2006a). Birds spent little time in the western gyre (Kuroshio and Oyashio regions).

Eleven of the 14 birds had sufficient data to analyze movements within Alaska. Within Alaska, albatrosses spent varying amounts of time among NMFS reporting areas, with six of the areas (521, 524, 541, 542, 543, 610) being the most frequently used (Suryan et al. 2006a). Albatrosses arriving from Japan spent the greatest amount of time in the western and central Aleutian Islands (541–543), whereas albatrosses tagged in Alaska were more widely distributed among reporting areas in the Aleutian Islands, Bering Sea, and the Alaska Peninsula. In the Aleutian Islands, area-restricted search patterns occurred within straits, particularly along the central and western part of the archipelago (Suryan et al. 2006b). In the Bering Sea, area-restricted search patterns occurred along the northern continental shelf break, the Kamchatka Current region, and east of the Commander Islands. Non-breeding, short-tailed albatross concentrate foraging in oceanic areas characterized by gradients in topography and water column productivity.

Telemetry data demonstrate that short-tailed albatrosses did not disperse widely throughout the subarctic North Pacific (Suryan et al. 2006b). The primary hot spots for short-tailed albatrosses in the Northwest Pacific Ocean and Bering Sea occur where a variety of underlying physical processes enhance biological productivity or prey aggregations. In this study, albatrosses made mainly transitory excursions along the northern boundary of the Kuroshio Extension and Oyashio Front while enroute to the Aleutian Islands and Bering Sea. The Aleutian Islands, in particular, were a primary foraging destination for short-tailed albatrosses. Passes within the Aleutian Islands with the greatest albatross area-restricted search pattern activity included Near, Buldir, Shumagin, and Seguam. Currents flowing through these relatively narrow and shallow passes cause localized upwelling, frontal zone formation, and eddies that enhance mixing, nutrient supply, and productivity. The significance of passes as feeding zones for breeding and migratory seabirds is well documented and their use by short-tailed albatrosses have been described from ship-based observations (Piatt et al. 2006).

In late June and early July 2006, USFWS and Oregon State University continued the satellite tagging study with at-sea tagging of six individuals in the Aleutian Islands, south of Amlia Island and in Seguam Pass. The 2006 tagging used the same deployment procedures and methodologies as those birds tagged in 2002 and 2003 (Suryan et al. 2006a and 2006b). Five of these hatching-year and subadult albatrosses were successfully tracked from June to September 2006.

6.1.4 Other Seabird Species of Conservation Concern

The 1988 amendment to the Fish and Wildlife Conservation Act mandates USFWS 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 (BCC) 2002 (USFWS 2002) 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 (NMFS 2004b) says the purpose of the BCC list is to highlight potential conservation issues and concerns before species get listed. The BCC report (USFWS 2002) lists 28 species of birds in Region 7 (Alaska Region). Many of these species do not interact with Alaska trawl and nontrawl fisheries, and, thus, are not addressed in this analysis.

Black-footed Albatross

Although not an ESA-listed species, the black-footed albatross is of concern because some of the major colony population counts may be decreasing or are 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 (USFWS 2006). Most of the population (95 percent) 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 1, 2004, the U.S. Fish and Wildlife Service (USFWS) received a petition to list the black footed albatross (*Phoebastria nigripes*) as a threatened or endangered species, and to designate critical habitat at the time of listing. The USFWS's response to the 90-day finding was deferred until October 9, 2007, due to insufficient resources. At that time, the USFWS found that the petition warranted further review. Following the publication of the black-footed albatross population status review, the USFWS began developing its 12-month finding indicating whether it believes a proposal to list this species as threatened or endangered is warranted. On October 9, 2007, the USFWS announced the decision that there is substantial scientific or commercial data to consider the ESA-listing of black footed albatross, and the agency has begun a 12-month review (Naughton et al, 2007, USFWS 2007 News release).

Melvin et al. (2006) states that the World Conservation Union (IUCN) changed its conservation status of the species under the international classification criteria from vulnerable to endangered in 2003. Additionally, USFWS 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 GOA, but do occur in the Aleutian Islands (Figure 6-2).

Red-legged Kittiwake

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, but outside of IPHC Area 4E (USFWS 2006). Of its worldwide population, 80 percent nest at St. George Island, with the remainder nesting at St. Paul Island, the Otter Islands, and Bogoslof and Buldir Islands. The total population is estimated at around 209,000 birds (USFWS 2006). They are listed as a USFWS bird of conservation concern because recent severe population declines remain unexplained (NMFS 2004b), but could be due to irregular food supplies in the Pribilof Islands. Red-legged kittiwakes are not expected to interact with hook-and-line fishing gear since none are reported as taken by fisheries observers.

Kittlitz's Murrelet

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. 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 percent), Malaspina Forelands (up to 75 percent), Kenai Fjords (up to 83 percent), 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. USFWS 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, USFWS (2004) gave the Kittlitz's murrelet (*Brachyramphus brevirostris*) a low ESA-listing priority because it has no imminent, high magnitude threats. The listing priority was elevated from 5 to 2 in 2007 in recognition that climate change will have a more immediate effect on this species than previously believed.

USFWS has conducted surveys for Kittlitz's murrelet in the Alaska Maritime National Wildlife Refuge over the past few years (USFWS 2006). These surveys have revealed substantial populations at Attu, Atka, Unalaska, and Adak. Intensive surveys in 2006 found an additional 10 nests in the mountains of Agattu. Biologists are now 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 2004a). Their foraging techniques, diet composition, and that they do not follow fishing vessels or congregate around them, reduce the likelihood of incidental take in groundfish fisheries (K. Rivera, NMFS, personal communication, November 2006).

Yellow-billed Loon

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. The wintering range includes coastal waters of southern Alaska from the Aleutian Islands to Puget Sound. They are believed to be long-lived and dependent upon high annual adult survival to maintain current population size. 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.

Most of the summer breeding habitat of the yellow-billed loon is available for oil and gas leasing and development. Yellow-billed loons are threatened by destruction of habitat, introduced predators, disturbance, and pollutants from oil and gas exploration 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.

USFWS received a petition from the Center for Biological Diversity in 2004 to list the yellow-billed loon as endangered or threatened throughout its range or as a distinct population segment and to designate critical habitat once listed. After a positive 90-day finding, the USFWS initiated a status review and determined that listing the yellow-billed loon as a threatened or endangered species is warranted under the Endangered Species Act, but that listing is precluded by other higher priority species. The "warranted but precluded" finding was published in the Federal Register on March 25, 2009 (74 FR 12932). The yellow-billed loon is now designated as a candidate species.

In 2006, the Bureau of Land Management, USFWS, 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.

6.2 Effects on Seabirds

The PSEIS identifies how BSAI groundfish fisheries activities may affect, directly or indirectly, seabird populations (NMFS 2004a). A direct effect on some seabird species may include incidental take (in fishing gear and vessel strikes) and is more fully described in section 3.7.1 of the PSEIS (NMFS 2004a). Indirect effects on some species may include prey (forage fish) abundance and availability, benthic habitat, processing waste and offal, contamination by oil spills, nest predators in islands, and plastics ingestion. These indirect effects are more fully described on pages 3.7–12 through 3.7–17 of the PSEIS.

Incidental Take

There is spatial overlap between the distribution of seabirds and fishing grounds in the Aleutian Islands. Suryan et al. (2006) discuss the spatial distribution of 11 tagged short-tailed albatross in the Alaska exclusive economic zone. Birds tagged in Torishima, Japan, spent 45 percent of their time in Alaska waters; those tagged in Alaska spent 60 percent of time in Alaska waters. Of their time in Alaska waters, the Alaska-tagged birds spent approximately 38 percent of their time in NMFS management Areas 541, 542, and 543. The Torishima-tagged birds spent 92 percent of their time in Alaska waters, within those areas. Most of the time spent in the Aleutian Islands management areas was in passes and nearshore areas, therefore mostly inside Steller sea lion critical habitat. Birds also transit outside of critical habitat. Direct effects, including incidental take of seabirds, are discussed in more detail below.

Prey Availability

Fisheries may compete with seabirds for prey species and may disturb bottom habitat that supports prey species. These indirect effects are also described below.

6.2.1 Significance Criteria for Seabirds

Table 6-4 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. These criteria are from the 2006–2007 groundfish harvest specifications environmental assessment/final regulatory flexibility analysis (EA/FRFA) (NMFS 2006). These criteria are applicable to this action because this analysis and the harvest specifications analysis both analyze the effects of groundfish fisheries on seabirds. The EA/FRFA provided the latest ideas on determining the significance of effects on seabirds based on similar information that is available for this environmental assessment/regulatory impact review (EA/RIR); no new information is available. The first criterion in the table was further refined for this analysis from NMFS (2006) to clearly provide a criterion for “insignificant impact” and to be consistent with other analyses of environmental components in this EA/RIR.

Table 6-4 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.

6.2.2 Incidental Take of Seabirds in Hook-and-Line Fisheries

The presence of "free" food in the form of offal and bait attracts many birds to fishing operations. In the process of feeding, birds sometimes come into contact with fishing gear and are accidentally killed. The probability of a bird being caught is a function of many interrelated factors including type of fishing operation and gear used, length of time fishing gear is at or near the surface of the water, behavior of the bird (feeding and foraging techniques), water and weather conditions, size of the bird, availability of food (including bait and offal), and physical condition of the bird (molt, migration, health).

Surface feeders, such as most *procelliforms* (albatross, fulmars, and shearwaters) and gulls, are most at risk of being taken in hook-and-line fisheries (Table 6-5). They are attracted to the vessels by the bait and the offal discharge. Nearshore foragers—such as cormorants, terns, guillemots, murrelets, Rhinoceros auklet, and puffins—are less likely to interact with offshore groundfish fisheries (NMFS 2004b). Additionally, their nearshore preferences, foraging techniques, diet composition, and that they do not follow fishing vessels or congregate around them, reduce the likelihood of incidental take in groundfish fisheries (K. Rivera, NMFS, personal communication, November 2006).

In hook-and-line fisheries off Alaska, surface feeders are attracted to the baited hooks when the gear is being set. They are caught from the surface down to a depth of 2 meters (m) (Melvin et al. 2001) and dragged underwater where they drown.

Table 6-5 Seabird species groups and risk of hook-and-line fishery interactions.

Species groups potentially at risk of interaction with hook-and-line gear	Species groups not likely to be at risk of interaction with hook-and-line gear
Albatross*	Cormorants
Fulmars	Terns*
Shearwaters	Guillemots
Gulls	Murrelets*
	Rhinoceros auklet
	Puffins
	Eiders*
	Loons*

* Includes a species that is listed as a bird of conservation concern with USFWS, IUCN, or listed as endangered or threatened under the ESA.

6.2.3 Incidental Take of Seabirds in Trawl Fisheries

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.

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

6.2.4 Prey Availability – Disturbance of Benthic Habitat

As noted in Table 6-6, prey species of seabirds in the Aleutian Islands are not usually fish that are targeted by non-pelagic commercial fishing gear. 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 essential fish habitat final environmental impact statement provides a description of the effects of trawling on bottom habitat in the appendix (NMFS 2005), including the effects of the commercial fisheries on the Bering Sea slope and shelf.

Table 6-6 Seabirds in Aleutian Islands: foraging habitats and common prey species. (USFWS 2006; Dragoo 2010)

Species	Foraging habitats	Prey
Short-tailed albatross	Surface seize and scavenge	Squid, shrimp, fish, fish eggs
Black-footed albatross	Surface dip, scavenge	Fish eggs, fish, squid, crustaceans, fish waste
Laysan albatross	Surface dip	Fish, squid, fish eggs and waste
Spectacled eider	Diving	Mollusks and crustaceans
Steller's eider	Diving	Mollusks and crustaceans
Red-legged kittiwake	Surface fish feeder	Myctophids, squid, amphipods, euphausids, minor amounts of pollock and sand lance
Black-legged kittiwake	Dip, surface seize, plunge dive	Fish, marine invertebrates
Kittlitz's murrelet	Surface dives	Fish, invertebrates, macroplankton
Short-tailed shearwater	Surface dives	Crustaceans, fish, squid
Northern fulmar	Surface fish feeder	Fish, squid, crustaceans
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
Glaucous-winged gull	Surface fish feeder	Fish, marine invertebrates, birds
Parakeet auklet	Surface dives	Crustaceans, fish, jellyfish
Least auklet	Surface dives	zooplankton
Horned and tufted puffins	Surface dives	Fish, squid, other invertebrates

It is not known how much seabird species use benthic habitat directly, although research funded by the North Pacific Research Board has been conducted on foraging behavior of seabirds in the Bering Sea in recent years. Thick-billed murres easily dive to 100 m, and have been documented diving to 200 m; common murres also dive to over 100 m. Since cephalopods and benthic fish compose some of their diet, murres could be foraging on or near the bottom (K. Kuletz, USFWS, personal communication, October 2008).

A description of the effects of prey abundance and availability on seabirds is in section 3.7.1 of the PSEIS (NMFS 2004a) and section 9 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). Detailed conclusions or predictions cannot be made regarding the effects of forage fish bycatch on seabird populations or colonies. NMFS (2007b) 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 sea ducks that depend on benthic habitat. These include Steller's eiders, spectacled eiders, scoters, cormorants, and guillemots, which may feed in areas that could be directly impacted by nonpelagic trawl gear (NMFS 2004b). 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 2010). Within the nearshore area, guillemots eat primarily fish and pelagic cormorants eat a variety of fish and invertebrates. Productivity data at Pierce and Round Island for pelagic cormorants is available from Dragoo (2010).

In the winter, spectacled eiders congregate in the open leads of ice in their critical habitat area to feed on benthic organisms. These ducks dive 40 m to 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 spectacled eiders (Greg Balogh, USFWS, personal communication, August 2005). Because nonpelagic trawl gear contacts the bottom, nonpelagic trawl gear in the spectacled eider critical habitat may have an impact on their 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, University of Wyoming, personal communication). 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 reports 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, Mier, and Dew (2000) studied trawling effects using the Bristol Bay area Crab and Halibut Protection Zone. They found more abundant infaunal bivalves (not including *Nuculana radiata*) in the highly fished area compared to the unfished area. 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 size 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, Jennings, and Kaiser 2006). The recovery rate may be affected by the animal’s ability to rebury itself after disturbance. Clams species may vary in their ability to rebury themselves based on grain size and whether they are substrate generalist, substrate specialist, or substrate sensitive species (Alexander, Stanton, and Dodd 1993). It is not known which category *Nuculana radiata* or other potential spectacled eider prey may occupy. The 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 *Nuculana radiata* is similar to bivalves studies in the North Sea, it is possible that recovery from nonpelagic trawl gear may take several years.

6.2.5 Alternative 1 – Status Quo

Alaska groundfish fisheries’ impacts on seabirds were analyzed in the Alaska Harvest Specifications EIS (NMFS 2007b). That document evaluates the impacts of the current alternative harvest strategies on seabird takes, prey availability, and seabird ability to exploit benthic habitat. The reader can consult that document for more information. A summary and updated information, where available, is presented below.

Incidental Take **-** *Estimating Seabird Bycatch in the Aleutian Islands and Bering Sea*

The North Pacific Observer Program provides estimates of seabird bycatch in Alaska's groundfish fisheries. They observe and estimate total seabird bycatch on vessels larger than 60 feet length overall and do not include interactions or entanglements with trawl cables or third wires (NMFS 2004b).

Rate of bycatch has decreased dramatically in hook-and-line fisheries since the use of streamer lines and other seabird avoidance measures in 2001. The fleet began voluntarily using these protection measures even before they were legally required. Seabird bycatch in the Aleutian Islands is comparable in total volume to bycatch in the GOA, and much less than the total bycatch in the Bering Sea. However, a higher percentage of albatross species is taken in the Aleutian Islands than either of the other areas.

Overall, hook-and-line gear interacts with a greater number of seabirds than any other type of fishing gear observed in Alaska. Hook-and-line gear took about twice as many seabirds as trawl gear in 2006, but caught about 98 percent of the albatross species taken. Seabird bycatch composition in the 2006 Aleutian Islands hook-and-line fishery was mostly northern fulmars and gull species, with about twenty percent albatross species, mostly Laysan with smaller numbers of black-footed. This is comparable to an average of around seventeen percent albatross species for the period 2000 to 2004. The 2006 Bering Sea hook-and-line fishery incidentally caught a much higher number of total birds including mostly northern fulmars and gull species, but only about two percent albatross species. This is comparable to an average of around two percent albatross species for the period 2000 to 2004. Most of the albatrosses taken with hook-and-line gear in the Aleutian Islands and Bering Sea are taken in the Pacific cod fishery.

Table 6-7 Seabird bycatch estimates in the 2006 Alaskan groundfish demersal longline fishery in the Aleutian Islands on vessels greater than or equal to 60 feet length overall. The point estimate for short-tailed albatross was zero.

Species	Point estimate	95% confidence interval
Laysan albatross	44	24–82
Black-footed albatross	3	1–12
Northern fulmar	89	55–144
Gull spp.	45	25–81
Unidentified albatross	2	1–119
Northern fulmar	8	2–226
Shearwater spp.	127	25–646

The trend in Alaska hook-and-line fisheries (2004–2006) was decreasing Laysan albatross bycatch and increasing black-footed albatross bycatch, although most of the 2006 black-footed albatross bycatch occurred in the GOA sablefish individual fishing quota fishery.

The Aleutian Islands trawl fisheries had very low seabird bycatch in 2006, compared to the Bering Sea, and mostly northern fulmars and shearwater species were caught. The Atka mackerel trawl fishery was only observed to have taken shearwater species. Pacific cod trawl took two unidentified albatross species and some northern fulmars. From 1993 to 2004, northern fulmars and shearwater species made up the majority of seabird bycatch in the Aleutian Islands trawl fisheries, with a smaller amount of Laysan albatrosses. Albatross species were even less commonly taken in the Bering Sea trawl fishery from 1993 to 2004.

As discussed in chapter 2 of this EA/RIR, much of the Aleutian Islands fishing grounds is currently closed to some gear types and fisheries inside Steller sea lion critical habitat and beyond in the status quo alternative, including Sequam Pass. These closures provide protection from interaction with seabirds in near-shore areas and important passes by decreasing 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. Additionally, the use of seabird avoidance measures in the hook-and-line fisheries has drastically reduced seabird bycatch (NMFS 2007a). These measures are not anticipated to change, so this protection would continue to be provided under any of the alternatives in this analysis.

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

Prey Availability and Benthic Habitat

Current groundfish fisheries do not harvest seabird prey species in an amount that would decrease food availability enough decrease survival or reproductive success, nor do they impact benthic habitat enough to decrease seabird prey base to a degree that would decrease survival or reproductive success.

6.2.6 Alternative 2

Alternative 2 prohibits retention of Atka mackerel and Pacific cod in Areas 543, 542, and in critical habitat in Area 541. In those areas, seabird interactions would likely decrease due to decreased fishing effort. If the trawl fleet is unable to catch their quota outside critical habitat in Area 541 or in the Bering Sea, the TAC would rollover to the hook-and-line fleet.

If the trawl fleet is not able to harvest their entire allocation as prescribed in Alternative 2, and that TAC is rolled over to the hook-and-line fleet, there could be additional effects to seabirds.

Incidental Take

As discussed earlier, hook-and-line fisheries have a much higher seabird interaction rate than trawl fisheries, and interactions with short-tailed albatross are more likely in the Aleutian Islands than in the Bering Sea. However, given the current take estimates as described above, an increase in effort from a roll-over is unlikely to cause significant effects to seabirds at the population level. Vessels would be required to continue to use seabird avoidance measures, which have drastically reduced interactions.
and fish outside closed areas.

Prey Availability and Benthic Habitat

Decreased fishing effort could further decrease any removals of seabird prey species and further mitigate any effects on benthic habitat. Even if TAC is rolled-over to the hook-and-line fleet, these changes are not expected to be very different from the current fisheries and are not likely to cause decreased survival or reproductive success.

6.2.7 Alternative 3

While more conservative than status quo, Alternative 3 closes less fishing grounds than Alternative 2 and has a seasonal component. This alternative closes Area 543, and closes critical habitat in Area 542 to all but non-trawl gear in the second half of the year. There is also a seasonal component to the closures in critical habitat in Area 541: non-trawl gear can be used to fish in the second half of the year and trawl gear can fish in the first half. Unfortunately, little information is available on the seasonal use of the habitat in the Aleutian Islands by seabirds. All of the tagged short-tailed albatross satellite tagging data is in the months of June through November, so we can use that limited sample size of birds to inform us about their behavior during the time that the hook-and-line fleet would be operating under this alternative.

The effects under this alternative would be similar to those under Alternative 2. Any benefits to seabirds from closing fishing grounds would likely be offset by additional effort in other places.

Incidental Take

These changes in fisheries effort are not likely to cause significant changes in the amount of seabird takes compared to the status quo and Alternative 2, and are not likely to cause a level of take that would have a population level impact.

Prey availability and Benthic habitat

Decreased fishing effort could further decrease any removals of seabird prey species and further mitigate any effects on benthic habitat. Even if TAC is rolled-over to hook-and-line fleet, these changes are not expected to be very different from the current fisheries and are not likely to cause decreased survival or reproductive success.

6.2.8 Alternative 4

The protection measures in Area 543 remain unchanged from Alternative 3. Alternative 4 differs from Alternative 3 by the protection measures in Areas 542 and 541, providing additional opportunity for fishing inside critical habitat for the Atka mackerel and Pacific cod fisheries while meeting the performance criteria specified in the FMP biop (NMFS 2010) to avoid the likelihood of JAM.

Incidental Take

While the proposed action may lead to a shift of hook-and-line vessels from the Aleutian Islands to the Bering Sea, due to the historical rarity of takes, this action is not expected to have implications for the short-tailed albatross population or other seabird populations.

Prey Availability and Benthic Habitat

Decreased fishing effort could further decrease any removals of seabird prey species and further mitigate any effects on benthic habitat. Even if TAC is rolled-over to hook-and-line fleet, these changes are not expected to be very different from the current fisheries due to fishing overall within the BSAI TAC and due to the reinitiation triggers applied to the Pacific cod fisheries in Areas 542 and 541. These limits on harvest ensure that the fisheries under this alternative are not likely to cause decreased survival or reproductive success.

6.3 Cumulative Effects

Cumulative impacts are defined in federal regulations (40 CFR 1508.7) 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 action taking place over a period of time.

In this case, changes in management of the Alaskan groundfish fisheries represent sequential actions that may, or may not, overlap in time. Each policy change contributes an increment to the total cumulative effect, while working in combination with the effects of other fisheries, other human activities, and natural phenomena. Because this analysis found that effects were limited to those on seabirds, this cumulative effects analysis is also limited to seabirds.

A detailed discussion of cumulative effects of the status quo fisheries on seabirds can be found in section 4.13 of the PSEIS (NMFS 2004a) and section 9.1 of the Alaska Groundfish Harvest Specifications EIS (NMFS 2007b). The PSEIS's cumulative effects analyses describe the potential direct and indirect effects of groundfish fishing on seabirds, identify external factors that may have additive or synergistic effects, and evaluate the significance of the effects. Section 9.3 of the groundfish EIS has the latest information on potential future actions and the impacts on seabirds.

Section 4.3.3 of the PSEIS (NMFS 2004a) provides a rationale for the consideration of potential direct and indirect fishery effects on different seabird taxonomic groups. This analysis displays only those effects that are additional and/or attributable to promulgation of revised regulations for seabird avoidance measures in the hook-and-line fisheries off Alaska to reduce incidental take of the short-tailed albatross (*Phoebastria albatrus*) and other seabird species. The environmental issues include direct effects of gear use and entanglement/entrapment of non-target organisms in active fishing gear. The intended effect of the proposed regulatory amendment is to maintain current protections for seabirds by using seabird avoidance measures where they are needed due to known fishery and seabird interactions.

Past effects on seabird species include hunting and harvesting for feathers, eradication of nests, the relocation in military programs of adult birds to reduce the interaction of seabirds with military aircraft, the introduction of new species (such as rabbits) into nesting habitat, and predation by introduced species such as rats. Fisheries outside of Alaska also have likely contributed to population decline. These stressors have affected some species more than others, including black-footed albatross, short-tailed albatross, red-legged kittiwakes, and Kittlitz's murrelet (Table 6-8).

Table 6-8 Stressors on seabird species of concern in Alaska.

Human activity stressor	**Species affected**
Gillnet fisheries	Kittlitz's murrelet, Steller's eider
Oil spills and leaks	Kittlitz's murrelet, red-legged kittiwake, short-tailed albatross
Other hook-and-line fisheries	black-footed albatross
Tourism/vessel traffic	Kittlitz's murrelet
Feather hunting	short-tailed albatross, black-footed albatross
Ingestion of plastics	short-tailed albatross, black-footed albatross, Laysan albatross
Collisions with fishing vessels	short-tailed albatross, Steller's eider, spectacled eider
Introduced species	black-footed albatross, red-legged kittiwake
Military eradication programs	black-footed albatross, Laysan albatross

The requirement of the use of seabird protection measures in previous regulations on hook-and-line fisheries in Alaska has decreased fishery bycatch rates substantially since 2001.

The 2007 Alaska Groundfish Harvest Specifications EIS identified the following future actions that could impact seabirds: ecosystem-sensitive management, fisheries rationalization; traditional management tools;

actions by other federal, state, and international agencies; and private action (NMFS 2007b). In nearly all cases, future actions were likely to reduce the impacts on seabirds, except for subsistence harvest.

Current and future threats to seabirds other than those analyzed in this document include collisions with aircrafts, vessels, and cables on fishing vessels, plastics ingestion, oil spills, ship bilge dumping, high seas driftnet and gillnet fisheries, and increased flightseeing near glaciers and tour boat traffic (specifically for Kittlitz's murrelets).

6.3.1 Reasonably Foreseeable Future Actions that may Affect the Impact of Groundfish Fishing on Seabirds

The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the direct and indirect effects of the alternatives on seabirds. These actions are described in chapter 3.

Ecosystem-sensitive Management

Increased attention to ecosystem-sensitive management is likely to lead to more consideration for the impact of the groundfish fisheries on seabirds, and more efforts to ensure that the ecosystem structure that seabirds depend upon is maintained, including prey availability. New observer data recording techniques are likely to lead to better estimates of seabird trawl bycatch takes. Research into trawl cable and "third wire" interactions is likely to lead to an improved understanding of the mechanisms by which seabirds are taken when they interact with the cables. This understanding may lead to trawling methods that take fewer seabirds through this mechanism. These results are likely to reduce any adverse impacts of fishery specifications. The North Pacific Fishery Management Council (Council) is considering a proposal to remove requirements for seabird protection measures from small hook-and-line vessels operating within specific State inside waters in areas where recent research indicates that hook-and-line operations attract relatively few seabirds.

Research into the importance of offal as a food source for seabirds is ongoing at the Alaska Fisheries Science Center. Researchers are working to describe the volume and physical characteristics of offal production in the groundfisheries during the years from 2003 to 2005. Researchers hope to relate "patterns of provisioning by fisheries," of "seabird distributions in space and time and seabird bioenergetic requirements." Research results should become available within the next year (S. Fitzgerald, personal communication, 2009).

Fisheries Rationalization

Rationalization may lead to fewer operations on the water. Moreover, if appropriate monitoring and enforcement provisions are incorporated into the programs, they can lead to more effective control over fisheries bycatch. These results are likely to reduce any adverse impacts of fishery specifications. Rationalization programs are under consideration in several fisheries, including the rockfish trawl fishery in the GOA, the head and gut trawl fishery in the BSAI, and the Pacific cod fishery in the BSAI. A Pacific cod program is speculative at this time.

Traditional Management Tools

Future actions include ongoing annual groundfish fisheries. These would cause additional incidental takes of seabirds, additional harvest of prey species, and additional impacts on benthic habitat. All of these would have adverse impacts on seabirds. However, while the groundfish fisheries are believed to have adverse impacts on seabirds through these mechanisms, in general, takes are believed to be small compared to the populations of affected seabirds. Groundfish fishing impacts on forage availability are believed to relatively limited (as discussed in section 9.2), especially given the variety of species consumed by seabirds. Moreover, there appears to be relatively little overlap between groundfish fishing operations and the benthic habitat used by bottom feeding seabirds.

In 2007, the Council will be considering refinements to existing regulations that set forth seabird avoidance measures for the hook-and-line gear fisheries. These refinements are intended to better coordinate applicable avoidance measures to the distribution of short-tailed albatross.

The December 2006 reauthorization of the Magnuson-Stevens Act included a provision for mandatory regionally-based seabird bycatch reduction programs. Section 116(c) requires the programs to be established in one year and allows for incentive programs that may be established in FMPs by Councils or the Secretary to reduce total bycatch and seabird interactions, bycatch rates, and post-release mortality in fisheries. The Magnuson-Stevens Act authorizes the Secretary, in coordination with the Department of the Interior, to undertake projects in cooperation with industry to improve information and technology to reduce seabird bycatch. Section 116(d) has an annual reporting requirement to Senate and House Committees that describes funding provided to implement the section, developments in gear technology achieved under the section, improvements and reduction in bycatch and seabird interactions associated with implementing this section, as well as proposals to address remaining bycatch or seabird interaction problems. Implementation of this program likely will result in a decrease in seabird bycatch in the fisheries, reducing the potential adverse impact of groundfish fisheries on seabirds.

Actions by other Federal, State, and International Agencies

The USFWS will continue its management of coastal and pelagic seabirds. These measures include research into the natural history and population status of seabird populations, efforts to protect bird populations (for example, through invasive species management in the Alaska Maritime National Wildlife Refuge), and listing of threatened or endangered bird species under the Endangered Species Act and consultations on actions that may affect listed species. If the Kittlitz's murrelet, or the black-footed albatross, is listed on the ESA threatened or endangered list by USFWS, NMFS will review activities managed in the areas where this species occurs to determine if Section 7 consultation is necessary. These ESA activities by the USFWS and NMFS will likely reduce any adverse impacts of fishery specifications.

Although the short-tailed albatross population is increasing, their numbers remain extremely low (approximately 2,000), and the population remains heavily dependent on the protection of breeding grounds concentrated at the volcanic Torishima Island, Japan. International efforts are underway by Japan, the United States and Canadian agencies to promote the growth of this species population, including the establishing a breeding colony on a non-volcanic island. The population has been growing at near maximum biological potential. Active public-private research efforts are underway to investigate the incidence of takes by fishing gear and to develop methods for reducing these takes that are practicable for industry. These efforts have led to the development of methods for reducing longline bycatch; research is currently underway into methods to estimate and reduce trawl interactions. The first year of tracking tagged breeding adults indicates that the birds forage in the heavily fished waters near Tokyo prior to their journey to Alaska (USFWS 2006).

Private Actions

Private firms will conduct fishing operations under the authority of the TAC specifications. The impact of these actions is considered under traditional management tools. In recent years, longline effort in the Eastern Bering Sea appears to have trended upwards. Fishing effort measured as numbers of hooks has consistently trended upwards since 1997. Until 2002, catch per unit of effort decreases appear to have more than offset the effort increases, since the bycatch rate was falling. The bycatch rate stopped decreasing in 2003 and rose slightly that year. If this trend persists through the forecast period, it may offset some part of any future potential gains from reductions in bird bycatch per unit of effort in the longline fishery. Subsistence and recreational hunting impose additional mortality on seabirds. The Alaska Migratory Bird Council has been monitoring subsistence harvests for 10 years. Survey results may be found at their website: http://alaska.fws.gov/ambcc/harvest.htm.

Subsistence takes appear to be on the order of about 32,000 seabirds annually. About 29 percent of these were auklets, about 23 percent were murres, and about 19 percent were king eiders. Annual average egg harvests in the late 1990s appear to be on the order of about 100,000 eggs. About 38 percent of these were murre eggs, and about 52 percent were gull eggs. As noted in chapter 11, increasing levels of human activity may increase the potential for the introduction of Norway rats to islands with seabird breeding colonies. These could deplete bird colonies. The Pollock Conservation Cooperative, and private companies, are cooperating with NMFS in research into ways to reduce mortality associated with trawl cables. The Washington Sea Grant program and the World Wildlife Fund have been active in outreach efforts with Russian fishermen in the North Pacific, encouraging the use of streamer lines and conducting education efforts on bycatch mitigation (K. Kuletz, personal communication, July 2006).

6.4 Summary of Effects

Many seabird species use the marine habitat of the Aleutian Islands, including several species of conservation concern. Some species are taken by hook-and-line gear, some 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 pelagic and 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 are summarized below in Table 6-9. Although the action alternatives may affect seabirds, NMFS has determined that all effects (both positive and negative) would be insignificant. The effects of the past, present, and reasonably foreseeable future actions on seabirds in combination with the potential effects of the alternatives for this action are not likely to result in substantial changes in seabird populations; therefore, the cumulative impacts are insignificant.

Table 6-9 Summary of impacts to seabirds from alternatives in this analysis.

Alternative	Impact on incidental take of seabirds in Alaska waters	Impact on prey density and benthic habitat
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 fisheries in the Aleutian Islands. Insignificant effects.	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 fisheries in the Aleutian Islands. Insignificant effects.
Alternative 2	Seabirds are taken by fisheries in minor amounts compared to population levels. Insignificant effects.	Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects. Insignificant effects.
Alternative 3	Seabirds are taken by fisheries in minor amounts compared to population levels. Insignificant effects.	Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects. Insignificant effects.
Alternative 4	Seabirds are taken by fisheries in minor amounts compared to population levels. Insignificant effects.	Overall prey availability is not affected by the groundfish fisheries at a level resulting in population level effects. Insignificant effects.

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7.0 Habitat

7.1 Status of Habitat

Descriptions of the Aleutian Islands habitat are in the Environmental Impact Statement for Essential Fish Habitat Identification and Conservation (EFH EIS; NMFS 2005) and in the Habitat Areas of Particular Concern Environmental Assessment (HAPC EA; NMFS 2006) and are incorporated by reference. Habitat of the Aleutian Islands has complicated mixes of substrates, including a significant proportion of hard substrates (pebbles, cobbles, boulders, and rock), but data are not available to describe the spatial distribution of these substrates. Therefore, it is difficult to assess habitat complexity in terms of specific substrates. Some information on vulnerable or fragile habitats can be surmised through the NMFS groundfish surveys and from observer data from the Alaska Fisheries Science Center. NMFS conducts groundfish surveys in the Aleutian Islands every three years, and also samples catch from commercial vessels. During the course of these surveys and commercial sampling any sponge or corals are documented, if possible, at the genus level. However, survey and observer data are not intended specifically to sample these species or their habitats.

7.2 Effects on 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 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, and the history of fishing in an area. This process is presented in more detail in section 3.2 in the HAPC EA (NMFS 2006). A specific description of the effects of bottom trawling on habitat is in section 3.2.1 of the HAPC EA and is incorporated by reference.

Based on the information available to date, the predominant direct effects caused by bottom trawling include smoothing of sediments, moving and turning of rocks and boulders, resuspension and mixing of sediments, removal of seagrasses, damage to corals and sponges, and damage or removal of epibenthic organisms (ICES 1973; Hutchings 1990; Auster et al. 1996; Heifetz 1997; 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 sweeps, footropes, and net can disrupt benthic biota and dislodge rocks. Larger seafloor features or biota are more vulnerable to fishing contact, so 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. This model is in Appendix B of the EFH EIS (NMFS 2005).

Hook-and-line and pot gear may also damage benthic habitat by contact with sedentary bottom dwelling organisms (e.g., seawhips, corals, and sponges) (sections 3.4.3.2.4 and 3.4.3.2.5 in NMFS 2005). Hook-and-line gear can snare coral and sponges and damage or remove these organisms during gear retrieval. Pots can crush or dislodge benthic organisms as the pots are set or as they are retrieved and dragged across the bottom.

7.3 Significant Criteria for Habitat

Criteria used in this EA/RIR to evaluate effects of the proposed action on habitat are provided in Table 7-1. The reference points against which the criteria are applied are the current size and quality of marine benthic habitat and other essential fish habitat (EFH) in the Aleutian Islands subarea and are incorporated from the HAPC EA (NMFS 2006). The criteria are grouped into four categories:

1. Mortality and damage to living habitat species: Damage to or removal of living habitat species by direct contact with fishing gear;
2. Modification of non-living substrate by direct contact with fishing gear (non-living substrates such as rock and cobble);
3. Modification of the community structure in terms of benthic biodiversity; and
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 various gear types at different levels of intensity affects different habitat types.

Several simplifying assumptions were made:

1. Disturbances, such as fishing, in sensitive habitats add additional stress on areas with slow recovery times and fragile sessile marine organisms.
2. Closing areas to disturbances benefits benthic habitat, presumably by allowing it to return to a condition similar to pre-fishing effects.
3. Removal or disruption of non-living structure, such as boulders, may remove attachment substrate for species, such as Primnoa coral 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 that propose to protect one area will likely result in benefits to that area, with potential for increased stress on habitats elsewhere.

Table 7-1 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.	Likely not to substantially change mortality or damage 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, alter, 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.

7.4 Long Term Effects Indices

Table 7-2 provides the long-term effects indices (LEIs) for Bering Sea and Aleutian Islands (BSAI) groundfish fisheries that may be affected by this action. The LEIs are based on the fisheries in 2005. The Atka mackerel fishery impacts at that time resulted in greater habitat reductions than other groundfish fisheries in the Aleutian Islands. This analysis has not been updated since the implementation of habitat conservation measures for the Aleutian Islands and Bering Sea so it is likely that these effects are less today than shown in the table.

Table 7-2 2005 Groundfish Fisheries LEI (percent reduction) of Habitat Features within Intersections of Species Distributions and Habitat Types.

Percent Reduction of Habitat [General Distribution (95%) and Concentration (75%)]

	% of Area		Infauna Prey		Epifauna Prey		Living structure		Non-living Structure		Hard Coral	
Habitat	(95%)	(75%)	(95%)	(75%)	(95%)	(75%)	(95%)	(75%)	(95%)	(75%)	(95%)	(75%)
Pacific Cod												
AI Deep	4	2	1	1	1	1	5	8	3	5	11	19
AI Shallow	4	4	1	1	1	1	8	10	5	6	19	24
BS Mud	7	6	0	0	0	0	1	1	0	0	0	0
BS Sand	21	23	1	1	1	1	6	7	1	1	0	0
BS Sand/Mud	32	36	2	2	2	2	11	13	2	2	0	0
BS Slope	2	3	2	2	2	2	10	10	3	3	0	0
Atka Mackerel												
AI Deep	33	57	2	3	2	3	15	20	10	13	32	40
AI Shallow	44	50	1	2	2	3	14	20	8	13	30	40
Yellowfin Sole												
BS Sand	53	61	1	0	0	0	5	5	0	0	0	0
BS Sand/Mud	43	39	2	3	2	3	13	18	1	2	0	0
Rock Sole												
BS Sand	28	37	1	1	1	1	6	6	1	1	0	0
BS Sand/Mud	37	41	2	3	2	2	13	15	2	2	0	0
Arrowtooth Flounder												
BS Sand/Mud	33	34	3	4	2	3	16	20	2	3	0	0
BS Slope	3	5	2	3	2	2	10	12	3	3	0	0

Source: Table B.3-3 in NMFS 2005

In 2005, the EFH EIS concluded that despite persistent disturbance to certain habitats, the effects of the Alaska groundfish fisheries on EFH are minimal because the analysis found no indication that continued fishing activities at the rate and intensity in 2005 would alter the capacity of EFH to support healthy populations of managed species over the long term. Even though this conclusion did not require minimizing fishing impacts, extensive habitat protection and conservation measures have been adopted for the Aleutian Islands and Bering Sea subarea (see chapter 2, section 2.1.1 of this EA/RIR; 71 FR 36694, June 28, 2006; and 73 FR 43362, July 25, 2008). The effects of the Aleutian Islands and Bering Sea groundfish fisheries habitat conservation measures were analyzed in previous NEPA analysis (NMFS 2005 and 2008). These habitat conservation measures were determined to have insignificant effects on habitat and these conclusions are incorporated by reference. Therefore, Alternative 1 (status quo) is likely to have insignificant effects on habitat complexity of living and nonliving structures, benthic diversity, and habitat suitability.

7.5 Effects of Alternatives 2, 3, and 4

In Alternatives 2, 3, and 4 large portions of the Central and Western Aleutian Islands would be closed to fishing for Atka mackerel and Pacific cod, which would likely result in benefits to habitat in those areas. In this EA/RIR, detailed information regarding the areas closed to fishing for each alternative can be found in chapter 2, and information regarding the likely outcome of changes in fishing effort can be found in section 10.3. The least amount of nonpelagic trawling in areas of the Aleutian Islands would be allowed under Alternative 2 with more areas open to trawling under Alternative 3 and the most areas open to trawling under Alternative 4.

In Area 543:

Nonpelagic trawling for Atka mackerel and Pacific cod would be prohibited in Areas 543 under Alternatives 2, 3, and 4. So the impacts under the action alternatives on habitat in Area 543 would be the same. The potential effects from the Atka mackerel and Pacific cod fisheries would be removed in this area but other groundfish fisheries would continue to be prosecuted in a manner allowed under the Aleutian Islands Habitat protection measures (71 FR 36694, June 28, 2006), so that some impacts on habitat from groundfish fisheries would occur but these impacts are less than those under the status quo.

In Area 542:

Alternative 2 would also prohibit nonpelagic trawling in Area 542. Alternative 3 would allow nonpelagic trawling outside of critical habitat in Area 542. Alternative 4 would allow Atka mackerel fishing outside of critical habitat and a limited amount of fishing inside 10 to 20 nm of critical habitat in a one degree area. Hook-and-line and pot fishing for Pacific cod in Area 542 would be limited to outside of 10 nm of critical habitat under Alternative 3. Hook-and-line and pot fishing for Pacific cod in Area 542 would be limited to outside of 6 nm of critical habitat under Alternative 4. Alternative 4 provides for more locations in Area 542 for fishing activities than Alternative 3 and therefore has more potential for impacts on habitat than Alternatives 2 and 3.

In Area 541:

Atka mackerel fishing would not occur in critical habitat in Area 541 under Alternatives 2, 3, and 4. Alternative 2 would also prohibit Pacific cod fishing inside critical habitat in Area 541 but Alternatives 3 and 4 would allow Pacific cod trawling in Area 541 outside of 10 nm of critical habitat.

Alternative 4 allows for more trawling and more hook-and-line and pot fishing in the Aleutian Islands subarea than Alternatives 2 and 3, which creates more potential for habitat impacts by fishing gear than Alternatives 2 and 3, but less than Alternative 1.

Due to the relatively large size of the areas closed to fishing and the substantial fishing effort in those areas, adjacent areas either in the Aleutian Islands or Bering Sea will likely support some level of the fishing being displaced under Alternatives 2, 3, and 4 (section 10.3.3 of this EA/RIR). This shifting of effort and potential impacts in the Bering Sea are less likely under Alternative 4 due to more fishing being available in the Aleutian Islands subarea compared to Alternatives 2 and 3. It is possible to assume that some fishing grounds would be fished with more frequency, potentially increasing direct impacts. However, based on existing habitat conservation and protection measures for the Aleutian Islands and Bering Sea subareas, increased fishing effort in habitats currently fished would likely not be significantly higher than already exists, and the types of habitat impacted would not change substantially.

For some stage of their life history, fish stocks may rely on habitats that may be impacted by the shift of fishing under Alternatives 2, 3, and 4. It is not likely that changes would occur to fish populations compared to the status quo as the 2005 EFH EIS found that in no case were the effects of fishing from any gear type more than minimal or not temporary in nature (NMFS 2005), and the current fisheries have been modified to further minimize the effect of fishing on habitat.

Because much of the primary fishing ground for both Atka mackerel and Pacific cod are closed under the action alternatives in the Western and Central Aleutian Islands, the positive changes in LEI (values are likely to tend towards 0) are likely to be relatively high. The fisheries participants may shift to Bering Sea yellowfin and rock sole to replace Aleutian Islands cod and Atka mackerel fisheries. These flatfish fisheries are prosecuted on sand or sand/mud habitats, which is much less vulnerable than the hard bottom coral-dominated ecosystem in the Aleutian Islands.

Due to the relatively small size of area that is open to fish in Area 542 under Alternatives 3 and 4, adjacent areas will likely support the amount of fishing being displaced, as Pacific cod is managed BSAI-wide. It is possible that some fishing grounds would be fished with more frequency, with the potential for increased direct impact. However, it is likely that the increased fishing effort in habitats currently fished would not be much greater than effort that already exists and the impacts would be minimized by the existing habitat conservation and protection measures.

The following examines the potential effects of the alternatives on habitat features listed in Table 7-1

Habitat Complexity (living habitat)

Several species of high relief coral have been documented in the Aleutian Islands. Fish and crab have been documented on or near the high relief living structures. Fishery data and the LEI analysis conducted for the EFH EIS suggest that fisheries conducted in the Aleutian Islands have a small impact on these features. Portions of the Aleutian Islands subarea would be closed from future Atka mackerel and Pacific cod fishing disturbances, further reducing potential impacts from those identified in NMFS (2005). Therefore, a slight benefit to these habitats is expected under the action alternatives; however, the extent of this benefit is not likely to cause a substantial increase in living habitat complexity, and therefore the effects of the action alternatives are likely insignificant.

Habitat Complexity (non-living)

Little information is available to assess non-living structures in the Aleutian Islands. Three-dimensional contour imagery is available for several small areas; however, comprehensive bottom sampling has not occurred. Substrate information reveals that the predominate types include hard bedrock, soft substrates, and a range of both hard and soft substrates. A fisheries gear assessment model (Fujioka 2006), discusses that harder substrates, such as bedrock, are able to withstand direct impacts from bottom contact gear. The model also suggests that fishing impacts on soft substrates can leave trenches and gear marks. Therefore, hard and soft non-living substrate could be altered minimally from bottom contact fishing, and it is unlikely that any substantial alteration of the physical structure occurs from removing fishing activity. Therefore, the effects of the action alternatives to non-living habitat are insignificant.

Benthic Biodiversity

While species information does exist in the Aleutian Islands, the direct relationship between resident fish, prey, and other species is unknown. A prohibition of bottom contact gear would reduce the effect on the benthic community, and is likely to protect the benthic community and decrease the likelihood of changing the community structure. A substantial increase in structure is not anticipated with Alternatives 2, 3, and 4, and therefore the effects of the action alternatives on benthic biodiversity are likely insignificant.

Habitat Suitability

Information is not available to assess the suitability of habitat in the Aleutian Islands. Regardless, Alternatives 2, 3, and 4 are likely to preserve the suitability of habitat but are not expected to enhance habitat to cause a substantial increase in suitability. Therefore, the effects of the action alternatives on habitat suitability are likely insignificant.

7.6 Cumulative Effects

A discussion of the cumulative effects of the groundfish fisheries is in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The past and current cumulative effects are discussed in the Alaska Groundfish Fisheries Programmatic Supplemental Environmental Impact Statement (NMFS 2004). Both of these discussions are incorporated by reference.

For habitat, several future actions were identified as reasonably foreseeable future effects. The discussions for each of these actions are in section 10.3 of NMFS (2007). The reasonably foreseeable future actions that may impact habitat are—

- ecosystem-sensitive management;
- fisheries rationalization;
- traditional management tools;
- actions by other state, federal, and international agencies; and
- private actions.

The following reasonably foreseeable future actions may have a continuing, additive, and meaningful relationship to the effects of the alternatives on EFH. These actions are described in chapter 3 of this EA/RIR.

Ecosystem-sensitive management

Habitat is one component of the ecosystem in which the groundfish fisheries are prosecuted. To the extent that the implementation of an ecosystem approach to management will likely result in reduced or modified fishing, the impacts of the proposed action will be reduced. Future fisheries management measures will be developed that consider the entire ecosystem, including habitat. Ongoing habitat research will increase our understanding of the spatial distribution of different habitats, the importance of different habitats to different life stages of fish species, the impact of different types of fishing gear on different types of living and nonliving habitat, and the recovery rates for different types of habitat. Ongoing research is summarized in the Ecosystems Considerations SAFE (Boldt and Zador 2009).

Although NMFS has already identified EFH and HAPC and has implemented conservation measures, increased protection for benthic habitat is contemplated to mitigate fishing impacts. Future habitat protection measures are likely to result in decreased mortality and damage to marine habitat, an increase in benthic community structure, and changes in the distribution of fishing effort (NMFS 2005). In October 2009, the North Pacific Fishery Management Council (Council) unanimously recommended Amendment 94. Amendment 94 requires modified nonpelagic trawl gear for directed fishing for flatfish in the Bering Sea subarea. The purpose of the action is to provide protection to Bering Sea bottom habitat from the potential adverse effects of nonpelagic trawl gear. This protection is achieved by modifying nonpelagic trawl gear by raising the trawl sweeps off the bottom. Studies have shown that elevating the trawl sweeps can reduce impacts on benthic organisms, such as basketstars, seawhips, and crabs. Because 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 nonpelagic trawl fisheries management in the Bering Sea subarea. The final rule was published in the *Federal Register* on October 6, 2010 (75 FR 61642). Implementation of the modified gear requirement is effective January 20, 2011.

The Alaska Fisheries Science Center is in the process of developing a plan for research on the effects on nonpelagic trawling on benthic habitat in the Northern Bering Sea Research Area (NBSRA). The NBSRA was established in the final rule for Amendment 89 to the BSAI groundfish fishery management plan (73 FR 43362, July 25, 2008). The research under this plan would be conducted by commercial vessels under exempted fishing permits. The completion of the research plan is scheduled for April 2012 and research activities would be after this date. Results of the research should provide a better understanding of the potential impacts of nonpelagic trawl gear on benthic habitat in the northern Bering Sea. Similar impacts may be seen in other areas of Alaska with similar habitat and nonpelagic trawling activities. The research results may improve the ability of fisheries management to mitigate potential adverse effects of nonpelagic trawling on benthic habitat.

Fisheries rationalization

Many of the resulting changes to the prosecution of the fisheries under rationalization would potentially reduce impacts of the fisheries on EFH. Future rationalization of the groundfish fisheries is expected to reduce fishing effort and improve manageability of the fisheries through better harvest and bycatch controls. A rationalization program would reduce the number of vessels that participate in the groundfish fisheries. A rationalization program would also potentially reduce the effects of the fisheries on EFH by providing fishermen the time to improve fishing practices and avoid sensitive habitat areas. With a guaranteed share of the harvest, fishermen would have the time to be selective and choose where to fish to avoid fishing on grounds with crabs or other benthic species. Increases in monitoring and observer coverage from implementing a rationalization program would increase our understanding of the impacts of these fisheries on EFH by providing better bycatch information and fishery locations. To the extent that the implementation of fisheries rationalization will likely result in reduced effort or modified fishing, the impacts of the proposed action may be reduced.

Traditional management tools

Since portions of habitat are impacted each year by fishing activities and since some of those habitats may require exceptionally long periods to recover from fishing impacts (e.g., slow growing, long lived corals;

NMFS 2005), the current harvest specifications, in combination with future harvest specifications, may have lasting effects on habitat. As the slow-growing, long-lived components of the habitat are impacted by cumulative years of fishing, there is likely to be cumulative mortality and damage to living habitat and changes to the benthic community structure. Species that are able to recover faster from fishing impacts may displace the longer-lived, slower-growing species, changing the structure and diversity of the benthic community. Improved monitoring and enforcement would improve the effectiveness of existing and future EFH conservation measures by ensuring the fleet complies with the protection measures, and thus, reduces the impacts of the future harvest specifications.

The EFH EIS noted that "…habitat loss due to fishing off Alaska is relatively small overall, with most of the available habitats unaffected by fishing…[b]ased on the best available scientific information, the EIS analysis concludes that despite persistent disturbance to certain habitats, the effects on EFH are minimal because the analysis finds no indication that continued fishing activities at the current rate and intensity would alter the capacity of EFH to support healthy populations of managed species over the long term" (NMFS 2005). Since past fishing activity has not resulted in impacts that are more than minimal, and future fishing activity is expected to be constrained by reasonably foreseeable future actions, the future effects of a continued fishery are predicted to continue to be minimal. The Council also has begun the process to evaluate the effects of nonpelagic trawl fishing on the northern Bering Sea bottom habitat. The research will improve the information known about the effects of nonpelagic trawl fishing and may result in changes in fishing activities to protect EFH in the Bering Sea, if such protection is deemed necessary.

Other federal, state, and international agency actions

New harbor developments contribute to, and are a result of, private actions described below, and may be associated with impacts to the coastal zone. New harbor developments by the U.S. Army Corps of Engineers–Civil Works are reviewed by NMFS for effects on habitat. NMFS makes recommendations to limit adverse impacts.

The State of Alaska's (State's) management of the Alaska Water Quality Standards and accepting primacy for the National Pollution Discharge Elimination System (NPDES) program from the U.S. Environmental Protection Agency may be future actions that affect EFH. The proposed generalization of residue criteria and increased discretion in determining exceedences of the water quality standards may result in changes in the quality of water located in nearshore EFH areas. Federal oversight of the State's implementation of the NPDES program would be critical to ensure the discharge activities do not result in less compliance with the Clean Water Act than is experienced under federal management. In either case, potential exists for a decrease in water quality in nearshore EFH locations if changes are made to the programs that allow more pollutants to enter the marine environment. Changes in water quality are likely to be localized effects near areas of development and are not likely to result in widespread impacts on EFH.

Expansion of State groundfish fisheries would impact EFH in State waters. The effects of those impacts combined with the impacts of the proposed action and its alternatives would be offset by the probable reduction in fishing in federal waters. The reduction of fishing in federal waters to provide for State guideline harvest fisheries would occur through future harvest specification processes. Thus, the effects of the annual harvest specifications in combination with the expansion of State groundfish fisheries would provide for similar effects to status quo.

The State implemented the EFH/HAPC measures, protecting Aleutian Islands Coral Habitat Protection Areas and other areas where EFH conservation and protection measures overlap with State waters. The Council and NMFS recommend that the Alaska Board of Fisheries (BOF) adopt parallel measures for Steller sea lion and EFH/HAPC protection measures. The BOF may adopt counterpart regulations for

State-permitted fisheries. State management of fisheries, in the same manner as the federal management of federally permitted vessels, would ensure protection of the marine environment from the effects of fishing in State waters. This would ensure protection measures are consistently applied to all vessels fishing inside State waters. In January 2010, the BOF will consider applying the same 3-nm groundfish closure around Kanaga Island/Ship Rock as described under Alternatives 2, 3, and 4 in this analysis. Fishing activity in the vicinity of Kanaga Island has been primarily Pacific cod nonpelagic trawl fishing (Figure 5-5). Very little fishing has occurred inside 3 nm of the rookery. If future fishing activity were similar to historical fishing activities in this area, even if the BOF did not adopt the 3-nm groundfish closure, the impact to habitat in this location is not likely to be different from status quo as there would be little overall change in fishing intensity inside or outside of the 3-nm closure.

Private actions

Other factors that may impact marine benthic habitat include ongoing non-fishing commercial, recreational, and military vessel traffic in Alaskan waters, and population growth that may impact the coastal zone. Appendix G of the EFH EIS identifies 24 categories of upland, riverine, estuarine, and coastal/marine activities that may have adverse effects on EFH (NMFS 2005). Little is known about the impacts of the listed activities on EFH in the Gulf of Alaska (GOA) and 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 EFH is expected to be modest.

Shipping routes from Pacific Northwest ports to Asia run across the GOA and through the BSAI, and pass near or through important fishing areas. The key transportation route from West Coast ports in Washington, Oregon, and British Columbia to East Asia (and back) passes from the GOA into the Eastern Bering Sea at Unimak Pass, and then returns to the Pacific Ocean in the area of Buldir Island. An estimate is that 3,100 large vessels used this route in the year ending September 30, 2006. An estimated 853 of these were bulk carriers, and an estimated 916 were container ships. (Nuka Research 2006:12). The direct routes from California ports to East Asia pass just south of the Aleutian Islands. Continued globalization, growth of the Chinese economy, and associated growth in other parts of the Far East may lead to increasing volumes of commercial cargo vessel traffic through Alaska waters. U.S. agricultural exports to China, for example, doubled between 2002 and 2004; 41 percent of the increase, by value, was soybeans and 13 percent was wheat (USDA 2005). In future years, this may be an important route for Canadian oil exports to China (Zweig and Jianhai 2005).

The significance of this traffic for the regional environment and for fisheries is highlighted by recent shipping accidents, including the December 2004 grounding of the M/V *Selendang Ayu* and the July 2006 incapacitation of the M/V *Cougar Ace*. The M/V *Selendang Ayu* dumped the vessel's cargo of soybeans and as much as 320,000 gallons of bunker oil, on the shores of Unalaska Island.[1] On July 23, the M/V *Cougar Ace*, a 654-foot car carrier homeported in Singapore, contacted the U.S. Coast Guard and reported that their vessel was listing at 80 degrees and taking on water. The M/V *Cougar Ace* was towed to Dutch Harbor where the listing problem was corrected. The vessel was then towed to Portland, Oregon.[2]

The impact of shipping on habitat primarily results from accidents and other activities that may release pollutants that could impact habitat. The M/V *Selendang Ayu* released soybeans and bunker fuel that impacted habitat in the area of the accident by smothering areas where the soybeans were released and coating areas in bunker fuel. These releases result in adverse effects on habitat in these locations. The

[1] USCG, M/V *Selendang Ayu* grounding Unified Command press release, April 23, 2005.

[2] Alaska Department of Conservation final situation report, September 1, 2006, available at: http://www.dec.state.ak.us/spar/perp/response/sum_fy07/060728201/sitreps/060728201_sr_10.pdf.

discrete locations for shipping accidents and releases are less likely to have significant impacts on habitat overall.

7.7 Summary of Effects

As previously stated, the EFH EIS (NMFS 2005) found no substantial adverse effects to habitat in the Aleutian Islands due to fishing activities; Alternatives 2, 3, and 4 would remove a substantial portion of any localized effects that were occurring under the status quo (Alternative 1). The potential effects on an area would be constrained by the amount of total allowable catch available (particularly for Atka mackerel) and by the existing habitat conservation and protection measures. It is possible that impacts may increase slightly in other areas due to displaced fishing effort, but in context of the entire Aleutian Islands and Bering Sea, the effects of either Alternatives 2, 3, or 4 on habitat are beneficial in the Aleutian Islands subarea, but not substantially so. Alternative 4 would result in more potential for bottom habitat impacts in Areas 541 and 542 as more fishing would be allowed under this alternative compared to Alternatives 2 and 3, but this fishing would be conducted within the annual harvest specifications and under the current habitat conservation and protection measures. Overall, the cumulative effects on habitat are likely to be beneficial as fisheries management would be further improved and cumulative adverse effects from shipping activities are likely to be localized. The combination of the direct, indirect, and cumulative effects on habitat complexity for both living and non-living substrates, benthic biodiversity, and habitat suitability is not likely to be significant for all habitat types evaluated under the alternatives.

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8.0 Aleutian Islands Ecosystem

The Aleutian Islands is a complex ecosystem. The Council created the Aleutian Islands Fishery Ecosystem Plan (AI FEP; NPFMC 2007) as an educational tool and resource that provides the Council with an "early warning system" and an ecosystem context to fishery management decisions affecting the Aleutian Islands area. The scope of the AI FEP encompasses all Federal fisheries within the area, and considers the interactions of Federal and State fisheries with each other, and with other components of the ecosystem, including relationships among fisheries, prey and predators of target and non-target species, their habitat, the impacts of climate, and the cumulative impact on ecosystems from all fisheries and non-fishing impacts.

The AI FEP provides an understanding of important relationships among ecosystem components, thereby assisting the Council to better integrate ecosystem principles into fishery management. The AI FEP also identifies areas of uncertainty, describes how the Council may currently be addressing the associated risks, and provides suggestions for other tools the Council may wish to consider.

8.1 Description of the Ecosystem

This EA incorporates by reference the information on the Aleutian Islands ecosystem provided in the AI FEP (NPFMC 2007). AI EFP chapter 3 describes the ecosystem, beginning with a historical overview, and addresses the ecosystem's current physical, biological, socioeconomic, and management relationships. AI FEP chapter 4 develops a framework of the key interactions that characterize the AI ecosystem, assesses risks, discusses the implications of the risk assessment, and identifies indicators for monitoring each interaction and future research needs.

This EA also incorporates by reference the information on the environmental baseline from the FMP biop (NMFS 2010). The FMP biop environmental baseline contains an analysis of the effects of past and ongoing human-caused and natural factors leading to the current status of Steller sea lions, their habitat, and the ecosystem within the action area.

The following indicators are summarized from the Ecosystem Considerations Report from 2009 (NPFMC 2009) and the upcoming draft Ecosystem Considerations Report for 2010. Indicators are interpreted for the AI ecosystem using the assessment framework set up in the AI FEP (NPFMC 2007), in particular the Climate, Fisheries, and Predator-Prey interactions.

8.1.1 Climate Indicators 2010 Overall Summary

The North Pacific experienced mostly cooler than normal upper ocean temperatures in its eastern and northern portions from fall 2009 through summer 2010 (Figure 8-1). These conditions can be attributed to the pre-existing state of the North Pacific and the basin-scale climate forcing during the past year. An El Niño occurred during the winter of 2009–10, and while the associated atmospheric circulation anomalies resembled those with past events, its effects do not appear to have persisted beyond spring 2010. La Niña began developing in the spring/summer of 2010 and is forecast to strengthen over the remainder of 2010. This should lead to a relatively weak Aleutian low, and a moderating effect on the Pacific Decadal Oscillation (PDO) for the North Pacific atmosphere-ocean climate system into spring 2011.

Alaska Peninsula and Aleutian Islands 2010 Climate highlights — The winds in this region impact the upwelling along the arc of the Alaska Peninsula and Aleutian Islands, and the flow of Pacific water through Unimak Pass into the Bering Sea (Stabeno et al. 2002). The winter of 2009–10 featured strong easterly wind anomalies, which probably promoted northward transport through Unimak Pass and enhanced the Aleutian North Slope Current. The predominance of the wind anomalies switched to anomalous westerly during the spring and summer of 2010 for the Alaska Peninsula and eastern Aleutian Islands. This would tend to produce suppressed upwelling on their north sides and enhanced upwelling to their south.

NPI (Indexes strength of Aleutian Low): The NPI underwent a tremendous swing from about 3 positive standard deviations during the winter of 2008–09 to about 2 negative standard deviations during the winter of 2009–10 (Figure 8-1). The magnitude of this transition has only been exceeded twice since 1968, with one of those instances being associated with the intense El Niño of 1982–83. The La Niña that is developing at the time of the writing of this overview suggests another sizable swing to a positive state for the NPI, as the trend in the index itself is demonstrating.

Eddies in the AI: Eddies in the Alaskan Stream south of the Aleutian Islands have been shown to influence flow into the Bering Sea through the Aleutian Passes (Okkonen 1996). By influencing flow through the passes, eddies could impact flow in the Aleutian North Slope Current and Bering Slope Current as well as influencing the transports of heat, salt, and nutrients (Mordy et al. 2005; Stabeno et al. 2005) into the Bering Sea. Particularly strong eddies were observed south of Amukta Pass in 1997/1998, 1999, 2004, 2006/2007, and 2009/2010. Eddy energy in the region appeared to be returning to low levels in the spring of 2010. These trends indicate that higher than average volume, heat, salt, and nutrient fluxes to the Bering Sea through Amukta Pass may have occurred in 1997/1998, 1999, 2004, 2006/2007, and 2009/2010 while these fluxes were reduced in the spring of 2010.

8.1.2 Climate and Physical Environment Indicators

Temperature: Temperature variations in this system are mediated by large-scale atmospheric patterns and ocean currents. Thus the cooler conditions observed this past year are likely to have ecosystem impacts in the entire Aleutian Island ecosystem.

Ecological impact: High. Temperature regulates all biological rates (e.g., growth, feeding) and has direct proven impacts on primary productivity and, thus, the forage base. A re-organization of species composition and dominance due to temperature effects has been thoroughly documented (e.g. in relation to the 1976/77 regime shift, recent changes in Calanus species composition), favoring some species and not others. Given this strong direct (exotherms and their habitat) or indirect (shift in distribution and abundance of prey base) dependency on water temperature, the impact of changes in water temperature on ecosystem processes and function is high. Species residing in shallow inshore areas, seabird and marine mammal populations, deepwater corals, and any animals unable to move to stay within a temperature range, are particularly likely to be affected.

Transport and upwelling: Water movement through Aleutian passes can affect the transport of biota (eggs, larvae, plankton), heat, and nutrients through the AI system. Changes in transport of larvae toward or away from favorable nursery habitat, for example, could influence recruitment (there is evidence for this kind of interaction in the Bering Sea (Stockhausen and Herman 2007) but no specific information exists for the AI). Thus the increased transport likely, the strong eddies observed during this past winter, and the altered spatial patterns of upwelling likely during the spring may have contributed to changes in productivity for multiple species in the food web. While low trophic level processes are unmonitored in the AI ecosystem, there may be observations from the 2010 bottom trawl survey that could be compared to past surveys to examine effects of these physical changes.

Ecological impact: Medium. If there were a change in nutrient transport, the impact could be substantial. There could be substantial change of primary production and pelagic habitat if current directions or magnitudes change. Change in the net transport from the Pacific Ocean into the Bering Sea could change the locations and intensity of blooms, the survival of larvae, the input of nutrients to the Bering Slope Current, and possibly the winter sea ice extent in the Bering Sea.

Changing weather patterns: Changes in the Aleutian Low could result in changing the location of the dominant storm track (Rodionov 2005) and/or in changes in stratification. Changes in the strength of the Aleutian Low are related to the position of mature cyclones with more cyclones occurring west of 180° during strong Aleutian Low years (Zhu et al. 2007). Thus, the extreme changes observed in the NPI index over the recent seasons suggest highly variable weather patterns in the AI ecosystem over relatively short timescales.

Ecological impact: Medium. The AI ecosystem is likely resilient to high variability in weather patterns, although this recent pattern is more extreme than usual. However, stratification in the passes is determined by tidal processes, not storms. Away from the passes, variations in storminess could affect stratification and thus production at low trophic levels. Local shifts in abundance and species composition could occur as a response to changing weather patterns. Impacts to the human component include the ability of the fisheries to operate safely and efficiently in response to changing weather patterns. Increased storminess could also affect productivity at lower trophic levels.

Ocean acidification (no time series for the AI) is documented to be occurring globally, and is likely to continue and increase given current trends in anthropogenic carbon emissions and projected release of deep water methane. It is projected that some subpolar surface waters will become undersaturated within the next 100 years (Orr et al. 2005). Shoaling of the calcite saturation horizon, where deep waters are undersaturated with calcium, and thus more acidic, while shallow waters are supersaturated, implies that deep-water species, including corals, may be influenced sooner.

Ecological Impact: High. The AI is an oceanic food web in which oceanic/planktonic energy is very important. Consequences of small changes in pH can be severe for calcifying organisms, such as shelled pteropods, corals, foraminifera, and coccolithophors. We cannot predict which species will become extinct and which will adapt, but the impacts to the food web could be severe if many species of plankton (or a few key species) are affected. The dissolution of corals in the Aleutians would have habitat implications for many species, and shelled pteropods contribute to the diets of many fish, including salmon, herring, cod, and pollock. Effects could include significant declines in primary production and carrying capacity of the AI ecosystem.

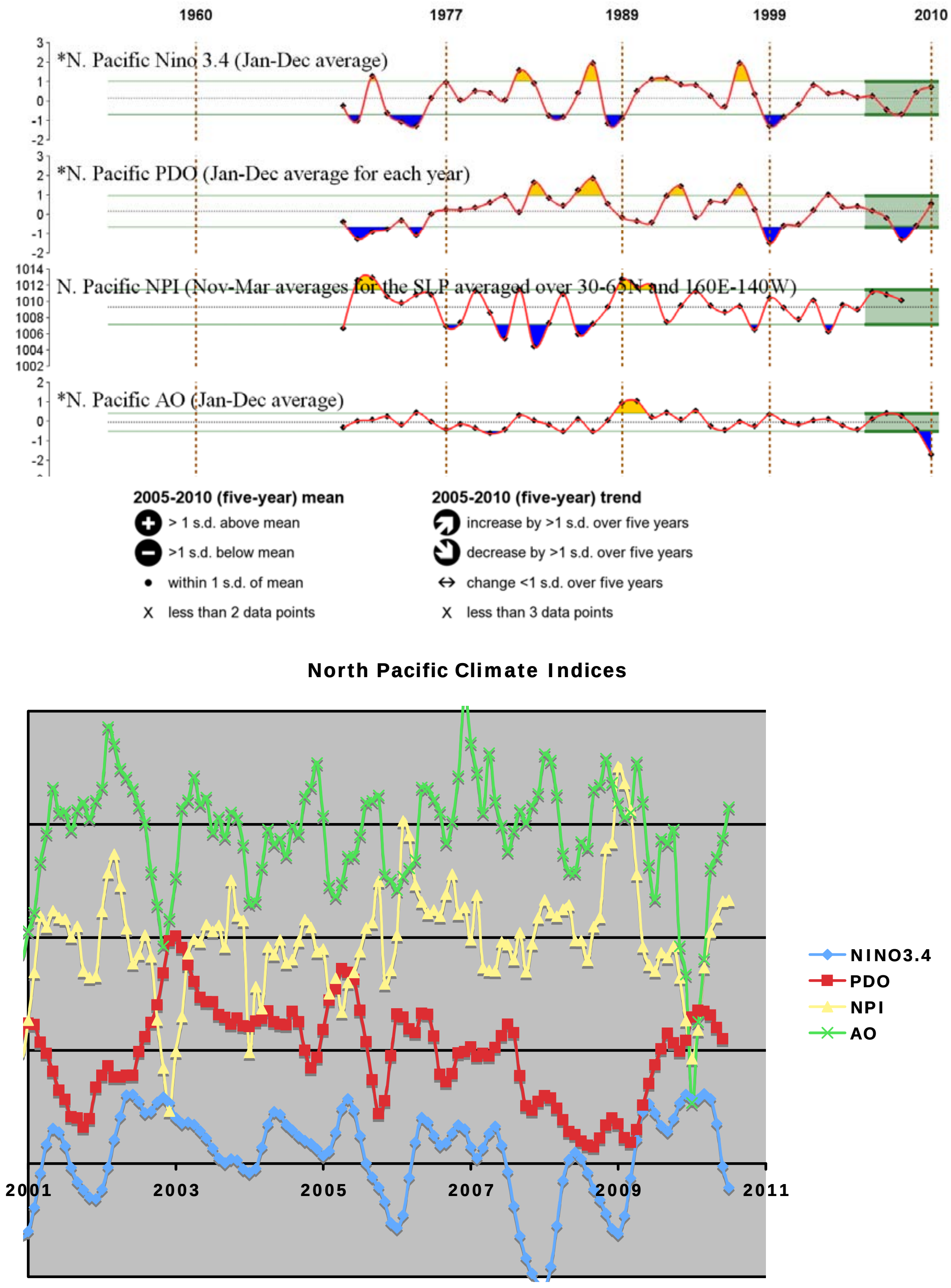

Figure 8-1 **Climate indicators and ecosystem trends.** (from 2010 Ecosystem Considerations SAFE, in prep)

8.1.3 Summary of Fishing Indices

For fishing and fisheries trends in the Aleutian Islands, see the AI FEP 2009 Ecosystem considerations contributions by Terry Hiatt, John Olson, and Jennifer Boldt (NPFMC 2009), and 2010 contribution by Sarah Gaichas.

Total catch, the Trophic Level of the Catch, and the FIB (Fisheries in Balance) indices for the AI have been stable and close to their long-term means since 1999 (Figure **8-2**). **Fishing effort** by gear type has likewise been stable in recent years, although there was a small increase in bottom trawl fishing effort in 2007. **Discards** show a steady decreasing trend, due to BSAI regulations for improved retention and utilization. **Nontarget (HAPC species) catch** is low overall in the AI and has also shown a decreasing trend in recent years from a peak in 2006.

Interpretation of indices from the AI FEP

Total catch: Fishing removals from the ecosystem occur and total removals are considered to be well managed under the current system in an effort to ensure ecosystem productivity. For groundfish removals, however, the Council/NMFS limits total removals from the BSAI as a whole and not specifically from the AI subarea. Although many species have AI-specific TACs, not all do, so there is a potential that total removals from the AI ecosystem may fluctuate. Crab TACs are AI-specific and not subject to impact from harvest occurring outside the AI subarea.

Ecological impact: The interactions of marine food webs are not fully understood, so if total removals in the Aleutian Islands ecosystem increased substantially there could potentially be increased uncertainty about impacts. Also, impacts could potentially be high if total fishery removals occurred in localized areas. There is much greater uncertainty associated with the levels of removals of many non-target species (some of which are not subject to any monitoring) relative to target species, contributing uncertainty to the level of total removals.

Fishing effort by gear: One process by which fisheries may interact is through the mechanical effects of fishing gear on habitat, or the disturbance and/or destruction of essential fish habitat. Of particular concern are fisheries that disturb spawning habitat, nursery or rearing areas, or juvenile habitat of other fished species, although the effects of this disturbance on those species may be uncertain or undocumented. Bottom trawl, longline, and pot fisheries have the potential to detrimentally affect habitat.

- The bottom trawl fishery is now constrained to historic fishing areas in the Aleutian Islands with the implementation of the Aleutian Islands Habitat Conservation Area in 2006. Approximately 60 percent of the fishable depths (less than 1000m) are closed to bottom trawling or some bottom-tending gears. Known sensitive areas such as deep coral gardens have been closed to all bottom-contact fishing gear.
- Longline & bottom trawl effort has been generally steady or declining since the early 1990s. The number of vessels participating in fisheries has declined since 1994.

Ecological impact: The bathymetric features of the Aleutian Islands limits the amount of area that can be impacted by mobile fishing gear such as bottom trawling at the current level of technology. The footprint of the trawl fishery has not expanded since 2006. The majority of bottom trawl tows occur between 50-150m, and the highest coral densities are distributed between 200-300m (Stone 2006), so while bottom trawl gear is presumed to have the greatest effect on living substrate, trawling intensity is not highest where coral densities are greatest. Golden king crab fishing (longline pots) and sablefish/turbot fishing (hook and line/pot) also have the potential to continue disturbing sensitive coral & sponge habitat, but the footprint of these fisheries is relatively small.

Bycatch and Discards: Management measures are in place to limit fishery bycatch impacts (prohibited species catch limits, required gear modifications, MRAs). Still, incidental species continue to be caught and often discarded in target fisheries.

- Catch and discards of non-target species (forage, HAPC biota, and non-specified groups) have been roughly stable or declined in the AI since the late 1990s, with the lowest values recorded in 2005. Non-target catch is primarily comprised of non-specified groups, mainly jellyfish, sea stars, grenadiers, and other fish.

Ecological impact: The ecological effect of fisheries on "other biota" is largely unknown.

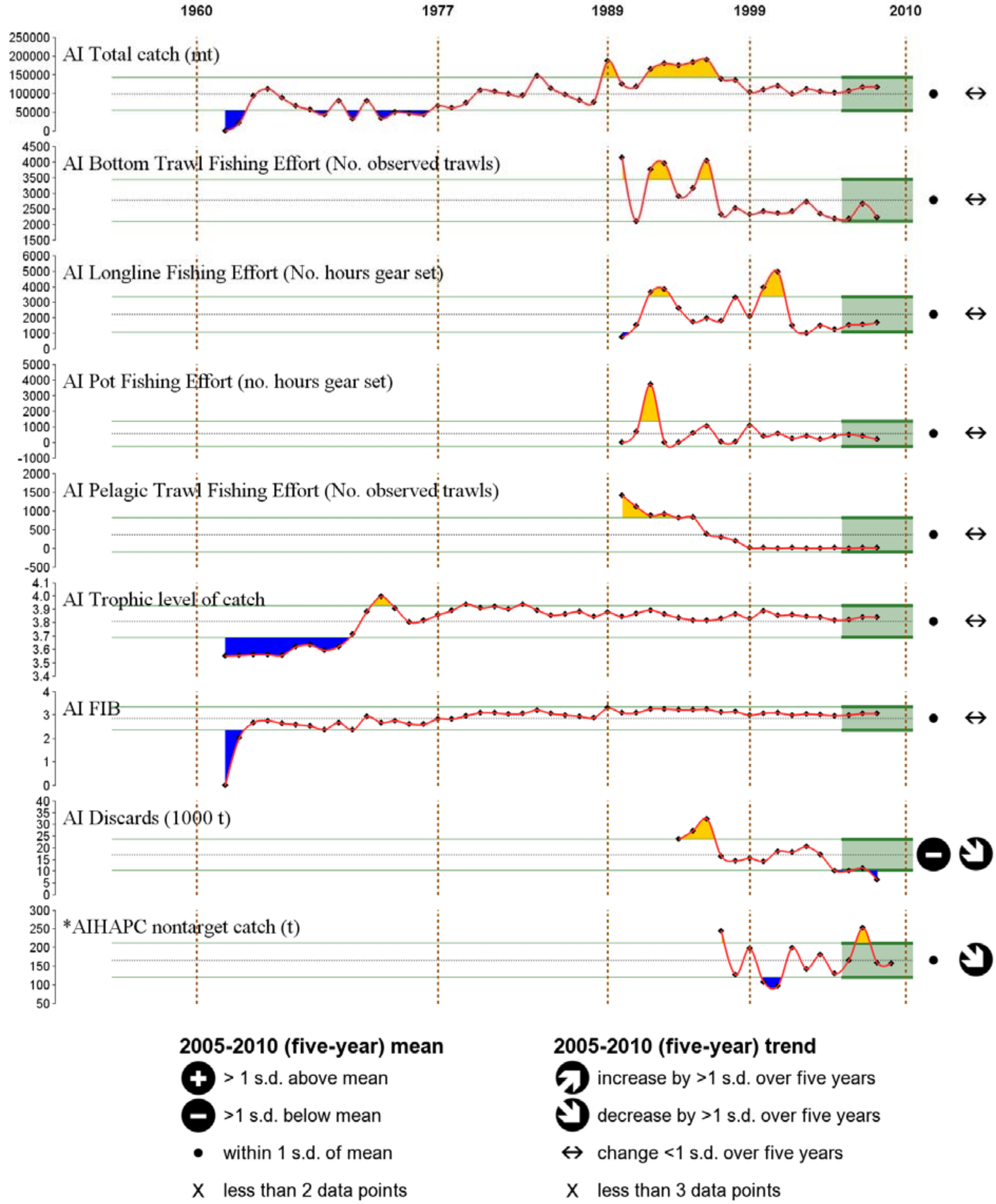

Figure 8-2 Fishing and fisheries – Aleutian Islands. (from 2010 Ecosystem Considerations SAFE, in prep)

8.1.4 AI Predator Prey and other Food Web Analyses

Predator prey and target fishery interactions in the AI: The AI FEP used a food web model to assess which fished species are both substantial diet components and cause substantial mortality for other Aleutian Islands biota. The results of the analysis identified key predator prey interactions:

- Pollock and Atka mackerel were both estimated to cause high mortality on each other despite being a small proportion of each other's diet. The high mortality is a result of the relatively large biomass of each species estimated to be in the ecosystem, combined with their consumption rates. Therefore, small changes in the biomass of either could result in large changes in the amount of mortality caused by predation (assuming the diet and consumption rates remain the same).
- A different impact is the combined effect of Pacific cod and halibut predation on sablefish. Sablefish are less than 1 percent of each of these species diets in the AI, but halibut are estimated to cause 17 percent and cod 18 percent of sablefish mortality; their combined effect is equivalent to the longline fishery (31 percent of total mortality in this analysis). Changes in the combined cod and halibut biomass might impact sablefish populations, and increased sablefish fishing mortality might have stronger population effects than estimated due to this predation mortality. However, a change in sablefish biomass may not affect cod or halibut as sablefish is a small portion of the overall diet.
- The interaction between Pacific cod and Atka mackerel is discussed in the annual Atka mackerel stock assessment. No adjustments are made to either the Pacific cod or Atka mackerel TACs in consideration of this interaction. Model simulations do not suggest that this interaction has a high impact relative to those identified above.

Ecological impact: The range in potential impacts across all predator prey and fishery interactions led us to rate this impact “medium” to reflect the averaging of potentially low to potentially high impacts. Changes in the level of fishing will have the highest impact where predation interactions are strongest. The strongest interactions identified by both analyses include the pollock and Atka mackerel interaction, the Atka mackerel and Steller sea lion interaction, and the halibut and Pacific cod combined impact on sablefish. The interaction of king crabs and Pacific ocean perch with other key species is low. Strong interactions among non key species mainly included effects of reduced nontarget prey species on commercial rockfish species; these interactions are also discussed below.

Ecosystem productivity in the AI: The overall amount of energy at low trophic levels in any ecosystem ultimately limits the productivity and biomass of higher trophic level predators, as well as fisheries catch. Changes in energy flow originating at low trophic levels are termed “bottom up” effects when viewed from the predator and fishery standpoint. We generally associate bottom up effects with changes in the physical environment, so this interaction is strongly linked to the climate and physical interactions discussed above. The AI FEP assessed the risks of bottom up effects by examining potential competition for prey resources shared by predators and fisheries in the current Aleutian Islands food web, and by simulating reductions in productivity for low trophic level groups in the food web. The results of model simulations indicated that:

- Sustained changes in bottom up production on the order of 10 percent are guaranteed to change biomass trajectories for multiple fished species and apex predators, but both the probability of the bottom up changes themselves occurring and the specific impacts are extremely difficult to predict. This assessment identifies species with greater than 10 percent of prey overlap in their diet, as well as exhibiting a dependence on that prey (i.e., it represents greater than 10 percent of their diet), as probable competitors, However, competition implies that the prey resource is limited, and prey overlap may just be a reflection of the high prevalence of the prey. Several fishery species, and many other species clearly share a prey base.

- The three strongest single prey bottom up interactions for commercial species is the importance of (1) Pandalid shrimp to rougheye rockfish, (2) benthic amphipods to dusky rockfish, and (3) non-Pandalid shrimps to shortraker rockfish. These interactions all occur through benthic energy pathways.
- However, the highest aggregate negative ecological impact would result from decreased productivity in the pelagic energy pathway of the AI food web, which potentially affects the prey for most key species. Specifically, these are the euphausiid prey base (shared by all forage fish, myctophids, baleen whales, squids, sablefish, Atka mackerel, seabirds, pollock, rockfish and POP); the copepod prey base (shared by the above species and euphausiids, and particularly important to POP and right whales); the squid prey base (shared by toothed whales, grenadiers, seabirds, halibut, and Atka mackerel); and the myctophid prey base (shared by flatfish, grenadiers, and pollock). King crab and sea otters are the exception, as they compete for benthic invertebrates with other fish, crabs and shrimp.
- Commercially important and protected species share the pollock and Atka mackerel prey base, which rely on the pelagic energy pathway. Pollock are the shared major prey of the Federal trawl fishery (in the early 1990s), as well as skates, pinnipeds, and Steller sea lions. Atka mackerel are shared major prey of Steller sea lions, skates, the fishery, halibut and Pacific cod.

Ecological impact: The degree of bottom up change and whether it is sustained over time determines the degree of ecological impact. The uncertainty in whether a sustained production change will occur combined with the complexity of potential impacts depending on which pathway a change affects led us to rate this impact “medium-high” to reflect the combination of fairly clear model impacts with the uncertainty and the averaging of potentially low to potentially high impacts. It is important to note that the potential competition between grenadiers and pollock for myctophid prey is not observed in any other Alaskan ecosystem, and the classification of sablefish with other zooplankton feeders is also unique to the AI. If competition for a prey base and/or overall ecosystem productivity is of concern, the importance of euphausiids and copepods as prey for a wide range of commercial and protected species in the AI suggests that production of these important zooplankton groups might be monitored, especially under future climate change. Direct exploitation of euphausiids has been prohibited since 1998.

Top predators and fisheries in the AI: High trophic level predators, including fisheries, affect ecosystem structure (species composition and food web topology) in space and time through both competitive interactions with each other and through their combined impacts on prey at mid and lower trophic levels. Basic ecosystem functions include nutrient cycling and energy transformation, which are linked processes affected by both bottom up changes in energy flow (described above) and the type of top down forcing applied by apex predators and fisheries. The AI FEP used a regional Aleutian Islands food web model to provide both mortality estimates and simulation analyses for unexploited apex predators in the ecosystem. Unexploited apex predators in the Aleutian Islands include seabirds, marine mammals, sharks, and skates. The results of model simulations indicated that:

- Fisheries currently directly impact sharks, skates, and birds through bycatch mortality, although the interaction with sharks and skates is much stronger than with birds. There is a negligible direct fishing mortality impact on marine mammals at present in the Aleutian Islands.
- Between apex predators, marine mammal predation is estimated to have a moderate impact on baleen whales, pinnipeds, sea otters, toothed whales, Steller sea lions, sharks, and skates. Seabirds (fulmars) have a moderate predation impact on other seabird groups. Sharks and skates appear to have few direct interactions with other apex predators. These direct interactions do change predation rates and therefore energy flow at lower trophic levels.
- Fisheries cause more mortality for non-target sharks (79 percent) and skates (56 percent) than for any target species aside from king crabs. These species are not intended to be exploited, but

effective exploitation rates as bycatch are high. While this may have large population consequences for sharks and skates, it is unclear whether this bycatch mortality has an ecosystem-level effect. Model simulations increasing mortality rates by 10 percent for sharks and skates showed limited positive effects to primary prey groups of less than 2 percent, and always less than 10 percent in even extreme cases. However, these results already incorporate the high fishing mortality rates implied for sharks and skates; at unfished biomass levels these predators might have larger ecosystem effects.

- Fisheries were estimated to cause 3 percent to 6 percent of bird group mortality in the early 1990s, again potentially with some consequences to bird populations but unclear ecosystem consequences; a simulated 10 percent increase in bird mortality had no effects beyond those to bird populations themselves using the regional AI food web model.
- Fisheries cause negligible direct mortality on marine mammals (other than subsistence on pinnipeds).
- Toothed whales are estimated to cause predation mortality (10 percent to 24 percent) on baleen whales, pinnipeds, sea otters, and lower estimated amounts (4 percent to 8 percent) on other toothed whales, sharks, skates, and Steller sea lions. While some theorize that toothed whale (transient killer whale) predation might account for declines in pinniped and sea otter populations (and thus changes in community composition of apex predators), it is unclear what their diet preferences and population size are to make credible quantitative estimates of their impacts to other mammal populations. To clarify this, directed research on transient killer whale population size, movements, and food habits should be continued, and this apex predator population should be monitored to the extent possible.
- Piscivorous birds cause some mortality on themselves (25 percent) and planktivorous birds (13 percent), which is the majority of explained bird mortality in the models, but a minority of total mortality (most is unexplained). This predation may have seabird population impacts, but has unclear ecosystem impacts.

Ecological impact: While bottom up impacts and key predator prey interactions have clear ecosystem wide impacts in food web simulation analyses, top down impacts due to unexploited apex predator interactions with fisheries appear to have few ecosystem wide effects. However, this result is based on the current ecosystem modeled with existing fishing effects already in place, which may contribute to this result. Therefore, to reflect current model results and the range of impacts, as well as our uncertainty, we rated this impact “medium-low” risk for Aleutian Islands ecosystem structure and function. This rating does not include the potentially large impacts fisheries may have on individual apex predators through direct mortality and competition effects (separate issues discussed under Interactions E, F, and L in the AI FEP).

8.2 Effects on Ecosystem Relationships

The previous chapters analyze the impacts of the four alternatives on each ecosystem component. The proposed action could affect the marine ecosystem in the Aleutian Islands through changes in spatial removals of fish biomass or alteration of habitat. An analysis of changes in spatial removals of fish biomass under the alternatives is provided in chapter 3 Target Species and chapter 4 Nontarget Species. These chapters concluded that the impacts of the alternatives on the stocks, species, or species groups evaluated are predicted to be insignificant. An analysis of the extent of change in habitat alternation under the alternatives is provided in chapter 7 Habitat. That chapter concluded that “[t]he combination of the direct, indirect, and cumulative effects on habitat complexity for both living and non-living substrates, benthic biodiversity, and habitat suitability is not likely to be significant for all habitat types evaluated under the alternatives.”

Additionally, the proposed action could affect the marine ecosystem through changes in interactions with marine mammals and seabirds. Chapter 5 Marine Mammals analyzes the impacts of the alternatives on marine mammals, including Steller sea lions, and concluded that "[e]xcept for Alternative 1 effects on prey availability for Steller sea lions, all of the potential effects on marine mammals from the alternatives are insignificant." Chapter 6 Seabirds analyzes the impacts of the alternatives on seabirds and concluded that, "[a]lthough the action alternatives may affect seabirds, NMFS has determined that all effects (both positive and negative) would be insignificant."

The AI FEP identifies the categories of AI ecosystem indicators: the Climate, Fisheries, and Predator-prey interactions. A risk assessment of alternatives, as described in the AI FEP, is beyond the scope of what can be accomplish with the current information. However, to understand whether the alternatives are likely to have a significant impact on the Aleutian Islands ecosystem, it is important to identify whether the alternatives have the potential to change the identified ecological impacts to the ecosystem indicators. Thus, the significance criteria for impacts on the AI ecosystem are measurable changes to the ecological impacts identified for each indicator.

Due to the nature of the action, the Atka mackerel and Pacific cod fisheries, as modified by the proposed action, are not predicted to have additional ecological impacts beyond those identified in the AI FEP or to change the identified ecological impact on the indicators. Based on the analysis presented in the AI FEP and summarized above, NMFS concludes that the Atka mackerel and Pacific cod fisheries, as prosecuted under Alternative 1, would have similar ecosystem impacts. Alternatives 2, 3, and 4, to the extent that they reduce fishing effort and redistribute remaining effort further from shore, would reduce the Pacific cod and Atka mackerel fishery's impacts from status quo, but not to the extent that it would change the identified ecological impact. Therefore, the impacts of the alternatives on the Aleutian Island ecosystem are insignificant.

A discussion of the cumulative effects of the groundfish fisheries is in the Alaska Groundfish Harvest Specifications EIS (NMFS 2007). The past and current cumulative effects are discussed in the Alaska PSEIS (NMFS 2004). Both of these discussions are incorporated by reference. The reasonably foreseeable future actions that may have a continuing, additive, and meaningful relationship to the direct and indirect effects of the alternatives on each ecosystem component are analyzed in the chapter for that component. No additional reasonably foreseeable future actions were identified that may have a continuing, additive, and meaningful relationship to the direct and indirect effects of the alternatives on the Aleutian Islands ecosystem.

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9.0 ENVIRONMENTAL CONCLUSIONS

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 the EA/RIR for this action. The results of that analysis are summarized here for those criteria. Alternative 4 is the proposed action and is the reasonable and prudent alternative (RPA) in the biological opinion on the authorization of the Alaska groundfish fisheries.

Context: For this action, the setting is the Bering Sea and Aleutian Islands Management Area (BSAI). The revisions to the protection measures primarily affect the Atka mackerel and Pacific cod fisheries conducted in the Aleutian Islands subarea. Any effects of this action are limited to the BSAI and the majority of the impacts are in the Aleutian Islands subarea. The effects of this action on society within the BSAI 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?* No. The proposed action would reduce the harvest of Pacific cod and Atka mackerel in the Aleutian Islands, reducing the mortality of these target species. The reduction in mortality by the fisheries would not jeopardize the sustainability of the Atka mackerel and Pacific cod stocks. The EA prepared for this action found no additional impacts on targeted species not previously considered in the Alaska Groundfish Harvest Specifications EIS. (EA Chapter 3)

(2) Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species? No. The impacts of reducing mortality of the Aleutian Islands Atka mackerel and Pacific cod target species would also reduce the mortality of non-target species that would be caught in these Aleutian Islands fisheries. Even though fishing effort may shift in time or location in a manner that may increase the harvest of prohibited species (e.g., halibut), the current Prohibited Species Catch management measures ensure this change in harvest is not likely to jeopardize the sustainability of any non-target species. (EA Chapter 4)

(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 FMPs?* No. Fishing effort would be reduced in the Aleutian Islands and may increase in the Bering Sea to offset the lost harvest opportunity in the Aleutian Islands for Atka mackerel and Pacific cod. Habitat in the Aleutian Islands would experience less impact from fishing activities with nonpelagic trawl gear,

while fishing with this gear type may increase in other areas. Regardless, the habitat conservation measures in the Aleutian Islands and the Bering Sea subareas provide protection to habitat and these measures are not changed by this action. Because of the existing habitat conservation measures the action is not expected to cause substantial damage to coastal habitat or essential fish habitat in either the Aleutian Islands or in the Bering Sea subareas. (EA Chapter 7)

(4) Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety? No. This action has effects that may affect safety in different ways. A shift in the fleet's center of gravity to the east, brings it closer to USCG search and rescue resources and to potential "good Samaritan" assistance. If profits are reduced there may be reduced investments in safety, and a reduction in the distance between fishing vessels may encourage a derby fishery mentality. The action may cause vessels shifting out of the Aleutian Islands to spend more time in the high traffic Unimak Pass area. Given that some factors tend to increase safety, while others may decrease it, there is no reasonable expectation of a substantial adverse impact on public safety. (RIR Chapter 10)

(5) *Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, seabirds, or critical habitat of these species?* No. The proposed action is not expected to result in increased interactions with endangered or threatened species, marine mammals, seabirds, or their critical habitat beyond those identified in previous consultations under section 7 of the Endangered Species Act (ESA). This action would reduce the potential adverse effects of the Aleutian Islands groundfish fisheries on ESA-listed Steller sea lions by closing portions of the Aleutian Islands subarea. These portions include areas of Steller sea lion designated critical habitat that would be closed to Atka mackerel and Pacific cod fishing. By closing these areas, the action reduces potential competition for prey, incidental takes, and disturbance that may result from the Atka mackerel and Pacific cod fisheries. In addition, the action would close groundfish fishing within 3 nm of Kanaga Island/Ship Rock rookery, further protecting this Steller sea lion site from potential adverse effects of groundfish fishing. (EA Chapters 5 and 6)

(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.)?* No. Effects of fishing on the marine ecosystem in Alaska are analyzed in detail in the Alaska Groundfish Fisheries PSEIS. Additional impacts on marine ecosystems in Alaska are summarized annually in the Stock Assessment and Fishery Evaluation reports. This action is limited in scope to the Aleutian Islands subarea and is intended to improve the predator-prey relationship for Steller sea lions and groundfish. No substantial impacts on biodiversity and/or ecosystem function were identified in the EA for this action. (EA Chapter 8)

(7) Are significant social or economic impacts interrelated with natural or physical environmental effects? No. Even though this action will have a substantial economic impact on participants in the Atka mackerel and Pacific cod fisheries in the Aleutian Islands, this cost is not interrelated to natural or physical environmental effects of the action. The costs are not a result of the environmental effects of the action, but are a result of the necessity to remove potential environmental effects of the groundfish fisheries in the Aleutian Islands. (RIR Chapter 10)

(8) Are the effects on the quality of the human environment likely to be highly controversial? No. There is concern for the potential economic impacts on the Atka mackerel and Pacific cod fisheries that are prosecuted in the Aleutian Islands subarea and disagreement among stakeholders on what is necessary to comply with the ESA. For these reasons, the draft RPA presented in the July 2010 draft Biological Opinion (Biop) may be considered controversial. NMFS has determined through its biological opinion on the groundfish fisheries that the potential effects of the action are necessary to meet the requirements of the ESA to prevent the likelihood of the groundfish fisheries from causing jeopardy of extinction or

adverse modification or destruction of designated critical habitat. NMFS has considered all comments received on the proposed RPA in the July 2010 draft Biop and developed this action taking into consideration recommended changes to the fisheries and the agency's need to ensure that the groundfish fisheries are not likely to cause jeopardy of extinction or adverse modification or destruction of critical habitat for Steller sea lions. The changes to the RPA in the final Biop from the draft RPA based on public comment reduce the controversial nature of this action to less than highly controversial. (EA Section 1.5 and Section 2.1.4)

(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?* No. The proposed action does not change the existing habitat conservation measures that are in place for the Aleutian Islands subarea. The habitat conservation measures protect ecologically critical areas such as coral gardens from the potential affects of groundfish fishing activities. The proposed action would reduce fishing activities in portions of the Aleutian Islands, resulting in less potential impacts for these areas and would have no impacts on historic or cultural resources, park land, prime farmlands, wetlands, or wild and scenic rivers. No additional impacts on ecological critical areas are expected to result from the proposed action. (EA Chapters 1 and 7)

(10) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks? No. The fish species and harvest methods involved, limited harvest amounts, and area of activity where potential effects might occur are well known and do not involve unique or unknown aspects. It is well understood that restricting the Atka mackerel and Pacific cod fisheries in the Aleutian Islands subarea would result in less fishing mortality on these important prey species in areas where Steller sea lions are experiencing the most population decline. (EA Chapters 3–8)

(11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts? No. The restrictions on the Atka mackerel and Pacific cod fisheries reduce potential effects on the environment, particularly for Steller sea lions. No additional past, present, or reasonably foreseeable future actions with cumulative impacts have been identified that would accrue from this action. (EA Chapters 3–7)

(12) *Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?* No. The proposed action will have no effect on districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places, or cause loss or destruction of significant scientific, cultural or historic places. Because this action occurs within waters 0 nm to 200 nm off the coast of the BSAI, this consideration is not applicable to the proposed action. (EA Chapter 1)

(13) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species? No. The proposed action will not introduce or spread nonindigenous species into Alaska beyond amounts previously identified because it does not change fishing, processing, or shipping practices that may lead to the introduction of nonindigenous species. By reducing fishing activities in Area 543, there would be less likelihood of introducing nonindigenous species by the Atka mackerel and Pacific cod fishing activities in this area. (EA Chapter 2)

(14) *Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?* No. The proposed action would revise Steller sea lion protection measures in the Aleutian Islands subarea that would remain in effect until changed by future rulemaking. Implementation of these revisions does not prevent the consideration of scientific and commercial information and the development of new protection measures that may provide

additional economic relief to the Atka mackerel and Pacific cod fisheries while ensuring the groundfish fisheries are not likely to cause jeopardy of extinction or adverse modification or destruction of designated critical habitat for the western distinct population segment of Steller sea lions. Each decision about the appropriate Steller sea lion protection measures is a separate decision requiring analysis and an adequate rationale. Therefore, this action does not create a precedent that binds NMFS or the Council in future management of the groundfish fisheries in a manner that protects Steller sea lions and complies with the ESA. (EA Chapter 1)

(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. The proposed action poses no known violation of federal, state, or local laws and requirements for the protection of the environment. The action is necessary to ensure compliance with the Magnuson-Stevens Fishery Conservation and Management Act and with the ESA. (EA Chapter 1)

(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?* No significant past, present, or reasonably foreseeable future action with cumulative impacts have been identified that would accrue in combination with the direct and indirect impacts on target and nontarget species from the proposed action. This action provides additional protection to target (Atka mackerel and Pacific cod) and non-target species (Steller sea lion), reducing the potential for adverse cumulative effects on these species. (EA Chapter 3–7)

10.0 REGULATORY IMPACT REVIEW

10.1 Introduction[1]

In April 2006, the National Marine Fisheries Service (NMFS) Alaska Region's Sustainable Fisheries Division (SFD, action agency), requested reinitiation of Endangered Species Act (ESA) Section 7 consultation with the NMFS Alaska Region, Protected Resources Division (PRD, consulting agency), on the potential effects of Alaska groundfish fisheries on ESA-listed species and their designated critical habitat (NMFS 2006). Consultation was reinitiated in June 2006 because of new scientific information and because of changes to the fisheries since the last biological opinion on the groundfish fisheries was supplemented in 2003 (NMFS 2003).

After reviewing all ESA-listed species within NMFS's jurisdiction that may be affected by the Alaska groundfish fisheries and after consulting with PRD, SFD determined that the Alaska groundfish fisheries were likely to adversely affect Steller sea lions and their designated critical habitat, humpback whales, and sperm whales; therefore, formal consultation was required. PRD began review of the status information for the species and designated habitat, environmental baseline information, and the potential effects of the action on the species in preparation for developing a biological opinion.

In August 2010, PRD released a draft biological opinion (FMP biop) on the Alaska groundfish fisheries (NMFS 2010b). The FMP biop found that additional changes to the Pacific cod and Atka mackerel fisheries in the Aleutian Islands are necessary to avoid the likelihood of JAM for the western distinct population segment (WDPS) of Steller sea lions and their designated critical habitat. This finding is based on biological information about the WDPS of Steller sea lions and about the potential effects of the groundfish fisheries on the WDPS of Steller sea lions and their critical habitat. The effects of the Alaska groundfish fisheries that are likely to result in JAM are located in the Western and Central sub-regions of the Aleutian Islands. These subregions were described in the 2008 Steller sea lion recovery plan (NMFS 2008).

The RPA to mitigate the effects of the groundfish fisheries on the WDPS of Steller sea lions is specific to the Atka mackerel and Pacific cod fisheries in Areas 541, 542, and 543 of the Aleutian Islands. This RPA provides the baseline for consideration of changes that could be implemented to ensure the WDPS of Steller sea lions are not likely to experience JAM because of the groundfish fisheries.

This regulatory impact review (RIR) provides a cost-benefit analysis of proposed changes to groundfish management required by the RPA.[2] The analysis in this document addresses the statutory requirements of Presidential Executive Order (E.O.) 12866.

10.1.1 What is a Regulatory Impact Review?

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

[1] This chapter provides an RIR addressing the requirements of E.O. 12866. If an action alternative is chosen by the Secretary, the action will be implemented by final rulemaking with a waiver of prior public review and comment and 30-day cooling off period. Thus an Initial Regulatory Flexibility Analysis is not required under the Regulatory Flexibility Act, and has not been prepared.

[2] Queirolo (2010) reviews the concept and appropriate content of an RIR.

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

E.O. 12866 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.

10.1.2 Statutory Authority

NMFS manages the U.S. groundfish fisheries of the Bering Sea and Aleutian Islands Management Area (BSAI) in the exclusive economic zone off Alaska under the Fishery Management Plan (FMP) for Groundfish of the BSAI (NPFMC 2009a). The North Pacific Fishery Management Council (Council) prepared, and the Secretary of Commerce (Secretary) approved, this FMP under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801, *et seq*.).

10.1.3 Purpose and Need

The purpose of this action is to manage Aleutian Islands Atka mackerel and Pacific cod fisheries so as to insure these fisheries are not likely to cause JAM for the WDPS of Steller sea lions and their critical habitat, when considering existing fishery management programs. If more than one alternative accomplishes the primary purpose of this action, a secondary objective is to modify the fisheries in a way that minimizes the economic and social costs that will be imposed on the commercial fishing industry and associated coastal communities.

This action is needed for several reasons. First, NMFS has a statutory responsibility to insure that fishing activities authorized under the groundfish FMPs and implementing regulations are not likely to jeopardize the continued existence of any ESA-listed species, or adversely modify or destroy its critical habitat.

Second, in order for the Pacific cod and Atka mackerel fisheries to begin on January 1, 2011, NMFS must implement a suite of Steller sea lion protection measures—the RPA from the 2010 FMP biop, or a different alternative that meets the same requirement, to avoid the likelihood of JAM. The commencement of a new fishing year and implementation of new harvest specifications must be done in compliance with the ESA. Without any action by NMFS, the Aleutian Islands Pacific cod and Atka mackerel fisheries prosecuted under the current Steller sea lion protection measures are likely to result in JAM, as determined by the FMP biop (NMFS 2010d).

Finally, this action is needed to meet the Council's objective in its groundfish FMPs to maintain or adjust current protection measures as appropriate to avoid the likelihood of jeopardy of extinction or adverse modification to critical habitat for ESA-listed Steller sea lions (section 2.2.1 in NPFMC 2009a). New information about potential interaction between Steller sea lions and the groundfish fisheries, and new trend information, have been taken into account in the FMP biop, allowing for adaptive management of the groundfish fisheries.

This action is focused on the Aleutian Islands, based on the population trends of the animals in sub-regions that were identified in the Steller sea lion recovery plan (NMFS 2008). The recovery plan divides Alaska waters into sub-regions for purposes of determining recovery. Area 543 is the Western Aleutian Islands sub-region and Areas 541 and 542 are the Central Aleutian Islands sub-regions. The recovery plan concluded that to achieve recovery, no two adjacent subareas may have significantly declining population trends for non-pups (NMFS 2008).

Steller sea lions occurring in the Aleutian Islands have experienced negative population trends (NMFS 2010d). The negative population trends for non-pups in Areas 541, 542, and 543 would prevent the population from meeting the recovery criterion (NMFS 2008). The negative growth rates and counts in Areas 541, 542, and 543 indicate that the Steller sea lions in these areas are having difficulty maintaining or increasing their populations, and removal of potential fisheries effects is needed to insure fisheries are not likely to result in JAM.

The remaining statistical areas for the groundfish fisheries in the Bering Sea and Gulf of Alaska (GOA) have positive or stable annual growth rates and unchanged or positive counts for pups and non-pups. Therefore, additional Steller sea lion protection measures for the groundfish fisheries in the Bering Sea and GOA are not required in the RPA to insure that effects from the remaining groundfish fisheries are not likely to result in JAM for Steller sea lions and their designated critical habitat.

Because of the overlap of Atka mackerel management between the Aleutian Islands and Bering Sea subareas, a minor change to the seasonal harvest of Atka mackerel in the Bering Sea subarea is included in the RPA. The total allowable catch (TAC) for Atka mackerel in Area 541 is combined with the Bering Sea subarea so that this allocation is managed as a unit. Any adjustments to Atka mackerel fishery management in Area 541 potentially would need to be applied to the Bering Sea subarea. A concurrent change in the Bering Sea subarea would not be necessary to prevent JAM, but would be necessary to facilitate management.

In addition, under Alternative 4, the directed fishery for Atka mackerel in the Bering Sea subarea would be closed, to provide for continued harvest of Atka mackerel in a manner historically practiced. Atka mackerel is primarily harvested in the Bering Sea subarea inside of critical habitat up to the maximum retainable amount (MRA) allowed, while directed fishing for other groundfish species outside of critical habitat (Table 11 to 50 CFR part 679). Atka mackerel is found primarily inside Steller sea lion critical habitat in the Bering Sea subarea, while other groundfish species used as a basis for retaining Atka mackerel up to the MRA occur primarily outside critical habitat. To prevent a new trip being triggered for Atka mackerel fishing and requiring a new basis species for fishing inside critical habitat, the Bering Sea subarea would be closed entirely to Atka mackerel directed fishing. This would allow the harvest of other groundfish species (e.g., yellowfin sole) outside of critical habitat to be used as the basis species for the harvest of Atka mackerel inside of critical habitat up to the MRA, as currently practiced.[3]

[3] See the longer discussion of this topic following Table 10-28.

10.1.4 Alternatives

Chapter 2 of this EA/RIR provides a detailed description of, and rationale for, the alternatives under consideration in this action. In summary, there are four alternatives:

Alternative 1 (Status Quo)

Under this alternative, no changes would be made to current groundfish fisheries management in the Aleutian Islands. Sub-section 2.2.1 provides a detailed description of the current management measures for Atka mackerel and Pacific cod fisheries in the Aleutian Islands.

Alternative 2 (Enhanced Conservation Approach)

This alternative would use management measures for the Aleutian Islands Atka mackerel and Pacific cod fisheries to remove most of the potential adverse effects on Steller sea lions and their critical habitat and insure the groundfish fisheries are not likely to result in jeopardy of extinction or adverse modification or destruction of designated critical habitat. Alternative 2 would provide protection measures for Steller sea lions and their critical habitat no less stringent than currently implemented and provide additional measures at least as protective as the RPA in the FMP biop (NMFS 2010a). The protection is greater in the areas where population growth has been the most negative (Areas 543 and 542 compared to Area 541). The enhanced conservation approach would facilitate NMFS's implementation by simplifying the area closures and seasonal management measures in Area 542 and 541 compared to critical habitat zone specific measures described in Alternative 3. Except for the changes described below, the current Steller sea lion protection measures (e.g., Pacific cod trawl season dates, no Atka mackerel directed fishing in critical habitat in Area 541) would remain unchanged.

Alternative 2 would—

<u>In Areas 542 and 543</u>:

- Prohibit retention of Atka mackerel and Pacific cod by federally permitted vessels, including those operating in State waters 0–3 nm.
- Establish TACs for Atka mackerel sufficient to support bycatch that may occur in other targeted groundfish fisheries (e.g., Pacific ocean perch target fishery).
- Eliminate the Atka mackerel platoon management system in the HLA (Area 543 and western portion of Area 542).
- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

<u>In Area 541 and the Bering Sea</u>:

- Close critical habitat in Area 541 to directed fishing for Pacific cod by federally permitted vessels.
- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.
- Prohibit Pacific cod directed fishing in Area 541 November 1 through December 31. (This extends the current trawl season restriction to the nontrawl fishery.)

Under this alternative, the TAC for Atka mackerel in Areas 543 and 542 would be set at a level sufficient to support incidental catch in other directed groundfish fisheries (e.g., Pacific ocean perch). Pacific cod in Areas 543 and 542 would be closed to directed fishing and placed on prohibited species status. Currently, Pacific cod is managed under a single TAC for the BSAI; therefore, no area specific TAC to support incidental catch can be specified. Any retention of Atka mackerel or Pacific cod would be prohibited to remove any incentive to retain these species by operators of vessels targeting other groundfish species. Because no directed fishery for Atka mackerel would be allowed in Areas 543 and 542, the platoon management system and HLA would be removed from the regulations. Unless otherwise restricted by the State, vessels not federally permitted may participate in the State-managed guideline harvest level (GHL) Pacific cod fisheries within waters 0–3 nm of areas closed to directed fishing for Pacific cod by federally permitted vessels. Federally permitted vessels in the State-managed (GHL) fisheries would be exempt from the Atka mackerel and Pacific cod closures under this alternative and would continue to comply with the 2003 Steller sea lion protection measures implemented under State regulations at 5 AAC 28.647.

Alternative 3 (July 2010 Draft RPA)

Alternative 3 is a more specific application of fishery restrictions based upon the management of the fisheries and Steller sea lion foraging behavior, population trends, and the potential competition between the Atka mackerel and Pacific cod fisheries and Steller sea lions. This alternative is the same as the draft RPA described in the July 2010 draft FMP biop, providing a level of fishery restrictions necessary to insure that JAM is not likely to occur for Steller sea lions and their designated critical habitat. Development of Alternative 3 considered current management of vessels under Amendment 80, historical harvest activities, and gear specific area closures and seasonal apportionments to disperse fishing over area and time. Unless otherwise specified in the alternative, all current Steller sea lion protection measures would continue to be implemented in the Aleutian Islands (e.g., Pacific cod seasonal apportionments; and pollock, Pacific cod, and Atka mackerel closures around rookeries and haulouts and in the Seguam foraging areas). Restrictions in State waters from 0–3 nm apply to federally permitted vessels. State-managed Guideline Harvest Level (GHL) Pacific cod fisheries for vessels not federally permitted may occur in waters from 0–3 nm unless otherwise restricted by the State. Federally permitted vessels in the State-managed (GHL) fisheries would be exempt from the Atka mackerel and Pacific cod closures under this alternative and would continue to comply with the 2003 Steller sea lion protection measures implemented under State regulations at 5 AAC 28.647.

Alternative 3 would—

In Area 543:

- Prohibit retention of Atka mackerel and Pacific cod.
- Establish a TAC for Atka mackerel sufficient to support the bycatch that may occur in other target groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA.

In Area 542:

Groundfish

- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

Pacific cod

- Close 0–10 nm zone of critical habitat year round to directed fishing by federally permitted vessels using nontrawl gear. Close critical habitat10 nm–20 nm to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels January 1 through June 10.
- Close 0–20 nm zone of critical habitat year round to directed fishing by federally permitted vessels using trawl gear.

- Prohibit Pacific cod fishing November 1 through December 31 in Area 542. (This extends this trawl gear restriction to nontrawl gear.)

Atka mackerel

- Set TAC for Area 542 to no more than 47 percent of acceptable biological catch (ABC).
- Close 0–20 nm critical habitat to directed fishing by federally permitted vessels year round.
- Change the Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.
- Eliminate the Atka mackerel platoon management system in the HLA.

<u>In Area 541 and the Bering Sea</u>:

Pacific cod

- Close 0–10 nm of critical habitat to directed fishing for Pacific cod by all federally permitted vessels year round.
- Limit the amount of catch that can be taken in the 10 nm–20 nm area of critical habitat based on gear type used:
    - Close critical habitat 10 nm–20 nm January 1 through June 10 to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
    - Close critical habitat 10 nm–20 nm June 10 through November 1 to directed fishing for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit Pacific cod fishing November 1 through December 31 in Area 541. (This extends this trawl gear restriction to nontrawl gear.)

Atka mackerel

- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 through June 10 for the A season and June 10 through November 1 for the B season.

Alternative 4 (Preferred alternative – final RPA)

Alternative 4 is the RPA in the final FMP biop. The final RPA is a revision of the July 2010 draft RPA based on public comment received by the agency and consideration of recommended changes to the draft RPA that would avoid JAM for Steller sea lions and provide additional relief to the Atka mackerel and Pacific cod fisheries. The protection measures in Area 543 remain unchanged from Alternative 3. Alternative 4 differs from Alternative 3 by the protection measures in Areas 542 and 541, providing additional opportunity for fishing inside critical habitat for the Atka mackerel and Pacific cod fisheries while meeting the performance criteria specified in the FMP biop to avoid JAM. The features of Alternative 4 are—

<u>In Area 543</u>:

- Prohibit retention of Atka mackerel and Pacific cod by all federally permitted vessels.
- Establish a TAC for Atka mackerel sufficient to support the incidental discarded catch that may occur in other target groundfish fisheries (e.g., Pacific ocean perch).
- Eliminate the Atka mackerel platoon management system in the HLA.

<u>In Area 542</u>:

Groundfish

- Close waters from 0–3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels.

Pacific cod

- Close 0–6 nm zone of critical habitat year round to directed fishing for Pacific cod by federally permitted vessels using nontrawl gear. For vessels 60 ft or greater, close critical habitat from 6 nm–20 nm January 1 to March 1, to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
- Between 177 E to 178 W longitude, close critical habitat from 0–20 nm year round to directed fishing for Pacific cod by federally permitted vessels using trawl gear.
- Between 178 W to 177 W longitude, close critical habitat from 0–10 nm year round to directed fishing by federally permitted vessels using trawl gear. Between 178 W to 177 W longitude, close critical habitat 10 nm–20 nm June 10 to November 1, to directed fishing for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit directed fishing for Pacific cod by all federally permitted vessels from November 1 to January 1. (This extends the trawl gear restriction to nontrawl gear.)
- Reinitiate ESA consultation if the nontrawl harvest of Pacific cod exceeds 1.5 percent of the BSAI Pacific cod acceptable biological catch (ABC) (equivalent to the Area 542 maximum annual harvest amount from 2007 through 2009). Similarly, reinitiate ESA consultation if the trawl harvest of Pacific cod exceeds 2 percent of the BSAI Pacific cod ABC (equivalent to the Area 542 maximum annual harvest amount from 2007 through 2009).

Atka mackerel

- Set TAC for Area 542 to no more than 47 percent of the ABC amount apportioned to Area 542 by the Council's SSC.
- Between 177 E to 179 W longitude and 178 W to 177 W longitude, close critical habitat from 0–20 nm year round to directed fishing for Atka mackerel by federally permitted vessels.
- Between 179 W to 178 W longitude, close critical habitat from 0-10 nm year round to directed fishing for Atka mackerel by federally permitted vessels. Between 179 W and 178 W longitude, close critical habitat from 10 nm–20 nm to directed fishing for Atka mackerel by federally permitted vessels not participating in a harvest cooperative or fishing a CDQ allocation.
- Add a 50:50 seasonal apportionment to the CDQ Atka mackerel allocation to mirror seasonal apportionments for Atka mackerel harvest cooperatives.
- Limit the amount of Atka mackerel harvest allowed inside critical habitat to no more than 10 percent of the annual allocation for each harvest cooperative or CDQ group. Evenly divide the annual critical habitat harvest limit between the A and B seasons.
- Change the Atka mackerel seasons to January 20 to June 10, for the A season and June 10, to November 1, for the B season.
- Eliminate the Atka mackerel platoon management system in the HLA.

In Area 541:

Pacific cod

- Close 0–10 nm of critical habitat year round to directed fishing for Pacific cod by all federally permitted vessels.
- Limit the amount of catch that can be taken in the 10 nm–20 nm area of critical habitat based on gear type used:
  - Close critical habitat 10 nm–20 nm January 1 to March 1to directed fishing for Pacific cod using nontrawl gear by federally permitted vessels.
  - Close critical habitat 10 nm–20 nm June 10 to November 1, to directed fishing by for Pacific cod using trawl gear by federally permitted vessels.
- Prohibit directed fishing for Pacific cod by federally permitted vessels November 1, to January 1. (This extends this trawl gear restriction to nontrawl gear.)
- Reinitiate ESA consultation if the nontrawl harvest of Pacific cod exceeds 1.5 percent of the BSAI Pacific cod ABC (equivalent to the Area 541 maximum annual harvest amount from 2007 through 2009). Similarly, reinitiate ESA consultation if the trawl harvest of Pacific cod exceeds 11.5 percent of the BSAI Pacific cod ABC (equivalent to the Area 541 maximum annual harvest amount from 2007 through 2009).

Atka mackerel

- Change the Bering Sea/Area 541 Atka mackerel seasons to January 20 to June 10, for the A season and June 10 to November 1, for the B season.
- Close the Bering Sea subarea year round to directed fishing for Atka mackerel.

Federally permitted vessels participating in the State-managed GHL fishery (5 AAC 28.647) would be exempt from the Atka mackerel and Pacific cod closures under this alternative. NMFS is developing rulemaking that would prevent Federal Fisheries Permits from being relinquished and easily reissued, which may reduce opportunities to participate in the State-managed GHL fishery without complying with all federal fisheries management measures. The State applies the 2003 Steller sea lion protection measures to this fishery. This would provide for continued harvest in this fishery, as analyzed in the cumulative effects of the FMP biop.

10.1.5 History of this Action

Section 1.4.1 of this EA/RIR includes a detailed description of the history of ESA consultations leading to the July 2010 draft FMP biop.

Initial drafts of the FMP biop, and of the EA/RIR, were provided to the Council's Scientific and Statistical Committee (SSC), its Advisory Panel (AP), and the Council itself, for review at a special August 2010 meeting. The Council, SSC, and AP each accepted public comment on this action. The Council unanimously passed a motion recommending that NMFS consider a new RPA, with less restrictive fishery closures in the Western and Central Aleutian Islands, which had not been considered in the draft FMP biop. The Council also recommended a 2-year sunset provision for the mitigation measures (NPFMC 2010:1).

When the draft FMP biop was released on August 3, NMFS opened a public comment period that was scheduled to run through August 27, 2010. That comment period was subsequently extended through September 3, 2010. NMFS received in excess of 10,600 comments. While many addressed the biological issues in the draft FMP biop and the EA, some included comments about the economic impacts of the action.

Alternative 4, the preferred alternative, includes revisions to the RPA developed by NMFS to reduce the burden on directly regulated parties, while maintaining adherence to the performance standards in the FMP biop. NMFS has revised the initial drafts of the EA and RIR, taking account of comments, the measures recommended by the Council, and additional analysis. The SSC minutes commenting on the RIR may be found in section 10.11.

10.2 Background

The analysis in this RIR groups the vessels harvesting Atka mackerel and Pacific cod in the Aleutian Islands into four sectors. The trawl catcher/processor sector is a small fleet of large vessels that fish using trawl gear and process their product on board. This sector has two components: a group of seven so called "Amendment 80" catcher/processors that target Atka mackerel and may target Pacific cod, and a more diverse group of catcher/processors (including one non-Amendment 80 vessel) that targets Pacific cod, but not Atka mackerel. This sector is discussed in sub-section 10.2.2.

Another fleet of catcher/processor vessels uses hook-and-line or pot gear to target Pacific cod. The catcher/processors fishing with these gears have been grouped into a "fixed gear" category for analysis. This is because, in some years, there were relatively few of the vessels of one or the other of these types operating, and that might create confidentiality problems. These vessels are discussed in sub-section 10.2.3.

Catcher vessels targeting Pacific cod form a third sector. These vessels use hook-and-line, jig, pot, and trawl gears. The largest part of this fleet, in both numbers of vessels and in volume of catch, is the trawlers. These vessels deliver to shoreside processors, shoreside floating processors, or catcher/processors acting as motherships. These four gear types have also been grouped for the purpose of this discussion, again out of a concern for confidentiality issues. This sector includes vessels fishing in federal waters, or in State waters during a simultaneous "parallel" fishery. The sector is discussed in sub-section 10.2.4.

A final sector includes vessels fishing in a state fishery that takes place when the federal fishery is closed. This fishery, described as the State's guideline harvest level (GHL) fishery, is discussed in sub-section 10.2.5.

Impacts on the fishing sectors will have impacts on the shoreside communities serving as home ports or operational bases for the vessels, or as places of residence for vessel crew. Employment and income impacts are discussed at length in section 10.7 of the RIR. Special attention has been given to three communities in the Aleutian Islands (Adak, Atka, and Unalaska/Dutch Harbor[4]) because of their potential susceptibility to changes in fishing activity in the region. These three communities are described in sub-section 10.2.8. Also related to localized impacts are sections on the Community Development Quota (CDQ) program (10.2.6), the subsistence hunt for Steller sea lions (10.2.7), and Alaska State fisheries taxation (10.2.9).

10.2.1 Atka mackerel and Pacific cod sector allocations

The action directly affects the harvest of Atka mackerel and Pacific cod in the Aleutian Islands. The spatial and temporal distribution of the acceptable biological catch (ABC) and total allowable catch (TAC) specifications for these two species differ, and this difference has implications for the action.

[4] In this RIR, Unalaska/Dutch Harbor is hereafter referred to as Unalaska, unless the port itself is meant.

Prior to 1992, Atka mackerel ABCs were allocated to the entire Aleutian Islands management area. In 1992, the Council recognized the need to disperse fishing effort throughout the range of the stock to minimize the likelihood of localized depletion because of increases in the ABC. In mid-1993, Amendment 28 to the BSAI FMP became effective, dividing the Aleutian Islands subarea into three districts for the purposes of spatially apportioning the ABC. Since 1994, the BSAI Atka mackerel ABC has been apportioned to the three regions based on the average distribution of biomass estimated from the Aleutian Islands bottom trawl surveys.

Descriptions of the Atka mackerel harvest specifications may be found in 50 CFR 679.20(a)(8)(ii), and in the final 2010 and 2011 harvest specifications for groundfish of the BSAI.[5] The Atka mackerel TAC is allocated to separate Amendment 80 and BSAI trawl limited access sectors, after subtraction of the CDQ reserves, jig gear allocation, and incidental catch allowance for the BSAI trawl limited access sector and non-trawl gear. The allocation of the initial TAC for Atka mackerel to the Amendment 80 and BSAI trawl limited access sectors is established in Table 33 to part 679 and § 679.91. Pursuant to § 679.20(a)(8)(i), up to 2 percent of the eastern Aleutian Islands and the Bering Sea (Area 541/Bering Sea) Atka mackerel initial TAC may be allocated to jig gear. The amount of this allocation is determined annually, by the Council, based on several criteria, including the anticipated harvest capacity of the jig gear fleet. Since 2008, it has been set at .05 percent. Table 10-1, below, describes the allocation of the Aleutian Islands Atka mackerel TAC among areas and sectors in 2010.

Table 10-1 Gear shares, CDQ reserve, incidental catch allowance, and Amendment 80 allocations of the BSAI Atka mackerel TAC.

2010 allocation by area (percent, unless otherwise indicated)			
Allocation	Eastern Aleutian District/Bering Sea	Central Aleutian District	Western Aleutian District
TAC	100%	100%	100%
CDQ reserve	10.7%	10.7%	10.7%
ICA (mt)	75	75	50
Jig	0.05%	0	0
BSAI trawl limited access	10%	10%	0
Amendment 80 sectors	79.25%	79.30%	89.30%
Source: BSAI harvest specifications for 2010/2011; Table 33 to part 679 and §679.91 and 75 FR 11778, March 12, 2010.			

Currently, the BSAI Pacific cod ABC and TAC are not allocated by subarea. However, the Council is considering the possibility of specifying separate TACs in the Bering Sea and Aleutian Islands subareas. A description of the Pacific cod TAC may be found in § 679.20(a)(7)(i) and (ii) and the final 2010 and 2011 harvest specifications for groundfish of the BSAI (75 FR 11778, March 12, 2010). The right to harvest BSAI Pacific cod may be exercised anywhere in the BSAI that is not closed by regulation. The TAC is subdivided among different sectors, defined by gear type, vessel size, catcher/processor or catcher vessel status, and AFA status. The percentages for the allocation of this TAC among the different sectors are described in Table 10-2 below.

[5] The final specifications are available at http://alaskafisheries.noaa.gov/sustainablefisheries/2010_11hrvstspecs.htm.

Table 10-2 Gear and sector allowances of the BSAI Pacific cod TAC.

Sector	Percentage share of non-CDQ TAC
Jig vessels	1.4%
Hook-and-line/pot catcher vessels < 60 ft. LOA	2%
Hook-and-line catcher vessels >= 60 ft. LOA	0.2%
Hook-and-line catcher/processors	48.7%
Pot catcher vessels > 60 ft. LOA	8.4%
Pot catcher/processors	1.5%
AFA trawl catcher/processors	2.3%
Non-AFA trawl catcher/processors	13.4%
Trawl catcher vessels	22.1%
Total	100%
Source: BSAI harvest specifications for 2010/2011; 75 FR 11778, March 12, 2010.	

An incidental catch allowance is deducted from the sum of the Pacific cod TACs, annually allocated to the hook-and-line and pot gear sectors, before these allocations are made. Since 2001, this amount has been 500 metric tons and is included in the harvest specifications.

Table 3-1 in Chapter 3 shows the ABCs, TACs, and estimated catches of Atka mackerel by management area from 1994 through 2010. In recent years, catches have been highest in Area 542, and lowest in Area 543. The ABC and TAC dropped in each area in 2010. Atka mackerel catches are typically quite close to the available TACs. Pacific cod ABCs, TACs, and catches may be found in Table 3-3. Pacific cod catches in the Aleutian Islands are smaller than those of Atka mackerel, and are concentrated to a greater extent in Area 541.

10.2.2 Trawl Catcher/Processors

Atka mackerel and Pacific cod are targeted by large trawl catcher/processors fishing Amendment 80 quota shares in the Aleutian Islands. In addition, a smaller group of Amendment 80 vessels and one non-Amendment 80, AFA catcher/processor (the F/V *Katie Ann*), target Pacific cod in the Aleutian Islands. The F/V *Katie Ann* also accepts deliveries of Pacific cod from several trawl vessels.

Amendment 80 trawl catcher/processors targeting Atka mackerel

Amendment 80 to the BSAI FMP identified a set of specific groundfish trawl catcher/processor vessels that were not covered by the AFA (i.e., the head-and-gut fleet) and established a framework for future fishing by this fleet. Among other things, the framework provided for an allocation of the fleet's share of the TACs of six groundfish species among trawl fishery sectors, created Amendment 80 quota share for the head-and-gut vessels, facilitated the development of cooperative arrangements among the vessels, and created an economic data reporting (EDR) program to collect data about the fleet. The fleet currently includes 23 vessels. Seven of these vessels currently target Atka mackerel in Areas 542 and 543 of the Aleutian Islands, and it is these seven vessels that are included in this category of trawl catcher/processors.[6] In addition, catcher vessels make deliveries of Pacific cod to Amendment 80 vessels as well.

[6] Table 10-4 provides counts of the vessels taking Atka mackerel as a target or incidentally in the AI. This shows 10 vessels for the overall Aleutians in 2009, and eight in each of Areas 542 and 543, with higher numbers in earlier years. Four firms operating seven vessels account for the overwhelming volume of Atka mackerel. The

The seven Amendment 80 vessels that target Atka mackerel and Pacific cod in the Aleutian Islands differ from the remaining Amendment 80 vessels in several respects. A preliminary analysis of the 2008 data collected in the EDR program shows that the Aleutian Islands vessels are larger and older, with larger crews, and larger revenues and costs (Haynie, personal communication).[7]

- The Amendment 80 vessels targeting Atka mackerel and Pacific cod averaged about 1,370 gross tons, compared to about 530 gross tons for other Amendment 80 vessels; their average length overall was about 220 feet, compared to 148 feet for others; they averaged about 2,600 horsepower, compared to 2,200 horsepower for the others; their average fuel capacity was about 144,000 gallons, compared to 65,000 gallons for the others.
- In 2008, the Amendment 80 vessels targeting these species had an average age of 32 years, compared to 28 years for the others.
- The average crew size for the Amendment 80 vessels targeting these species was about 53 persons, compared to about 30 persons for the others. The vessels targeting Atka mackerel and Pacific cod in the Aleutian Islands employed an average of 146 persons during 2008, compared to 78 for the others.
- Average 2008 gross revenues for the vessels targeting Atka mackerel and Pacific cod in the Aleutian Islands were about $18.6 million, while average gross revenues for the other vessels were about $9.9 million. Average costs for the Aleutian Islands vessels were about $14.5 million, while average costs for the others were about $9.2 million.

For Amendment 80 vessels in a cooperative, NMFS assigns quota share (QS) for Amendment 80 species to the owners of Amendment 80 vessels. Therefore, Amendment 80 QS can be used to yield an exclusive harvest privilege for a portion, or all of, the Amendment 80 sector's initial TAC. Amendment 80 establishes criteria for harvesters in the Amendment 80 sector to apply for and receive QS, and for NMFS to initially allocate and transfer QS. Amendment 80 assigns QS based on historical participation of Amendment 80 vessels during 1998 through 2004. QS allocations are based on the relative proportion of an Amendment 80 species harvested by an Amendment 80 vessel, compared with the proportion harvested by all other Amendment 80 vessels. Table 10-3 shows the share of Amendment 80 quota held by the different Amendment 80 firms.

larger numbers in Table 10-4 reflects targeting vessels in Area 541, which is not affected by this action, incidental harvests by vessels in Areas 542 and 543, and occasional small targeted catches by other vessels. Another factor in the difference in counts is that the Alaska Ranger, which once did target Atka mackerel in the area, sank in March 2008.

[7] Alan Haynie, Ph.D., Economist, NMFS Alaska Fisheries Science Center. Personal communication August 2010.

Table 10-3. Share of Amendment 80 QS, by firm, 2010.

Firm	Atka Mackerel	Flathead Sole	Pacific Cod	Pacific ocean Perch	Rock Sole	Yellowfin Sole
ALASKA ALLIANCE, LLC	1%	1%	2%	0%	1%	0%
ALASKA JURIS, INC.	13%	2%	3%	16%	5%	8%
ALASKA LEGACY, LLC	1%	3%	4%	0%	5%	3%
ALASKA SPIRIT, INC.	9%	2%	3%	2%	7%	8%
ALASKA VAERDAL, LLC	1%	1%	4%	0%	3%	2%
ALASKA VICTORY, INC.	11%	1%	3%	7%	3%	7%
ARCTIC SOLE SEAFOODS, INC.	0%	1%	0%	0%	1%	0%
ARICA VESSEL LLC	0%	7%	6%	0%	5%	5%
CAPE HORN VESSEL, LLC	0%	9%	5%	0%	4%	3%
FCA HOLDING INC	1%	0%	1%	2%	1%	1%
M/V SAVAGE, INC.	19%	1%	5%	19%	2%	5%
NORTH PACIFIC FISHING, INC.	1%	2%	6%	0%	8%	4%
OCEAN ALASKA, LLC.	0%	2%	1%	0%	1%	1%
OCEAN PEACE, INC.	9%	5%	5%	14%	4%	4%
O'HARA CORPORATION	1%	33%	19%	0%	18%	14%
REBECCA IRENE VESSEL LLC	0%	7%	5%	0%	4%	4%
SEAFREEZE ALASKA I LLC	8%	3%	6%	14%	3%	4%
THE FISHING COMPANY OF ALASKA, INC.	24%	3%	5%	26%	8%	15%
TREMONT VESSEL, LLC	0%	9%	3%	0%	4%	3%
TRIDENT SEAFOODS CORPORATION	0%	0%	0%	0%	1%	1%
U.S. FISHING, L.L.C.	1%	3%	9%	0%	7%	4%
UNIMAK VESSEL, LLC	0%	3%	5%	0%	7%	5%
Tot percentage	100%	100%	100%	100%	100%	100%
Average	5%	5%	5%	5%	5%	5%
Standard deviation	7%	7%	4%	8%	4%	4%
Median	1%	3%	4%	0%	4%	4%
Minimum	0%	0%	0%	0%	1%	0%
Maximum	24%	33%	19%	26%	18%	15%

Note: rounding errors prevent precise calculation of summary statistics from reported percentages.
Source: AKR RAM website, 2010 QS holdings. October 1, 2010.

Firms receiving Amendment 80 QS may, on an annual basis, elect to form a cooperative with other Amendment 80 QS holders to receive an exclusive harvest privilege for the portion of the initial TAC resulting from the cooperative's members' aggregated QS holdings. This "cooperative quota" (CQ) is the amount of annual Amendment 80 species initial TAC dedicated for exclusive use by that cooperative. Amendment 80 establishes the requirements for forming an Amendment 80 cooperative, as well as procedures for the allocation of annual CQ to a cooperative and transfers of CQ between cooperatives. The cooperative structure presents a number of operational and economic benefits to its members.

Cooperative participants could consolidate fishing operations on a specific Amendment 80 vessel or subset of Amendment 80 vessels, thereby reducing monitoring, enforcement, and other operational costs, and harvest fish in a manner more likely to be economically efficient. Amendment 80 provides flexibility, encourages efficient harvesting, and discourages waste through the opportunity to trade harvest privileges with other cooperatives.

In addition to annual CQ of Amendment 80 species, each Amendment 80 cooperative receives an exclusive allowance on the amount of crab and halibut prohibited species catch (PSC) the cooperative may use without penalty while harvesting in the BSAI. This halibut and crab PSC CQ is assigned to a cooperative in an amount proportionate to the amounts of Amendment 80 QS held by its members, and is not based on the amount of crab or halibut PSC historically removed by the cooperative members.

A cooperative structure may allow Amendment 80 vessel operators to better manage PSC rates than do operators who must race to harvest fish as quickly as possible before a PSC allocation causes fishery closures. By reducing PSC through more efficient cooperative operations (such as through gear modifications or "hot spot" avoidance) Amendment 80 vessel operators may also increase the harvest of valuable targeted groundfish species and improve revenues that would otherwise be forgone.

Amendment 80 cooperative participants may have access to additional initial TAC. Amendment 80 cooperatives may receive a reallocation of an additional amount of CQ, if a portion of the Amendment 80 species, or of crab or halibut PSC allocated to the BSAI trawl limited access sector, is projected to go unharvested. This reallocation to the Amendment 80 cooperatives is at the discretion of NMFS, based on projected harvest rates in the BSAI trawl limited access sector and other criteria. Each Amendment 80 cooperative would receive an additional amount of CQ based on the proportion of the Amendment 80 QS held by that Amendment 80 cooperative as compared with all other Amendment 80 cooperatives.

In order to limit the ability of Amendment 80 firms to expand their harvest efforts in the GOA, the Amendment 80 program established groundfish and halibut PSC catch limits for program participants. These are referred to as "sideboards" (75 FR 11749, March 12, 2010). Groundfish harvesting sideboard limits were established for all Amendment 80 vessels, other than the F/V *Golden Fleece*, to amounts no greater than the limits shown in Table 37 to part 679. Sideboard limits in the GOA are for pollock in the Western and Central Regulatory Areas and in the West Yakutat district, Pacific cod GOA-wide, Pacific ocean perch, and pelagic shelf rockfish in the Western Regulatory Area and West Yakutat district, and northern rockfish in the Western Regulatory Area. (75 FR 11749, March 12, 2010) The harvest of Pacific ocean perch, pelagic shelf rockfish, and northern rockfish in the Central Regulatory Area of the GOA is subject to regulation under the Central GOA Rockfish Program. Amendment 80 vessels not qualified under the Rockfish Program are excluded from directed fishing for these rockfish species in the Central GOA. The F/V *Golden Fleece* is prohibited from directed fishing for pollock, Pacific cod, Pacific ocean perch, pelagic shelf rockfish, and northern rockfish in the GOA. (75 FR 11749, March 12, 2010) Groundfish sideboard limits for Amendment 80 vessels operating in the GOA are based on their average aggregate harvests from 1998 to 2004. All targeted or incidental catch of sideboard species made by Amendment 80 vessels will be deducted from the sideboard limits. (75 FR 11749, March 12, 2010)

The sideboard limits on PSC for Amendment 80 vessels in the GOA are based on the historical halibut PSC mortality by Amendment 80 vessels in each PSC/target category from 1998 through 2004. These values are slightly lower than the average historical PSC, to accommodate two factors: allowances of halibut PSC cooperative quotas (CQs) under the Central GOA Rockfish Program and the exemption of the F/V *Golden Fleece* from this restriction (§ 679.92(b)(2)) (75 FR 11749, March 12, 2010).

A minimum groundfish retention standard (GRS) applies to all Amendment 80 vessels and Amendment 80 cooperatives fishing in the BSAI. The GRS was recommended by the Council as Amendment 79 to the BSAI FMP, in June 2003, published in the *Federal Register* as a final rule in April 2007, and became effective in 2008. The percentage of catch that must be retained was 65 percent in 2008, increasing to 75 percent in 2009, 80 percent in 2010, and 85 percent in 2011 and all future years.

Amendment 80 modified the GRS as recommended under Amendment 79 to apply to all non-AFA trawl catcher/processors operating in the BSAI, without an exemption for vessels under 125 feet LOA, and to modify the method of calculating the total retention of catch that applies to cooperatives and not to individual vessels belonging to the cooperative. Under the GRS as modified by Amendment 80, each vessel participating in the Amendment 80 limited access fishery must ensure that it meets the GRS requirements, based on the amount of catch retained by that vessel. Vessels participating in a cooperative can aggregate the total catch and total retained catch by all vessels in the cooperative. Therefore, vessels with poorer retention rates may have an incentive to join a cooperative with other vessels that have a better retention rate and are able to offset the lower retention rate of those vessels. For these, and other reasons, vessels participating in the limited access fishery may face increasing difficulty meeting the GRS.

In June 2010, the Council received a status report on the implementation of the GRS prepared in response to a request to NMFS in April 2010. The Council had been seeking information on enforcement and prosecution concerns raised during the development of the GRS Program, on any new concerns about monitoring and enforcing the GRS Program that had been identified by the agency or industry participants, and on potential concepts for refinement of the GRS Program to address concerns (NPFMC 2010a:6).

In the report, NMFS identified two issues with the current GRS Program. First, the regulatory methodology adopted for implementation of the GRS differed from that used in the analysis of the GRS at the time of Amendment 79 final action, and required groundfish retention beyond levels intended by the Council. Thus, the current GRS calculation schedule may impose economic hardships to the Amendment 80 fleet beyond those considered in the Amendment 79 analysis. Second, NMFS enforcement has significant concerns with the cost of enforcing a GRS violation, which may hinder their ability to enforce the current GRS Program (NPFMC 2010a:6).

After reviewing the June 2010 report and listening to public comment, the Council approved an emergency action to temporarily suspend the GRS regulations. NMFS expects to implement an emergency rule in December 2010, exempting the Amendment 80 sector from the GRS in 2010 and 2011. Additionally, the Council initiated an FMP amendment to explore revising the current GRS Program, including by allowing the Amendment 80 sector to engage in internal monitoring and administration of a groundfish retention program to meet the Council retention goals described in Amendment 79. An analysis has been prepared, and this issue is expected to be on the Council's December 2010 agenda.

Amendment 80 firms receiving QS are required to supply detailed information on their costs via an economic data report (EDR) for fishing operations conducted during the previous calendar year. The annual EDR submission deadline is June 1**.** The Pacific States Marine Fisheries Commission has been designated by NMFS to be the Data Collection Agent for the Amendment 80 EDR program. Data from 2008 (the first year of the program) has been carefully reviewed and audited. Data from 2009, is in the process of validation and not yet available.

Vessels targeting Pacific cod, but not Atka mackerel

This group of vessels includes several Amendment 80 trawl catcher/processors that target Pacific cod, but not Atka mackerel, in the Aleutian Islands, as well as the non-Amendment 80, AFA catcher/processor the F/V *Katie Ann*, which targets Pacific cod.

A small number—three in 2008 and 2009—of Amendment 80 trawl catcher/processors target Pacific cod in the Aleutian Islands. These vessels tend to fish in the eastern part of the Aleutian Islands, and to have significantly smaller income dependence on the fishery than the Amendment 80 vessels targeting Atka mackerel. Average wholesale revenues for these three vessels in this fishery were under a million dollars in both 2008 and 2009. Income dependence ranged between four and seven percent per vessel in those two years (estimates of income dependence for trawl catcher/processors as a whole are shown in Table 10-8).

The F/V *Katie Ann* is an AFA catcher/processor that targets Pacific cod in the Aleutian Islands, and that accepts deliveries at sea from a small number of trawl catcher vessels. Built in 1969 and owned by American Seafoods, the F/V *Katie Ann* is about 1,700 gross tons, about 300 feet length overall, 4,400 horsepower, and has a 166,000 gallon fuel capacity. Her homeport is Seattle, Washington. While fishing for Pacific cod, the F/V *Katie Ann* carries a crew of about 100. The Pacific cod season lasts from January

20 through early April, and there is no need for a crew rotation during this time period (Alaska CFEC 2010; Jacobs, personal communication).[8]

As a catcher/processor, she harvests a portion of the AFA's Pacific cod sideboard. As a mothership, the F/V *Katie Ann* accepts deliveries from three catcher vessels fishing in the federal/parallel Pacific cod fishery, and then in the State GHL Pacific cod fishery (Jacobs, personal communication).

A typical year for the F/V *Katie Ann* begins in late January, when she travels north from Seattle to the BSAI for the opening of the trawl Pacific cod fishery on January 20. She typically fishes for Pacific cod herself, or serves as a mothership for catcher vessels fishing for Pacific cod, during the federal/parallel fishery, and then serves as a mothership for catcher vessels during the State GHL fishery which follows. She may, during this period, take an occasional trip to fish for yellowfin sole in the Bering Sea. When the Pacific cod fishery closes, the F/V *Katie Ann* returns to Seattle for refitting. In past years, she has returned to Alaska to tender for pink salmon in Prince William Sound in June, July, and August.[9] The end of the pink salmon season concludes her year in Alaska and she normally returns to Seattle in August. In 2009, the F/V *Katie Ann* reportedly earned approximately 80 percent of her annual gross revenues from the Pacific cod fishery in the Aleutian Islands (Jacobs, personal communication; Jacobs 2010).

The F/V *Katie Ann* produces a frozen shatterpack fillet product. In recent years, she has been supplying Ivar's, a regional restaurant chain, with Pacific cod for use in the preparation of fish and chips meals. She supplies the "overwhelming" proportion of the raw material for this Ivar's product. American Seafoods and Ivar's representatives indicate that western Aleutian Islands Pacific cod makes an unusually good raw material for fish and chips because of its large size, permitting "thick, moist fillets." An Ivar's representative indicates that Ivar's served more than 2 million orders of fish and chips in 2009, most prepared from product supplied by the F/V *Katie Ann*. She has also supplied product to Wendy's, a national fast food restaurant chain (Jacobs, personal communication; Donegan 2010).

Aggregate sectoral harvest

The small number of Amendment 80 vessels that actually fish Atka mackerel use their own quota share, Amendment 80 quota share leased from other holders, or fished under cooperative arrangements, and CDQ quota (see sub-section 10.2.6). Table 10-4 shows the numbers of trawl catcher/processors active with targeted or incidental catches in the Aleutian Islands Atka mackerel and Pacific cod fisheries each year. In recent years seven trawl catcher/processors have been targeting Atka mackerel in the areas affected by the Atka mackerel elements of this action (Areas 542 and 543). Frequent reference will be made to these seven vessels.

[8] Jan Jacobs, Director of Government Affairs, American Seafood Company, Seattle, Washington. Personal communication, August 24, 2010.

[9] The F/V *Katie Ann* did not do so in 2010.

Table 10-4 Number of active trawl catcher/processors.

Numbers of vessels								
	Atka mackerel				Pacific cod			
Year	541	542	543	AGG	541	542	543	AGG
2004	6	10	9	10	10	6	3	10
2005	9	10	11	11	7	4	4	8
2006	10	11	9	11	8	6	5	9
2007	11	11	8	12	10	9	3	10
2008	8	9	7	9	6	3	2	6
2009	10	8	8	10	4	2	2	5
Source: NMFS AKR CAS. Vessels with targeted and/or incidental catches using Amendment 80 quota share or CDQ.								

Figure 5-2, in Chapter 5 shows the locations of non-pelagic trawl gear Pacific cod harvests in the Aleutian Islands. The figure shows the locations for catcher vessel and catcher/processor Pacific cod trawl harvests in the Aleutian Islands. Confidentiality considerations preclude presenting the locations of Amendment 80 catcher/processor trawl fishing activity alone in a similar figure.

Table 10-5 shows estimated gross revenues from trawl catcher/processors fishing for Atka mackerel and Pacific cod in the three areas of the Aleutian Islands, from 2004 through 2009. The Pacific cod prices used in this analysis are average BSAI-wide first wholesale prices. The source for wholesale prices used in BSAI analyses, the annual Commercial Operator's Annual Reports, or "COAR" reports, collected by the State of Alaska, does not request information at a level of detail that makes it possible to break out wholesale prices separately for the Aleutian Islands and Bering Sea. This may create an issue in certain fleet sectors, since anecdotal evidence from industry sources suggests that the size distribution of Pacific cod taken in the Aleutian Islands is skewed towards larger fish, than the size distribution in the Bering Sea, and that the larger fish tend to bring higher market prices. This may not be a problem for Pacific cod caught and/or processed by the Amendment 80 fleet. A statistical analysis of COAR prices, conducted at the Alaska Fisheries Science Center (AFSC) to support this analysis, did not find evidence of an "Aleutian Islands price premium for the Amendment 80 fleet" (Haynie, personal communication).[10] Representatives of the F/V *Katie Ann* indicate that she does receive a higher average price for her product than she would receive for Bering Sea Pacific cod (Jacobs 2010). The F/V *Katie Ann* was not included in the statistical analysis. Because of this, use of an average BSAI-wide price, reflecting prices in the Bering Sea, as well as the Aleutian Islands, may bias the revenue estimates for the Aleutian Islands downward.

[10] Data on wholesale Pacific cod prices are not kept by NMFS at the area level, but only at the FMP level and only at the annual-level. However, different vessels fish different amounts of their activity in different areas. For example one vessel might fish 50% of its effort in the Aleutian Islands, another might fish only 10% in the Aleutian Islands, while another might only fish in the Bering Sea. Using variation in area-specific catch among these vessels, it is possible to econometrically test whether there is a price premium evident for vessels, based on how much they fish in the Aleutian Islands. The econometric analysis was unable to identify such a premium, for either the Amendment 80 or long line fisheries. Many different functional forms (e.g., with different starting years, with vessel and annual fixed effects, etc.) were evaluated. However, it should be noted that there are many factors that affect variation among vessels, and it is possible there is a premium for some vessels in some instances. The full regression results are confidential, because they are vessel-specific. (Haynie, pers. comm.)

Table 10-5 Estimated trawl catcher/processor first wholesale gross revenues from Atka mackerel and Pacific cod, 2004–2009.

Atka mackerel									
	Metric tons (round weight)				$/mt round weight	Gross revenue (in millions of $)			
	541	542	543	Total		541	542	543	Total
2004	3,161	26,560	16,527	46,248	603	1.9	16.0	10.0	27.9
2005	3,356	33,598	18,852	55,806	635	2.1	21.3	12.0	35.4
2006	4,013	38,447	14,374	56,835	657	2.6	25.3	9.4	37.3
2007	19,752	25,475	8,847	54,074	805	15.9	20.5	7.1	43.5
2008	18,701	21,725	16,105	56,531	848	15.9	18.4	13.7	47.9
2009	25,734	28,349	15,578	69,661	948	24.4	26.9	14.8	66.0
Mean	12,453	29,026	15,047	56,526	749	10.5	21.4	11.2	43.0
Median	11,357	27,454	15,841	56,169	731	9.2	20.9	11.0	40.4
Minimum	3,161	21,725	8,847	46,248	603	1.9	16.0	7.1	27.9
Maximum	25,734	38,447	18,852	69,661	948	24.4	26.9	14.8	66.0
Pacific cod									
	Metric tons (round weight)				$/mt round weight	Gross revenue (in millions of $)			
	541	542	543	Total		541	542	543	Total
2004	5,597	3,267	3,241	12,105	1,131	6.3	3.7	3.7	13.7
2005	5,117	2,184	4,103	11,404	1,310	6.7	2.9	5.4	14.9
2006	5,045	1,854	3,016	9,915	1,698	8.6	3.1	5.1	16.8
2007	7,728	2,142	2,227	12,098	1,893	14.6	4.1	4.2	22.9
2008	2,834	773	1,664	5,271	1,762	5.0	1.4	2.9	9.3
2009	1,966	1,515	1,660	5,141	1,151	2.3	1.7	1.9	5.9
Mean	4,714	1,956	2,652	9,322	1,491	7.2	2.8	3.9	13.9
Median	5,081	1,998	2,622	10,659	1,504	6.5	3.0	3.9	14.3
Minimum	1,966	773	1,660	5,141	1,131	2.3	1.4	1.9	5.9
Maximum	7,728	3,267	4,103	12,105	1,893	14.6	4.1	5.4	22.9

Notes: Catches are in metric tons round weight retained catch, including targeted and incidental and Amendment 80 and CDQ.
"C" means combined with estimate in column to left for confidentiality. Atka mackerel values in dollars per metric ton round weight are from the 2009 and 2010 SAFE reports, Table 27. Pacific cod values provided by AFSC.
Source: NMFS AKR

Revenues from targeting Atka mackerel and Pacific cod in the Aleutian Islands are a significant part of the estimated gross revenues these vessels earn during their annual round of fisheries. For the vessels involved in these fisheries, Table 10-6 provides estimates of the ratio of revenues earned from Atka mackerel and Pacific cod caught in the AI to all revenues from fishing sources in Alaska for the trawl catcher/processors in this sector. The ratios range from 24 percent to 39 percent of all revenues for these vessels. From 2004 through 2008, the percentages are all under 30 percent; in 2009, the percentage jumps to 39 percent. The annual percentages mask a considerable range in the percent of income earned in the Aleutian Islands.[11]

The numerators and denominators used to prepare these percentages are estimates. The numerators are the products of wholesale value per metric ton of trawl catcher/processor Atka mackerel and Pacific cod production and the estimated metric tons of target and incidental Atka mackerel and Pacific cod catch by trawl catcher/processors targeting either of these species in the Aleutian Islands. The denominator is derived from data prepared for the annual Economic SAFE report; these data value Pacific cod at a BSAI-wide average price. As discussed just above in connection with Table 10-5, the prices used to make these revenue estimates for the numerator may understate the price received for Pacific cod in the Aleutian

[11] The revenue estimates in the denominator are those used by the AFSC to generate Tables 36 and 37, on the numbers of large and small fishing operations, in the annual Economic SAFE report. A comparison of these estimates with those reported in the 2008 Amendment 80 EDR reports for the seven Amendment 80 trawl catcher/processors that target Atka mackerel shows that the AFSC estimates exceed the EDR estimates by an average of 18 percent. The EDR data are vessel specific, and have been audited. The AFSC estimates have been extrapolated on the basis of regional and annual behavior (thus a BSAI-wide wholesale price for Pacific cod is applied to the Aleutian Islands cod caught by these vessels). If the 2008 ratio is recalculated using the EDR data for the Amendment 80 trawlers targeting Atka mackerel, the new ratio increases from 28% to 31%.

Islands. This could lead to an underestimate of the proportion of revenues earned in the Aleutian Islands. On the other hand, the denominator only includes revenues from fishing by the vessel in state and federal fisheries in and off Alaska. To the extent that the vessel earns revenues outside of Alaska, or from non-fishing activities, the ratio will overstate revenues accruing to the vessel from Atka mackerel and Pacific cod fishing in the Aleutian Islands. As noted above, in at least one instance, one of these trawl catcher/processors is active tendering salmon at another time of the year. The numerators do not include the value of incidental catches of other species. Moreover, several catcher vessels deliver to catcher/processors acting as motherships. The wholesale value of these revenues is captured in a later section, as the wholesale value of catcher vessel production. It is not included here, since few catcher/processors act as motherships, raising confidentiality concerns. This imparts a downward bias to the percentages.

Table 10-6 Proportion of trawl catcher/processor revenues earned from fishing for Atka mackerel and Pacific cod in the Aleutian Islands, 2004–2009.

Year	Revenues from Atka mackerel and Pacific cod in the AI (millions of $)	All revenues from fishing in Alaska (millions of $)	Percentage of revenues from the AI (percent)	Number of vessels included in calculation of all Alaska revenues
2004	41.6	162.9	26%	15
2005	50.3	208.5	24%	13
2006	54.1	228.5	24%	14
2007	66.4	237.4	28%	15
2008	57.2	205.1	28%	11
2009	71.9	185.8	39%	11

Source: AKR estimates based on CAS, AFSC data total operation revenues, and prices from 2009 and 2010 SAFEs, Table 27. Revenues from the AI are derived from those in Table 10-5. Vessels are those targeting Atka mackerel and/or Pacific cod.

Table 10-7 provides estimates of the percent of the Pacific cod harvest made in targeted Pacific cod hauls, by fleet sector, Aleutian Islands area, and year. In Area 541, in all fleet sectors, most Pacific cod is taken in targeted hauls. The percentages are significantly smaller in Area 542 for the trawl catcher/processors, and variable for the fixed gear catcher/processors. The trawl catcher/processor percentages drop off considerably in 2008 and 2009, after the introduction of Amendment 80. In Area 543 the percentages have been high in recent years for fixed gear catcher/processors and catcher vessels, and somewhat lower for trawl catcher/processors.

Table 10-7 Percent of the Pacific cod catch made as targeted harvests, by fleet segment and management area, 2004–2009

Area 541			
	Trawl Gear CP	Fixed Gear CP	Catcher Vessels
2004	98%	99%	100%
2005	98%	99%	98%
2006	96%	100%	100%
2007	94%	99%	100%
2008	94%	100%	100%
2009	83%	99%	99%
Area 542			
	Trawl Gear CP	Fixed Gear CP	Catcher Vessels
2004	46%	100%	99%
2005	52%	2%	98%
2006	47%	46%	97%
2007	56%	96%	93%
2008	9%	100%	88%
2009	16%	99%	95%
Area 543			
	Trawl Gear CP	Fixed Gear CP	Catcher Vessels
2004	90%	100%	0%
2005	75%	0%	0%
2006	88%	100%	100%
2007	84%	100%	100%
2008	83%	100%	99%
2009	83%	100%	99%
Source: NMFS AKR estimates from CAS Notes: CP refers to catcher/processors			

Employment

EDR data for the Amendment 80 trawl catcher/processors indicate that the average crew size per vessel in 2008 was 53 positions. This total includes an average of 8 deck crew, 36 processing crew, and 9 others, including officers, engineers, and cooks. The average number of employees during a year was 146 (Haynie, personal communication). The number of employees exceeds the number of positions because of turnover and crew rotations. On the basis of this, the Amendment 80 portion of this fleet is estimated to use 371 crew positions during the Atka mackerel and Pacific cod fisheries.

The EDR data provides information on crew compensation, as well as on the numbers of crew members. The deck crew on an average Amendment 80 vessel targeting Atka mackerel and Pacific cod in the Aleutian Islands received about $900,000 in compensation in 2008, the processing crew received $2.6 million, and the other employees received about $1.1 million. This compensation is annual payments by the vessel's owners, and covers payments for activity in fisheries other than the Atka mackerel and Pacific cod fisheries. These labor expenses came to a total of about $4.5 million. In addition to these expenses, identified as labor expenses on the survey, the crew would have received some portion of a $600,000 category described as "Recruitment, travel, benefits" (Haynie, personal communication). Focusing only on the 2008 expenses identified as labor, the information about the number of employees and compensation implies that the average person would have earned about $31,000 in 2008. Focusing only on the number of positions, the average position would have received about $85,000 in 2008.

A representative of American Seafoods estimated that the F/V *Katie Ann* carries a crew of about 100 persons, and that there are no crew rotations during the winter-spring Pacific cod season (Jacobs, personal communication).[12] An examination of daily processor reports for the spring-winter season of 2010 shows her reported crew sizes ranging between 94 and 96 (NMFS AKR estimate). For the purposes of this

[12] Jan Jacobs. Director of Government Affairs, American Seafoods Company. Seattle Washington. Personal communication, August 24, 2010.

discussion the crew size is estimated to be 96 persons. Amendment 80 catcher/processors that are not targeting Atka mackerel in the Aleutian Islands averaged 30 crew positions and 78 employed persons per year in 2008 (EDR data). Assuming the three Amendment 80 trawlers targeting Pacific cod in the Aleutian Islands in 2008 and 2009 had 30 crewmembers each, this portion of the fleet would have averaged 90 crew positions.

Thus, the total number of persons employed in this sector is estimated to be 557.[13] This estimate does not include the crews on the catcher vessels delivering Atka mackerel and/or Pacific cod to these catcher/processors. Employment on these vessels is included in the estimate of catcher vessel employment provided later in this section.

10.2.3 Fixed Gear Catcher/Processor sector

A small number of hook-and-line and pot catcher/processors targets Pacific cod in the Aleutian Islands. Table 10-8 provides estimates of the numbers of these vessels by year and area. The number of hook-and-line vessels ranged from four to 10; the number of pot vessels ranged from none to four. In much of this chapter, these two sectors are treated as a single sector to address confidentiality concerns with the data from both.

Table 10-8 Number of Active Fixed Gear Catcher/Processors

Numbers of vessels								
	Hook-and-line				Pot			
Year	541	542	543	Aleutians	541	542	543	Aleutians
2004	6	2	3	6				
2005	4	1		4				
2006	9	1	1	10	1			1
2007	3	3	2	5		1		1
2008	7	7	3	9	2	4	1	4
2009	6	6	2	7	2	3	1	3

Source: NMFS AKR CAS.
Note: "Aleutians" is the number of unique vessels using that gear type in all three areas during the listed year, and is not the sum of the number of unique vessels in each area.

Table 10-7 shows the percentages of fixed gear catcher/processor harvests of Pacific cod taken in the Pacific cod target fishery. The sector has typically taken almost all of its Pacific cod as targeted harvests in all three areas. The only exceptions appear in Area 542 in 2005 and 2006 and in Area 543 in 2005.

Table 10-9 shows that the fixed gear catcher/processor fleet has accounted for between about $4 million and about $14 million in estimated gross revenues (at first wholesale prices) each year. Gross revenues rose each year from 2004 through 2008, and then fell precipitously in 2009.

Because of the issues connected with COAR data discussed earlier, the prices used to make the calculations in Table 10-9 are BSAI-wide average prices. However, freezer-longliner representatives indicate that they receive a higher price for the head-and-gut product produced in the Aleutian Islands[14]

[13] This is a revision from an estimate of 384 used in the July draft of this document. The revision is based on the use of EDR data, on additional information from American Seafoods, and on a correction to account for the three Amendment 80 trawl catcher/processors targeting only Pacific cod.

[14] The value difference per pound round weight is reportedly created by a higher price for the products from the larger fish, and from improved product recovery from the larger fish. This can be illustrated with the following example, reported to be representative of prices in mid-September 2010. These fish are sold "headed and gutted" (H&G). Larger fish lend themselves to an H&G cut called "collar bone on" (CBO). Smaller cod are given a cut called a J-cut. CBO cut fish produce a 57 percent recovery rate, while a J-cut produces a 47 percent recovery rate.

(Hosmer, Magnuson, personal communications)[15]. NMFS was unable to find strong statistical evidence for an Aleutian Islands price premium in a statistical analysis of production records, however the test had little statistical power.[16] This remains an area for further research (Haynie, personal communication). Given the detailed description of marketing and price issues provided by industry sources, this analysis will assume that a price difference of unknown size exists for this sector. An Aleutian Islands price premium would mean that actual gross revenues are higher than the estimates shown in this table.

Table 10-9 Estimated gross revenues for fixed gear (hook-and-line and pot) catcher/processor vessels targeting Pacific cod in the Aleutian Islands, 2004 through 2009.

	Metric tons					Gross revenue (in millions of $)			
	541	542	543	Total	$/mt	541	542	543	Total
2004	1,568	974	395	2,937	1,189	1.9	1.2	0.5	3.5
2005	2,794	C	C	2,794	1,435	4.0	C	C	4.0
2006	3,051	C	C	3,051	1,833	4.6	C	C	5.6
2007	1,770	730	1,660	4,160	2,148	3.8	1.6	3.6	8.9
2008	1,898	2,516	2,309	6,723	2,124	4.0	5.3	4.9	14.3
2009	1,409	1,924	2,756	6,090	1,283	1.8	2.5	3.5	7.8
Average	2,082	C	C	4,292	1,669	3.4	C	C	7.4
Median	1,834	C	C	3,606	1,634	3.9	C	C	6.7
Minimum	1,409	C	C	2,794	1,189	1.8	C	C	3.5
Maximum	3,051	C	C	6,723	2,148	4.6	C	C	14.3

Notes: Catches are in metric tons round weight retained catch, including targeted and incidental and Amendment 80 and CDQ. “C” combined with cell to the left for confidentiality
Source: NMFS AKR

Table 10-10 shows estimates of the annual percentage of their revenues that the fixed gear catcher/processors operating in the Aleutian Islands Pacific cod fisheries have earned from their harvests in that fishery for the years 2004 through 2009. These percentages range from 10 percent to 22 percent. They appear to have risen somewhat over this time period, and in 2008 and 2009, as a group, they earned just over a fifth of their revenues from this fishery. These aggregate percentages mask considerable differences within the fleet. In some instances, the percentage of revenues from Aleutian Islands Pacific cod, is quite low, on the order of 1 percent. For others, it can be about 50 percent. The proportion of the vessels earning a significant part of their annual gross revenues in this fishery has changed through time, falling from 2004 to 2006 and then rising after that.

The approach to estimating these percentages has shortcomings. As noted in sub-section 10.2.2, BSAI wholesale prices are collected at a regional level, as operations report a BSAI price for different products. Thus regional, Aleutian Islands, or Bering Sea, wholesale prices cannot be directly identified. However, fixed gear industry sources report that a larger size distribution of Pacific cod harvested in the Aleutian Islands brings a higher average price than does the cod harvested in the Bering Sea (Hosmer, Magnuson, personal communication). This is similar to the situation of the F/V Katie Ann, discussed in sub-section 10.2.2. A statistical analysis of fixed gear price reports conducted by NMFS for this analysis was unable

At the time the example was reported, the price FOB Unalaska for CBO cut Pacific cod was $1.80 per pound. Converting this into dollars/pound round weight ($1.80*.57) gives a price of $1.03. At that time, J-cut was selling for $1.50 headed and gutted. Converting this into dollars/pound round weight ($1.50*.47) gives a price of $0.70. The price differences reflect the different markets into which the Pacific cod of different sizes are directed. The larger fish is more likely to be shipped to Portugal and Norway for salting and then exported to Brazil to be rehydrated for use in a popular local salted fish dish called Bacalhau. Smaller J-cut fish are more likely to be sent for a different type of processing in Denmark, France, and Portugal, and then make their way to markets in Spain, Italy, and France. (Magnuson).

[15] Chuck Hosmer, General Manager, M/V Baranof and M/V Courageous. Personal communication, August 2010; Lance Magnuson, Blue North Fisheries, personal communication, September 16, 2010.

[16] See footnote 10 for more information on this statistical analysis.

to identify a statistically significant price difference, however, the analysis had weak statistical power (Haynie)[17]. An Aleutian Islands price premium would increase the numerator and denominator in the ratio of Aleutian Islands to Bering Sea prices, but would increase the numerator more than proportionately, thus increasing the percentage. The ratio also compares Pacific cod revenues (but not revenues from fish taken incidentally to Pacific cod fishing) to all revenues from targeted and incidental fishing. Since the Aleutian Islands fishery is a fairly clean fishery, with little incidental catch (NMFS AKR in-season management), this is not expected to introduce a large bias.

Table 10-10 Proportion of fixed-gear catcher/processor revenues earned from fishing for Pacific cod in the Aleutian Islands, 2004–2009.

Year	Revenues from Pacific cod in the AI (Millions of $)	All revenues from fishing in Alaska (Millions of $)	Percentage of revenues from Pacific cod in the AI (%)	Number of vessels included in calculation of all Alaska revenues
2004	3.5	32.4	11%	6
2005	4	25.8	16%	4
2006	5.6	57.8	10%	10
2007	8.9	50.1	18%	8
2008	14.3	65.2	22%	12
2009	7.8	39.6	20%	9

Notes: Vessels are those targeting Pacific cod.
Source: AKR estimates based on CAS, AFSC data total operation revenues, and prices from 2009 and 2010 SAFEs, Table 27.

Since 2006, most of the persons holding license limitation permits (LLPs) endorsed for freezer longliner catcher/processors have been members of the Freezer Longliner Conservation Cooperative. In June 2010, the remaining LLP holders joined the cooperative, so that with the start of the 2010 “B” season on August 15, all holders of LLPs authorizing the use of these vessels were members of the cooperative. Each year an allocation is made to the freezer longline catcher/processor sector through the annual harvest specifications process. Cooperative members each receive a share of the quota for harvest; shares are issued in proportion to historical fishing activity with the LLP. Cooperative members are free to exchange their quota shares among themselves, and to stack shares on individual vessels. Compliance with the agreement is monitored by SeaState, Inc., and the contract signed by the members imposed heavy financial penalties for non-compliance. In the past, even without 100 percent membership, the cooperative has been able to organize GOA harvests, so as to make reliable commitments that members would reach halibut PSC avoidance goals. NMFS has relied on these commitments to open fisheries that would not otherwise have been opened. Cooperative efforts have led to the withdrawal of vessels from the fishery (Hosmer, Downs, personal communications; NMFS AKR in-season management).

The Council is considering splitting the BSAI Pacific cod TAC into separate Aleutian Islands and Bering Sea TACs. A proposal to establish separate Pacific cod sector allocations between the Bering Sea and Aleutian Islands areas was originally included as part of BSAI Amendment 85 in 2006, but was removed from this amendment package prior to final action. In October 2008 the Council received a report by the SSC regarding separating the combined BSAI Pacific cod harvest specifications into Bering Sea and Aleutian Islands specifications. The SSC supported setting a combined BSAI overfishing level and separate ABCs for the Bering Sea and Aleutian Islands for Pacific cod. The Council has received discussion papers on this topic, and on the difficult issues associated with such a separation, given the different sectors and existing sectoral allocations of Pacific cod (NMFS 2008). The Council has not taken final action on a split-proposal.

Northern Economics (2001a) provides estimates of average crew sizes for longline and pot catcher/ processors operating in the BSAI. Average crew sizes for the pot catcher/processors averaged 11 persons

[17] A similar analysis of prices for the Amendment 80 fleet was discussed in sub-section 10.2.2.

over the period 1992 through 2000 (the annual estimated averages, based on weekly production reports, varied between 10 and 14 from 1992 through 2000). Average crew sizes for the longliners averaged 19 persons over the same period (the estimates varied from 17 to 20). Estimates of the numbers of hook-and-line and pot catcher/processors fishing for Pacific cod in the Aleutian Islands were supplied in section 10.3. In 2008, there were nine hook-and-line vessels and 4 pot vessels. Using the crew sizes reported above, this implies that there were 171 longline crew and 44 pot crew. In 2009 there were seven hook-and-line vessels and three pot vessels, implying 133 hook-and-line crew and 33 pot crew. These changes in these estimates from one year to the next reflect the variability in the number of vessels participating in the federal waters and state parallel Pacific cod fisheries. Recall that Pacific cod prices were very high in 2008 and very low in 2009.

10.2.4 Catcher vessel sector

Catcher vessels fishing for Pacific cod operate in the Aleutian Islands using jig, hook-and-line, pot, and trawl gear. Table 10-11 provides counts of the number of vessels using each of these gears, and estimates of their Pacific cod catches, from 2004 through 2009. The number of hook-and-line vessels ranged between one and nine, the number of jig vessels, between zero and 10, the number of pot vessels between zero and seven, and the number of trawl vessels between 15 and 37. The trawl vessels accounted for the largest volume of fish harvested among these fleet segments.

Table 10-11 Number of active catcher vessels,

Numbers of vessels								
	Hook-and-line				Pot			
Year	541	542	543	Aleutians	541	542	543	Aleutians
2004	2	2		2				
2005		1		1				
2006	3			3	3	3		4
2007	8	3		8	6	2		7
2008	9	5		9	6			6
2009	5			5				
	Jig				Trawl			
Year	541	542	543	Aleutians	541	542	543	Aleutians
2004					19	16		20
2005	1			1	15	6		15
2006	1	1		1	20	18	1	24
2007	2			2	37	23	1	37
2008	9	7		10	36	17	2	36
2009	2			2	25	15	2	27

Source: NMFS AKR estimates from CAS.
Note: "Aleutians" is the number of unique vessels using that gear type in all three areas during the listed year, and is not the sum of the number of unique vessels in each area.

Table 10-7 shows the percentages of catcher vessel harvests of Pacific cod in the Pacific cod target. The sector has taken almost all of its harvests in targeted Pacific cod fisheries. The overall sectoral percentages are dominated by trawl production. In many years hook-and-line harvests have come in large part as incidental catches in other targeted fisheries, such as sablefish.

Table 10-12 shows that the catcher vessel fleet has accounted for a harvest with an ex-vessel (to the fishermen) value of between about $4 million and about $18 million. Gross revenues rose each year from 2005 through 2008, and then fell off precipitously in 2009. The table also shows the first wholesale value to shoreside processors, shoreside floating processors, or vessels acting as motherships that accepted delivery of Pacific cod from catcher vessels. These wholesale gross values ranged between $10 million and $30 million.

Table 10-12 Estimated ex-vessel gross revenues for catcher vessels targeting Pacific cod in the Aleutian Islands, 2004 through 2009, and estimates of the gross first wholesale value of processed product from their landings.

Ex-vessel value of catcher vessel landings									
	Metric tons					Gross ex-vessel revenue (in millions of $)			
	541	542	543	Total	$/mt	541	542	543	Total
2004	11,034	2,468	13	13,515	473	5.2	1.2	0.0	6.4
2005	6,711	1,297	C	8,007	531	3.6	0.7	C	4.3
2006	5,139	1,064	1,036	7,239	776	4.0	0.8	0.8	5.6
2007	11,237	1,127	1,068	13,432	966	10.9	1.1	1.0	13.0
2008	10,613	675	3,117	14,404	1,236	13.1	0.8	3.9	17.8
2009	9,753	1,856	3,460	15,069	481	4.7	0.9	1.7	7.2
Average	9,081	1,414	C	11,944	744	6.9	0.9	C	9.0
Median	10,183	1,212	C	13,473	654	5.0	0.9	C	6.8
Minimum	5,139	675	C	7,239	473	3.6	0.7	C	4.3
Maximum	11,237	2,468	C	15,069	1,236	13.1	1.2	C	17.8
Wholesale gross value associated with catcher vessel landings									
	Metric tons landed round weight					Gross wholesale revenue (in millions of $)			
	541	542	543	Total	$/mt	541	542	543	Total
2004	11,034	2,468	13	13,515	959	10.6	2.4	0.0	13.0
2005	6,711	1,297	C	8,007	1,268	8.5	1.6	C	10.2
2006	5,139	1,064	1,036	7,239	1,581	8.1	1.7	1.6	11.4
2007	11,237	1,127	1,068	13,432	2,145	24.1	2.4	2.3	28.8
2008	10,613	675	3,117	14,404	2,062	21.9	1.4	6.4	29.7
2009	9,753	1,856	3,460	15,069	1,188	11.6	2.2	4.1	17.9
Average	9,081	1,414	C	11,944	1,534	14.1	1.9	C	18.5
Median	10,183	1,212	C	13,473	1,425	11.1	1.9	C	15.4
Minimum	5,139	675	C	7,239	959	8.1	1.4	C	10.2
Maximum	11,237	2,468	C	15,069	2,145	24.1	2.4	C	29.7

Notes: Catches are in metric tons round weight retained catch, including targeted and incidental and Amendment 80 and CDQ. "C" combined with column to left for confidentiality
Source: NMFS AKR; ex-vessel $/mt from Aleutian Islands trawl fish tickets; wholesale $/mt from 2009 and 2010 Groundfish Economic SAFEs, Table 27.

Table 10-13 shows that the catcher vessels active in the Aleutian Islands Pacific cod fishery in any year earned between 12 percent and 25 percent of their annual fishing gross revenues in and off Alaska from that fishery. The percentage fell from 2004 to 2006, and then rose from 2006 to 2008–09. The estimates in the table combine the experience of both fixed gear and trawl catcher vessels. The fixed gear vessels actually earned a smaller proportion of their revenues from the Aleutian Islands Pacific cod than the trawlers. The fixed gear percentages, for the years in which the information is not confidential, earned from 3 percent to 15 percent of their revenues from Aleutian Islands Pacific cod. The trawl percentages were very similar to those shown in the table.

The numerators and denominators in the percentages are estimates. The denominators include revenues from fishing by the vessels in state and federal fisheries in and off Alaska. To the extent that vessels earn revenues from regions outside of Alaska, or from non-fishing activities, or to the extent that the firm owning the vessel owns other revenue-producing vessels, the percentages will overstate revenues accruing to the vessel and/or firm from Pacific cod fishing in the Aleutian Islands as well. No incidental catch is included in the Aleutian Island estimates (although this is a relatively clean fishery). There is some evidence from fish tickets of a trawl catcher vessel Aleutian Islands Pacific cod value premium.[18] This is accounted for in the numerator values which are based on Aleutian Islands ex-vessel prices, but not in the denominator. This may inflate the percentages. Non-fishing revenues—for example, from salmon tendering—are not included in the denominator.

[18] Fish tickets lend themselves to finer scale spatial disaggregation than the COAR reports, used to estimate wholesale prices in sub-sections 10.2.2 and 10.2.3.

Table 10-13 Proportion of catcher vessel gross revenues earned from fishing for Pacific cod in the Aleutian Islands, 2004–2009.

Year	Revenues from Pacific cod in the AI (millions of $)	All revenues from fishing in Alaska (millions of $)	Percentage of all revenues from the AI (millions of $)	Number of vessels included in calculation
2004	6.4	31.6	20%	23
2005	4.3	25.2	17%	17
2006	5.6	46.2	12%	28
2007	13	70.6	18%	44
2008	17.8	73.6	24%	50
2009	7.2	29.3	25%	27

Notes: Aleutian Islands revenues are revenues from targeted and incidental harvests of Pacific cod by the vessels fishing there. “All revenues” are revenues from all fishing sources in state and federal fisheries in Alaska, for the vessels retaining Pacific cod in the Aleutian Islands. Notes: Vessels are those targeting Pacific cod.
Source: AKR calculations based on CAS, AFSC price estimates, AFSC estimates of vessel revenues from all sources

The Pacific cod fishery by catcher vessels in the Aleutian Islands is largely conducted by trawl vessels and is seasonal with the majority of harvests occurring from February to April. Catcher vessels targeting Pacific cod largely focus effort in Area 541, around Adak and Atka Islands. Some effort occurs in Areas 542 and 543, primarily by catcher vessels delivering to motherships. Effort in Area 543 by catcher vessels was minimal prior to 2006. In 2006 and 2007 approximately 1,000 metric tons were taken in this area. In 2008 and 2009, the catch in Area 543 increased to 3,000 metric tons.

Northern Economics (2001b) provides estimates of numbers of vessels falling into seven categories of catcher vessels. Categories were defined by gear type, vessel length, and AFA eligibility. The report provides estimates of the number of vessels and the number of crew members in each category. This permits an estimate of the average number of crew. Among the fixed gear and trawl categories over 60 feet, crew size estimates ranged from an average of four and a half for trawlers to an average of five and a half for fixed gear vessels. Estimates of catcher vessel numbers were supplied in sub-section 10.2.4. Applying these average crew sizes to the number of catcher vessels operating in 2008, provides estimated crew sizes of 138 fixed gear catcher vessel crew, and 162 trawl catcher vessel crew. Applying the crew sizes to the number of catcher vessels in 2009, provides estimated crew sizes of 122 trawl catcher vessel crew, and 28 fixed gear catcher vessel crew.

Catcher vessels deliver their products to several outlets. These include catcher/processors, such as the F/V *Katie Ann* (discussed in sub-section 10.2.2), shoreside processors, or floating processors. There are relatively few delivery points compared to the catcher vessels and this discussion is limited out of a concern for confidentiality issues.

Catcher vessels may also deliver Pacific cod to shoreside processors, a shoreside floating processor, or motherships. Within Area 541, Adak and Atka have shoreside processing plants. Atka Pride Seafoods in Atka has not processed Pacific cod in the past. The plant at Adak was very active processing Pacific cod, but the firm operating this plant filed for bankruptcy in late 2009, and the future of Pacific cod processing at that community is uncertain. The owners of the plant at Adak have recently waived their rights to confidentiality in another analysis, and the information from that analysis is summarized in the discussion of Adak in sub-section 10.2.8. Relatively small amounts of unprocessed catcher vessel product have been delivered to Unalaska and Akutan.

Floating processors are vessels that anchor within State waters and accept deliveries. An important floating processor in the Aleutian Islands Pacific cod fishery is Trident’s vessel, the M/V *Independence*. The M/V *Independence* (353 feet long, with a crew of about 235 when processing Pacific cod) has recently been processing Pacific cod in the winter-spring season and salmon in the summer. In the past she has processed crab. Normally, she travels from Seattle and begins her Pacific cod season with operations near Akutan. As the season progresses, she works west to locations in Area 541, first near

Atka, and later near Adak. Following the closure of the federal/parallel fishery, she may process fish caught in the GHL fishery. After the Pacific cod fishery she travels to Seattle, returning to Alaska for the salmon season later in the spring. Her year normally concludes by the end of August or early September when she returns to Seattle. The M/V *Independence* may buy from as many as 20 catcher vessels, independents as well as Trident boats, mainly from trawlers but from some fixed gear vessels as well. She supplies a variety of markets. Her two most important products are a finished, trimmed, boned out, individually quick frozen fillet product (Costco is among the markets for this) and a headed and gutted product, exported to many countries. Aside from providing a market for catcher vessels, the M/V *Independence* interacts with local communities through its needs for logistical support and State of Alaska fish taxes (Soper, McManus, Scheibert, personal communication).[19]

Catcher vessels fish in federally managed fisheries under the authority of licenses issued under a limited entry program. Vessel licenses carry endorsements, authorizing fishing in different areas with trawl and non-trawl gears. In general, vessels with endorsements to fish in the Aleutian Islands area are also endorsed to fish in the Bering Sea. An examination of the 2010 vessel license list showed just 12 non-trawl vessels with an Aleutian Islands endorsed license that was not also endorsed for the Bering Sea non-trawl fishing.[20] Two of these had Bering Sea trawl endorsements. During the years 2004 through 2009, only one of these fished for Pacific cod in the AI. Trawl catcher vessels endorsed to fish in the Aleutian Islands in 2010 all had licenses endorsed to operate trawl gear in the Bering Sea (Based on a review of vessel license file for November 16, 2010; NMFS AKR in-season management).

10.2.5 State of Alaska GHL fishery[21]

In February, 2006, the Alaska Board of Fisheries approved regulations creating a non-exclusive state-waters Pacific cod fishery in the Aleutian Islands. The fishery was established to encourage the economic development of Adak. The following excerpt from Milani (2009) and amplified by Milani, Bowers, and Barnhart for this analysis, provides a regulatory history through 2010[22]:

Regulations for Aleutian Islands state Pacific cod fishery as of June 2010:

1. Area is Aleutian Islands west of 170.
2. The guideline harvest level (GHL) is 3% of federal BSAI Pacific cod ABC.
3. Max of 70% of GHL is available before June 10.
4. Fishery “A” season opens 4 days after the closure of the federal BSAI CV Pacific cod trawl fishery, when federal BSAI CV Pacific cod trawl fishery reopens.
5. Fishery “A” season closes when GHL is reached or on April 1.
6. If there is remaining “A” season GHL, fishery “A” season will reopen after federal BSAI CV Pacific cod trawl fishery closes.
7. “A” season legal gear is non-pelagic trawl for vessels ≤100 feet LOA, jig and longline for vessels ≤58 LOA, and pot for vessels ≤125 LOA

[19] Paul Soper, Vic Scheibert, and Jim McManus, officials of the Trident Company. Seattle, WA. Personal communication, September 27, 2010.

[20] Since vessels might carry more than one license, it is possible that some of these 12 vessels carried another license, not reviewed here, that permitted non-trawl or trawl fishing in the Bering Sea. Thus this estimate of 12 may be high.

[21] In this analysis, the State managed fishery in State waters that takes place while the federal fishery is open is called the “parallel fishery.” The State managed fishery in State waters that takes place when the federal fishery is closed, the fishery discussed in this section, is called the “GHL fishery.”

[22] Krista Milani. NMFS, AKR. Dutch Harbor. personal communication. August 3, 2010. Forrest Bowers, ADF&G, Dutch Harbor. personal communication August 5, 2010; Heather Barnhart. personal communication. August 6, 2010.

8. Fishery "B" season opens on June 10.
9. Fishery "B" season closes when GHL is reached or on Sept 1, when federal BSAI CV Pacific cod ≥60 feet for pot gear opens.
10. If there is remaining "B" season GHL, fishery "B" season will reopen after federal BSAI CV Pacific cod ≥60 feet for pot gear closes.
11. From June 10–July 31 "B" season is open to trawl, jig, longline, and pot gear for vessels ≤60 LOA.
12. August 1–December 31 "B" season is open to trawl, jig, and longline vessels ≤60 LOA, and pot vessels ≤125 LOA.
13. A vessel may concurrently utilize both jig and longline gear.
14. 150,000 lb trip and daily limit is in place.
15. All NMFS Steller sea lion closures, Aleutian Islands Habitat Conservation Area closures, and coral garden closures that are in effect during the parallel season remain closed during the state-waters Pacific cod fishery.

Historical regulations for Aleutian Islands state Pacific cod fishery:

The fishery GHL was set by regulation at three percent of the federal BSAI ABC with a maximum of 70% of the GHL available before June 10. By regulation the fishery opened on or after March 15, at the conclusion of the initial parallel catcher vessel trawl fishery for Pacific cod in the federal BSAI Area. Non-pelagic trawl, longline, jig, and pot gear were all permissible in the 2006 fishery and there were no vessel size limits. Trawl and longline gear could not be used from May 1 through September 15, unless operating in the Adak vessel length and gear restriction zones. The Fishery Management Plan stipulated a daily harvest limit of 150,000 pounds and a 300,000 pound trip limit. All Pacific cod was required to be retained and any overage was required to be immediately reported to ADF&G, with proceeds from the overage forfeited to the state. In addition, all fishers were required to report daily to ADF&G the pounds of Pacific cod taken by the vessel.

All NMFS Steller sea lion closures, Aleutian Islands Habitat Conservation Area closures, and coral garden closures that are in effect during the parallel season remain closed during the state-waters Pacific cod fishery.

In October of 2006, the BOF made several changes to the Aleutian Islands Pacific cod management plan. The management plan defined the portion of the GHL available before June 10 as the A season, and the portion available after June 10 as the B season. The A season opening date was changed to four days after the closure of the initial parallel catcher vessel trawl fishery for Pacific cod in the federal BSAI Area. Vessel size limits of 125' or less length overall (LOA) for pot vessels, 100' or less LOA for trawl vessels, and 58' or less LOA for longline and jig vessels were adopted. In addition, the trip limit was lowered to 150,000 pounds. The vessel size limits and smaller trip limits were adopted in part to slow the pace of the fishery during the A season. The BOF repealed the regulations applying to the Adak vessel length and gear restriction zones for the duration of the state-waters fishery. The regulation which allowed unharvested state-waters Pacific cod to be utilized by NMFS was repealed as well. The new regulations took effect beginning in the 2007 fishery.

In December 2008, the BOF passed a new regulation prohibiting vessels >60 from participating in the B season which went in to place for the 2009 June 10 B season opening.

In February 2010 the BOF again amended the management plan allowing pot vessels ≤125 feet LOA to participate in the B season beginning on August 1. From June 10 to July 31 the B season would still be restricted to vessels ≤60 feet. These new regulations took effect in the 2010 June 10 B season.

Table 10-14 and Table 10-15 summarize key information about this state waters fishery for 2006 through 2009. Annual harvest information for 2006, 2009, and 2010 is confidential. During 2007 and 2008, this fishery harvested about 11.6 million pounds a year, or about 5,300 metric tons. This was about 16 percent of the total harvest of the federal parallel fishery and GHL harvest from the three Aleutian Island management areas during those two years.[23]

Table 10-14 Summary information on the state waters Pacific cod fishery in the Aleutian Islands.

Year	Season	Initial GHL (millions of whole pounds)	Harvest (millions of whole pounds)	Vessels (number)	Fishery value (millions)	Average dollars/lb
2006	A	8.9	8.5	26	$1.3	$0.23
	B	3.8	C	5	C	C
	Total	12.8	C	30		
2007	A	8.1	8.2	27	$3.6	$0.45
	B	3.5	3.4	15	$1.3	$0.52
	Total	11.6	11.6	41		
2008	A	8.1	7.5	30	$4.5	$0.63
	B	3.5	4.2	18	$1.8	$0.57
	Total	11.6	11.7	45		
2009	A	8.4	5.5	22	$0.4	$0.25
	B	3.6	C	C	$0.6	$0.22
	Total	12.0	C	C	CF	CF
2010	A					
Source: Milani (2009); Milani, Bowers, Barnhart, personal communication "C" is confidential						

Table 10-15 shows estimates of harvest by gear type and season in the GHL fishery. Much of this information is confidential, however, the table does suggest that trawl and pot gear dominate the aggregate harvests. The trawl fishery takes place in the "A" season, while the pot harvest is divided between the two seasons.

Table 10-15 Harvests by gear type in state-waters Pacific cod fishery in the Aleutian Islands (millions of whole pounds).

Year	Season	Longline	Trawl	Pot	Jig	Total
2006	A	C	7.1	C	0	8.5
	B	C	0	C	0	C
2007	A	O	7.0	1.2	0	8.2
	B	C	0	2.4	C	3.4
2008	A	C	6.1	C	0	7.5
	B	0.4	0	3.8	0.1	4.2
2009	A	C	1.3	3.9	C	5.5
	B	C	C	C	C	C
2010	A					
Source: Milani (2009) ; Milani, Bowers, Barnhart, personal communication. "C" is confidential						

10.2.6 CDQ Program

The CDQ Program was designed to improve the social and economic conditions in western Alaska communities by facilitating their economic participation in the BSAI fisheries. The large scale commercial fisheries of the BSAI developed in the eastern Bering Sea without significant participation from rural western Alaska communities. These fisheries are capital-intensive and require large investments in vessels, infrastructure, processing capacity, and specialized gear. The CDQ Program was

[23] Estimated using the GHL harvests from Table 10-15, and the federal and parallel Pacific cod harvests reported in Table 10-5.

developed to redistribute some of the BSAI fisheries' economic benefits to adjacent communities by allocating a portion of commercially important BSAI species, including halibut, crab, pollock, and various other groundfish, to such communities.

The percentage of each annual BSAI catch limit allocated to the CDQ Program varies by both species and management area. These allocations, in turn, provide an opportunity for residents of these communities to participate in and benefit from the BSAI fisheries.

A total of 65 communities are authorized under section 305(i)(1) of the Magnuson-Stevens Fishery Conservation and Management Act to participate in the program through six CDQ entities.[24] These CDQ entities are non-profit corporations that manage and administer the CDQ allocations, economic development projects, and investments, including ownership interest in the at-sea processing sector and catcher vessels. Annual CDQ allocations provide a revenue stream for CDQ entities through various channels, including the direct catch and sale of some species, leasing quota to various harvesting partners, and income from a variety of investments. Geographically dispersed, the member communities extend westward to Atka, on the Aleutian Island chain, and northward along the Bering Sea coast to the village of Wales, near the Arctic Circle. The 2000 population of these communities totaled over 27,000 persons, of whom approximately 87 percent were Alaska Native. In general economic terms, CDQ communities are remote, isolated settlements with few commercially valuable natural assets with which to develop and sustain a viable, diversified economic base. As a result, economic opportunities are few, unemployment rates are chronically high, and communities and the region are economically depressed. The CDQ Program ameliorates some of these circumstances by providing an opportunity for residents of CDQ communities to directly benefit from the BSAI fishery resources.

The CDQ Program was implemented by the Council and NMFS in 1992 with allocations of 7.5 percent of the BSAI pollock TAC. Allocations of halibut and sablefish were added to the program in 1995. Authorization for the CDQ Program was added to the Magnuson-Stevens Fishery Conservation and Management Act by the U.S. Congress in 1996. In 1998, the Council expanded the CDQ Program by adding allocations of the remaining groundfish species, prohibited species, and crab. Currently, the CDQ Program is allocated portions of the groundfish fishery that range from 10.7 percent for Amendment 80 species, 10 percent for pollock, and 7.5 percent for most other species.

The Atka mackerel CDQ allocation is divided among the three management areas in proportion to the allocation of TAC across those three areas. In the five-year period from 2005 through 2009, CDQ groups were able to use their Atka mackerel allotments effectively, normally fishing over 95 percent of each. The only instance in which the harvest fell below 90 percent was in 2005, when only about 85 percent of the Area 541-Bering Sea CDQ allotment was harvested.

Allotments are not distributed equally among the six CDQ groups. Table 10-16 shows the distribution in 2010. These have not changed since 2006. Three groups, APICDA, BBEDC, and YDFDA, have relatively large allotments of Amendment 80 species. APICDA, especially, gets a relatively large share of the Atka mackerel allotment (30 percent). One CDQ group, CBSFA, has relatively small allotments of Amendment 80 species (8 percent to 9 percent of each).

[24] The CDQ entities include the Aleutian Pribilof Island Community Development Association (APICDA), the Bristol Bay Economic Development Corporation (BBEDC), the Central Bering Sea Fishermen's Association (CBSFA), the Coastal Villages Region Fund (CVRF), the Norton Sound Economic Development Corporation (NSEDC), and the Yukon Delta Fisheries Development Association (YDFDA).

Table 10-16 Proportional allotments of Amendment 80 species CDQ allocations among CDQ Groups in 2010.

	APICDA	BBEDC	CBSFA	CVRF	NSEDC	YDFDA
Pacific cod	15	21	9	18	18	19
Atka mackerel	30	15	8	15	14	18
Yellowfin sole	28	24	8	6	7	27
Rock sole	24	23	8	11	11	23
Flathead sole	20	21	9	15	15	20
Pacific ocean perch	30	15	8	15	14	18
Source: NMFS AKR worksheet accessed at http://alaskafisheries.noaa.gov/cdq/current_historical.htm on July 2, 2010.						

Most Pacific cod CDQ is harvested in the Bering Sea, rather than in the Aleutian Islands. Table 10-17 shows harvests of Pacific cod CDQ in each of the three Aleutian Islands management areas, and in the BSAI as a whole. From 2004 through 2009, from 2 percent to 16 percent of the harvest of the annual CDQ Pacific cod allocation was harvested in the Aleutian Islands fisheries.

Table 10-17 CDQ Pacific cod harvests in the Aleutian Islands (metric tons).

Year	541	542	543	Total	BSAI	AI % of BSAI
2004	9	246	18	273	16,024	2%
2005	690	198	114	1,002	14,689	7%
2006	756	263	81	1,101	14,256	8%
2007	1,684	158	226	2,068	12,773	16%
2008	1,435	186	109	1,730	18,181	10%
2009	628	159	100	887	18,552	5%
Source: AKR CAS; annual BSAI CDQ harvests from the AKR catch reports website: http://www.alaskafisheries.noaa.gov/sustainablefisheries/catchstats.htm						

In 2007, the six CDQ entities held approximately $543 million in assets. Since inception of the CDQ Program in 1992, the CDQ entities have generated more than $204 million in wages, education, and training benefits. CDQ entities fund fisheries infrastructure investments such as docks, harbors, seafood processing plants, and fisheries support centers, and vessels such as motherships and catcher/processors that operate in crab, halibut, and groundfish fisheries. In 2007, fisheries and fishery related investments by the six CDQ entities totaled more than $140 million, primarily in the BSAI. Local programs purchase limited access privileges in the fishery and acquire equity position in existing fishery businesses. The six CDQ entities had total revenues in 2007 of approximately $170 million, of which 41 percent ($70 million) was derived from CDQ royalties. Income from sources other than royalties has exceeded royalty income since 2004, with direct income accounting for 54 percent to 59 percent of revenues annually (WACDA 2007).

Pollock royalties are a very important source of CDQ Program revenues that directly fund investments in the region. Pollock royalties have historically represented about 80 percent of total annual royalties from the CDQ allocations and, in 2005, were approximately $50 million. Specific information about total annual pollock royalties for all CDQ entities combined has not been publically available since 2005.

10.2.7 Subsistence use of Steller sea lions

Alaska Natives hunt Steller sea lions for subsistence. They have done so for at least 6,000 years, as indicated by remains found at prehistoric archeological sites (Turek et al. 2008:14). Harvest data collected intermittently between 1981 and 1991, from 25 communities on the lower Alaska Peninsula, lower Cook Inlet, Prince William Sound, and Kodiak Island, indicate an annual harvest of between 300 and 400 animals in those areas (Turek et al. 2008:34). Systematic harvest estimates are available from 1992 through 2008; the point estimates of total takes (harvested animals and animals struck and lost) range from 146 animals in 2008 to 549 animals in 1992. The 95 percent confidence interval around the 2008 point estimate was 106 to 224 animals. The harvest declined from 1992 to 1996, and then leveled off at a lower level through 2008 (Wolfe et al. 2009:25–26).

Relatively small numbers of subsistence users harvest Steller sea lions. In 2008, an estimated 57 Alaska Native households reported hunting Steller sea lions, and an estimated 50 households reported harvesting sea lions. These participation levels had dropped considerably since 1992, when 135 households reported hunting sea lions, and 91 reported harvesting sea lions. In 2008, 96.8 percent of the households surveyed did not hunt Steller sea lions (Wolfe et al. 2008:35, 38).

Larger numbers of households are affected by subsistence harvests, since Steller sea lion products are distributed through subsistence trade and sharing networks (Wolfe et al. 2009:38). For example, in Atka, a small community in Area 541 for which subsistence survey information was collected in 2008, there were 25 Native households and an estimated Native population of 84 persons. Atka residents harvested an estimated 35 sea lions in 2008. An estimated 40 percent of the households harvested sea lions, 70 percent received sea lion products, and 60 percent gave away sea lion products (Wolfe et al. 2009:C-91). The reported survey information does not distinguish between sea lion products entering and leaving the community. The percentages suggest that people receiving sea lion products will also give them away, and that households harvesting sea lions may still receive sea lion products through exchange networks.

Atka is one of two Alaska communities within the action area of Areas 541, 542, and 543. Atkans are relatively active in Steller sea lion harvests and distribution, compared to residents of other Alaska subsistence communities. The 2008 Atka harvest of 35 sea lions was a large percentage of the statewide 2008 harvest of 146 sea lions. The other community in this action area is Adak. Residents of Adak are estimated to have taken four sea lions in 2008 (Wolfe et al. 2009:C–87).

Turek et al. (2008), citing Haynes and Mishler (1991:14), describe the traditional subsistence uses for sea lions:

> Traditionally, Steller sea lions were taken for food, clothing, and for materials for skin boats. Sea lion blubber and meat, including the livers and hearts, was dried, baked, boiled, or eaten raw. Boots soles were made from the skin of the flippers and boot uppers from the skin of the throats. The stomach was used as a water-tight container, and the bladder was made into a fishing float. Sea lion whiskers decorated wooden hunting hats and cleaned tobacco pipes.

As noted, harvests of sea lions declined in the early 1990s and then leveled off for the remainder of the period. Subsistence harvests of sea lions have not been regulated or controlled by the state or federal government; therefore, this is not the reason for the decline in subsistence hunting. The size of the sea lion population could affect this in three ways. [25]

First, a smaller population may lead to lower catch per unit of effort. Even if effort stayed at historical levels, catches could drop. Steller sea lions aggregate reasonably persistently at known haulout and rookery locations year after year. Declining populations would still do so, except if a haulout or rookery population crossed a threshold leading to abandonment of a site. Under these circumstances catch per unit of effort could remain relatively high as population declined.

[25] It is possible that increasing productivity in other subsistence activities, or increasing wage income opportunities, may increase the opportunity costs of hunting sea lions. Desire to harvest Steller sea lions may also change as village culture evolves.

Second, it is unlikely that effort would stay at historical levels. If catch per unit of effort gets smaller, time required to find and kill each sea lion increases, and the opportunity costs of harvesting sea lions, as opposed to pursuing other subsistence activities, or using time for other purposes, becomes larger. A day spent hunting sea lions would have a higher cost in terms of forgone harvests of other fish and game species. Some subsistence hunters would spend less time hunting sea lions, and others would stop hunting altogether.

Third, publicity about declining stocks and the listing of the animals may cause subsistence hunters to stop hunting because of a conservation motive, or out of confusion about hunting regulations. Haynes and Mishler (1991:33) observed “a widespread misapprehension among Native hunters that it is illegal for them to take sea lions for subsistence because of their widely publicized listing as a threatened species. All over the state Native hunters are increasingly afraid of being prosecuted if they do take sea lions…. This misunderstanding in itself will almost certainly lead to a reduced overall harvest in coming years.”

The available information is not sufficient to discriminate between these reasons for the decline in harvests. The impact of this action on subsistence communities is discussed in section 10.4.

10.2.8 Regional communities potentially affected by this action

Communities in Alaska and in the Pacific Northwest may be affected by this action through changes in demand for the goods and services they provide to fishing firms in their home ports, or in ports used by the firms for logistical support (indirect impacts). These, and additional, communities may also be affected as incomes from fishing operation shares and wages, profits, or royalties, and income in indirect sectors, change and, in turn, impact demand for goods and services people consume in their personal lives (induced impacts). This section provides background on communities that may be most affected by this action.

Adak, Atka, and Unalaska

Three fishery-dependent communities have been singled out for special attention in this analysis. Adak, Atka, and Unalaska are relatively small, remote communities and are dependent on BSAI fisheries for employment, income, and tax revenues.[26]

Unalaska is the biggest, with a population that ranged between about 3,500 and 4,400 persons over this period. The population has generally fallen since 2003. Adak and Atka are much smaller. Adak’s population has ranged between about 70 and about 320 persons over this period, while Atka’s has ranged between about 70 and about 100. Adak’s population was about 300 in 2000, then fell to about 70, before rebounding somewhat to about 170 at the close of the period. Atka’s population has varied less, but ended the period at the low end of its range.

[26] At the special August 2010 meeting of the Council, the SSC specifically pointed to the need to provide a more detailed description of the impacts of the action on these three communities.

Adak[27]

Like the rest of the Aleutian Islands, Adak was historically settled by the Unangan people.[28] The once heavily-populated island was abandoned in the early 1800s as the Aleutian Island hunters followed the Russian fur trade eastward, and famine set in on the Andreanof Island group. However, the Unangans continued to hunt, trap, and fish around the island until World War II (NPFMC 2009b:36).

A large military base at Adak, developed during the war, supported the U.S. offensive against the Japanese-held islands of Kiska and Attu. After World War II, a Naval Air Station at Adak played an important role during the Cold War, as a submarine surveillance center. At its peak, the station housed 6,000 naval personnel and their families (NPFMC 2009b:37).

The station officially closed on March 31, 1997, and the Aleut Corporation acquired a significant portion of Adak Island, along with the naval facilities, under the base realignment and closure, and other, federal land transfer processes. This was a complicated multi-step process that ultimately resulted in a land exchange between the Aleut Corporation and the U.S. Fish and Wildlife Service (USFWS). A significant portion of land on the southeastern edge of the former military-controlled land was retained as Federal land, due to its high wildlife value and its connection to other USFWS owned land. The Aleut Corporation has sought to develop Adak as a commercial center and civilian community with a private sector economy focused heavily on commercial fishing (NPFMC 2009b:37).

Adak has had mixed success in developing fisheries for a resident fleet to be able to deliver to a shoreside processor located on Adak. Through Congressional action, Adak currently receives an exclusive allocation of Western Aleutian Islands golden king crab (allocated to a non-profit entity representing Adak) and an exclusive allocation of Aleutian Islands pollock awarded to the Aleut Corporation (commercial pollock fishing had, until this exclusive allocation, been closed in the AI management area). The Adak seafood processing plant, to date, has processed only a small amount of Aleutian Islands pollock, since the implementation of the 2005 set-aside. Critical habitat issues severely constrain the fishery, and almost all pollock has been harvested under experimental fishery permits thus far (NPFMC 2009b:37). In 2006, the State of Alaska created its Aleutian Islands Pacific cod fishery (GHL fishery), in order to provide economic opportunities at Adak (Milani 2009:7). In 2008, Adak Fisheries asked NMFS to develop an emergency rule to require that all trawl harvested Pacific cod in the region be delivered onshore in the 2009 “A” season (NPFMC 2009b:36). NMFS did not adopt this proposal. The Council is currently considering measures to restrict some catcher/processors from operating as motherships in the central and western Aleutian Islands, in order to protect Adak’s position as a market for Aleutian Islands Pacific cod (NPFMC 2009b:vi).

The local fleet in Adak remains fairly small, composed primarily of vessels 32’ or less in length. A recent community profile (EDAW 2008a) reports that at the time of fieldwork in 2007, five small vessels were considered “local” by residents and actively engaged in, or attempted to be engaged in, local fisheries. Additionally, there are a number of other vessels that spend time in Adak and may have the community name painted on their vessel, but are not considered part of the local fleet by Adak residents, as they have stronger homeport linkages and fishing effort ties elsewhere (NPFMC 2009b: 37). Table 10-19, which summarizes information on the home ports for vessels targeting Pacific cod in the Aleutian Islands, shows

[27] This description of Adak draws heavily on a description originally prepared for the Council (NPFMC 2009:36–38).

[28] “Unangan” is the name by which the original inhabitants of the Aleutian Islands referred to themselves. “Aleut” was a name introduced by the Russians. Unangan is used here, following the practice of Sepez et al. (2005), Langdon (2002), and Bielawski (2007).

that, in 2008, 6 vessels identified Adak as their home port. These were vessels using hook-and-line and jig gear. The preceding year a pot catcher vessel had identified Adak as its home port.

According to preliminary Commercial Fisheries Entry Commission (CFEC) data, eight permits were held by three permit holders in 2009. Two of these permit holders fished four of the permits. The permits were all groundfish (including sablefish) or halibut permits. Most of the permits were for fishing with longline gear from vessels under 60 feet in length, but one permit (which apparently went unfished in 2009) authorized its holder to use mechanical jig gear. In addition, five persons held crew member licenses in 2009. These permit holdings are broadly similar to those in 2008 (although in 2008 there was one less permit, one less permit holder, and the jig permit was fished) (CFEC online reports).[29]

Adak has one fish processing plant. In past years, the activity in the Adak processing plant has been greatest in January through March, relatively quiet from April through June, and then runs about half-speed from July through September, before activity tapers off from October into November. The "A" season Pacific cod fishery is the main source of income for the plant (and raw fish tax revenue for the City of Adak), accounting for about 75 percent of plant revenue. Beyond the processing crew that comes to the community during peak processing periods, between 7 and 10 plant employees live in the community year-round. A number of other local residents fill in for short periods of time, when additional labor is needed at the plant. During a normal winter-spring busy season, the plant might employ an average of 60 persons, with a peak of 150 about March 1 (EDAW 2008a:3-65, 3-66).

The plant at Adak has been heavily dependent on the deliveries of Pacific cod in recent years. Detailed information on deliveries and production at the plant in recent years is available in the public record in light of a waiver the plant owners signed to allow that information to be used in a Council analysis in 2009 (NPFMC 2009:60). Data from this source is summarized in Table 10-18. In recent years, the plant has processed some halibut and golden king crab, but most of the product by volume has been groundfish, and most of this groundfish has been Pacific cod. In 2008, the volumes of crab were confidential, and 218 metric tons of halibut were processed. In addition, the plant processed about 6,400 metric tons of groundfish, about 5,600 mt (about 87 percent) of which were Pacific cod. Volumes of groundfish were greater in 2007, but the proportions were similar. Of about 14,000 metric tons of groundfish processed in 2007, about 89 percent was Pacific cod (NPFMC 2009:40).

A significant amount of the Pacific cod processed in Adak has come from the State of Alaska's GHL fishery for Pacific cod, since that began in 2006. Pacific cod from the GHL fishery accounted for about 14 percent of the Pacific cod deliveries to the plant in 2006, and about 23 percent in each of 2007 and 2008 (NPFMC 2009:40).

Most of the product delivered from the Federal and the State parallel fisheries has come from Area 541. A significantly smaller amount has come from area 542. Over the period 2002 through 2008, an average of 88 percent of the Pacific cod delivered to Adak came from Area 541, and an additional 12 percent came from Area 542. During this period, on average, 63 percent of the Aleutian Islands catcher vessel deliveries of Pacific cod were made to Adak, annually. The broad outlines of this pattern are reported to have continued into 2009 (NPFMC 2009:60–61).[30]

[29] Specifically, the CFEC online Permit & Fishing Activity report; CFEC online Permit Holder and Crew Member Counts by Census Area & City of Residence.

[30] The percentages reported in this paragraph exclude CDQ Pacific cod.

Table 10-18 Amount of catcher vessel Pacific cod harvested in the Central and Western Aleutian Islands and delivered to Adak Fisheries, LLC, 2002–2008.

Year	Area 541		Area 542		AI total Adak landings	% of total AI CV cod landings to Adak	Total CV cod landings in AI
	mt	%	mt	%			
2002	7,091	83%	1,407	17%	8,498	56%	15,140
2003	7,776	89%	930	11%	8,706	51%	17,031
2004	8,453	90%	975	10%	9,428	69%	13,657
2005	5,280	82%	1,156	18%	6,435	81%	7,939
2006	4,986	89%	591	11%	5,576	82%	6,818
2007	8,733	91%	870	9%	9,603	84%	11,429
2008	4,043	94%	277	6%	4,319	38%	11,224
Average	6,623	88%	886	12%	7,509	63%	11,891

Source: Prepared by Council staff using ADF&G fish tickets, 2003–2008, retained catch only, NPFMC 2009:60.
Notes: Excludes CDQ harvest and State AI cod fishery harvest. A confidentiality waiver was procured from Adak Fisheries by the authors of NPFMC 2009, in order to provide these data.

The shoreside processor in Adak has seen a number of ownership changes since its establishment in 1999 as Adak Seafoods, LLC. In mid-July 2000, Norquest became a predominant partner. In January 2002, Icicle Seafoods became a relatively equal partner in the operation, which operated as Adak Fisheries, LLC. Other ownership changes ensued, although until recently, the company still operated as Adak Fisheries, LLC, and one of the two individuals who originally started the plant was still active in its ownership and operation (NPFMC 2009:38).

The significant drop in the Pacific cod markets in 2009 also affected Adak Fisheries operations. It realized a substantial reduction in the price paid per ton for frozen head and gut cod product compared to 2008. As the market dropped, many customers backed out of their pre- and in-season offers. As a result, sales of product from Adak Fisheries were well below pre-season expectations, and at the end of 2009, much of the 2009 product was in cold storage. At that time, Adak Fisheries was almost paid up for all fish delivered during the Federal Pacific cod A season, but had been unable to pay for all fish delivered in the State water A season and Federal B season. At the same time, Adak Fisheries did not pay its power bill in full, so power was shut off to the plant in the spring of 2009. Power is supplied by TDX, a power production and distribution company owned by an Alaska Native village corporation. In effect, the plant was essentially in hibernation mode, using generators to keep limited power to the building. Adak Fisheries essentially stopped processing after the 2009 Federal Pacific cod B season and the start of the State waters Pacific cod A season (mid-April) (NPFMC 2009:38).

In September 2009, Adak Fisheries officially filed for Chapter 11 bankruptcy. The Adak plant and related assets were transferred to a new company, Adak Seafood, LLC. Only a limited number of deliveries were made to the plant in 2010, and the future of operations at Adak is uncertain (NPFMC 2009b:38; Council 2010b: 5).[31]

Adak also provides logistic support for the fisheries of the Central and Western Aleutian Islands. The facilities and work force in Adak are much more limited than those at Unalaska. However, fishing operations do conduct crew rotations through the Adak airport. The port of Adak is also used for transferring processed product from catcher/processors to other vessels for shipment out of Alaska. For example, the owners of the F/V *Seafisher* report that their vessel conducts offloads and/or crew changes about four times per year in Adak (Kerchevel, personal communication).[32] A representative of United States Seafoods reports that in 2009, the company flew over 250 crew members through Adak, and spent over $1.2 million in the town on fuel, food, and lodging (Wood 2010).

[31] Council, 2010b provides a survey of events affecting this plant.
[32] Nancy Kercheval, President, Cascade Fisheries, Inc. Personal communication, October 8, 2010.

A consultant's report from 2008 (EDAW 2008a:3-1) indicates that there are several basic industries[33] in Adak: (1) fishing, fish processing, and fisheries support; (2) government activity; and (3) some tourism. Government activity has involved base remediation and clean-up, including the location and disposal of unexploded ordinance, activity associated with the potential location of a Department of Defense SBX radar system and support infrastructure, and seasonal USFWS logistical support for Aleutian Island operations and visitor services. Tourists arrive by air and, sometimes, by cruise ship. Attractions include the World War II and Cold War history of the region, a desire to visit or revisit the location of a relative or one's own military service, hunting for caribou, and bird watching. (EDAW 2005:3-97 to 3-102)

The 2005 EDAW study provides considerable detail about the economy of Adak, at that time. However, detailed information is not available with which to provide a precise quantitative measure of the significance of Pacific cod fishing to Adak, at present. Notwithstanding this fact, a consideration of the historical evidence, and anecdotal information, suggests that Pacific cod has been the basis of a large proportion of the economic activity at Adak. Historically, the processing plant is reported to employ 7 to 12 persons year round. This is a significant number in a community of 165. In addition, during the winter-spring Pacific cod processing period, a number of additional persons are brought in for the processing lines. These individuals spend money for food, other incidentals, and clinic services in Adak, creating additional income flows to local residents. The 2005 EDAW report notes that children of processing employees accounted for five of the 23 peak attendance students at the Adak school during the 2006–2007 year. Logistical support for vessels involves crew rotations through the airport, creating demands for transportation, food, incidentals, and lodging. As noted, the Aleut Enterprise Corporation has indicated that a significant portion of its business is connected to fueling visiting fishing vessels. This corporation employs a further 8 persons, so some of these may be there because of the fisheries.

As discussed in sub-section 10.2.9, the City of Adak earns money from the State Fisheries Business Tax and the State Fishery Resource Landing Tax. In 2008, Adak received $254,000 and $128,000 from these sources, respectively. Adak was not reported to have levied a municipal raw fish tax in 2007. The Aleut Corporation is one of the thirteen regional Native corporations, established in 1972, under the terms of the Alaska Native Claims Settlement Act (ANCSA). Through its subsidiaries, the Aleut Enterprise, LLC and the Aleut Real Estate, LLC, the Aleut Corporation and its shareholders have important investments in Adak. The Corporation's website notes that the Corporation owns the northern half of Adak Island, and goes on to say, "Subsidiary companies of the Aleut Corporation manage a year round ice-free port, a fuel farm with over 20 million gallons of storage, commercial and residential properties, and a hotel, Adak Island Inn." Aleut Corporation shareholders, thus, have an interest in the success of the community of Adak.

Atka[34]

Atka is one of the westernmost fishing communities in the Aleutian chain. The island has been occupied by the Unangan people for at least 2,000 years. The first contact with Russians occurred in 1747, and Atka became an important trade site and safe harbor for Russians. During the 1920s, Atka became relatively affluent due to fox farming. After the Japanese attacked Unalaska and seized Attu and Kiska in

[33] In economic base analysis, an economy is divided into basic and non-basic sectors. The basic sectors export goods or services in exchange for cash or financial assets. The non-basic sectors develop within the economy to service community needs. This is an extremely simplified model of a regional and local economy. An important limitation is that, by directing the focus of the analysis to exporting industries, it tends to downplay important factors, including (1) the role of financial inflows, such as pensions, Social Security, and investment income, and (2) the role that can be played by the development and deepening of the non-basic sector.

[34] This description of Atka is based on a description originally prepared for the Council (NPFMC 2009b:35–36).

June 1942, the U.S. Government evacuated Atka residents to the Ketchikan area. Atka was burned to the ground to prevent advancing Japanese forces from using it. The community was rebuilt by the U.S. Navy after World War II, and residents were allowed to return. Many Attu residents, released from imprisonment in Japan in 1945, relocated to Atka (NPFMC 2009:35).

Atka was incorporated as a second class city in 1988, and had a 2000 U.S. Census population of 92. More recently, the State of Alaska estimated a 2009 population of 70 persons. Residents of Atka are primarily Alaska Native (Unangan), and a Federally-recognized tribe is located in the community (the Native Village of Atka organized pursuant to the Indian Reorganization Act). Atka has a State-owned runway, and scheduled air services are available twice weekly from Unalaska. Planes can also be chartered from Anchorage, Cold Bay, or Unalaska. Coastal Transportation provides freight service from May to October. A new dock and port facility, operated by the city, were recently completed five miles from town (NPFMC 2009:35),

The economy is predominantly based on subsistence hunting and fishing, as well as commercial halibut and sablefish fishing and fish processing. According to preliminary CFEC data, two halibut longline permits for vessels under 60 feet in length were held by two permit holders in Atka in 2009. One of these was fished. In addition, two persons held crewmember licenses in 2009. The number of permit holders in 2009 was the lowest in the five-year period from 2005 through 2009. In 2005, the year with the greatest number of permits issued in Atka, six permit holders held 12 separate permits, of which 7 were fished. Six of these permits were for halibut, four for sablefish, one for salmon, and one for other groundfish. The "other groundfish" permit was not fished (CFEC online reports).[35]

Atka has a small onshore processor (Atka Pride Seafoods) which serves the local fleet and employs local residents. Atka is a CDQ community, represented by APICDA, and the processing plant is a joint venture between APICDA Joint Ventures and the Atka Fisherman's Association. They formed Atka Pride Seafoods in 1994, began processing in 1995, and have processed every year since. The primary species processed are halibut and sablefish, and the commercial fleet delivering to Atka is involved mainly in those fisheries. The APICDA website notes that Atka Pride Seafoods typically operates seasonally, from June through September. It also notes that the decline in Area 4B halibut quota has reduced the amount processed in Atka (NPFMC 2009:35–36).

Atka Pride has recently rebuilt its processing plant in Atka. The project began because the original facility was deteriorating, necessitating reconstruction. During the rebuild, Atka took the opportunity to remodel and upgrade the facility to provide space to process crab and Pacific cod. However, the equipment necessary for processing crab or Pacific cod has not been installed. Anecdotal evidence suggests that a high volume of cod is necessary to make Pacific cod processing operations economically viable. Adding the capacity to process Pacific cod was relatively simple and inexpensive to incorporate into the rebuild, so Atka Pride rebuilt the plant in a way that gives it the opportunity to process Pacific cod if it became worthwhile to do so. However, Atka Pride does not currently, and does not have plans to, process Pacific cod (other than incidental amounts that might be delivered with other species) at this time. (NPFMC 2009b: 36; Kyle, Snigaroff, Kimball, Lokanin, personal communication)[36]

The shoreside processor, M/V *Independence*, normally operates near Atka before moving on to Adak, and there is limited use of the town's airstrip for crew rotations. For example, the owners of the F/V *Seafisher*

[35] Specifically, the CFEC online Permit & Fishing Activity report; CFEC online Permit Holder and Crew Member Counts by Census Area & City of Residence.

[36] Joe Kyle, COO and CFO of APICDA, Mark Snigaroff of Atka, Nicole Kimball of the North Pacific Fisheries Management Council, Leonty Lokanin, Mayor of Atka, personal communications, August-September 2010.

report that their vessel conducts offloads and/or crew changes about two times per year in Atka. (Kerchevel) However, these appear to have little impact on the community. (Snigaroff, Lokanin, personal communication)

As discussed in sub-section 10.2.9, the City of Atka earns money from the State Fisheries Business Tax and the State Fishery Resource Landing Tax. In 2008, Atka received $18,000 and $16,000 from these sources, respectively. In 2007, Atka imposed a 2 percent raw fish tax and a 10 percent bed tax, raising about $26,000 and about $4,000 from these sources, respectively.

Unalaska/Dutch Harbor[37]

Unalaska faces Iliuliuk Bay on Unalaska Island in the Aleutian Islands. Dutch Harbor, on nearby Amaknak Island, is primarily an industrial area, with group housing for temporary workers. Most of the resident population at Unalaska and its port of Dutch Harbor lives in Unalaska, which is accessed from Dutch Harbor by a short bridge.

The Aleutian Islands have been populated for 3,000 to 6,000 years by the Unangan. In 1759, there were estimated to be more than 3,000 Unangan in 24 settlements on Unalaska and Amaknak. Russian traders and explorers began visiting the Aleutian Islands in 1741, and established a permanent fur-trading post at Unalaska in 1774. The Russian period brought forced labor in the fur trade for the Russian American Company, depletion of local fur-bearing animals, epidemic disease outbreaks, the Russian Orthodox religion, and an alphabet for the Aleut language. The 1867 purchase of Alaska by the United States introduced different forms of commerce, including the establishment of the Alaska Commercial Company, a fishing outfit. (Sepez, et al.)

A naval radio command station was opened in 1911. World War II brought significant military development with the population reaching 50,000 to 70,000 by 1943 (AWCRSA Profile, 2002). The Japanese bombed Dutch Harbor in June 1942, and shortly after the Unangan of Unalaska were forcibly evacuated by the United States and interned at an abandoned cannery at Burnett Inlet, near Wrangell in southeast Alaska. By 1951, the military presence was almost gone from the city. By 1960 Unalaska was the only surviving settlement out of the 24 that had existed on Unalaska and Amaknak Islands when the Russians arrived. (Sepez, et al.)

The decennial censuses between 1890 and 1970 reported a resident population ranging between 180 and 430 persons. While the population estimate for 1970 is controversial, with estimates ranging between the official U.S. census count of 178 persons, and other estimates in the area of 336 to 342 persons, it still fell into the range experienced since 1890, and was much lower than the resident population has been since that time. During the late 1970s, Unalaska experienced a boom driven by the development of the king crab fishery. A more diversified menu of fisheries was substituted when the king crab fishery went into decline. Unalaska is now one of the nation's premier fishing ports. It has been number one in the volume of landings since 1992, and for a number of years from the late eighties to the late nineties, it was number one in value. Decennial population estimates during this period were about 1,300 in 1980, about 3,100 in 1990, and about 4,200 in 2000. Population has fallen off somewhat since 2000; the State of Alaska estimates the population at about 3,700 in 2009 (EDAW, 2005; Alaska Department of Labor, Research and Analysis web pageADOL).

Unalaska's economy is based almost entirely on commercial fishing. Sepez et al. state that it is the major source of employment, accounting for over 90 percent of jobs. The source of the 90 percent estimate is unclear, but considering the growth of the town by 12 times (from about 300, to about 3,700) since the

[37] As noted earlier, Unalaska/Dutch Harbor will be generally referred to as Unalaska.

king crab boom, and considering that some fishing activity took place before the boom, this seems plausible. Employment occurs in the harvest and processing sectors, and in fishing-related services, such as fuel, vessel maintenance, trade, and transportation (Alaska Department of Community and Economic Development). A nascent tourism industry is present, with cruise ship stopovers, sport fishing, kayaking, and bird-watching attracting visitors. The subsistence economy is also still important. (Sepez, et al.)

The Atka mackerel and Pacific cod fisheries in the western and central Aleutian Islands generate economic activity in Unalaska; however, it is difficult to determine how significant that activity is in comparison with activity associated with other fisheries, including those for pollock and for crab. Relatively little Atka mackerel and Pacific cod are delivered to Unalaska for processing. Impacts associated with deliveries of processed product for transshipment, with logistical support, and from induced impacts as fishermen resident in Unalaska spend their income are probably more important.

The Atka mackerel and Pacific cod fisheries probably generate relatively little processing activity in Unalaska. Little Atka mackerel is delivered to shore for processing in Alaska. Aleutian Islands catcher vessel Pacific cod deliveries to Unalaska have been considerably lower than those to Adak. The traveling distance is much greater, leaving less time for fishing, and possibly raising product quality issues. Over the period 2003 through 2009, a total of 3,990 metric tons of Aleutian Islands Pacific cod were delivered to processors at Unalaska. This is an estimated 4.8 percent of the total Pacific cod harvest in the Aleutian Islands during that time. (NMFS AKR estimate based on eLandings). During the same period, 2003 through 2009, over 2 million metric tons of unprocessed fish products are estimated to have been landed in Unalaska. Aleutian Islands Pacific cod deliveries therefore have been less than a fifth of a percent of total landings by volume. (EDAW 2008b:2-17; NMFS, 2009:7; AKR estimate)

At Unalaska, catcher/processors transfer processed products to trampers for export to foreign markets or to vessels for shipment to U.S. markets outside Alaska. Data on the numbers of transfers of product involving Atka mackerel and Pacific cod harvested in the Aleutian Islands are not available, although conversations with NOAA Office of Law Enforcement staff familiar with product transfer records, suggest that most transfers take place in either Adak or Unalaska, with the greater proportion probably taking place at Unalaska. Relatively small numbers of transfers evidently take place in U.S. internal waters outside of a port (Hansen, personal communication).[38] Transfers may involve a direct movement of product across the dock to containers or cold storage, or they may involve the transfer from a catcher/processor anchored in the harbor directly to a receiving vessel. Union contracts for longshore service require that vessels transferring while anchored in the harbor use teams of longshore workers brought from shore to the vessels. (Robinson, personal communication; Kelty, personal communication)

Unalaska also provides support services for vessels operating in the Aleutian Islands fisheries. Quantitative information on the size of these, absolutely, and in proportion to expenditures in other fisheries is unavailable. Information on vessel visits associated with different fisheries is unavailable, as is information on the value of goods and services purchases made by these vessels. Vessels could require a wide range of services when they visit Unalaska. Vessels will often rotate significant parts of their crews through Unalaska. This would involve transportation from the airport to and from the vessel. If a rotation involves an overnight stay on shore in Unalaska, the visit would involve expenditures for a room, meals, crew member incidentals, etcetera. Companies may maintain a building and van in town to reduce the costs of these visits. Vessels may make relatively minor repairs, or carry out maintenance in Unalaska, modifying processing lines or switching out nets. This creates a local demand for a number of specialties, including welders, electronics service staff, engine mechanics, and net systems experts. The nets used by the larger trawlers are large and heavy, and require secure storage, cranes, flatbed trucks, and loaders for on-shore transport. Vessels may make purchases of perishable groceries in Unalaska, but

[38] Ken Hansen, NOAA Office of Law Enforcement. Kodiak, Alaska.

those that originate in Seattle will probably get most of the other groceries there. Vessels may refuel or take on water. Pilot assistance may be required to enter or leave the harbor if the weather is bad. Vessels may maintain, or share an agent on salary in Unalaska. These may assist fishing operations by picking up parts, coordinating delivery of supplies, taking care of other logistics, and handling the arrangements for crew rotations.

As discussed in sub-section 10.2.9, the City of Unalaska earns money from the State Fisheries Business Tax and the State Fishery Resource Landing Tax. In 2008, Unalaska received about $3.5 million and about $4.8 million from these sources, respectively. In 2007, Unalaska raised about $6.3 million from a 2 percent sales tax, about $4 million from a 2 percent raw fish tax, about $3.1 million from a 1 percent capital tax, and $100,000 from a five percent bed tax. Fishing operations in the Aleutian Islands contribute to each of these sources, but it is not known to what extent. Contributions associated with changes in the fishing activity that would be caused by the RPA are probably relatively small in proportion to contributions from other fishing sources.

Other communities that may be impacted by this action

Records linking fishing activity in the Aleutian Islands to individual communities are limited. The key records are state fish tickets identifying the state statistical area sources for landings at individual sites, information matched from fish tickets to state or federal vessel license files identifying the home ports of vessels used to make fish deliveries, and information matched from fish tickets to state limited entry permits showing the mailing address for holders of state entry permits used to make fish landings (used here as a proxy for residence). The vessel and permit application forms do not define home port or mailing address precisely, the information is self-reported, and it is not carefully audited. Information on the residency of crew, or, on the locations at which processed product is transshipped from catcher/processors, is not available. Little Atka mackerel is landed unprocessed in Alaska ports. Pacific cod is generally landed at Adak or in smaller amounts at Unalaska and Akutan. The volumes landed at Unalaska and Akutan cannot be reported in detail. Landings at Akutan probably have little impact on the community there, given the small amounts and the separation between the processing plant and the community. The remainder of this section examines information from vessel licensing records and Alaska entry permits about the ports affected by the Aleutian Island Pacific cod and Atka mackerel fisheries.

Table 10-19 shows the vessel home ports identified on federal vessel licensing documents, for vessels making targeted landings of Pacific cod in Areas 541, 542, or 543. Home port is not carefully defined in the instructions for filling out the licensing forms; the data are self-reported, and the information is not checked for validity. The data, thus, have limitations as a guide to actual vessel home port.

In 2008, a year of high Pacific cod prices, 23 of the 70 active vessels had home ports in Alaska. In 2009, a year with low Pacific cod prices, 11 of 41 vessels were, reportedly, from Alaska. Adak was the home port identified by six vessels in 2008, but only one in 2009. Dutch Harbor had four vessels in 2008, but only one in 2009. Other ports along the coast of the Gulf of Alaska, from Ketchikan to Sand Point, were identified as home port for from one to three of these vessels in those two years. A large proportion (40 out of 70 in 2008, and 28 out of 41 in 2009) of the vessel licenses reported a home port in the Pacific Northwest. (AKR data)

Table 10-19 Home ports for vessels targeting Pacific cod in Areas 541–543.

State	City	2004	2005	2006	2007	2008	2009
Alaska	ADAK	1		1	3	6	1
	ANCHORAGE		1	2	2	2	2
	CORDOVA					1	
	DUTCH HARBOR	3	2	3	2	4	1
	GIRDWOOD		1	1	1		
	HOMER					1	
	JUNEAU	4	2	2	5	2	3
	KETCHIKAN					1	
	KING SALMON				1		
	KODIAK	2	1		1	2	1
	PETERSBURG	1	1	1	1	1	1
	SAND POINT	2	1		3	2	2
	SITKA	1					
	UNALASKA			2	1	1	
	Total	14	9	12	20	23	11
Maine	ROCKLAND				1	1	1
	Total				1	1	1
Oregon	HARBOR					1	
	NEWPORT			1	1	2	
	PORTLAND					1	
	Total			1	1	4	
Washington	BLAINE				1	1	
	PORT TOWNSEND	1	1	1	1	1	1
	SEATTLE	24	18	30	38	36	27
	WESTPORT			1			
	Total	25	19	32	40	38	28
Grand Total		39	30	47	64	70	41

Notes: Home ports listed in vessel license file for vessels making targeting landings of Pacific cod from Areas 541, 542, and 543 in each year. Counts include catcher/processors and catcher vessels using trawl, pot, jig, and hook-and-line gear.
Source: AKR CAS and vessel license files

An alternative analysis of Pacific cod vessels, using a state vessel licensing file for 2008, provides very similar results. Out of the 70 vessels, 42 had licenses identifying a home port in the Pacific Northwest, and 19 had licenses identifying a home port in Alaska. Licenses identified four vessels with home ports in Adak, and the remainder were distributed among home ports along the Gulf coast from Ketchikan to Dutch Harbor. (AKFIN data reviewed in AKR)

In 2008 and 2009, seven catcher/processors and one catcher vessel were identified as having targeted Atka mackerel in Areas 542 and 543 (Area 541 is not affected by this action). The licenses for five of the catcher/processors report a Pacific Northwest home port, while the licenses for the other two report Dutch Harbor. The license for the catcher vessel does not report a home port. (AKR data)

An alternative approach to determining the bases for fishing operations, is to look at the place of residence for persons holding licenses authorizing their participation in a fishery. The State of Alaska requires persons fishing for groundfish in its Aleutian Islands' waters, or delivering groundfish to its ports, to hold interim use permits. Table 10-22 shows the distribution of permits used to make landings of targeted or incidentally caught Pacific cod, by the mailing address (used as a proxy for residence) of the permit holder.

In 2008, a good year for Pacific cod, Alaska residents held 23 of the Alaska limited entry permits. Most of the rest were held by residents of Washington (43 permits), and of Oregon (13 permits). The number of persons from each state, using a permit to make landings, fell off considerably in 2009. Pacific cod prices had reached very high levels in 2008, and fell considerably in 2009. Because of the limitations of this data (described above), these residence estimates are only presented as broadly indicative of the places of residence.

Table 10-20 State of residence of persons using Alaska permits to land Pacific cod from the Aleutian Islands, 2003–2009.

State	2003	2004	2005	2006	2007	2008	2009
AK	11	11	8	9	9	23	9
AZ	1	1	1		1	1	
CA	1		1			1	1
CO			1			1	
FL					1		1
ID			1			1	
MA						1	
NV	1	2					1
NY			1			1	
OR	6	3	3	6	7	13	5
TX				1			
UT						1	
WA	42	36	32	30	38	43	27
(blank)							
Grand Total	62	53	48	46	56	86	44
Notes: Mailing address used as a proxy for residence. Source: Alaska CFEC data on permits, prepared by AKFIN							

Because many Alaskan communities are small, relatively remote, and tend to be fisheries dependent, the Alaska data are further broken out in Table10-23, by city. In 2008, a recent year in which prices for Pacific cod were very high, 23 Alaska residents made Pacific cod landings with a permit. A third of the persons (8) reported a residence in Kodiak. Another six were held by persons reporting an Anchorage residence and two were held in Adak. The remaining permits were held in six communities, from Juneau to Sand Point. The numbers of persons using permits to make these landings fell off considerably the following year.

Table 10-21 City of residence for Alaska residents using Alaska permits to land Pacific cod from the Aleutian Islands, 2003–2009.

City	2003	2004	2005	2006	2007	2008	2009
ADAK			2	2	1	2	
ANCHORAGE				2	2	6	
CORDOVA	1	3				1	
DUTCH HARBOR	1	1			1		1
HOMER						2	
HOONAH				1			
JUNEAU		1				1	
KETCHIKAN			1	1			
KODIAK	4	1	3	1	4	8	3
NIKOLAEVSK						1	
NORTH POLE		1					
PETERSBURG			1				1
SAND POINT	3	2	1	1	1	1	
SEWARD	1	1					
SITKA							2
UNALASKA	1	1		1		1	
WASILLA							2
Notes: Mailing address used as a proxy for residence. Source: Alaska CFEC data on permits, prepared by AKFIN							

The location at which unprocessed fish are landed for further processing is another index of the impact of fishing activity in the Aleutian Islands by community. Adak, Unalaska, and Akutan all receive deliveries of product. Adak and Unalaska have been discussed. Small amounts of Pacific cod from the Aleutian Islands have been delivered to Akutan. Given the small amounts, and the relative separation between the processing plant and the community in Akutan, this is not expected to create a large impact.

10.2.9 State and municipal fishery taxes[39]

The State of Alaska levies taxes on fishery resources processed outside of and first landed in Alaska, as well as on fishery resources processed in Alaska. Alaska statutes provide that a percentage of revenue collected from these taxes shall be shared with qualified municipalities in Alaska. The amount of money available to distribute is based upon fisheries business and fishery resource landing taxes collected during the program base year as defined in Alaska statute. Essentially, the tax is levied against fishery resources processed or landed the year before. For example, fiscal year 2007 payments were based on taxes collected in fiscal year 2006, for fish that were processed or landed during calendar year 2005.

State Fisheries Business Tax

The fisheries business tax ("raw fish tax") is levied on businesses that process fisheries resources in Alaska or that export fisheries resources from Alaska. The tax is based on the value of the raw fishery resource, and the tax rates vary from 1 percent to 5 percent, depending on whether the fishery resource is considered "established" or "developing," and whether it was processed by a shore-based or floating processor. Currently, the tax rates for established fisheries are 3 percent for fishery resources processed at shorebased plants and 5 percent for those processed at floating processors (AS 43.75.015). Revenues are deposited into the State of Alaska's General Fund, and 50 percent of revenues are distributed to qualified municipalities. In 2008, the shared amount to municipalities was approximately $20.2 million. The shared revenues for Adak, Atka, and Unalaska are summarized in Table 10-22.

Table 10-22 Adak, Atka, and Unalaska State fisheries business tax revenues (in thousands of dollars).

Fiscal year	Adak	Atka	Unalaska
2004	303	24	3,227
2005	247	24	3,014
2006	117	19	3,321
2007	116	20	3,178
2008	254	18	3,469

Source: NPFMC 2009:17–19.
Note: estimates in thousands of dollars.

State Fishery Resource Landing Tax

The fishery resource landing tax is levied on fishery resources processed outside of and first landed in Alaska, and is based on the unprocessed statewide average price of the resource. The tax is primarily collected from floating processors and catcher/processors that process fish outside the State's 3-mile limit and bring products into Alaska for transshipment, or any processed fishery resource subject to section 210(f) of the AFA. Tax rates range from 1 percent to 3 percent (AS 43.77.010). All revenues are deposited in the State of Alaska's General Fund, and 50 percent of revenues are distributed to qualified municipalities (see Appendix 6). In 2008, the shared amount to municipalities was approximately $6.4 million.

Most catcher/processors offload processed fish in Alaska communities and pay a 3 percent fishery resource landing tax to the State. The tax is based on the unprocessed value of the resource, which is determined by multiplying a statewide average price (determined by ADF&G) by the unprocessed weight. The tax is primarily collected from processors that process fish outside State waters and bring their product into Alaska for transshipment.

[39] This section is based on the discussion of state and municipal taxes in Council, 2009b: 33-35.

Revenues from the fishery resource landing tax are allocated to municipalities within Alaska in a two-stage process. First, revenues are allocated among the 19 Fisheries Management Areas (FMA) within Alaska based on the ratio of the management area's fishery resource landing tax production value to the value for all management areas combined. Second, payments to municipalities within each FMA are determined under one of two methods. If available funds are less than $4,000 multiplied by the number of municipalities in the FMA, then 50 percent of funds are divided equally among communities and 50 percent are distributed based on the population of each community. If available funds are more than $4,000 multiplied by the number of municipalities in the FMA, then municipalities apply for funds based on the cost of fisheries business impacts experienced by the community and other considerations.

The landing tax revenues received by Adak, Atka, and Unalaska are summarized in Table 10-23. Unalaska is the primary beneficiary of this revenue source, in the State. For example, in 2008, Unalaska received about 92 percent of the state-wide disbursements.

Table 10-23 Adak, Atka, and Unalaska fishery resource landing tax revenues (in thousands of dollars).

Fiscal year	Adak	Atka	Unalaska
2004	82	~	3,629
2005	52	9	3,476
2006	20	6	4,358
2007	64	0	4,362
2008	128	16	4,771

Source: NPFMC 2009: Appendix 6.
Note: estimates in thousands of dollars. "~" indicates non-zero, but would have rounded to zero.

Municipal Raw Fish Tax

In addition to the State taxes described above, municipalities may collect their own raw fish taxes on landings. (All political subdivisions within the State of Alaska are termed "municipalities" for these purposes.) Municipal raw fish taxes vary by community, and range from approximately 1 percent to 3 percent of the unprocessed value of the fishery resources. Municipalities may impose other taxes as well, including sales and bed taxes.

Adak did not use these revenue sources in 2007. In 2007, Atka imposed a 2 percent raw fish tax and a 10 percent bed tax, raising about $26 thousand and about $4 thousand from these sources. In 2007, Unalaska raised about $6.3 million from a 2 percent sales tax, about $4 million from a 2 percent raw fish tax, $3.1 million from a 1 percent capital tax, and $100,000 from a 5 percent bed tax (NPFMC 2009:34-35, Appendix 7).

10.3 Impact on Fleet Activity and Fish Harvests

10.3.1 Introduction

The three action alternatives may change the behavior of fishing vessels, and the amounts of fish of different species that are harvested. Directly regulated fishing firms may shift their vessels to alternative fisheries, and these shifts may affect vessels already active in those, and related, fisheries.

In recent years, researchers have begun to publish analyses based on models of the ways firms choose to deploy their fishing vessels in various locations and fisheries, when operating in the North Pacific.[40] These are similar to models that have been used in fisheries since the 1980s, and for the analysis of

[40] These models are variants of random utility discrete choice modeling (also called random utility models or RUMs).

choices among other types of discrete alternatives since the 1970s. In the North Pacific, models have been applied to Bering Sea pollock fishing decisions in 2000 (Haynie and Layton 2010), GOA groundfish fishing decisions in 2001 (Berman et al. 2008.), Bering Sea and Aleutian Islands flatfish fishing (Haynie, Hicks, and Schnier 2009; Abbott and Wilen 2010), and Aleutian Islands Atka mackerel fishing (Hicks and Schnier 2010; Schnier and Felthoven [forthcoming]). In several instances, these models have been applied to evaluate the impacts of spatial fishery closures (Haynie and Layton 2010; Berman et al. 2008; Hicks and Schnier 2009; Schnier and Felthoven [forthcoming]). The time frame for this analysis, however, has been too short to make direct use of this modeling approach, although the analysis does benefit from insights deriving from this area of research.[41]

Because a uniquely fitted model was not feasible in the present context, a more qualitative, three-part, approach has been used:

- First, the impacts of the alternative actions on the directly regulated vessels are evaluated. These alternatives restrict harvesting activity and lead to reductions in Atka mackerel and Pacific cod catches in the Aleutian Islands. The impacts are identified and described, and estimates of catch reductions are made, to the extent practicable.
- Second, the potential responses of the directly regulated vessels are evaluated. When vessel operators lose fishing opportunities for species in a given area, they will respond in one of several ways in an effort to minimize their losses. The most likely alternative opportunities are identified and described. Possible alternative species catch weights are estimated.
- Third, the impacts of the redeployment of the directly regulated vessels on the vessels already operating in the fisheries to which they redeploy, or in related fisheries, are evaluated.

Estimates are based on the judgment of NMFS Alaska Region staff and input from fishing industry sources. Information on the constraints imposed in modern fisheries by quota share programs, TAC limits, sector allocations, sideboards, and other regulatory restrictions has been used to help bound estimates of potential impacts.

When TACs are used in the analysis, the 2011 TACs are used. These are 2011 TACs adopted by the Council in December 2009 and published in the *Federal Register* (75 FR 11778, March 12, 2010). These are currently the TACs for the first year in which this action will be effective. The Council and Secretary will revisit these TACs in fall 2010, and many of them may change in response to new and updated information about the fisheries.

This section only discusses changes in vessel deployment and in the weights of fish caught. Estimates of revenue and welfare impacts are in section 10.6.

As discussed in section 10.2, for the purpose of this analysis, the vessels that may be directly regulated by this action have been grouped into three categories: (1) trawl catcher/processors targeting Atka mackerel and/or Pacific cod, (2) fixed gear (longline and pot) catcher/processors targeting Pacific cod, and (3) catcher vessels using trawl, hook-and-line, jig, and pot gear to target Pacific cod. Vessels operating in State-waters during the parallel fishery are included in these categories. Vessels operating within the State GHL Pacific cod fishery in the Aleutian Islands will not be regulated by this action. Some segments of this fleet include small numbers of vessels, or the segments deliver to a limited number of firms, so

[41]Models of the type used in these analyses can permit inferences about the welfare impacts of fisheries closures. This is discussed in section 10.6.

confidentiality of data precludes providing certain information.[42] Hook-and-line and pot catcher/processor vessels are aggregated into a fixed gear group for this reason.

The analysis assumes that the State will continue to manage its parallel fishery by adopting the management regulations governing the fishery in federal waters. The State's actual management would depend on actions taken by the Alaska Board of Fisheries. The analysis assumes that the State will manage its state waters GHL fishery so as to maintain the character of the fleet.

As described in section 10.2, the BSAI Pacific cod TAC is allocated among sectors defined by vessel length, fishing gear, processor status, and AFA, CDQ, or Amendment 80 status. While the sector allocations are complex, the area allocations are simple: each sector allocation may be fished anywhere a Pacific cod fishery is authorized in the BSAI—that is, the sector allocations are not divided among fishing areas within the BSAI. A fishing vessel may fish against its sector allocation in the Aleutian Islands or in the Bering Sea. Prohibiting retention in the Aleutian Islands does not change the size of the overall sector TAC allocation.[43]

10.3.2 Trawl Catcher/Processors

The trawl catcher/processor sector was described in sub-section 10.2.2. The proposed action would reduce the sector's catches of Atka mackerel and Pacific cod. Reduced fishing effort for these target species would reduce harvests of species taken as incidental catch, bycatch, or PSC in the Aleutian fisheries.[44] The sector will not be able to find sources of Atka mackerel to offset the loss of fishing opportunities for that species. The fleet may have difficulty offsetting the loss of Pacific cod by fishing for it more intensively in the Bering Sea. Currently, regulations do not authorize the reallocation of unused sector TAC from the Amendment 80 sector[45], and as a result, this action could reduce the overall harvest of Pacific cod. The fleet is likely to increase its harvests of rock sole and yellowfin sole in the Bering Sea in reaction to the Aleutian Islands regulation changes.

Table 10-24 outlines the key provisions of Alternatives 2, 3, and 4 that would affect trawl gear catcher/processors. All alternatives close the waters from 0 to 3 nm around Kanaga Island/Ship Rock rookery to groundfish fishing. As noted in a subsequent section, this is expected to have little impact on directed fishing. All alternatives also eliminate the Atka mackerel platoon system.

[42] A four entity minimum is necessary for reporting State data, while a three entity minimum is necessary for reporting federal data.

[43] As discussed later in this section, the Council is currently considering measures to separate the BSAI Pacific cod TAC into separate Aleutian Islands and Bering Sea TACs.

[44] In this analysis, prohibited species catch, or PSC, refers to catches of species designated as prohibited species in 50 CFR 679.2, which must be avoided to the extent practicable and discarded if caught. Incidental catch refers to catches of other non-target species which are retained, and bycatch refers to catches of other non-target species which are discarded.

[45] Under certain circumstances, regulations permit the reallocation of a fishing sector's Pacific cod TAC allocation to another fishing sector if it appears the original fishing sector may not be able to fully harvest it during a season. Regulations governing BSAI Pacific cod reallocations are at 50 CFR 679.20. These regulations are complex.

Table 10-24 Selected provisions affecting trawl catcher/processors in the Aleutian Islands (expressed as changes from status quo).

Area	Alternative 2	Alternative 3	Alternative 4
Atka mackerel			
541	Change in Atka mackerel seasons	Change in Atka mackerel seasons.	Change in Atka mackerel seasons.
542	Prohibit retention of Atka mackerel.	Close 0 to 20 nm of critical habitat. Reduce TAC to no more than 47% of the ABC. Modify the Atka mackerel season.	Similar to the provisions for Alternative 3, except that vessels participating in a harvest cooperative or fishing CDQ could harvest up to 10% of the cooperative quota or CDQ in critical habitat from 10 nm – 20 nm between 179W and 178W.
543	Prohibit retention of Atka mackerel.	Prohibit retention of Atka mackerel.	Prohibit retention of Atka mackerel.
Bering Sea	No explicit closure	No explicit closure	Prohibit directed fishing
Pacific cod			
541	Close critical habitat to directed fishing.	Close 0 to 10 nm to directed fishing. Close 10 to 20 nm of critical habitat from June 10 to November 1.	Close 0 to 10 nm to directed fishing. Close 10 nm to 20 nm of critical habitat from June 10 to November 1. Reinitiation trigger.
542	Prohibit retention of Pacific cod.	Close 0 to 20 nm of critical habitat to directed fishing .	Similar to provisions for Alternative 3, except that fishing would be permitted from 10 nm –20 nm in critical habitat from 177W to 178W from January 20 to June 10. Reinitiation trigger.
543	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.
Source: Discussion of alternatives in chapter 2 of the EA.			

Aleutian Islands Atka mackerel fishery

Alternative 2 prohibits retention of Atka mackerel in Areas 542 and 543. Firms would neither be able to use this quota for directed fishing, nor as an incidental catch for operations targeting other species—for example, Pacific ocean perch in Areas 542 and 543. Atka mackerel TACs would be set at a level large enough to allow other target fisheries to continue, but these operations would be required to discard any Atka mackerel taken. Directed trawling for Atka mackerel is already prohibited within critical habitat in Area 541 (50 CFR 679); this measure would not impact fishing for Atka mackerel in Area 541. It does contain a provision that would interfere with existing fishing practices for Atka mackerel in the Bering Sea. This is discussed at greater length following Table 10-28 below.

The regulatory changes in Areas 541 and 543 are the same under all the action alternatives. The Alternative 3 and 4 measures in Area 542 are not as restrictive as the Alternative 2 measures. For Alternative 3, no Atka mackerel fishing would be allowed in critical habitat from 0 to 20 nautical miles. Fishing outside critical habitat would be limited to a quota equal to 47 percent of the Area 542 TAC. This is based on historical harvests from outside critical habitat. From 2003 through 2009, 47 percent of Atka mackerel harvests were taken from outside critical habitat in Area 542 (the calculation excludes the years with the highest and lowest percentages). Very little Atka mackerel came from the Kanaga Island/Ship Rock closure zone. Thus, to preserve historical access to Atka mackerel resources outside of critical habitat, while preventing more intensive harvesting outside, due to redeployment of the fleet, the RPA requires that the TAC in Area 542 be set at no more than 47 percent of ABC (NMFS 2010d).

Alternative 4 is very similar to Alternative 3, except that a provision is made to allow some Atka mackerel harvest from within critical habitat, between 178°W. and 179°W. longitudes. This is an area in the eastern part of Area 542. Cooperatives and vessels with CDQ would be allowed to harvest up to 10 percent of their quota shares within waters between 10 nm and 20 nm of critical habitat in this area.

Table 10-25 shows the estimated impacts of Alternatives 2, 3, and 4 on Atka mackerel harvests in the Aleutian Islands.[46] The columns in the table fall into three major groupings: (1) five columns have

[46] The general format of this table is followed in subsequent sections, which refer back to this description.

estimates of Atka mackerel production from each area in the Aleutian Islands, and from the Bering Sea, for each of the six years from 2004 through 2009. At the bottom of each column are summary statistics for the column (average, median, minimum, and maximum); (2) five columns show estimated changes in production in the area and year, if the protection measures had been in place that year; (3) five columns show the residual production from each area and year, if the measures had been in place. Each of the columns in groups (2) and (3) also has associated summary statistics. The final column in the table shows the estimated percent of the "baseline" catch that would still be taken, if the action is implemented.

The rows in the table fall into three major groups: (1) the rows in the upper part of the table provide information about Alternative 2; (2) the rows in the middle provide information about Alternatives 3 and 4; and (3) the bottom rows provide supplementary information about Alternative 4. Alternatives 3 and 4 have the same impact on overall production from Area 542. However, Alternative 4 adds a provision allowing a limited amount of Atka mackerel harvest to be shifted from outside critical habitat, to inside critical habitat. The bottom rows provide estimates of the potential shift in each of the years.

There is assumed to be no change in production in Area 541 or the Bering Sea under any alternative. Under Alternative 2, production in Areas 542 and 543 is assumed to be changed to zero. Under Alternatives 3 and 4, production in Area 542 is assumed to be reduced to 47 percent of former "baseline" levels, and production in Area 543 is assumed to be changed to zero. As noted above, Alternatives 3 and 4 differ with respect to the location from which some Atka mackerel may be harvested. The analysis assumes most of the Atka mackerel production under Alternative 3 would come from the Petrel Banks. Industry sources indicate that Atka mackerel from the Petrel Banks are smaller and bring lower prices. In light of this, the analysis assumes that industry will take full advantage of the provisions for fishing for higher valued Atka mackerel from within critical habitat, and would, thus, take 10 percent of the TAC from within this area of critical habitat each year.

Under Alternative 2, the annual decline in catch ranged from about 34,300 metric tons, to about 52,800 metric tons. The median decline in catch would have been about 43,500 metric tons. For the purpose of evaluating the impact of Alternative 2 on Atka mackerel production in the Aleutian Islands, a range was defined by the aggregate production in 2008 and 2009. The pattern of landings in the region can be seen to have changed systematically over the period, with increasing production in recent years from Area 541. This choice of years reflects recent experience in harvests, and also includes the two years covered by the Amendment 80 program.

The second block of Table 10-25 provides estimates of the potential reductions in Pacific cod harvests by Atka mackerel catcher/processors, as if Alternatives 3 or 4 had been in place in each year. The decline in catch ranged from about 36,700, to about 22,348. The median decline in catch would have been about 30,604 metric tons. For the purpose of evaluating the impact of Alternative 3 on Pacific cod production in the Aleutian Islands, a range was also defined by the aggregate production in each of the years 2008 and 2009. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands is a reduction of about 27,600 metric tons to 30,600 metric tons.

As shown in the final column, on average over the six-year period, Alternative 2 would have reduced Aleutian Islands production (excluding Bering Sea production) to about a fifth of its former level. However, because of changes in the fishery over the period, reductions in production would have been smaller in the more recent years (2007 through 2009), and remaining production would have been somewhat over a third of former levels. The impact of Alternative 3 or Alternative 4 is smaller: average residual Aleutian Islands production (excluding Bering Sea production) would have been about 45 percent of the baseline production over the six-year period, while it appears to be between about 50 percent and about 60 percent for the more recent 2007 through 2009 period.

Table 10-25 Estimated aggregate reductions in trawl catcher/processor Atka mackerel harvests in the Bering Sea and Aleutian Islands, had Alternatives 2, 3, or 4 been in effect, by year, from 2004 through 2009.

Alternative 2

	Baseline catch (mt)					Reduction in catch (mt)					Residual catch (mt)					AI
	541	542	543	BS	Tot	541	542	543	BS	Tot	541	542	543	BS	Tot	Residual as % of baseline
2004	3,161	26,560	16,527	2,441	48,689	0	26,560	16,527	0	43,087	3,161	0	0	2,441	5,602	7%
2005	3,356	33,598	18,852	2,196	58,002	0	33,598	18,852	0	52,450	3,356	0	0	2,196	5,552	6%
2006	4,013	38,447	14,374	2,015	58,850	0	38,447	14,374	0	52,821	4,013	0	0	2,015	6,029	7%
2007	19,752	25,475	8,847	2,619	56,693	0	25,475	8,847	0	34,322	19,752	0	0	2,619	22,372	37%
2008	18,701	21,725	16,105	303	56,834	0	21,725	16,105	0	37,829	18,701	0	0	303	19,004	33%
2009	25,734	28,349	15,578	199	69,861	0	28,349	15,578	0	43,927	25,734	0	0	199	25,934	37%
Ave	12,453	29,026	15,047	1,629	58,155	0	29,026	15,047	0	44,073	12,453	0	0	1,629	14,082	21%
Med	11,357	27,454	15,841	2,106	57,418	0	27,454	15,841	0	43,507	11,357	0	0	2,106	13,463	20%
Min	3,161	21,725	8,847	199	48,689	0	21,725	8,847	0	34,322	3,161	0	0	199	3,360	6%
Max	25,734	38,447	18,852	2,619	69,861	0	38,447	18,852	0	52,821	25,734	0	0	2,619	28,354	37%

Alternatives 3 and 4 (Preferred alternative)

	Baseline catch (mt)					Reduction in catch (mt)					Residual catch (mt)					AI
	541	542	543	BS	Tot	541	542	543	BS	Tot	541	542	543	BS	Tot	Residual as % of baseline
2004	3,161	26,560	16,527	2,441	48,689	0	14,077	16,527	0	30,604	3,161	12,483	0	2,441	18,085	34%
2005	3,356	33,598	18,852	2,196	58,002	0	17,807	18,852	0	36,659	3,356	15,791	0	2,196	21,343	34%
2006	4,013	38,447	14,374	2,015	58,850	0	20,377	14,374	0	34,751	4,013	18,070	0	2,015	24,099	39%
2007	19,752	25,475	8,847	2,619	56,693	0	13,502	8,847	0	22,348	19,752	11,973	0	2,619	34,345	59%
2008	18,701	21,725	16,105	303	56,834	0	11,514	16,105	0	27,619	18,701	10,211	0	303	29,215	51%
2009	25,734	28,349	15,578	199	69,861	0	15,025	15,578	0	30,603	25,734	13,324	0	199	39,258	56%
Ave	12,453	29,026	15,047	1,629	58,155	0	15,384	15,047	0	30,431	12,453	13,642	0	1,629	27,724	45%
Med	11,357	27,454	15,841	2,106	57,418	0	14,551	15,841	0	30,604	11,357	12,904	0	2,106	26,657	45%
Min	3,161	21,725	8,847	199	48,689	0	11,514	8,847	0	22,348	3,161	10,211	0	199	18,085	34%
Max	25,734	38,447	18,852	2,619	69,861	0	20,377	18,852	0	36,659	25,734	18,070	0	2,619	39,258	59%

Alternative 4 (supplement)

	542 residual (mt)	Shift of QS into CH (mt)
2004	12,483	1,248
2005	15,791	1,579
2006	18,070	1,807
2007	11,973	1,197
2008	10,211	1,021
2009	13,324	1,332
Ave	13,642	1,364
Med	12,904	1,290
Min	10,211	1,021
Max	18,070	1,807

Notes: Metric tons round weight retained Atka mackerel from targeted and incidental fishing. The Alternative 4 supplement assumes that the fleet will take advantage of this measure to shift 10% of its harvest of the TAC from outside Area 542 critical habitat to inside critical habitat from 10 to 20 miles off the coast of Alaska between 179 W and 178 W longitude. The AI residual percent is calculated after excluding Bering Sea harvests from both the baseline and residual harvests.

Overall Aleutian Islands harvests are the same under Alternatives 3 and 4. These may be found in the section of this table just above this one. However, under Alternative 4, part of the harvest in Area 542 is shifted from areas outside of critical habitat to areas inside critical habitat. That shift is estimated in this block of the table.

Source: NMFS AKR estimates using CAS and CIA data.

The prohibition on retention of mackerel in Areas 542 and/or 543 is unlikely to lead to a shift of effort into the Area 541 or the Bering Sea Atka mackerel fishery. This fishery is governed by holdings of Amendment 80 or CDQ quota share. This will prevent new effort from entering an area in a competitive race to catch the available TAC. Since the advent of Amendment 80, in 2008, at least 98 percent of the Amendment 80 and CDQ Atka mackerel allocations for Area 541 have been harvested (NMFS Alaska Region [AKR] Catch[47]).

Estimated ranges of reductions in Atka mackerel production were made, based on Table 10-25 above.[48] These can be compared to estimates of reductions based on a consideration of 2011 harvest specifications for Atka mackerel. Estimates based on both sources are very similar, with 2011 specifications-based estimates for the alternatives falling in the middle of the ranges based on Table 10-25. Under Alternative 2, directly affected vessels are estimated to lose a total of about 41,800 metric tons of Atka mackerel production in 2011. The calculation, based on the 2011 TACs and TAC allocation, and the percentages of TAC allocations harvested in 2008–2009 (under Amendment 80), is detailed in Table 10-26.

Under Alternatives 3 and 4, firms would no longer be able to target Atka mackerel in Area 543, and would lose an estimated 17,700 metric tons of Atka production from that area in 2011. The estimate takes account of the 2011 TACs and TAC allocation, and of the percentages of TAC allocations harvested in 2008–2009 (under Amendment 80). This is based on the estimate of the 2011 harvest in Area 543, in Table 10-26. The 2011 ABC and TAC were both equal to 26,000 metric tons, and consideration of 2008–2009 harvest rates suggests that 24,100 metric tons of this would have been harvested. A 53 percent reduction in this harvest implies that the fleet would lose an estimated 11,300 metric tons from this area. Thus, the total estimated reduction in Atka mackerel harvest under Alternative 3 or Alternative 4 is 29,000 metric tons.[49]

[47] Reports accessed at http://alaskafisheries.noaa.gov/sustainablefisheries/catchstats.htm.

[48] The earlier draft of the RIR estimated the reductions using 2011 TACs and the procedure described in the remainder of this paragraph. The approach described in the preceding sentence was adopted in this draft to improve consistency with estimates of Pacific cod impacts and to provide a range, thus better reflecting uncertainty. The results from both approaches are very similar; the point estimate from the earlier draft falls within the range resulting from the current procedure.

[49] A comparison of these Alternative 2, 3, and 4 harvest change estimates, with those for 2008 and 2009 (the Amendment 80 fishing years) from Table 10-25, shows that they are similar. The range of Alternative 2 harvest changes from Table 10-25 is about 38,000 metric tons to about 44,000 metric tons, and the range of Alternative 3 and 4 changes is about 28,000 metric tons to 31,000 metric tons. In each case, these estimates fall within the range.

Table 10-26 Estimated 2011 Atka mackerel catch under status quo in Areas 541, 542, and 543.

Area	2011 TAC component	2011 TAC allocation (mt)	Percent of TAC Allocation harvested in 2008–2009	Estimated 2011 harvest (mt)
541	TAC	20900		
	ICA	75	0.328	25
	Trawl LA	1480	0.978	1,447
	Trawl A80	17016	0.978	16,638
	CDQ	1581	0.987	1,560
	Total 541 harvest			19,670
542	TAC	26,000		
	ICA	75	3.033	228
	Trawl LA	1,851	0.914	1,692
	Trawl A80	21,292	0.914	19,461
	CDQ	2,782	0.985	2,741
	Total 542 harvest			24,122
543	TAC	18,100		
	ICA	50	2.100	105
	Trawl A80	16,113	0.975	15,706
	CDQ	1,937	0.970	1,879
	Total 543 harvest			17,689

Sources: 75 FR 11778, March 12, 2010; NMFS AKR BSAI Catch Reports (including CDQ) for 2007, 2008, and 2009. Accessed at http://alaskafisheries.noaa.gov/sustainablefisheries/catchstats.htm on June 25, 2010. Trawl limited access allocation and Amendment 80 allocations in Area 542 have been consolidated and adjusted with the same percent of allocation percentage.

Alternative 2 is estimated to reduce aggregate Amendment 80 trawl catcher/processor effort targeting Atka mackerel in Areas 542 and 543 by about 70 weeks, since the seven catcher/processor vessels targeting Atka mackerel averaged ten weeks with an Atka mackerel target haul in those areas in 2008 and 2009.

Alternatives 3 and 4 are estimated to reduce the average Amendment 80 fishing time in Areas 542 and 543 to four weeks. Under both alternatives, Area 543 is closed to fishing. In 2008 and 2009, vessels spent an average of eight weeks fishing in Area 542. Given the reduction in the Area 542 TAC to no more than 47 percent of the ABC under Alternatives 3 or 4, the vessels active in Area 542 are assumed to require half as much fishing time. Thus, while Alternative 2 is estimated to shorten the average weeks fished in Areas 542 and 543 from 10 weeks to zero, Alternatives 3 and 4 are estimated to shorten it from 10 weeks to approximately four.

Alternative 4 will shift some effort from the Petrel Banks into critical habitat. Given the range of estimated volumes of Atka mackerel to be taken from critical habitat, and the average volume of Atka mackerel taken per week by vessels targeting Atka mackerel (about 600 metric tons), this may be associated with a shift of about two vessel-weeks of fishing.

The reduction in targeted Atka mackerel fishing in the Aleutian Islands would be associated with reductions in the catches of groundfish species taken incidentally, and with prohibited species catches. Table 10-27 provides estimates of the reductions in incidental catch and PSC, by species, for all alternatives, using average incidental catch and PSC rates. Incidental catch estimates are limited to species with commercial value that are not Amendment 80 species.[50] These are the species that will be

[50] Amendment 80 species are not included for two reasons. Pacific cod incidental catch will be picked up and evaluated in the Pacific cod section, whether it is targeted or incidental. To treat it here would lead to double counting. In addition, the analysis assumes that reductions of incidental catches of other species, such as Pacific ocean perch, will, in general, release Amendment 80 quota for use in a target fishery for the species.

used for valuing the impacts of the action in section 10.6. Table 10-28 provides estimates of the PSC rates in this fishery.[51]

Table 10-27 Estimated changes in catches of species in 2011 by trawl catcher/processors targeting Atka mackerel in the Aleutian Islands under Alternatives 2, 3, and 4.

	Alternative 2		Alternative 3		Alternative 4		Units
	Low	High	Low	High	Low	High	
Atka mackerel	37,829	43,927	27,619	30,603	27,619	30,603	mt
Arrowtooth	76	88	55	61	55	61	mt
Greenland turbot	76	88	55	61	55	61	mt
Northern rockfish	643	747	470	520	470	520	mt
Pollock	151	176	110	122	110	122	mt
C. bairdi	3	3	2	2	2	2	crab
C. opilio	0	0	0	0	0	0	crab
Red king crab	336	390	245	271	245	271	crab
Halibut	32	37	23	26	23	26	mt
Chinook salmon	120	140	88	97	88	97	salmon
Other salmon	438	509	320	354	320	354	salmon

Notes: Groundfish incidental catch estimates are for species, other than Amendment 80 species, estimated to have significant commercial value based on production reports and knowledge of the fleet. PSC rates are based on average rate of PSC per retained metric ton of the target species from 2004 to 2009. PSC species subject to limits are included.
Source: NMFS AKR estimates based on CAS

Table 10-28 Estimated rates of prohibited species catch (averages for 2003 to 2009) per metric ton of trawl catcher/processor Aleutian Island groundfish harvest in the Atka mackerel fishery.

Species	PSC rate	Units
C. bairdi	0	Crab/mt groundfish
C. opilio	0	Crab/mt groundfish
Red king crab	0.019	Crab/mt groundfish
Halibut	0.0008	mt mortality/mt groundfish
Chinook salmon	0.003	Salmon/mt groundfish
Other salmon	0.004	Salmon/mt groundfish

Note: Ratios and percentages were calculated to show the metric tonnage of the incidental or PSC species per metric ton of retained and discarded target species. PSC species subject to limits are included.
Source: NMFS AKR Catch Accounting System

Since Amendment 80 was implemented in 2008, the cooperative allocation of Atka mackerel for Area 541 and the Bering Sea has resulted in most Atka mackerel being provided to vessels that target this species in Area 541, with smaller amounts allocated to "non-Atka mackerel vessels" fishing in the Bering Sea. During the past three years, these non-Atka mackerel Amendment 80 Bering Sea vessels and non-Amendment 80 vessels have harvested between 125 mt and 398 mt of Atka mackerel. Most of this catch has come from Bering Sea critical habitat (Lava Reef and Bishop Point), which seems to be where most Bering Sea Atka mackerel have been distributed in recent years. When the Bering Sea Atka mackerel fishery is closed, these vessels have retained Atka mackerel harvested within critical habitat up to the

[51] As discussed in the notes to Table 10-27 and Table 10-28, the methods used to estimate the incidental and PSC rates in the tables, differ somewhat. The procedure used in Table 10-27 was adopted to calculate retained incidental harvests and PSC from a base of retained target species, and is table-specific. The method used in Table 10-28 relates retained incidental catch, bycatch, and PSC, to retained groundfish catch, and is a more traditional way of expressing these rates. Table 10-27 was prepared more recently and used 2004 through 2009 data, while Table 10-28 is older and uses 2003 through 2009 data. In the revisions to this document since the August 2010 Council meeting, there has been a shift to 2004 through 2009 data, because of a problem with the treatment of CDQ harvests in 2003 data. This should, however, not lead to a significant problem in interpreting the rates in the older table.

maximum retainable amount (MRA) using retained amounts of Bering Sea groundfish open to directed fishing as basis species.[52]

Current Steller sea lion protection measures close the Atka mackerel fishery from April 15 through September 1. During this time period, incidental catch amounts of Atka mackerel can be retained, consistent with the MRA restrictions in regulations at 50 CFR part 679.20(d)(iii)(B). These regulations generally restrict retained amounts of Atka mackerel to no more than 20 percent of the round weight equivalent of retained basis species (species open to directed fishing), at any time during a fishing trip.

Alternatives 2 and 3 would remove the April 15 through September 1 directed fishery closure for Atka mackerel, in order to encourage the spread of the Atka mackerel harvest through the year, and because this restriction no longer is necessary when the HLA Platoon fishery is removed. Instead, the A and B seasons would be consistent with other prey species fisheries (January 20 through June 10 and June 10 through November 1, respectively). A lengthened open season for a directed fishery becomes problematic for the Bering Sea vessels that retain incidental amounts of Atka mackerel, because as these vessels traverse between open areas and critical habitat, closed to directed fishing, a new fishing trip is triggered (see definition of "fishing trip" at 50 CFR 679.2(1)(i)). As a result, these vessels may no longer use retained catch from the Bering Sea outside of critical habitat as a basis to retain Atka mackerel in critical habitat. This impact is not reflected in a change of harvest in the Bering Sea in Table 10-25, because of the small amount at issue and the difficulty of estimating the actual volume of harvest change, since it would still be possible to harvest Atka mackerel in Bering Sea critical habitat, just more difficult.

Considering the small amount of Atka mackerel historically taken incidentally in critical habitat (about 125 mt to 398 mt, annually), and the fact that Steller sea lion populations have improved in the Bering Sea under these and higher levels of harvest in critical habitat, NMFS determined that imposing this requirement is not necessary. Although the distribution and abundance of Atka mackerel in the Bering Sea have varied widely since 2003, in recent years, Atka mackerel seems to be distributed primarily within Steller sea lion critical habitat areas in the Bering Sea. Alternative 4 (the preferred alternative) modifies Alternative 3 to close the Bering Sea directed fishery year round, while continuing to allow for a lengthened open season in Area 541. This would allow for the pattern of fishing and associated incidental catch that has occurred since Amendment 80 was implemented in 2008.

Atka mackerel tend to be larger in the Bering Sea, and, with the reduction in harvests in the Aleutian Islands, the price should be higher. However, the necessity to harvest these fish under an MRA for another species makes them relatively expensive to harvest compared to harvest in a directed Atka mackerel fishery.

Aleutian Islands Pacific Cod Fishery

The first block of Table 10-29 provides estimates of the potential reductions in Pacific cod harvests by trawl catcher/processors, by year, including both the Amendment 80 vessels and the F/V *Katie Ann*, for 2004 through 2009, as if Alternative 2 had been in place in each year. The bottom half provides estimates of the potential reductions under Alternatives 3 and 4. The table organization is the same as that for Table 10-25. The text accompanying Table 10-25 explains this organization.

For areas in which retention is prohibited (Areas 542 and 543 under Alternative 2, and Area 543 under Alternatives 3 and 4) the change of catch is equal to the total catch from the area in a given year. For

[52] The discussion of Atka mackerel fishing in the Bering Sea in this paragraph, and in the next few paragraphs, is based on communications from NMFS AKR in-season managers.

other areas and alternatives, the change in catch is equal to the volume of catch coming from areas and periods during which fishing is closed by the alternative.[53]

Under Alternative 2, the decline in catch would have ranged from about 10,800 metric tons, to about 4,400 metric tons. The median decline in catch under Alternative 2 would have been about 9,500 metric tons. For the purpose of evaluating the impact of Alternative 2 on Pacific cod production in the Aleutian Islands, a range was defined by the aggregate production in each of the years from 2004 through 2009. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands, from the restrictions in Alternative 2, is a reduction of about 4,400 metric tons to about 10,800 metric tons.

Under Alternative 3, the decline in catch would have ranged from about 2,500 metric tons, to about 7,400 metric tons. The median decline in catch under Alternative 2 would have been about 5,200 metric tons. For the purpose of evaluating the impact of Alternative 2 on Pacific cod production in the Aleutian Islands, a range was defined by the aggregate production in each of the years from 2004 through 2009. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands from the restrictions in Alternative 3 is a reduction of about 2,500 metric tons to about 7,400 metric tons.

Under Alternative 4, the decline in catch would have ranged from about 2,500 metric tons to about 6,700 metric tons. The median decline in catch under Alternative 2 would have been about 5,000 metric tons. For the purpose of evaluating the impact of Alternative 2 on Pacific cod production in the Aleutian Islands, a range was defined by the aggregate production in each of the years, from 2004 through 2009. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands, from the restrictions in Alternative 4, is a reduction of about 2,500 metric tons to about 6,700 metric tons.

Table 10-29 also shows that Alternative 2 would reduce Pacific cod catches by this fleet to an average of about 13 percent of what they were, annually, during the six-year period from 2004 through 2009. Alternatives 3 and 4 have a significantly smaller impact, reducing production to about half of what it would have been.

[53] Estimates of volumes of catch from different areas and periods were obtained from the AKR Catch Accounting System (CAS) and Catch in Area (CIA) data bases.

Table 10-29 Estimated aggregate reductions in trawl catcher/processor Pacific cod harvests in the Aleutian Islands, had Alternatives 2, 3, or 4 been in effect, by year, from 2004 through 2009.

Alternative 2													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Tot	541	542	543	Tot	541	542	543	Tot	
2004	5,597	3,267	3,241	12,105	4,301	3,267	3,241	10,809	1,296	0	0	1,296	11%
2005	5,117	2,184	4,103	11,404	3,681	2,184	4,103	9,967	1,436	0	0	1,436	13%
2006	5,045	1,854	3,016	9,915	4,227	1,854	3,016	9,097	817	0	0	817	8%
2007	7,728	2,142	2,227	12,098	6,114	2,142	2,227	10,484	1,614	0	0	1,614	13%
2008	2,834	773	1,664	5,271	1,975	773	1,664	4,412	859	0	0	859	16%
2009	1,966	1,515	1,660	5,141	1,190	1,515	1,660	4,364	777	0	0	777	15%
Ave	4,714	1,956	2,652	9,322	3,581	1,956	2,652	8,189	1,133	0	0	1,133	13%
Med	5,081	1,998	2,622	10,659	3,954	1,998	2,622	9,532	1,077	0	0	1,077	13%
Min	1,966	773	1,660	5,141	1,190	773	1,660	4,364	777	0	0	777	8%
Max	7,728	3,267	4,103	12,105	6,114	3,267	4,103	10,809	1,614	0	0	1,614	16%
Alternative 3 (Preferred alternative)													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Tot	541	542	543	Tot	541	542	543	Tot	
2004	5,597	3,267	3,241	12,105	1,177	2,337	3,241	6,756	4,420	930	0	5,349	44%
2005	5,117	2,184	4,103	11,404	1,375	1,934	4,103	7,413	3,742	249	0	3,991	35%
2006	5,045	1,854	3,016	9,915	600	1,462	3,016	5,079	4,445	391	0	4,836	49%
2007	7,728	2,142	2,227	12,098	1,364	1,631	2,227	5,222	6,365	511	0	6,876	57%
2008	2,834	773	1,664	5,271	279	522	1,664	2,464	2,555	251	0	2,806	53%
2009	1,966	1,515	1,660	5,141	47	749	1,660	2,456	1,920	765	0	2,685	52%
Ave	4,714	1,956	2,652	9,322	807	1,440	2,652	4,898	3,908	516	0	4,424	48%
Med	5,081	1,998	2,622	10,659	888	1,547	2,622	5,150	4,081	451	0	4,414	51%
Min	1,966	773	1,660	5,141	47	522	1,660	2,456	1,920	249	0	2,685	35%
Max	7,728	3,267	4,103	12,105	1,375	2,337	4,103	7,413	6,365	930	0	6,876	57%
Alternative 4 (Preferred alternative)													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Tot	541	542	543	Tot	541	542	543	Tot	
2,004	5,597	3,267	3,241	12,105	1,095	2,337	3,241	6,674	4,502	930	0	5,431	45%
2,005	5,117	2,184	4,103	11,404	697	1,934	4,103	6,734	4,420	249	0	4,670	41%
2,006	5,045	1,854	3,016	9,915	596	1,462	3,016	5,075	4,449	391	0	4,840	49%
2,007	7,728	2,142	2,227	12,098	1,325	1,391	2,227	4,943	6,403	751	0	7,154	59%
2,008	2,834	773	1,664	5,271	273	522	1,664	2,459	2,561	251	0	2,812	53%
2,009	1,966	1,515	1,660	5,141	46	748	1,660	2,454	1,920	767	0	2,687	52%
Ave	4,714	1,956	2,652	9,322	672	1,399	2,652	4,723	4,043	557	0	4,599	50%
Med	5,081	1,998	2,622	10,659	646	1,427	2,622	5,009	4,435	571	0	4,755	51%
Min	1,966	773	1,660	5,141	46	522	1,660	2,454	1,920	249	0	2,687	41%
Max	7,728	3,267	4,103	12,105	1,325	2,337	4,103	6,734	6,403	930	0	7,154	59%
Notes: Metric tons round weight retained Pacific cod from targeted and incidental fishing. Source: NMFS AKR estimates using CAS and CIA data.													

Separate estimates of the number of weeks fishing Pacific cod have not been prepared for the Amendment 80 vessels targeting Atka mackerel, as these vessels tend to target Pacific cod during periods when they are also in the Aleutian Islands to harvest Atka mackerel. Estimates have not been made for the F/V *Katie Ann*, or Amendment 80 vessels targeting only Pacific cod, as these are not used in the discussion of their alternative fishing options.

Other groundfish are taken incidentally in the Aleutian Islands Pacific cod fishery. Likewise, PSC mortality is associated with these fisheries. Table 10-30 provides estimates of changes in the incidental catches of groundfish species, as well as PSC mortality, associated with the Aleutian Islands Pacific cod harvest declines under Alternatives 2, 3, and 4. Table 10-31 provides the estimated PSC rates in the fishery.

Table 10-30 Estimated changes in catches of species by trawl catcher/processors targeting Pacific cod in the Aleutian Islands under Alternatives 2, 3, and 4.

	Alternative 2		Alternative 3		Alternative 4		Units
	Low	High	Low	High	Low	High	
Pacific cod	4,364	10,809	2,456	7,413	2,454	6,734	mt
Arrowtooth	26	65	15	44	15	40	mt
Flathead sole	4	11	2	7	2	7	mt
Greenland turbot	0	0	0	0	0	0	mt
Northern rockfish	17	43	10	30	10	27	mt
Pollock	74	184	42	126	42	114	mt
Pacific ocean perch	26	65	15	44	15	40	mt
Rock sole	87	216	49	148	49	135	mt
C. bairdi	1,230	3,045	692	2,089	691	1,897	crab
C. opilio	2	6	1	4	1	4	crab
Red king crab	56	139	32	95	32	87	crab
Halibut	15	38	9	26	9	23	mt
Chinook salmon	286	707	161	485	161	441	salmon
Other salmon	42	103	23	70	23	64	salmon

Notes: Groundfish incidental catch estimates are for species, other than Amendment 80 species, estimated to have significant commercial value, based on production reports and knowledge of the fleet. PSC rates are based on average rate of PSC per retained metric ton of the target species from 2004 to 2009. PSC species subject to limits are included.
Source: NMFS AKR estimates based on CAS

Table 10-31 Estimated rates of prohibited species catch for (averages for 2003–2009) per metric ton of trawl catcher/processor groundfish harvest in the Aleutian Island Pacific cod fishery.

Species	PSC	Units
C. bairdi	0.154	Crab/mt groundfish
C. opilio	0.013	Crab/mt groundfish
Red king crab	0.062	Crab/mt groundfish
Halibut	0.0018	mt mortality/mt groundfish
Chinook salmon	0.045	Salmon/mt groundfish
Other salmon	0.010	Salmon/mt groundfish

Note: ratios and percentages were calculated to show the metric tonnage of the incidental or PSC species per metric ton of retained and discarded target species. PSC species subject to limits are included.
Source: NMFS AKR Catch Accounting System

Redeployment of trawl catcher/processors

The trawl catcher/processors whose Atka mackerel and Pacific cod harvests are restricted in the Aleutian Islands may be used to harvest fish in other fisheries. The Bering Sea Pacific cod, rock sole, and yellowfin sole fisheries are the most likely alternatives. However, halibut PSC in these fisheries may limit fishing activity. At this time, it is not clear which combination of these other fisheries might be utilized, or to what extent. Fisheries alternative to these are less likely options.

The Atka mackerel catch in Area 541 should not be affected by any of these alternatives. None of the alternatives requires changes to current fishing practices in this area. In addition, under Alternatives 3 and 4, the fishery may harvest up to 47 percent of the Area 542 TAC. Firms will continue to fish for Atka mackerel in Areas 541 and 542, under the authority of the Atka mackerel quota shares issued under Amendment 80. These quota share arrangements will prevent a shift of additional effort from Area 543, into these remaining fishing areas.

In the analysis that follows, fishing for Atka mackerel is assumed to be the primary behavioral driver for the Amendment 80 trawl catcher/processors targeting Atka mackerel in the Aleutian Islands. The fleet makes many Aleutian Islands hauls that target Pacific cod, but, by and large, these take place when the fleet is in the Aleutian Islands to target Atka mackerel. As discussed earlier, Alternative 2 is expected to shorten the Amendment 80 Atka mackerel fishery in Areas 542 and 543 by about ten weeks, while Alternatives 3 and 4 are expected to shorten the fishing by about six weeks. This time is divided between the “A” and “B” seasons. In addition to the reduced fishing time for these vessels, the Amendment 80 trawlers targeting Pacific cod, but not Atka mackerel, and the F/V *Katie Ann* and its associated catcher vessels, would also spend less time fishing for Pacific cod in the Aleutian Islands.

Flatfish.

Bering Sea yellowfin sole and rock sole are alternative targets for the Amendment 80 trawl vessels targeting Atka mackerel in the Aleutian Islands. These fisheries take place during periods when Atka mackerel fishing would no longer be allowed. The Amendment 80 trawl catcher/processors hold quota share for these fisheries, may be able to lease it from other quota share holders, or may access CDQ allocations. Recent TACs have not been fully harvested, leaving room for expansion in production. Halibut PSC rates are lower for these fisheries than for the Bering Sea Pacific cod fishery.

The Aleutian Islands component of the Amendment 80 fleet typically fishes Atka mackerel first thing in the year, switching to rock sole at the end of February and in March. The fleet then fishes rock sole for about four weeks. During this early part of the year, yellowfin sole fishing grounds are, typically, still covered by sea ice and are inaccessible to the fleet. If Pacific cod fishing in the Bering Sea were precluded for the reasons discussed above, NMFS estimates that, of the ten weeks that may be freed up by the closure of the Atka mackerel and Pacific cod fisheries in the Aleutian Islands, three weeks could be spent in the rock sole fishery in the Bering Sea. The Amendment 80 fleet typically fishes yellowfin sole in April and May, and again in August and October. The fall Atka mackerel season typically occurs in September (NMFS AKR in-season management). Thus, it is likely that the remaining seven weeks, freed up by the Atka mackerel closure, would be spent fishing for yellowfin sole.

In 2008–2009, Amendment 80 vessels caught 445 metric tons of yellowfin a week, during weeks in which they were targeting that species, and Amendment 80 vessels targeting rock sole caught 204 metric tons of rock sole a week. Assuming these rates could be sustained, and all else equal, seven vessels fishing yellowfin sole for an additional seven weeks could take 21,800 metric tons, while seven vessels fishing for rock sole for an additional three weeks could take 4,284 metric tons. These harvest amounts are used as the basis for estimates of potential yellowfin sole and rock sole catches, incidental groundfish catches, and PSCs summarized below, in Table 10-32.

Table 10-33 summarizes the incidental catch and PSC rates used to prepare Table 10-32.

Table 10-32 Hypothetical harvests by Amendment 80 trawl catcher/processor fishing Bering Sea yellowfin sole at a rate of 445 mt a week, and Bering Sea rock sole at a rate of 204 mt a week (unless otherwise noted, all units are in metric tons round weight).

	Rock sole		Yellowfin sole		Overall change	
	Alt 2	Alts 3 and 4	Alt 2	Alts 3 and 4	Alt 2	Alts 3 and 4
Rock sole	4,284	4,284	1,744	748	6,028	5,032
Flathead sole	257	257	872	374	1,129	631
Yellowfin sole	1,114	1,114	21,805	9,345	22,919	10,459
Pacific cod	514	514	1,744	748	2,258	1,262
Arrowtooth flounder	86	86	436	187	522	273
Total groundfish	6,255	6,255	26,602	11,401	32,857	17,656
C. bairdi (No. crab)	10,633	10,633	63,845	27,362	74,478	37,995
C. opilio (No. crab)	1,876	1,876	82,467	35,343	84,343	37,219
Red king crab (No. crab)	6,255	6,255	5,320	2,280	11,575	8,535
Halibut (mortality)	81	81	186	80	268	161
Chinook salmon (No. fish)	63	63	27	11	89	74
Other salmon (No. fish)	25	25	53	23	78	48

Notes: Groundfish incidental catch estimates are for species, other than Amendment 80 species, estimated to have significant commercial value based on production reports and knowledge of the fleet. PSC species subject to limits are included.
Source: NMFS AKR estimates based on CAS

Table 10-33 Estimated rates of prohibited species catch per metric ton in the Amendment 80 Bering Sea rock sole and yellowfin sole trawl catcher/processor harvests.

	Rock Sole	Yellowfin sole	Units
C. bairdi	2.4	1.7	Crab/mt
C. opilio	3.1	0.3	Crab/mt
Red king crab	0.2	1	Crab/mt
Halibut	0.007	0.013	Percent of weight
Chinook salmon	0.001	0.01	Salmon/mt
Other salmon	0.002	0.004	Salmon/mt

Note: ratios and percentages were calculated to show the metric tonnage of the incidental or PSC species per metric ton of retained and discarded target species. PSC species subject to limits are included.
Source: NMFS AKR Catch Accounting System

The BSAI flatfish fisheries are no longer open access fisheries. Amendment 80 vessels that intend to substitute yellowfin sole and rock sole fishing for fishing opportunities that are no longer available in the Aleutian Islands Atka mackerel and Pacific cod fisheries will either have Amendment 80 quota share for yellowfin sole and rock sole, which they are not fishing, available to them or they will have to acquire fishing rights, either from other Amendment 80 fishing operations or from holders of CDQ. It is possible that Amendment 80 firms would deny their competitors flatfish quota in order to seize a competitive advantage. If the leases do take place, a considerable part of the net revenues from such deals would accrue to firms not directly regulated by this action in the Aleutian Islands, and would not generate an actual revenue offset to injured firms.

Prior to 2008, CDQ program yellowfin sole and rock sole quota shares were heavily used. From 2005 through 2006, between 89 percent and 99 percent of the CDQ for these species was harvested each year. This percentage fell off considerably, to 32 percent, in 2008, and fell further, to 8 percent in 2009. (NMFS AKR catch reports). This may have been connected with the introduction of Amendment 80.

Prior to Amendment 80, vessels in the head-and-gut (H&G) fleet were engaged in a race for fish as they sought to harvest available allocations of yellowfin sole and rock sole. CDQ fish provided a mechanism for extending the season. Amendment 80 eliminated the race for fish, and may have reduced the demand for access to the CDQ allocations, by Amendment 80 operators.

In general, crab PSC limits are unlikely to be a constraint. Most crab PSC allowances are very large in proportion to past yellowfin and rock sole harvests. Table 10-34 summarizes crab PSC allowance and removal information for 2004 through 2009. Aside from activity in the Red King Crab Savings Subarea, in no case did a fleet harvest as much as half of the allowed crab PSC. The PSC in the Red King Crab Savings Subarea has routinely exceeded the target limit by large amounts. The issues associated with this are discussed later in this sub-section.

Table 10-34 Annual BSAI crab PSC and PSC removal.

PSC	Allowance mt (2009)	Harvest mt (2009)	Percent harvested (2009)	Percent harvested (2004-2008)
Opilio Crab, COBLZ, trawl gear	4,350,000	435,666	10%	40% 66% 16% 42% 16%
Bairdi Crab, Zone 1, trawl gear	980,000	191,392	20%	22% 24% 21% 17% 19%
Bairdi Crab, Zone 2, trawl gear	2,970,000	287,116	10%	14% 15% 21% 18% 16%
Red King Crab, Zone 1	197,000	66,315	34%	38% 49% 38% 44% 43%
Red King Crab Savings Subarea, trawl	49,250	64,091	130%	176% 228% 165% 195% 168%
Source: AKR Catch reports web page. (Includes PSC and CDQ PSQ. CDQ PSQ included since this is also available to Amendment 80 vessels through lease or joint venture arrangements).				

Amendment 80 vessels specializing in Atka mackerel in the Aleutian Islands received large amounts of Amendment 80 Atka mackerel quota, because of their fishing history. Amendment 80 PSC allowances were also distributed within the fleet on the basis of fishing history. Thus, vessels that fished relatively more in the Aleutian Islands, where PSC rates were relatively low, received PSC allowances that were relatively low, compared to those of other vessels. This may leave these vessels at a disadvantage in pursuing fisheries in the Bering Sea, where PSC rates are relatively higher. These firms may be able to lease PSC allowance amounts from other firms, but this is likely to be costly, if it is possible, as, especially in the case of halibut PSC, it is likely to be in short supply.

Industry sources have expressed concern that current yellowfin sole and rock sole fishing opportunities are due to low ABCs for pollock in the Bering Sea. By statute, the sum of the BSAI TACs cannot exceed 2.0 million metric tons per year, and historically, the pollock TAC has been given a high priority. Pollock TACs are currently relatively low, and flatfish TACs have been set relatively high as a result. If pollock TACs were to increase again, flatfish TACs might revert to earlier, lower, levels (Orr, 2010).

A possible inverse relationship between flatfish and pollock TACs may be stronger for rock sole than for yellowfin sole. Simple linear regressions of yellowfin sole and rock sole TACs on their own ABCs, and on pollock TACs, show negative relationships between the flatfish TACs and the pollock TACs. Summary results are shown in Table 10-35. However, the regressions show little relationship between the rock sole TAC and its ABC, and they show a statistically significant negative relationship between the rock sole TAC and the pollock TAC. The relationship between the yellowfin sole TAC and its ABC is stronger, while the relationship between the yellowfin sole TAC and pollock TAC is weaker than it is for rock sole, and is not statistically significant.

Table 10-35 Regression models of yellowfin sole and rock sole TACs

Rock sole			Yellowfin sole		
Rock sole TAC	coefficient	t-statistic	Yfin sole TAC	coefficient	t-statistic
Intercept	166,621.3	3.35	Intercept	95,065.8	1.75
Rock sole ABC	0.251	0.32	Yfin sole ABC	.649	5.94
Pollock TAC	-0.079	-2.79	Pollock TAC	-.057	-1.64
Other statistics					
N	22 (1989–2010)		N	31 (1980–2010)	
R2	.44		R2	.63	
Notes: data from annual Council SAFE documents; OLS regression					

Figure 10-1 shows that in the early years of the 21st century, pollock ABCs rose to very high levels, while pollock TACs were capped at 1.5 million metric tons per year by the constraints imposed by the BSAI optimum yield, and the desire to harvest other species as well. While pollock ABCs are projected to rebound (the November 2010 pollock SAFE authors recommend a 1.267 million metric ton ABC in 2011 and a 1.595 million metric ton ABC in 2012) the actual TAC levels for pollock, and TAC levels for other species, are difficult to project, and may not follow patterns observed in the past.

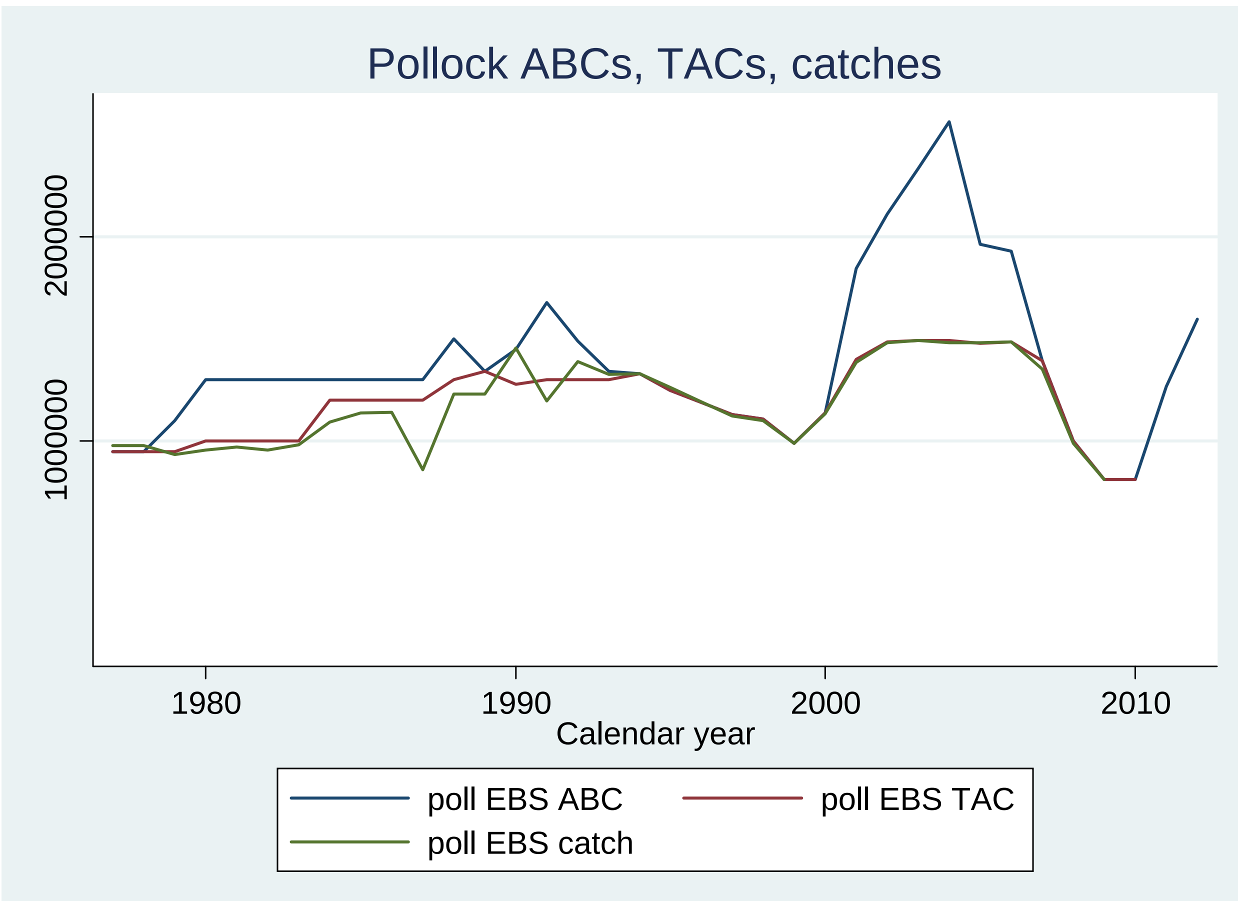

Figure 10-1 EBS pollock ABCs, TACs, and catches, 1979–2008. (Source: Annual EBS Pollock SAFE report for 2009) 2011 and 2012 ABCs are projections based on Pollock plan team author's November 2010 pollock ABC recommendations.

Pacific cod.

The trawl catcher/processor fleet could choose to fish its Pacific cod quota share in the Bering Sea, rather than in the Aleutian Islands. Table 10-36 provides estimates of the amounts of groundfish incidental catch and PSC that might be taken, if the fleet were able to offset the entire estimated reduction in Aleutian Islands Pacific cod harvests in the Bering Sea. Table 10-37 provides the PSC rates for this fishery.

Table 10-36 Hypothetical incidental catch and PSC if trawl catcher/processors catch as much Pacific cod in the Bering Sea as they caught in the Aleutian Islands under Alternatives 2, 3, and 4.

	Alternative 2		Alternative 3		Alternative 4		Units
Species	Low	High	Low	High	Low	High	
Pacific cod	4,364	10,809	2,456	7,413	2,454	6,734	mt
Pollock	196	486	111	334	110	303	mt
C. bairdi	8,446	20,918	4,753	14,346	4,749	13,032	crab
C. opilio	2,927	7,250	1,647	4,972	1,646	4,517	crab
Red king	66	164	37	112	37	102	crab
Halibut	95	236	54	162	54	147	mt mortality
Chinook	320	793	180	544	180	494	salmon
Other salmon	77	190	43	130	43	118	salmon

Notes: Groundfish incidental catch estimates are for species, other than Amendment 80 species, estimated to have significant commercial value based on production reports and knowledge of the fleet. PSC species subject to limits are included.
Source: NMFS AKR estimates based on CAS.

Table 10-37 Estimated species catch rates per ton of trawl catcher/processor groundfish harvest in the Bering Sea Pacific cod fishery, and rates of prohibited species catch (averages for 2003–2009).

	PSC	Units
C. bairdi	2.172	Crab/mt
C. opilio	1.635	Crab/mt
Red king	0.043	Crab/mt
Halibut	0.0182	mt mortality/mt
Chinook	0.043	Salmon/mt
Other salmon	0.033	Salmon/mt

Note: As discussed in the text, data for extrapolating targeted groundfish bycatch in the Bering Sea is limited for this fleet. Trawl catcher vessel target rates have been used as a proxy. Ratios and percentages were calculated to show the metric tonnage of the incidental or PSC species per metric ton of retained and discarded target species. PSC species subject to limits are included.
Source: NMFS AKR Catch Accounting System

There are several reasons why the Amendment 80 fleet may not fully offset its lost Pacific cod harvest in the Bering Sea. First, industry sources indicate that Pacific cod in the Bering Sea tend to be somewhat smaller than in the Aleutian Islands and, thus, a less attractive target. As noted earlier, a statistical analysis of the Amendment 80 vessels was unable to identify a statistically significant “Aleutian Islands Pacific cod premium” for the Amendment 80 vessels. This analysis did not cover non-Amendment 80 vessels, such as the F/V *Katie Ann*. (Haynie, personal communication, September 20, 2010). Second, the Amendment 80 vessels that target Atka mackerel in the Aleutian Islands have shown little evidence of targeting Pacific cod in the Bering Sea in the past. Thus, this is not a traditional fishery for this fleet.

Third, the halibut PSC in the Bering Sea Pacific cod trawl fishery is high, compared to halibut PSC in the Aleutian Islands. The estimated halibut PSC rate in the Aleutian Island Pacific cod fishery is 0.0018 metric tons of halibut mortality per metric ton of groundfish (Table 10-31); however, it is 0.0182 metric tons (ten times as much) of halibut mortality per metric ton of groundfish in the Bering Sea. Moreover, the rates are per metric ton of groundfish associated with harvesting a Pacific cod target; estimated incidental catch rates of groundfish in a Pacific cod target fishery, are somewhat higher in the Bering Sea than in the Aleutian Islands. The estimated halibut PSC when taking 10,000 metric tons of Pacific cod in the Aleutian Islands is 18 metric tons (see Table 10-31), but the estimated halibut PSC required to take the same 10,000 metric tons of Pacific cod in the Bering Sea is 182 metric tons (see Table 10-37).

In 2008 and 2009, the years after fishing began under the Amendment 80 program, the difference between the Amendment 80 halibut PSC allowance and the fleet's actual halibut PSC was about 300 metric tons. In-season managers would like to see at least a 50-metric-ton buffer between expected PSC mortality and the PSC allowance. This suggests that Amendment 80 fishing may be limited by a 250-metric-ton potential increase in halibut PSC.

Table 10-38 summarizes information on halibut PSC changes from earlier tables in this section. Each of the lines summarizing earlier table information is based on the linear extrapolation under consideration in each of those tables. Each table was prepared *without* considering the way halibut prohibited species use in another fishery would affect production in the fishery (Pacific cod, rock sole, or yellowfin sole) for which the table was prepared. Under the action alternatives, halibut PSC limits could make it impossible to realize all the potential groundfish harvest discussed above. The calculations in this section are rough approximations, and halibut PSC needs could be more (or less) than implied under the alternative summaries. Although the halibut allowance may be a limiting factor, new cooperatives established under the Amendment 80 program may be able to reduce halibut PSC rates in the Bering Sea. This may have some, albeit unknown, potential to relieve the halibut PSC constraint somewhat.

Table 10-38 Potential halibut PSC changes estimated in this section.

	Alternative 2		Alternative 3		Alternative 4	
Species	Low	High	Low	High	Low	High
Aleutian Islands Atka mackerel	-32	-37	-23	-26	-23	-26
Aleutian Islands Pacific cod	-15	-38	-9	-26	-9	-23
Bering Sea Pacific cod	95	236	54	162	54	147
Bering Sea rock sole	81	81	81	81	81	81
Bering Sea yellowfin sole	186	186	80	80	80	80
Net halibut requirement	316	429	183	272	183	259
Available PSC	250	250	250	250	250	250
Net halibut requirement minus available PSC	66	179	-67	22	-67	9

Source: Earlier tables in this section
Note: Hypothetical changes in halibut associated with assumptions used in each section. Calculations do not take account of potential limitation of groundfish catch by halibut PSC constraints. Calculations of available halibut are based on the PSC allocation to the Amendment 80 fleet in 2012, when halibut PSC allocations to the fleet have been reduced to Council mandated levels.

NMFS is unable to judge how the Amendment 80 trawl catcher/processors would divide their available halibut PSC allowance among Bering Sea rock sole, yellowfin sole, and Pacific cod fisheries. There may be some additional effort in the parts of the Aleutian Islands where Pacific cod habitat remains available under the action alternatives, providing access to Pacific cod at a lower cost in terms of halibut mortality. However, because of the limited Pacific cod habitat remaining available under the alternatives, the Amendment 80 fleet would, presumably, be unable to harvest the amounts it has historically taken in the Aleutian Islands. Therefore, the Amendment 80 vessels would likely need to move to the Bering Sea to harvest additional Pacific cod.

Since targeted Pacific cod in the Bering Sea has a high rate of halibut PSC, it is possible that a Pacific cod allocated to Amendment 80 vessels would be left unharvested. Table 10-29 shows the estimated reduction in Pacific cod harvests in the Aleutian Islands. Based on this table, a significant portion (4,400 metric tons to 10,800 metric tons) of Pacific cod could go unharvested under Alternative 2. Lesser amounts might go unharvested under Alternatives 3 (2,500 metric tons to 7,400 metric tons), and 4 ((2,500 to 6,700). Unlike other groundfish species quotas, unharvested Pacific cod could not be reallocated to other sectors and, thus, would be left in the sea.

The Amendment 80 vessels are subject to a groundfish retention standard (GRS), established under BSAI FMP Amendments 79 and 80. This currently (October 2010) requires Amendment 80 catcher/processors of all sizes to retain and utilize 80 percent of all the groundfish caught during fishing operations. This percentage is scheduled to increase to 85 percent in 2011, and remain at that level thereafter. Retention rates are relatively high in the Aleutian Island Atka mackerel and Pacific cod fisheries, and industry sources have expressed concern that reductions in the level of fishing activity in these fisheries will make it more difficult for the industry to meet the scheduled retention standards (Swanson, 2010).

However, the GRS may be rescinded by January 2011, and so may not be a concern. At its June 2010 meeting, the Council received a groundfish retention standard discussion paper from NMFS, prepared in response to a Council request at its April meeting. The NMFS paper pointed to a "disconnect" between the implementation of the retention rate calculation in regulations, and the method considered in the analysis reviewed by the Council when it took its original action. It also pointed to concerns about the costs of enforcing the program (NMFS 2010a; NPFMC 2010a). In light of these concerns, the Council approved an emergency action to temporarily suspend the retention standard regulations. NMFS is currently preparing an emergency rule to implement this, which should take effect at the start of the 2011 fishing season (Merrill, personal communication).[54] Should this emergency rule be implemented, the retention standard would no longer be applicable, and should not be a concern. Should the Council adopt a new retention standard in the future, it could do so taking account of the limits imposed by the Steller sea lion protection measures.

As noted in sub-section 10.2.1, the Pacific cod TAC in the BSAI is a BSAI-wide TAC. Although it is allocated among user groups, vessels in a user group may fish their allocation anywhere in the BSAI. At its October 2008 meeting, the Council received a report from its SSC, supporting setting a combined BSAI overfishing level and separate ABCs for Bering Sea and Aleutian Islands Pacific cod. At its December 2008 meeting, the Council received an updated discussion paper on this topic (NPFMC 2008). In February 2009, the Council approved the creation of a committee to begin looking at the issues involved (NPFMC 2009a). In December 2008 and February 2009, the Council was aware of the complications that might be created if the FMP biop, then under development, included an RPA that modified the management of BSAI Pacific cod, and it believed it necessary to see the FMP biop, before making decisions about Pacific cod.

Industry sources have expressed concern about the loss of Pacific cod fishing opportunities, if the Council acts to split the BSAI Pacific cod TAC. If, during the process of splitting the TACs, the Council takes steps to allocate Amendment 80 quota shares or other individual fishing privileges to Aleutian Islands and Bering Sea allocations on the basis of fishing history in the Aleutian Islands and the Bering Sea, operations whose fishing history is in the Aleutian Islands may receive quota share to TACs that have been severely limited. If the Council chooses not to designate quota shares as either Aleutian Islands or Bering Sea quota share, additional vessels shifting from the Aleutian Islands to the Bering Sea would compete with vessels already active in the Bering Sea for the share of the TAC available there, reducing average harvests (i.e., effectively, the status quo condition). Pacific cod fishing operations may also

[54] Glenn Merrill. Sustainable Fisheries Division, National Marine Fisheries Service, Alaska Region. Personal communication, September 16, 2010.

become more highly concentrated in the eastern Aleutian Islands, if fishing operations attempt to harvest the full Aleutian Islands share of their allocations in this more limited area.

Other options for the trawl catcher/processors

In addition to the options just discussed, trawl catcher/processors have other options, including (1) remaining in port; (2) pursuing fishing opportunities outside of the BSAI and GOA; (3) increasing the effort put into BSAI species that are not covered by Amendment 80, for example, arrowtooth flounder and Greenland turbot; (4) increasing effort in the GOA; and (5) increasing fishing effort for other Amendment 80 species. Each of these five possibilities is discussed below.

Vessels may remain in port during the period they would otherwise have been harvesting Atka mackerel and Pacific cod in the Aleutian Islands. If the vessels displaced from the Aleutian Islands remained in their home ports during the period when they had formerly been fishing, there would be no offsetting fish catches. Vessels may remain in port only part of this period, fishing off Alaska for the remainder. For example, it is possible that vessels may remain in port for a week or so longer than they otherwise would have, before traveling to fishing grounds off Alaska. Each of these alternative strategies would reduce variable operating costs, to some degree.

Opportunities for these vessels to fish outside North Pacific and Bering Sea waters are probably limited. Large catcher/processors are unusual in most U.S. fisheries, although trawl catcher/processors are used in the fishery for Pacific whiting, under the MSA management jurisdiction of the Pacific Fishery Management Council. While some catcher/processors in the pollock fishery participate in the Pacific whiting fishery, the Pacific whiting fishery is now under limited entry. Catcher/processors displaced from the Aleutian Islands could only enter the Pacific whiting fishery, either as a catcher/processor or mothership, by buying a limited entry permit. Freezer-longliner participation is prohibited in the Pacific Northwest sablefish fishery, so Pacific cod longline catcher/processors could not be used there. In general, this does not appear to be a source of offsetting revenues for the firms adversely impacted by this alternative, nor does it appear to be a source of offsetting aggregate production for U.S. fisheries (J. Seger, personal communication).[55]

These vessels may also increase effort for BSAI species that are not covered by Amendment 80. The most likely fisheries are those for arrowtooth flounder and Greenland turbot. These are relatively new target fisheries, and some Amendment 80 Atka mackerel vessels have been targeting these species since the Amendment 80 program began in 2008. The season opening date for both fisheries is May 1, thus, these fisheries are not available as a new target for the Atka mackerel vessels when the “A” season Atka mackerel fishery is currently open. While arrowtooth flounder and Greenland turbot production may increase through time, this production would not be related to the closure of Atka mackerel fishing in Areas 542 and 543 during the first part of the year.

Alaska plaice and “other flatfish” are the only other BSAI species or species groups not managed under catch shares and, thus, open for new entrants for directed fishing. Alaska plaice has generally been lightly harvested, as no major commercial market or this species exists. The 2009 catch was 13,944 metric tons or 33 percent of the initial TAC, primarily caught in pursuit of other flatfish species. The miscellaneous species of the “other flatfish” complex are generally not pursued as fishery targets, but are captured in fisheries for other species. The 2009 catch of “other flatfish” was 2,163 metric tons or 15 percent of the initial TAC. Amendment 80 catcher/processors also could target the trawl allocation of sablefish, but there are high halibut PSC rates in this fishery.

[55] James Seger, Economist, Pacific Fisheries Management Council, personal communication, June 25, 2010.

These vessels are unlikely to shift to the GOA. Regulations limit Amendment 80 vessels to historical catch levels, by establishing sideboard amounts for some GOA groundfish species and associated halibut PSC allowances. Amendment 80 sideboards are applied to all Amendment 80 vessels, in aggregate. Since sideboards were implemented to limit the Amendment 80 vessels to historical levels of harvest, once they had become rationalized in their Bering Sea fisheries, these vessels are not believed to have much opportunity to expand operations in the GOA, as a means to compensate for the loss of fishing opportunities in the Aleutian Islands.

These firms might put more effort into fishing for other Amendment 80 species. In addition to Atka mackerel, rock sole, yellowfin sole, and Pacific cod, the Amendment 80 species include Pacific ocean perch in the Aleutian Islands, and flathead sole. The Amendment 80 program created quota shares for these species.

It is possible that these vessels would fish Pacific ocean perch more intensively, and come closer to taking the full TAC. With the cessation of targeted Atka mackerel harvests, the opportunity cost of time spent fishing and processing in the Pacific ocean perch fishery would get smaller, and firms may feel justified in investing the time needed to fish for and process that species.

In general, increases in Pacific ocean perch catches are likely to be modest. As shown below, in most of the Aleutian Islands areas, vessels normally take in excess of 90 percent of the available TACs. The only area where the catch fell significantly below the TAC was the Bering Sea, since directed fishing for Pacific ocean perch has been closed there. Table 10-39 provides an estimate of the total potential Pacific ocean perch TAC that may be available for more intensive harvest. The estimate is the difference between the average catch from 2007 through 2009, and the 2011 TACs (and set to zero, when the average historical catch exceeds the 2011 TACs). The estimated Pacific ocean perch available is about 3,300 metric tons.

Table 10-39 Pacific ocean perch catches in the BSAI.

Pacific ocean perch catches compared to 2011 TACs (all values in mt)						
Area	2007	2008	2009	Avg. 07–09	2011 TAC	TAC – Avg.
BS (incl. CDQ)	870	510	623	668	3,790	3,122
541	4,762	4,250	3,621	4,211	3,733	0
541 CDQ	335	445	416	399	447	48
542	4,303	4,358	3,848	4,170	3,777	0
542 CDQ	357	450	429	412	453	41
543	7,280	6,653	5,768	6,567	5,787	0
543 CDQ	544	764	643	650	693	43
Total						3,254
Sources: 75 FR 11778; NMFS AKR BSAI Catch Reports (including CDQ) for 2007, 2008, and 2009. Accessed at http://alaskafisheries.noaa.gov/sustainablefisheries/catchstats.htm on June 25, 2010.						

In addition to these considerations, Pacific ocean perch is traditionally fished in the GOA and Aleutian Islands, in July. This is a holdover from the years before the implementation of Amendment 80, when the fishery opening was restricted to July 1, by regulation. For at least the first years of the Amendment 80 management program, the Amendment 80 vessels have continued to operate in this fishery in July. Thus, the additional fishing time for Amendment 80 trawl catcher/processors will not be created at the traditional period for the Pacific ocean perch fishery. However, as time passes, vessels may experiment with this fishery at other times of the year. The release of Amendment 80 vessels in the spring and fall may prompt Pacific ocean perch fishing in those periods. However, given the high levels of this TAC already taken, this would offer only limited potential opportunity in aggregate.

Flathead sole has not been targeted by Amendment 80 Atka mackerel vessels in the past. The flathead sole these vessels have caught was usually caught incidentally in yellowfin sole and rock sole target fisheries. The Amendment 80 Atka mackerel vessels receive only 19 percent of the overall flathead sole quota share. If halibut PSC mortality is low enough, compared to the available allowance of PSC, it may be possible for these vessels to increase their flathead sole catch; however, past history suggests that it is more likely they would reserve their available halibut PSC allowance for use in the rock sole, yellowfin sole, and arrowtooth flounder fisheries. As discussed elsewhere in this section, halibut PSC could significantly restrict Amendment 80 vessel redeployment.

Impacts on other fleets

As new vessels shift onto the yellowfin sole, rock sole, and Pacific cod grounds currently used by other fishing vessels there is potential for increased congestion, and for increased production and lower prices for existing producers.

Figure 10-2 shows the areas within which the rock sole, yellowfin sole, and Pacific cod fisheries take place. The large areas that are fished, and the mobile nature of trawl gear, militate against significant congestion, or other direct impacts on other vessels operating in non-Amendment 80 fleets, as trawl catcher/processors increase the time spent in the fishery. Nevertheless, there is potential for increased costs and downtime for vessels already in the fishery, if they are forced to queue up and spend more time waiting to make a limited number of productive tows in each area.

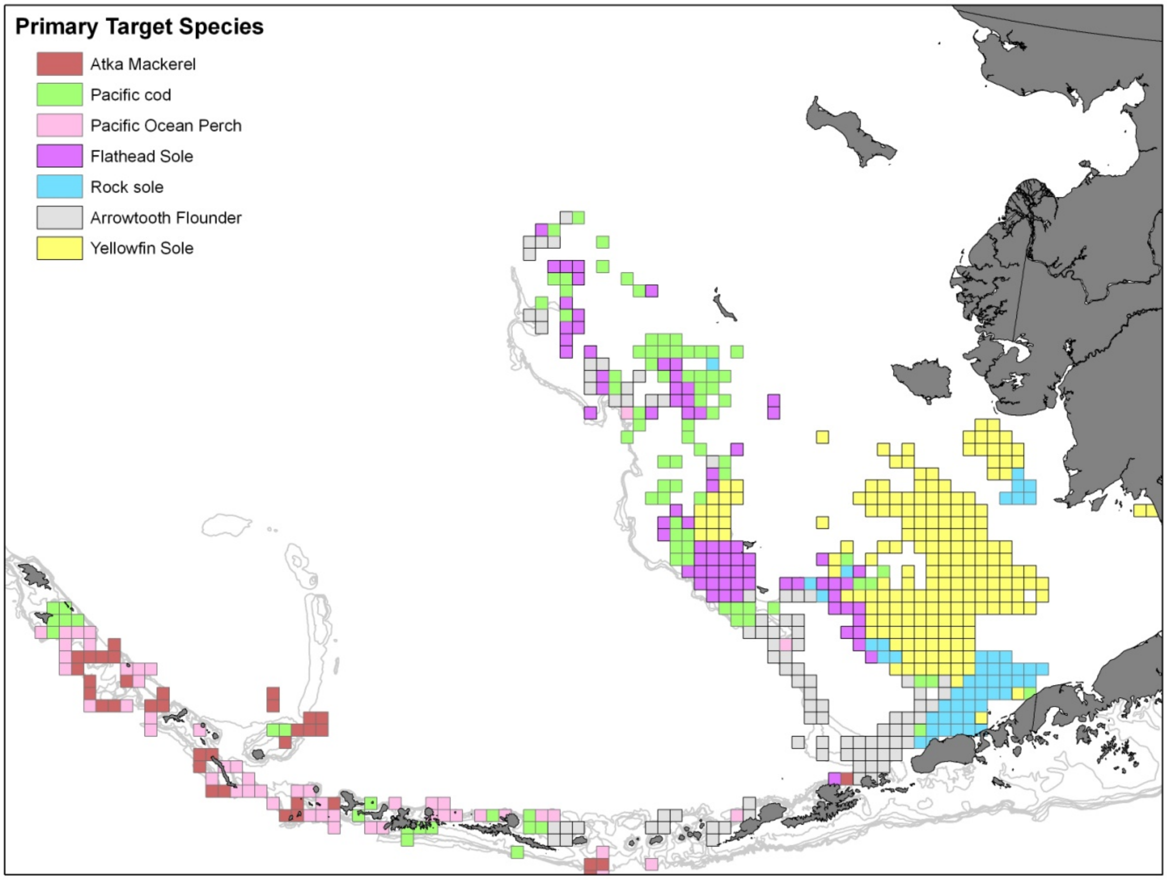

Figure 10-2 Primary target areas for Amendment 80 species (Atka mackerel, Pacific cod, Pacific ocean perch, flathead sole, rock sole, and yellowfin sole) and arrowtooth flounder. (Source: NMFS AKR Catch Accounting System)

Large reductions in directed Atka mackerel harvests may increase Atka mackerel prices, creating an incentive for vessels in other fisheries to increase their incidental catch of Atka mackerel. Increased production of rock sole and yellowfin sole may lead to price reductions for those species. Potential price impacts are discussed further in section 10.6.

In addition to these general considerations, industry sources have pointed to several specific issues of potential significance.

As discussed above, in general, crab PSC limits are not likely to create binding constraints as a result of this action. However, a concern has been raised about potential problems with the Red King Crab Savings Subarea, the portion of the BSAI Red King Crab Savings Area lying between 56° 00′N. and 56° 10′ N. latitude. Less formally, this is called the "10 minute strip."

Non-pelagic trawlers may target groundfish in this part of the savings area, if ADF&G has established a guideline harvest level the previous year for the red king crab fishery in Bristol Bay. When the subarea is open, NMFS, after consultation with the Council, specifies a red king crab PSC limit, not exceeding 25 percent of the red king crab PSC allowance for Zone 1 (50 CFR 679.21(e)(3)((i)(B)). Figure 10-3 shows the location of the savings area and the 10 minute strip (Source: NMFS AKR regulations webpage).

The red king crab PSC in Zone 1 is apportioned among the Amendment 80 and non-Amendment 80 trawl sectors; the Amendment 80 trawl sector apportionment is further divided between the cooperative and limited access fisheries. Despite these Zone 1-level apportionments, the red king crab PSC in the 10 minute strip is not apportioned to separate groups of harvesters (Park, 2010).

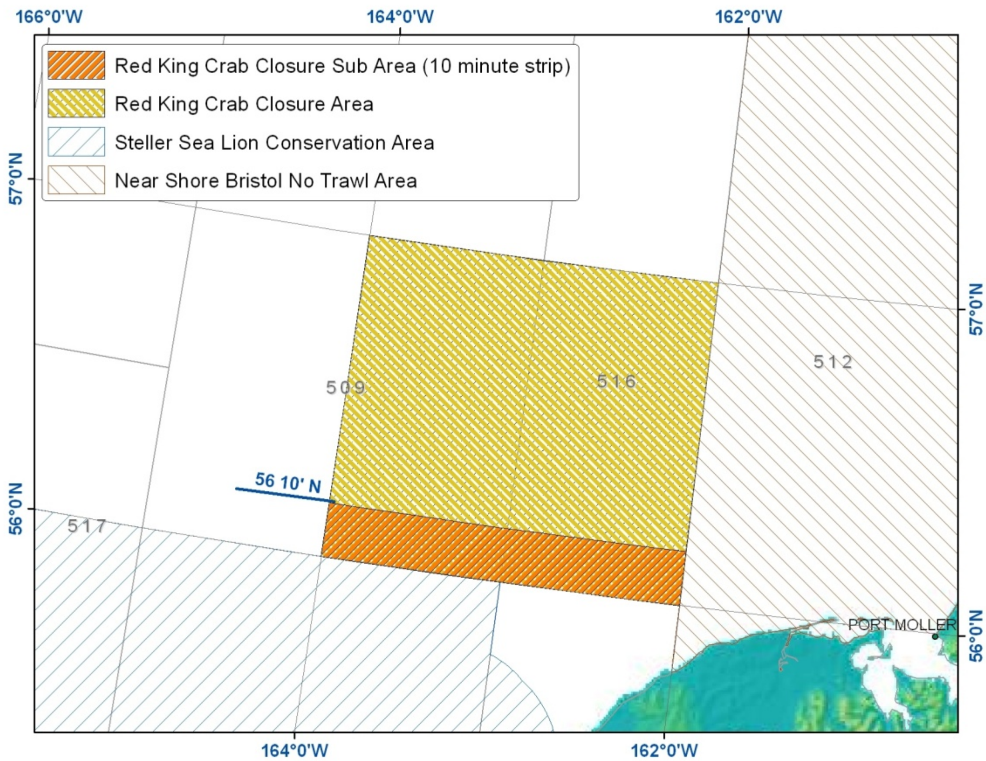

Figure 10-3 Location of the "10 minutes strip".

The 10 minute strip is important to the rock sole fishery, because it can have high CPUE and low halibut PSC rates. A premature closure of the 10 minute strip may shift rock sole vessels south, into areas of lower CPUE and higher halibut PSC. The higher halibut PSC rates may ultimately mean less PSC allowance available for other Amendment 80 fisheries. Fishing south of the 10 minute strip also puts the fleet into higher incidental and bycatch rates of Pacific cod, reducing the amounts available to the fleet for meeting its incidental catch needs during the rest of the year (Park, 2010).

Trawl catcher/processor vessels that fish rock sole have worked cooperatively when fishing in the 10 minute strip. Voluntary agreements have included timed schedules for fishing inside and then leaving the strip, so that data managers can enumerate the red king crab PSC. Captains also have determined acceptable PSC rates, above which vessels voluntarily leave the strip. These voluntary agreements evolved as captains worked together, over a long period of time. Concerns have been raised that a shift into the rock sole fishery by Amendment 80 Atka mackerel boats that have not previously been a party to the voluntary agreements, or that do not voluntarily comply with the guidelines on the grounds, may increase aggregate effort, produce higher harvest rates, and impose early closure of the 10 minute strip. Since allowable removals from the 10 minute strip are not apportioned by sector, any vessel's usage will affect all the non-pelagic trawl groups' access to the 10 minute strip during the rock sole fishery (Park, 2010).

Trawl catcher/processors that do not target rock sole, because they have relatively small Amendment 80 rock sole quota, may fish yellowfin sole up to the ice edge in the *C. opilio* Bycatch Limitation Zone

(COBLZ) area. In the late winter and early spring, opilio crab is found comingled with the yellowfin sole. In 2010, there was new effort by the AFA catcher/processors in this yellowfin sole fishery. The AFA vessels' crab PSC rates, while fishing yellowfin sole in 2010, were high enough that their PSC allowance of opilio crab was fully harvested and the COBLZ area was closed to them. That closure pushed those AFA yellowfin sole vessels into Zone 1, where the Amendment 80 fleet fishes rock sole. If this pattern is repeated, with the addition of the displaced Amendment 80 trawl catcher/processors that must fish yellowfin sole instead of Atka mackerel or Pacific cod, the result could be greater effort in Zone 1 and higher PSC removals (Park, 2010).

The incidental catch rate of rock sole in the early yellowfin sole fishery can be relatively high (25 percent to 35 percent). Amendment 80 incidental catches will be counted against their quota share. For non-Amendment 80 trawl vessels, such as the F/V *Katie Ann* and its catcher vessels, this rock sole is funded by the incidental catch allowance (ICA). This may create pressure to increase the ICA to accommodate the extra rock sole harvest. Any increase to the ICA will decrease the amount available for the Amendment 80 directed fishery allotments of rock sole (Park, 2010).

Figure 10-2 shows that, with one exception, yellowfin sole and rock sole are not targeted in the Bristol Bay area. Most of Bristol Bay has been closed to flatfish trawling since 1997, by the Nearshore Bristol Bay Trawl Closure Area. The only exception is a relatively small area (the Nearshore Bristol Bay Trawl Area) that remains open to trawling from April 1 to June 15. This opening provides flatfish trawling opportunities in an area with high flatfish CPUE, and relatively low PSC. The timing was meant to close trawling activity in the area, when halibut begin to move nearshore, in mid-June (Wilson and Evans 2009:8). Local representatives remain concerned about the volume of halibut PSC mortality, and about potential gear conflicts. In 2009 and 2010, most of the Amendment 80 fleet had a voluntary agreement with local fishermen in the Bristol Bay region to limit the location and time the trawl fleet fishes in this area more than regulation would have permitted. Local representatives are concerned that, with pressure to offset revenue at risk in the Aleutian Islands, that voluntary agreement could be abandoned, leaving local, small-scale fishermen vulnerable to gear conflict and preemptive harvest of halibut PSC allowance amounts (Samuelson, 2010).

The Amendment 80 ITAC formula for non-Atka mackerel Amendment 80 vessels is based on the entire BSAI Atka mackerel TAC. Therefore, if the Atka mackerel TAC is reduced in Areas 543 and 542, the incidental catch amounts of Area 541 and the Bering Sea Atka mackerel for the non-Atka mackerel fleet will be reduced. The resulting Area 541 and the Bering Sea Atka mackerel quota is valuable and, once harvested, limits further fishing for many of the smaller non-Atka mackerel vessels in the Bering Sea. Industry has expressed concern that the decrease in the non-Atka mackerel Area 541 and Bering Sea allocation could reduce revenues of the non-mackerel fleet and, potentially, constrain their efforts in other fisheries (Wood, 2010).

Using the 2011 proposed TAC as a proxy, and assuming the Area 543 TAC would be 0 and the Area 542 TAC would be 47.6 percent of the 2011 TAC, the Amendment 80 ITAC would be 17,061 metric tons for Area 541 and the Bering Sea, and 10,135 metric tons for Area 542. The non-mackerel boats would receive 1,234 metric tons in Area 541 and the Bering Sea, and the mackerel boats would receive 15,827 metric tons. These allocations appear to be large enough to support any incidental catch of Atka mackerel by non-mackerel Amendment 80 vessels in Area 541 and the Bering Sea and still allow a directed Atka mackerel fishery. In the last three years, the total Eastern Bering Sea catch of Atka mackerel by Amendment 80 vessels has been less than 100 metric tons a year (Merrill, personal communication)[56].

[56] Glenn Merrill, National Marine Fisheries Service, Alaska Regional Office. Personal communication, September 15, 2010.

10.3.3 Fixed Gear Catcher/Processors

[ERRATA: after this analysis was prepared in October 2010, the RPA was altered to provide more fishing time for fixed gear catcher/processors in the spring. That may have an impact on estimates of potential revenue losses. This issue is discussed in Section 10.9 on additional issues.]

The alternatives

Catcher/processors operating in the Aleutian Islands with hook-and-line and pot gear target Pacific cod (but, not Atka mackerel). Alternatives 2, 3, and 4 would restrict their Pacific cod fishing opportunities. This fleet is likely to be able to make up the volume of Pacific cod catch in the Bering Sea, although, as discussed in section 10.6, the nature of the fish harvested is likely to be different, and prices received are likely to be lower. This sub-section discusses the shift in Pacific cod harvests, and associated changes in incidental catches of other groundfish species and PSC.

Table 10-40 outlines the key provisions of Alternatives 2, 3, and 4 that would affect fixed gear catcher/processors. All alternatives close the waters from 0 to 3 nm around Kanaga Island/Ship Rock rookery to groundfish fishing. As noted in a subsequent sub-section, this would have little impact on directed fishing.

Table 10-40 Key provisions affecting fixed gear catcher/processors catching Pacific cod (expressed as changes from status quo).

Area	Alternative 2	Alternative 3	Alternative 4 (Preferred)
541	Close critical habitat to directed fishing for Pacific cod.	Close 0–10 nm of critical habitat to directed fishing. Close critical habitat from 10 nm to 20 nm from January 1 through June 10. Prohibit Pacific cod fishing in November and December.	Close 0–10 nm of critical habitat to directed fishing. Close critical habitat from 10 nm to 20 nm from January 1 through March 1. Prohibit Pacific cod fishing in November and December. Reinitiation trigger.
542	Prohibit retention of Pacific cod.	Close 0 to 10 nm of critical habitat to directed fishing. Close 10 nm to 20 nm to directed fishing from January 1 through June 10. Prohibit Pacific cod fishing in November and December.	Similar to Alternative 3, except (a) vessels less than 60 ft may fish in critical habitat from 6 miles to 20 miles, from January 1 to November 1; (b) vessels 60 ft or greater may fish from 6 miles to 20 miles from March 1 to November 1. Reinitiation trigger.
543	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.
Source: Discussion of alternatives in chapter 2 of the EA.			

Impact on operations in the Aleutian Islands

The top block of Table 10-41 provides estimates of the potential *reductions* in Pacific cod harvests by fixed gear catcher/processors, by year, for 2004 through 2009, if Alternative 2 had been in place in each year. The annual estimates in this table are based on estimates of the volume of Pacific cod taken in waters, and at times, that would be closed by the alternative.[57] The decline in catch ranged from about 2,100 metric to about 6,400 metric tons. The median decline in catch would have been about 2,900 metric tons.

For the purpose of evaluating the impact of Alternative 2 on Pacific cod production in the Aleutian Islands, a range was defined by the aggregate production in 2008 and 2009. Harvests rose from 2005 to 2008, and then dropped slightly in 2009. However, harvests in both 2008 and 2009 were over twice the 2005 harvests. In the analysis, the estimated impact on the round weight of Pacific cod harvests in the

[57] In some years, in some areas, confidentiality concerns preclude reporting the round weight of Pacific cod harvest that would have been caught or forgone.

Aleutian Islands is a reduction of about 5,800 metric tons to 6,400 metric tons to reflect high recent (2008 and 2009) harvests.

The second block of Table 10-41 provides estimates of the potential reductions in Pacific cod harvests by fixed gear catcher/processors, if Alternative 3 had been in place in each year. The decline in catch ranged from about 1,800 metric tons in 2006, to about 6,200 metric tons in 2008. The median decline in catch would have been about 2,900 metric tons.

For the purpose of evaluating the impact of Alternative 3 on Pacific cod production in the Aleutian Islands, a range was defined by the aggregate production in each of the years 2008 and 2009. These years were chosen to reflect the impact of the recent increase in production in Areas 542 and 543. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands is a reduction of about 4,900 metric tons to 6,200 metric tons.

Finally, the bottom block of Table 10-41 provides estimates of the potential reductions in Pacific cod harvests by fixed gear catcher/processors, if Alternative 4 had been in place in each year. The decline in catch ranged from about 1,400 metric tons to about 4,200 metric tons. The median decline in catch would have been about 2,000 metric tons.

For the purpose of evaluating the impact of Alternative 4 on Pacific cod production in the Aleutian Islands, a range was defined by the aggregate production in each of the years 2008 and 2009. These years were chosen to reflect the impact of the recent increase in production in Areas 542 and 543. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands is a reduction of about 3,700 metric tons to 4,200 metric tons.

The last column of Table 10-41 summarizes information about the impact of this action on fixed gear catcher/processor aggregate production of Pacific cod in the Aleutian Islands. Alternative 2 would reduce Pacific cod catches by this fleet to an average of about 17 percent of what they were annually, during the six-year period from 2004 through 2009. Alternative 3 has a smaller impact, reducing production to about 23 percent of what it would have been, and Alternative 4 has an even smaller impact, reducing production to about 44 percent of what it would have been. The impact of this action appears stronger when the last two years of this period, 2008 and 2009—when Aleutian Islands production was significantly higher than it had been in earlier years—are examined. Alternative 2 would have left 4 or 5 percent of the pre-existing production, Alternative 3 would have left 8 percent to 20 percent, and Alternative 4 would have left 38 percent to 39 percent. In all cases, however, the percentage reduction in harvests will be significant.

Table 10-41 Estimated aggregate reductions for fixed gear catcher/processors in Pacific cod harvests in the Aleutian Islands, had Alternatives 2, 3, and 4 been in effect, by year, from 2004 through 2009.

Alternative 2													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Total	541	542	543	Total	541	542	543	Total	
2004	1,568	974	395	2,937	990	994	395	2,378	579	0	0	558	19%
2005	2,794	C	C	2,794	2,087	C	C	2,087	707	C	C	707	25%
2006	3,051	C	C	3,051	2,083	C	C	2,083	980	C	C	968	32%
2007	1,770	730	1,660	4,160	1,008	751	1,697	*3,455*	763	0	0	705	17%
2008	1,898	2,516	2,309	6,723	1,491	2,535	2,362	6,388	407	0	0	335	5%
2009	1,409	1,924	2,756	6,090	1,059	1,957	2,812	5,828	351	0	0	261	4%
Ave	2,082	C	C	4,292	1,453	C	C	3,703	631	C	C	589	17%
Med	1,834	C	C	3,606	1,275	C	C	2,917	643	C	C	631	18%
Min	1,409	C	C	2,794	990	C	C	2,083	351	C	C	261	4%
Max	3,051	C	C	6,723	2,087	C	C	6,388	980	C	C	968	32%
Alternative 3													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Total	541	542	543	Total	541	542	543	Total	
2004	1,568	974	395	2,937	983	969	395	2,347	585	4	0	589	20%
2005	2,794	C	C	2,794	1,908	C	C	1,908	886	C	C	886	32%
2006	3,051	C	C	3,051	1,819	C	C	1,819	1,238	C	C	1,232	40%
2007	1,770	730	1,660	4,160	1,014	751	1,697	*3,462*	756	0	0	699	17%
2008	1,898	2,516	2,309	6,723	1,401	2,422	2,362	6,185	497	93	0	538	8%
2009	1,409	1,924	2,756	6,090	794	1,295	2,812	4,902	615	629	0	1,188	20%
Ave	2,082	C	C	4,292	1,320	C	C	3,437	763	C	C	855	23%
Med	1,834	C	C	3,606	1,207	C	C	2,904	686	C	C	792	20%
Min	1,409	C	C	2,794	794	C	C	1,819	497	C	C	538	8%
Max	3,051	C	C	6,723	1,908	C	C	6,185	1,238	C	C	1,232	40%
Alternative 4 (Preferred alternative)													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Total	541	542	543	Total	541	542	543	Total	
2004	1,568	974	395	2,937	539	499	395	1,433	1,030	474	0	1,504	51%
2005	2,794	C	C	2,794	1,736	C	C	1,736	1,057	C	C	1,057	38%
2006	3,051	C	C	3,051	1,385	C	C	1,385	1,672	C	C	1,666	55%
2007	1,770	730	1,660	4,160	314	300	1,697	2,311	1,456	430	0	1,849	44%
2008	1,898	2,516	2,309	6,723	940	896	2,362	4,197	959	1,620	0	2,526	38%
2009	1,409	1,924	2,756	6,090	480	395	2,812	3,688	930	1,529	0	2,402	39%
Ave	2,082	C	C	4,292	899	C	C	2,458	1,184	C	C	1,834	44%
Med	1,834	C	C	3,606	739	C	C	2,024	1,044	C	C	1,758	42%
Min	1,409	C	C	2,794	314	C	C	1,385	930	C	C	1,057	38%
Max	3,051	C	C	6,723	1,736	C	C	4,197	1,672	C	C	2,526	55%

Notes: Metric tons include retained and discarded Pacific cod from targeted and incidental fishing. "C" indicates that data in the cell has been added to the cell on the left to maintain confidentiality. All residuals were estimated by subtracting reductions (from the CAS) from the baseline (from the CIA). Since residuals and baseline numbers came from different sources, discrepencies can produce negative values for residuals. These have been set to zero.
Source: NMFS AKR estimates using CAS and CIA data.

Reaction of directly impacted Pacific cod fixed gear catcher/processors

Depending on the alternative, Pacific cod fixed gear catcher/processors may shift fishing effort to places and periods in Aleutian Islands Areas 541 and 542, which are still open to fishing for Pacific cod. However, due to the footprint that fixed gear catcher/processors require to effectively fish an area, and due to the limited amount of Pacific cod habitat available, increased effort in those areas would be limited. The prime Pacific cod fishing locations are found within critical habitat.

The Pacific cod TAC for the BSAI is not currently split between the Aleutian Islands and the Bering Sea. The hook-and-line and pot catcher/processor sectors harvest under the authority of BSAI-wide TACs that may be fished in either area. Thus, vessels unable to continue to fish within the Aleutian Islands would be able to shift their fishing effort into the Bering Sea. As discussed earlier, the Council is considering measures to divide the BSAI Pacific cod ABC and TAC into separate Bering Sea and Aleutian Islands ABCs and TACs. The impact of that action would depend on the method it used to assign fishing access privileges to different entities.

Fixed gear catcher/processors that are active in the Aleutian Islands have a history of activity in the Bering Sea. Comparisons of vessels that fish in the Aleutian Islands indicate there are no significant differences in weekly catch rates in the Aleutian Islands versus the Bering Sea, by those same vessels and at those same time periods. Table 10-42 shows annual weekly average harvest in the Bering Sea, expressed as a percentage of annual weekly average harvest in the Aleutian Islands, for the vessels that were active in the Aleutian Islands "B" season in each year. In the Aleutian Islands, most fixed gear catcher/processor effort occurs in the "B" season and is spread out along the entire Aleutian chain.

Table 10-42 Comparison of average "B" season weekly harvest rates in the Bering Sea and the Aleutian Islands for vessels active in the Aleutian Islands.

Year	Number of vessels	Average weekly BS harvest in this year, expressed as an average of average weekly AI harvest in this year, for the vessels active in the AI in this year
2003	*3*	126%
2004	*3*	109%
2005	*2*	C
2006	*3*	149%
2007	*3*	94%
2008	*9*	83%
2009	*5*	95%

Notes: number of vessels is the number targeting Pacific cod in the Aleutian Islands in the year shown. "C" indicates confidential information.
Source: NMFS AKR calculation from CAS.

The hook-and-line catcher/processor sector normally receives reallocations of BSAI Pacific cod TAC from other fishing sectors that are likely to be unable to take their full allocations. Between 2004 and 2009, these reallocations have ranged between about 2,200 metric tons and about 22,200 metric tons.[58] The fleet has shown the ability to harvest these reallocations in the Bering Sea. The annual Aleutian Islands harvest during this period, between about 2,600 metric tons and about 6,400 metric tons, is at the lower end of this range of reallocations. This further suggests that the fleet will have the capacity to harvest the fish forgone in the Aleutian Islands, by shifting effort to the Bering Sea.

As discussed in sub-section 10.2.3, the hook-and-line vessels in this sector are members of a cooperative, with the ability to coordinate the fishing activity of member vessels. While the cooperative is a voluntary association, all the fishing firms with License Limitation Permits (LLPs) for the hook-and-line catcher/processor sector are signatories to a cooperative contract, effectively creating private quota shares. Cooperative-member compliance is monitored by SeaState, Inc., and the contract signed by members imposes financial penalties for non-compliance. (Downs, pers. comm.)[59] This cooperative arrangement may give the sector a mechanism to coordinate responses to the change in regional fishery quotas.

[58] At the time of writing (October 2010), it is not clear if the hook-and-line catcher/processor sector will receive reallocations in 2010 (NMFS AKR in-season management).

[59] Kenny Down, Executive Director of the Freezer Longliner Coalition, personal communication, August 23, 2010.

A shift in the location of Pacific cod harvests by this sector would be associated with changes in the incidental catch of other groundfish species, and of PSC species, however, changes in PSC harvests appear unlikely to constrain Bering Sea production by this fleet. The relevant incidental catch and PSC rates for the Aleutian Islands and the Bering Sea are summarized in Table 10-44. The estimated impacts on actual harvests are summarized in Table 10-43. The top part of the table shows the estimated changes in incidental catches and PSC in the Aleutians as Pacific cod production is reduced by the amounts shown. The middle part shows similar changes in the Bering Sea, if production of Pacific cod increased there by the same amounts. Finally, the third part shows the net impact on PSC. (PSC rates are relatively low for this fleet, and PSC is not likely to be a constraint on them.

Table 10-43 Summary of harvest impacts associated with regulation of the fixed gear catcher/processor vessels. (metric tons unless otherwise noted)

Area	Species	Alternative 2		Alternative 3		Alternative 4 (preferred)	
		Low	High	Low	High	Low	High
Aleutian Islands	Pacific cod	-5,828	-6,388	-4,902	-6,185	-3,688	-4,197
	Greenland turbot	-6	-6	-5	-6	-4	-4
	Pollock	-12	-13	-10	-12	-7	-8
	Rougheye	-12	-13	-10	-12	-7	-8
	C. bairdi (No.)	-25,073	-27,482	-21,089	-26,608	-15,866	-18,056
	C. opilio (No.)	-29,564	-32,405	-24,867	-31,375	-18,708	-21,290
	Red King crab (No.)	-593	-650	-499	-630	-375	-427
	Halibut	-57	-62	-48	-60	-36	-41
	Chinook salmon (No.)	0	0	0	0	0	0
	Other salmon (No.)	-1	-1	-1	-1	-1	-1
Bering Sea	Pacific cod	5,828	6,388	4,902	6,185	3,688	4,197
	Greenland turbot	6	6	5	6	4	4
	Pollock	245	268	206	260	155	176
	Rougheye	0	0	0	0	0	0
	C. bairdi (No.)	4,626	5,070	3,891	4,909	2,927	3,331
	C. opilio (No.)	10,690	11,717	8,991	11,345	6,765	7,698
	Red King crab (No.)	679	744	571	721	430	489
	Halibut	29	32	24	31	18	21
	Chinook salmon (No.)	2	2	2	2	1	1
	Other salmon (No.)	9	10	7	9	6	6
Net impact on PSC	C. bairdi (No.)	-20,447	-22,411	-17,198	-21,699	-12,939	-14,725
	C. opilio (No.)	-18,874	-20,688	-15,875	-20,030	-11,944	-13,592
	Red King crab (No.)	86	94	72	91	54	62
	Halibut	-28	-30	-23	-29	-18	-20
	Chinook salmon (No.)	2	2	2	2	1	1
	Other salmon (No.)	8	9	7	8	5	6

Notes: Groundfish incidental catch estimates are for species estimated to have significant commercial value based on production reports and knowledge of the fleet. PSC rates based on average rate of PSC per retained metric ton of the target species from 2004 to 2009. PSC species subject to limits are included.
Source: NMFS AKR estimates based on CAS.

Table 10-44 Estimated species catch rates per ton of fixed gear catcher/processor groundfish harvest, and rates of prohibited species catch (averages for 2003 through 2009).

	PSC AI	PSC BS	Units
C. bairdi	4.406	3.807	Crab/mt groundfish
C. opilio	5.687	3.025	Crab/mt groundfish
Red king crab	0.145	0.178	Crab/mt groundfish
Halibut	0.0094	0.004	mt mortality/mt groundfish
Chinook salmon	0	0	Salmon/mt groundfish
Other salmon	0	0.001	Salmon/mt groundfish

Note: Ratios and percentages were calculated to show the metric tonnage of the incidental or PSC species per metric ton of retained and discarded target species.
Source: NMFS AKR Catch Accounting System

As discussed in sub-section 10.3.4, the trawl catcher vessel fleet may be unable to effectively harvest additional Pacific cod in the Bering Sea to make up for the loss of Pacific cod fishing opportunities in the Aleutian Islands. If that is the case, the unused trawl allocation may be reallocated to other fleets, and may find its way to the fixed gear catcher/processor fleet, towards the end of the year. Table 10-45 shows the potential harvest increment, and associated groundfish and PSC, if such a reallocation occurs. The amounts of Pacific cod are those estimated to be given up in the Aleutian Islands, by the trawl catcher vessel fleet, while the amounts of other groundfish and of the prohibited species are estimated using the respective fixed gear catch rates. The estimates in Table 10-45 are speculative, depending on the behavior of the trawl catcher vessel sector and on potential reallocation among sectors between the trawlers and the hook-and-line catcher/processors. The changes in the volumes of Pacific cod that drive the results in the table are derived from Table 10-48.

Table 10-45 Possible additional incidental groundfish catch and PSC by fixed gear vessels, if the trawl catcher vessel allotments in the Bering Sea are reallocated to the vessels in the sector.

Species	Alternative 2		Alternative 3		Alternative 4 (preferred)		Units
	Low	High	Low	High	Low	High	
Pacific cod	6,800	12,976	2,631	6,066	2,331	5,978	mt
Greenland turbot	7	13	3	6	2	6	mt
Other species	286	545	111	255	98	251	mt
Rougheye	0	0	0	0	0	0	mt
C. bairdi	5,397	10,299	2,088	4,815	1,850	4,745	Crab
C. opilio	12,473	23,801	4,826	11,126	4,276	10,965	Crab
Red king crab	792	1,512	307	707	272	696	Crab
Halibut	34	65	13	30	12	30	mt
Chinook salmon	2	4	1	2	1	2	Salmon
Other salmon	10	20	4	9	4	9	Salmon

Notes: Groundfish incidental catch estimates are for species, other than Amendment 80 species, estimated to have significant commercial value based on production reports and knowledge of the fleet. PSC species subject to limits are included.
mt represents metric tons of halibut PSC mortality.
Source: NMFS AKR estimates based on CAS.

While the hook-and-line vessels may be able to offset the volume loss of Pacific cod by redeploying into the Bering Sea, the shift will nevertheless have adverse implications for the fishing operations. These catcher/processing vessels had originally gone to the Aleutian Islands because they expected—given vessel configuration, captain's skills, and marketing networks—that the Aleutian Islands would be the most profitable destination. Restrictions that force redeployment to other fishing grounds, move the vessels towards what are, for them, likely to be less profitable fisheries. Industry sources indicate that fishery conditions are different in the Aleutian Islands and the Bering Sea. For example, they indicate that the size distribution of fish in catches tends to be skewed toward larger fish in the Aleutian Islands, and that the larger fish have a distinct market niche that receives a higher price. Thus, a shift towards the smaller size classes of fish found in the Bering Sea may constrain the industry's ability to service certain markets, and reduce the overall value of the harvest to the industry. This is discussed in more detail in sub-section 10.6.3 and section 10.8.

Other information indicates that fishing operations are different in the Bering Sea. The Bering Sea fishery tends to be a higher volume fishery, depending on fishing more gear and fishing it more intensively. This may affect operations on the cost side. For example, the Bering Sea fishery may be more bait intensive (Hosmer, personal communication).[60] In addition to increasing this element of fishing costs, this may also affect demand for, and the price of, bait.

The shift may have other operational implications for vessels fishing in the Aleutian Islands. One operator has indicated that his fishing strategy in the Aleutian Islands depends on the availability of both Pacific cod and sablefish fishing opportunities. This operator finds that Orca and sperm whale predation on his gear becomes a problem when he is targeting sablefish or Greenland turbot in the Aleutian Islands. When this becomes a problem he stops fishing deep water gear and shifts to targeting Pacific cod, until the whales disperse. He indicates that it is not uncommon for whales to follow his boat for a week or more, until they become discouraged (Lone, 2010).

Indirectly impacted sectors

Fixed gear catcher/processor vessels operating in the Bering Sea could face increased congestion and competition for resources. The amount of available Pacific cod habitat in the Bering Sea and the small number of vessels affected will tend to reduce potential impacts. From 2005 through 2009, 38 to 39 hook-and-line catcher/processors, and 2 to 6 pot catcher/processors, operated in the BSAI (Hiatt et al. 2010:78) During this same period, 4 to 10 hook-and-line catcher/processors, and 1 to 4 pot catcher/processors, operated in the Aleutian Islands (see Table 10-8). This action would result in a shift of a significant amount of the Aleutian Islands effort to the Bering Sea. The vessels in the Aleutian Islands also fished in the Bering Sea at other times. The variation in numbers in the Aleutian Islands over the time period indicates that in some years relatively few vessels may fish in the Aleutian Islands, irrespective of this action. It is possible that ongoing license buyback and cooperative-driven fleet consolidation in the hook-and-line catcher/processor fleet may mitigate potential congestion.

Conflicts between hook-and-line catcher/processors and trawlers seem unlikely, since the two vessel classes tend to fish in different areas. The trawlers are concentrated in southern Area 517 and in Area 509, while the hook-and-line catcher/processors tend to fish around the Pribilof Islands and north of the Pribilof Islands in northern Area 517, and in Areas 513 and 521 (communication from NMFS AKR in-season managers).

The concern has been expressed that fixed gear catcher/processors that choose to shift into the GOA may pre-empt Amendment 80 directed fishing. Pending implementation of a GOA Pacific cod sector allocation under GOA Groundfish FMP Amendment 83, the vessels in the offshore sector share an offshore Pacific cod allocation (regardless of gear type). Pacific cod for the Amendment 80 fleet is really not a viable target, until the second quarter, when this fleet has a more substantial shallow-water halibut PSC sideboard allowance. However, by the second quarter, the offshore Pacific cod could be closed to directed fishing or on “prohibited” status, since the fixed gear boats start fishing on January 1 (Park, 2010). However, this action is likely to have minimal impacts on the deployment of fixed gear catcher/processors in the first half of the year. Most of the fixed gear catcher/processor activity takes place in the “B” season. From 2004 through 2010, the percent of the BSAI freezer longline “A” season harvest taken in the Aleutian Islands, ranged from one percent to three percent. Five of the seven years it was one percent (NMFS AKR CAS).

[60] Chuck Hosmer, General Manager M/V *Baranof* and M/V *Courageous*. Personal communication, August 2010.

Pot vessels are unlikely to shift into the GOA, because they lack endorsements to do so (communication from NMFS AKR in-season management).

10.3.4 Catcher Vessels

The alternatives

Alternatives 2, 3, and 4 treat trawl and non-trawl catcher vessels differently. The differences, by management area, are described in Table 10-46. Both alternatives close the waters from 0 to 3 nm around Kanaga Island/Ship Rock rookery to groundfish fishing. As noted elsewhere, the closure around Kanaga Island would have little impact on directed fishing.

Table 10-46 Key provisions affecting Pacific cod catcher vessel operations (expressed as changes from status quo).

Area	Alternative 2	Alternative 3	Alternative 4 (Preferred)
Trawl			
541	Close critical habitat to directed fishing.	Close 0 to 10 nm of critical habitat to fishing. Close 10 nm to 20 nm to directed fishing from June 10 to November 1.	Close 0 to 10 nm of critical habitat to fishing. Close 10 nm to 20 nm to directed fishing from June 10 to November 1.
542	Prohibit retention of Pacific cod.	Close 0 to 20 nm of critical habitat to directed fishing year round.	Close 0 to 20 nm of critical habitat to directed fishing year round, except: permit trawl vessels to fish for Pacific cod from 10 nm to 20 nm of critical habitat from 178°W to 177°W, January 20 to June 10.
543	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.
Fixed gear			
541	Close critical habitat to directed fishing. Prohibit directed fishing by non-trawl gears in November and December.	Close 0 to 10 nm of critical habitat to fishing. Close 10 nm to 20 nm to directed fishing from January 1 through June 10.	Close 0 to 10 nm of critical habitat to fishing. Close 10 nm to 20 nm to directed fishing from January 1 through March 1.
542	Prohibit retention of Pacific cod.	Close 0 to 10 nm to directed fishing year round. Close 10 nm to 20 nm to directed fishing January 1 through June 10.	Permit non-trawl vessels < 60 feet to fish for Pacific cod from 6 nm to 10 nm in critical habitat year round. Permit non-trawl vessels ≥ 60 feet to fish for Pacific cod in critical habitat March 1 to November 1.
543	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.	Prohibit retention of Pacific cod.
Source: Discussion of alternatives in chapter 2 of the EA.			

As discussed in sub-section 10.2.4, trawl, hook-and-line, pot, and jig catcher vessels all harvest Pacific cod in federal waters and in parallel fisheries in state waters of the Aleutian Islands. To preserve data confidentiality, the vessels in these fleets have been grouped together in a catcher vessel category for analysis. The vessels that operate in the State GHL Pacific cod fishery will be treated in a later section.

This action reduces the catch of Pacific cod by catcher vessels in the Aleutian Islands. Catcher vessels may be able to offset some of this lost harvest by increased activity in the Bering Sea; however, it is also possible that this fleet will not be able to fully offset the lost harvest. If it is not able to so do, Pacific cod TAC may be reallocated to other sectors in the fall. This shift in sectoral activity may also have adverse effects on other fleets.

Direct impacts in the Aleutian Islands

The first part of Table 10-47 provides estimates of the potential reductions in Pacific cod harvests by catcher vessels delivering to motherships and/or shoreside processors, by year, for 2004 through 2009, if the management measures proposed under Alternative 2 had been in place in each year. The annual estimates in this table are based on estimates of the volume of Pacific cod taken in waters and at times that would be closed by the alternative. The decline in catch would have ranged from about 6,800 metric tons, to about 13,000 metric tons. The median decline in catch would have been about 11,300 metric tons. For the purpose of evaluating the impact of Alternative 2 on Pacific cod production in the Aleutian Islands in section 10.6, a range was defined by the aggregate production in each of the years from 2004 through 2009. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands, from the restrictions in Alternative 2, is a reduction of about 6,800 metric tons to 13,000 metric tons.

The second part of Table 10-47 provides estimates of the potential reductions in Pacific cod harvests if Alternative 3 had been in place in each year. The decline in catch would have ranged from about 2,600 metric tons, to about 6,100 metric tons. The median decline in catch would have been about 5,800 metric tons. For the purpose of evaluating the impact of Alternative 3 on Pacific cod production in the Aleutian Islands in section 10.6, a range was defined by the aggregate production in each of the years from 2004 through 2009. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands, from the restrictions in Alternative 3, is a reduction of about 2,600 metric tons to 6,100 metric tons.

The third part of Table 10-47 also provides estimates of the potential reductions in Pacific cod harvests if Alternative 4 had been in place in each year. The decline in catch would have ranged from about 2,300 metric tons, to about 6,000 metric tons. The median decline in catch would have been about 5,600 metric tons. For the purpose of evaluating the impact of Alternative 4 on Pacific cod production in the Aleutian Islands in section 10.6, a range was defined by the aggregate production in each of the years from 2004 through 2009. Thus, the estimated impact on the round weight of Pacific cod harvests in the Aleutian Islands, from the restrictions in Alternative 4, is a reduction of about 2,300 metric tons to 6,000 metric tons.

The last column of Table 10-47 summarizes information about the impact of this action on fixed gear catcher/processor production of Pacific cod in the Aleutian Islands. The table shows that Alternative 2 would reduce Pacific cod catches by this fleet to an average of about 11 percent of what they were annually, during the six-year period from 2004 through 2009. Alternative 3 has a significantly smaller impact, reducing production to about 58 percent of what it would have been. Alternative 4 has a slightly smaller impact than Alternative 3, reducing production to about 60 percent of what it would have been.

Table 10-47 Estimated aggregate Pacific cod reductions for catcher vessels delivering to motherships or shoreside processors in the Aleutian Islands had Alternatives 2 and 3 been in effect, by year, from 2004 through 2009.

Alternative 2													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Tot	541	542	543	Tot	541	542	543	Tot	
2004	11,034	2,468	13	13,515	9,400	2,478	13	11,891	1,634	0	0	1,624	12%
2005	6,711	1,297	C	8,007	6,270	1,385	C	7,655	441	0	C	352	4%
2006	5,139	1,064	1,036	7,239	4,655	1,109	1,036	6,800	484	0	0	439	6%
2007	11,237	1,127	1,068	13,432	8,516	1,130	1,068	*10,713*	2,722	0	0	2,719	20%
2008	10,613	675	3,117	14,404	8,830	703	3,123	12,656	1,783	0	0	1,748	12%
2009	9,753	1,856	3,460	15,069	7,661	1,856	3,460	12,976	2,092	0	0	2,092	14%
Ave	9,081	1,414	C	11,944	7,555	1,444	C	10,449	1,526	0	C	1,496	11%
Med	10,183	1,212	C	13,473	8,088	1,258	C	11,302	1,709	0	C	1,686	12%
Min	5,139	675	C	7,239	4,655	703	C	6,800	441	0	C	352	4%
Max	11,237	2,468	C	15,069	9,400	2,478	C	12,976	2,722	0	C	2,719	20%
Alternative 3													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Tot	541	542	543	Tot	541	542	543	Tot	
2004	11,034	2,468	13	13,515	4,253	1,801	13	6,066	6,781	668	0	7,449	55%
2005	6,711	1,297	C	8,007	2,824	801	C	3,625	3,887	560	C	4,382	55%
2006	5,139	1,064	1,036	7,239	715	880	1,036	2,631	4,424	184	0	4,608	64%
2007	11,237	1,127	1,068	13,432	3,614	1,056	1,068	*5,738*	7,623	71	0	7,693	57%
2008	10,613	675	3,117	14,404	2,047	703	3,123	5,873	8,566	0	0	8,531	59%
2009	9,753	1,856	3,460	15,069	2,002	524	3,460	5,986	7,751	1,332	0	9,083	60%
Ave	9,081	1,414	C	11,944	2,576	961	C	4,987	6,505	469	C	6,958	58%
Med	10,183	1,212	C	13,473	2,435	841	C	5,806	7,202	372	C	7,571	58%
Min	5,139	675	C	7,239	715	524	C	2,631	3,887	0	C	4,382	55%
Max	11,237	2,468	C	15,069	4,253	1,801	C	6,066	8,566	1,332	C	9,083	64%
Alternative 4 (Preferred alternative)													
	Baseline catch (mt)				Reduction in catch (mt)				Residual catch (mt)				Residual catch as % of baseline
	541	542	543	Tot	541	542	543	Tot	541	542	543	Tot	
2004	11,034	2,468	13	13,515	4,251	1,703	13	5,966	6,783	765	0	7,549	56%
2005	6,711	1,297	C	8,007	2,824	784	C	3,608	3,887	577	C	4,399	55%
2006	5,139	1,064	1,036	7,239	715	581	1,036	2,331	4,424	484	0	4,908	68%
2007	11,237	1,127	1,068	13,432	3,614	806	1,068	5,489	7,623	320	0	7,943	59%
2008	10,613	675	3,117	14,404	1,980	619	3,123	5,723	8,632	56	0	8,682	60%
2009	9,753	1,856	3,460	15,069	1,999	519	3,460	5,978	7,753	1,337	0	9,090	60%
Ave	9,081	1,414	C	11,944	2,564	835	C	4,849	6,517	590	C	7,095	60%
Med	10,183	1,212	C	13,473	2,412	702	C	5,606	7,203	530	C	7,746	60%
Min	5,139	675	C	7,239	715	519	C	2,331	3,887	56	C	4,399	55%
Max	11,237	2,468	C	15,069	4,251	1,703	C	5,978	8,632	1,337	C	9,090	68%

Notes: Metric tons include retained Pacific cod from targeted and incidental fishing. All residuals were estimated by subtracting reductions (from the CAS) from the baseline (from the CIA). Since residuals and baseline numbers came from different sources, discrepencies can produce negative values for residuals. These have been set to zero.
Source: NMFS AKR estimates using CAS and CIA data.

Response by trawl catcher vessels

Most of this discussion deals with the impact on the trawl catcher vessels. As discussed in sub-section 10.2.4, this is the largest component of the fleet, in recent years (2007 through 2009) the numbers of vessels in it have fluctuated less than those using other gears, it produces a disproportionate share of the harvest of Pacific cod in the Aleutian Islands, and the vessels in it tend to earn a larger share of their fishing revenues from activity in the Aleutian Islands. Small numbers of pot, hook-and-line, and jig catcher vessels also participate in the Aleutian Islands fisheries. These vessels are expected to respond to this action by shifting the center of their fishing operations to the east, generally reducing fishing activity in the Aleutian Islands, and increasing it in the Bering Sea.

Trawl catcher vessels may adapt to new restrictive regulations in federal waters and the parallel fishery by shifting operations to remaining unrestricted waters in the Aleutian Islands, to Bering Sea Pacific cod fisheries, or to GOA fisheries.

As shown in Table 10-47, Alternative 2 is estimated to reduce harvests to about 12% of their previous levels. However, significant fishing opportunities will remain in the Aleutian Islands under Alternatives 3 and 4, under which 50 percent to 60 percent of the previous harvest should still remain. The number of catcher vessels returning to fish in the Aleutian Islands should decline with the increased restrictions; however, there may be increased congestion in the remaining fishing areas. The impact on harvests may depend on whether or not the M/V *Independence* finds it worthwhile to return to the Aleutian Islands, and the progress made by Adak Seafoods to resolve its bankruptcy.

Other vessels are likely to shift to the Pacific cod fisheries in the Bering Sea.[61] High halibut PSC rates would be an important constraint on trawl catcher vessels operating in the Bering Sea, and could prevent them from making up lost harvest opportunities. Trawl halibut PSC rates are higher in the Bering Sea than in the Aleutian Islands (see Table 10-49). Halibut PSC constraints may prevent trawl catcher vessels that historically participated in the Aleutian Islands from catching as much Pacific cod in the Bering Sea. If Pacific cod harvests from the trawl catcher vessel allocation decline, unused amounts of “B” season trawl catcher vessel Pacific cod allocation would be rolled into the trawl catcher vessel “C” season. Since the “C” season quota is rarely fully used by the trawl catcher vessel fleet, a large amount of this may be reallocated to other sectors. Trawl catcher vessels take relatively little crab PSC.

The impact of the Aleutian Islands Pacific cod restrictions are examined in Table 10-48 for the trawl catcher vessels, under two alternative scenarios: (1) that the catcher vessel fleet finds itself able to fully harvest the Pacific cod in the Bering Sea (in the bottom block of the table showing the net effects of the Aleutian Island restrictions and possible additional Bering Sea fishing), and (2) that it is unable to do so, and the Pacific cod quota is entirely rolled over to the “C” season and harvested by other sectors (in the top block of the table showing the adverse impact on Aleutian Island harvests only). These two scenarios bound the range of potential outcomes. Table 10-49 summarizes PSC rates for this fishery.

[61] While there are flatfish quotas available for limited access vessels in the Bering Sea, the fishery is small because of limited local markets (NMFS AKR in-season management)

Table 10-48 Changes in Aleutian Island trawl catcher vessel Pacific cod harvests, and possible changes for the same fleet in the Bering Sea, if it completely offsets its Aleutian Islands Pacific cod harvests there.

Area	Species	Alternative 2		Alternative 3		Alternative 4 (preferred alternative)	
		Low	High	Low	High	Low	High
Aleutian Islands	Pacific cod (mt)	-6,800	-12,976	-2,631	-6,066	-2,331	-5,978
	Pollock (mt)	-7	-13	-3	-6	-2	-6
	C. bairdi (No.)	-3,689	-7,039	-1,427	-3,290	-1,264	-3,243
	C. opilio (No.)	-4,541	-8,665	-1,757	-4,051	-1,557	-3,992
	Red king (No.)	-657	-1,254	-254	-586	-225	-578
	Halibut (mt)	-8	-16	-3	-7	-3	-7
	Chinook salmon (No.)	-249	-476	-97	-223	-86	-219
	Other salmon (No.)	-99	-189	-38	-88	-34	-87
Bering Sea	Pacific cod (mt)	6,800	12,976	2,631	6,066	2,331	5,978
	Pollock (mt)	306	584	118	273	105	269
	C. bairdi (No.)	13,160	25,112	5,092	11,739	4,511	11,569
	C. opilio (No.)	4,561	8,703	1,765	4,069	1,563	4,010
	Red king (No.)	103	196	40	92	35	91
	Halibut (mt)	149	284	57	133	51	131
	Chinook salmon (No.)	499	952	193	445	171	438
	Other salmon (No.)	119	228	46	106	41	105
Change	*C. bairdi (No.)*	9,471	18,074	3,665	8,449	3,247	8,326
	C. opilio (No.)	20	38	8	18	7	18
	Red king (No.)	-554	-1,057	-214	-494	-190	-487
	Halibut (mt)	140	268	54	125	48	123
	Chinook salmon (No.)	249	476	96	222	85	219
	Other salmon (No.)	20	39	8	18	7	18

Notes: Groundfish incidental catch estimates are for species estimated to have significant commercial value based on production reports and knowledge of the fleet. PSC rates based on average rate of PSC per retained metric ton of the target species from 2004 to 2009. PSC species subject to limits are included. mt represents metric tons of halibut PSC mortality.
Source: NMFS AKR estimates based on CAS.

Table 10-49 Estimated species catch rates per ton of catcher vessel groundfish harvest, and rates of prohibited species catch (averages for 2003–2009).

	PSC AI	PSC BS	Units
C. bairdi	0.154	2.172	Crab/mt groundfish
C. opilio	0.013	1.635	Crab/mt groundfish
Red King	0.062	0.043	Crab/mt groundfish
Halibut	0.0018	0.0182	mt mortality/mt groundfish
Chinook salmon	0.045	0.043	Salmon/mt groundfish
Other salmon	0.01	0.033	Salmon/mt groundfish

Note: Ratios and percentages were calculated to show the metric tonnage of the incidental or PSC species per metric ton of retained and discarded target species.
Source: NMFS AKR Catch Accounting System

Almost all fixed gear vessels are less than 60 feet in length and would, thus, not be impacted by this action.

As discussed in section 10.3.2, the Council is currently considering measures to split the BSAI Pacific cod ABC and TAC into separate Aleutian Islands and Bering Sea ABCs and TACs. The discussion in that section is also relevant to the impacts on the fixed gear catcher/processors.

Indirectly impacted sectors

The State of Alaska manages GHL fisheries in Prince William Sound, Cook Inlet, and the Western and Central GOA. These occur at times when the federal/parallel fisheries in adjacent waters are closed.

Legal gears include pot, jig, and hand troll, thus, unless the Board of Fisheries takes action to allow the use of trawl gear, these fisheries are not available to Aleutian Islands trawlers (Sagalkin et al. 2009).

Industry has suggested that trawl catcher vessels fishing for Pacific cod in the Aleutian Islands may shift their operations into GOA Pacific cod fisheries as a result of this action. Additional competition for Pacific cod quotas could lead to shorter seasons, reduced revenues for vessels already active in those fisheries, and adverse economic impacts on GOA communities (Park, 2010).

Some trawling may shift to the GOA, however, there is only a limited overlap in time between the two fisheries. The GOA Pacific cod fishery is largely complete before the Bering Sea fishery gets underway. This may limit the extent to which vessels shift between the fisheries (assuming these vessels are fully subscribed during the entire fishing year). As shown in Table 10-50, Western and Central GOA Pacific cod fisheries close from late January until late February or early March, and the Aleutian Islands Pacific cod trawl catcher vessel fishery does not begin to get significantly underway, normally, until late February. This is because the Pacific cod don't become available to fishing gear until the indicated time. As shown in Figure 10-4, most harvests of Pacific cod in the Aleutian Islands take place after that time. The timing of the Aleutian Islands Pacific cod trawl fishery is driven by the date when aggregations of Pacific cod normally appear in the Aleutian Islands. Vessels that fish in the Aleutian Islands Pacific cod fishery are normally active in other fisheries prior to March, some in the GOA.

Vessels may also be constrained from fishing in the GOA by licensing and sideboard restrictions. Of the vessels with LLPs with both AI and trawl endorsements in 2010, 11 had trawl endorsements for the GOA as well. (Communication from NMFS AKR in-season management, based on the LLP list as of November 16, 2010).

Table 10-50 Closure dates for the GOA Pacific cod fishery compared to Aleutian Islands fishing periods.

Year	Western Gulf	Central Gulf	Week ending date for first week contributing 10% or more to cumulative AI harvest
2004	February 24	January 31	February 28
2005	February 24	January 26	February 26
2006	February 23	February 23	February 18
2007	March 8	February 27	February 24
2008	February 29	February 20	February 16
2009	February 25	January 27	February 28
2010	February 19	January 31	

Notes: Pacific cod "A" season inshore closures,
Source: AKR web site; Council 2008: 40; NMFS AKR in-season management calculations.

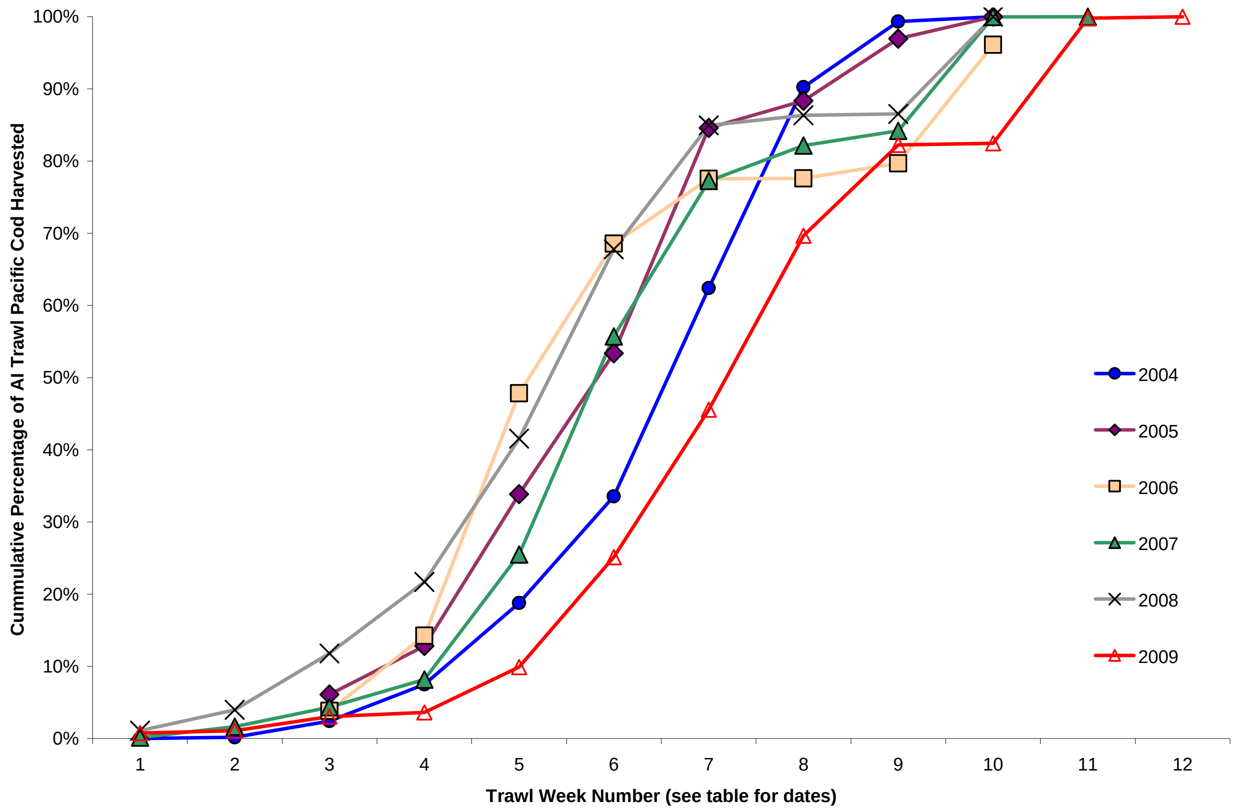

Figure 10-4 **Cumulative percentage trawl catcher vessel Pacific cod harvests in the Aleutian Islands, prior to June 10 (by statistical week).**

It is possible that trawl catcher vessels from the Aleutian Islands could shift to the GOA and increase catcher vessel effort devoted to flatfish fishing. A concern has been expressed that such a shift could affect the Amendment 80 fleet's ability to harvest its sideboard permitted flatfish. While Amendment 80 vessels do not share the same Pacific cod apportionment with catcher vessels, they do share halibut PSC allowances with the catcher vessel trawl fleet. If the trawl catcher vessels fish Pacific cod, they take shallow-water halibut PSC. If they fish flatfish, they take deep-water halibut PSC. The Amendment 80 sideboards are caps, not shares, so the catcher vessels can fish into the Amendment 80 sideboard limit. The Amendment 80 fleet could be pre-empted by the catcher vessel fleet's exhaustion of the shallow-water halibut PSC, and so lose access to cod and flathead sole targets. If the catcher vessels try to make up lost revenue in flatfish, rather than or in addition to, Pacific cod, the Amendment 80 fleet could see deep-water halibut PSC allowances used up, and could be pre-empted in arrowtooth and rex sole targets (Park, 2010). There has not been significant activity by these vessels in the GOA flatfish fishery in the past. They may have trouble entering the fishery, because of limited market opportunities (NMFS AKR in-season management).

10.3.5 State GHL Pacific Cod Fishery in the Aleutian Islands

This action will not directly regulate vessels with federal fishing permits (FFPs) while fishing in the State GHL fishery in the Aleutian Islands. The impacts of this action will depend in part on whether or not the State changes the management measures it currently uses in its Aleutian Islands fisheries.

10.3.6 Kanaga Island and HLA Repeal

Alternatives 2, 3, and 4 close waters from 0 to 3 nm around Kanaga Island/Ship Rock to directed fishing for groundfish by federally permitted vessels. This measure, therefore, goes beyond the regulation of Atka mackerel and Pacific cod, and would prohibit all groundfish harvest in this area. However, this measure would have minimal impacts on fishing activity. A review of catches in this area from 2003 through 2009 shows an average annual harvest of about five metric tons of fish. Much of this was Atka mackerel and Pacific cod, and retention of these would already be prohibited under Alternative 2.

Kanaga Island

Under Alternative 1, the status quo, Atka mackerel trawling is allowed in Area 543 and the western portion of Area 542, within critical habitat under the Harvest Limit Area (HLA) program of platoon management. The platoon system is intended to distribute and disperse fishing effort and was implemented by final rule in 2003 (68 FR 204, January 2, 2003).

HLA repeal

The HLA includes 20-nm areas around Steller sea lion rookeries and haulouts in Area 543 and the western portion of Area 542, shown in Figure 2-3 in chapter 2. The HLA includes critical habitat and additional 20-nm areas around haulouts that were identified in the 2001 biological opinion (NMFS 2001). The amount of Atka mackerel harvest in the HLA is limited to no more than 60 percent of the seasonal apportionment. The harvest of Atka mackerel in the HLA is further dispersed by dividing the Atka mackerel fleet into platoons that are limited to fishing in one area (either 543 or 542) at a time. Vessels in a platoon fish in their assigned area for the estimated number of days for the vessels to take the available TAC, and then switch to the other HLA area. Because Pacific cod trawling is prohibited in the HLA when the HLA is open to Atka mackerel trawling, each HLA fishery is limited to 14 days.

Any non-Amendment 80 trawl vessel (catcher/processor and catcher vessel) with an LLP allowing it to fish in the BSAI may register with NMFS to fish for a BSAI trawl limited access HLA allocation in Area 542. Any Amendment 80 vessel may register with NMFS to fish in the HLA fisheries for the Amendment 80 cooperative or Amendment 80 limited access allocations. Once vessels register, they are randomly assigned to one of the two area HLA fisheries. HLA fishing begins about January 22 and lasts two weeks. Then the registered vessels have two days to move to the other area for two more weeks of fishing, during the second HLA opening. Each season, during the first HLA fishery, vessels that registered for the HLA fisheries are prohibited from participating in any groundfish directed fishery. If directed fishing is open for their sector, Amendment 80 and BSAI trawl limited access vessels may fish for Atka mackerel in 541, while the HLA fishery is ongoing. Vessels have been known to forgo their HLA fishing in Area 543, to fish in Area 541 or outside critical habitat in Area 542 (Furuness, personal communication).[62]

Since the implementation of Amendment 80, the fleet has shown it can modify its fishing patterns to reduce catch rates. The ability to tailor fishing operations to the specific allocation of quota allows vessel operators to avoid the concentration of harvests that may occur under a race for fish. The HLA fishery, however, requires Atka mackerel to be harvested during a discrete time period. HLA management may result in a greater concentration of Atka mackerel harvest than would occur under cooperative management, without the HLA.

[62] Mary Furuness. Sustainable Fisheries Division, Alaska Region, National Marine Fisheries Service.

Because no directed fishery for Atka mackerel would be allowed in critical habitat in Areas 543 and 542 under any of the alternatives to the status quo, the platoon management system and HLA would be removed from the regulations.

10.4 Benefits of Protecting the Western Stock of Steller Sea Lions

This section analyzes the economic benefits to the public of improved protection for the western stock of Steller sea lions.

People value the health of the Steller sea lion population for a variety of reasons. A small number of people live a life-style in which subsistence hunting plays an important part. Others may value stock health, if it allows them to view Steller sea lions, or it draws eco-tourism clients. Other people, who do not use the stock in these ways, may still place a value on knowing that the stock is healthy. They may value the existence of the stock, or value the option of one day hunting or viewing the animals. Other motivations may exist, as well. It is also possible that some would incur costs if stock health improves. Steller sea lions compete with humans for prey species and have been a nuisance for fishing operations when they interact with fishing gear.

Ideally, the economic value people place on a good or service could be inferred from their behavior. For an environmental good, like the health of the Steller sea lion population, however, this is often difficult. In these instances, there is limited behavioral information in markets for the good or service, or in related markets, from which to infer a value. Under these circumstances, analysts often use survey research to attempt to estimate the appropriate value.

Willingness to accept (WTA) compensation for a reduction in Steller sea lion health below some ideal level may be appropriate in a context in which individuals may be said to have a property right in the health of the resource, which may be the case in this instance. WTA is the minimum compensation that would have to be paid to people to make them indifferent to the difference between the actual and desired level of population health. However, there are problems with the use of survey methods to gather the information needed to estimate WTA measures. Under these circumstances, it is common practice to estimate a related measure, willingness to pay (WTP). WTP is an estimate of the maximum amount individuals would be willing to pay for something, rather than go without it. In general, estimated WTA tends to be higher than estimated WTP.

A recent study, prepared at the NMFS Alaska Fisheries Science Center, can be used as a basis for estimates of WTP for improvements in the Steller sea lion population trajectory (Lew et al., 2010).[63] The study was based on survey research conducted in 2007. Survey respondents were presented with a set of scenarios and asked to rank them according to their preferences for them. Each scenario included information about the state of the eastern and western populations in 60 years, and a cost to the respondent that would be incurred in equal increments over a 20-year period. A copy of one of the questions is shown in Figure 10-5.[64]

[63] This study, described in the following paragraphs, is discussed in more detail in the appendix to this section.

[64] Each survey contained three separate versions of this question and three separate versions of the survey were used.

Q10 **Which of the following three alternatives do you most prefer, and which you least prefer? Please indicate your responses below the table.**

	Results in 60 years for each alternative		
	Alternative A Current program	**Alternative B**	**Alternative C**
Western Stock Population status................ (Endangered now)	Endangered	Threatened	Endangered
Population size.................. (45,000 now)	45,000	75,000	45,000
Eastern Stock Population status................ (Threatened now)	Recovered	Recovered	Recovered
Population size.................. (45,000 now)	60,000	80,000	80,000
Added cost to your household each year for 20 years............	$0	$40	$10

	Alternative A	Alternative B	Alternative C
Which alternative do you prefer the most? *Check one box------>*	☐	☐	☐
Which alternative do you prefer the least? *Check one box------>*	☐	☐	☐

Figure 10-5 Typical formulation of the choice question in the AFSC Steller sea lion valuation survey.

The questions posed in the survey framed the scenarios in terms of outcomes known with certainty. Value estimates based on these will overstate, by an unknown margin, the willingness to pay for results that are uncertain.[65]

The survey results have been used to infer the values households place on changes that are expected to lead to a -2 percent, +1 percent, and +2 percent change in the annual rate of western Steller sea lion population growth. Assuming that the baseline was a stable stock,[66] the mean WTP estimates were $0 per responding household for -2 percent, about $100 per responding household for 1 percent growth, and about $116 per responding household for 2 percent growth.

These household WTP estimates were extrapolated to the population of households in the United States[67] for each of 20 years and converted to present values using discount rates of 1.4 percent and 5.5 percent. At a discount rate of 1.4 percent, the 1 percent growth rate had a present value of $102 billion and the 2 percent growth rate had a value of about $119 billion. At a discount rate of 5.5 percent, the 1 percent growth rate had a present value of about $73 billion and the 2 percent growth rate had a value of about $85 billion.

[65] Assuming people are risk-neutral or risk averse (and not risk loving).

[66] In the analysis, “stable stock” means that the Steller sea lion population will remain listed as endangered and maintain its current population size in 60 years. The analysis uses the stable stock assumption on the basis of the most recent stock assessment available at the time it was completed (Allen and Angliss 2010:3). This is discussed in the text following Table 10-53. The Biological Opinion states that the western population has been increasing at a rate of about 1.4 percent, however, it notes that the estimate is not statistically significant. (NMFS, 2010b: 367). Should the stock turn out to be increasing, the analysis could be adapted to approximate the benefits to the public from an action to benefit the Steller sea lions. However, this has not been done in this instance because, as discussed in the text, the RPA does not predict that the action will necessarily lead to an increase in the rate of growth of the Steller sea lion population.

[67] Households not responding to the survey, or completing the surveys in a way that somehow called in to question the credibility of their scenario choices, were treated as placing a zero value on Steller sea lion population improvements.

While this survey-based evidence suggests that an improvement in the stock population growth rate has a large value, the RPA does not predict that the action will necessarily lead to an increase in the rate of population growth of Steller sea lion populations, nor does it make probabilistic statements about the range of potential outcomes.

The FMP biop states that "While effects of the RPA on the response of the Steller sea lion population cannot be projected with certainty with the available information, NMFS has determined that conserving important prey species to foraging Steller sea lions in the areas and seasons commensurate with the rate of decline observed in each fishery management area will be adequate to reduce the effects of the fisheries such that they would not be likely to suppress the survival and recovery of the species to an appreciable extent." (NMFS 2010: 365). The RPA also notes that the "…effects of the RPA on the response of the Steller sea lion population cannot be projected with any amount of certainty with the available information …" (NMFS 2010:*xxxvi*). The element of uncertainty about the impact of the proposed action on Steller sea lion population trajectories, makes it impossible to apply the survey results to this action to estimate its benefits to persons with non-consumptive motives for valuing the health of the population.

As described in sub-section 10.2.7, some Alaska Natives harvest Steller sea lions for subsistence. While the Steller sea lion survey results theoretically captured all benefits, in practice the survey sample probably did not include persons from this small segment of the U.S. population. Moreover, subsistence communities' use may raise distinctive distribution issues.

Successful efforts to improve the Steller sea lion population trajectory, and a possible associated change in listing from endangered to threatened, or a possible delisting, could lead to increased catch per unit of effort, reduced opportunity costs of harvesting, and increased harvests, or to a reduction in conservation or regulatory concerns about hunting, and a greater willingness to hunt sea lions. If sea lion hunting or butchering skills have been lost, or cultural interest in harvesting sea lions has declined, due to relatively low participation in hunts in recent years, hunting could be delayed in returning to historical levels, or might never return.

An increase in the catch per unit of effort for hunting sea lions could improve welfare if households are able to consume more sea lions and/or to spend more time on collection and preparation of other subsistence resources, while maintaining existing sea lion harvests. An increased variety of species for hunting may allow subsistence hunters and communities to diversify their "portfolios" of resources, and reduce income risks associated with changes in the availability of individual resources.

This result could strengthen subsistence based communities. Individual hunting households could be better off, as could individual households receiving sea lion products through exchange or as a gift. Native community cultures originated in subsistence communities and continue to depend on subsistence production (even if most communities are now subsistence-market hybrids). Improved subsistence hunting opportunities could strengthen Native communities. This cultural contribution could be an important external effect of subsistence harvesting.

Improved stocks in the western Aleutian Islands might have little impact on catch per unit of effort for most subsistence hunters, since there are no local subsistence communities within Areas 542 and 543. This may also be the case if catch per unit of effort remained high while populations were low as depleted populations remained concentrated in a few locations. There might be some benefits to small communities, particularly to Atka, where subsistence harvests remain high and might be directly influenced by improvements in local populations. Benefits might be greater if subsistence hunters elsewhere in the BSAI or GOA regions are refraining from targeting sea lions to some extent from a precautionary motive, and if improvement in stocks leads to a change in listing status for the western population segment, as a whole. If this is the mechanism by which the action benefits subsistence activities, the impact may be delayed for some years, until listings are modified.

The information is not available that would make it possible to determine for sure the qualitative or quantitative impacts of sea lion population recovery on rural welfare or community health. Moreover, these would be difficult to measure in a way commensurate with the measurements of other costs and benefits.

Uncertainty about the recovery of sea lion hunting in response to a population recovery, and limitations in available research, make it impossible to determine whether sea lion populations will improve, and consequently, whether there would be a positive net impact on subsistence households.[68] Subsistence users almost certainly did not fall in the sample of the U.S. population surveyed in the WTP analysis discussed above. Thus, the WTP estimates do not include WTP for subsistence. Subsistence values, if they could be had, would be additive with those WTP estimates. While individual subsistence households and subsistence community members may value an improvement in sea lion populations much more than members of the average U.S. household, the number of U.S. households is so much larger (approximately 112 million U.S. households) that a quantitative estimate of the value of subsistence consumptive-use would be much smaller, in nominal terms, than a national valuation of non-consumptive benefits.

Technical Appendix to Section 10.4

This section is organized on the basis of whether or not a value derives from activities taking animals out of the population, or otherwise disturbing or harming the animals. Values derived from activities that do so are defined as “consumptive” activities, and are dealt with in sub-section 10.4.3. Non-consumptive values are defined as values from activities that do not kill, harm, or disturb specific animals, or the population. Non-consumptive values are addressed in sub-section 10.4.2. A wide variety of activities and motivations may give rise to non-consumptive values. The study on which the non-consumptive benefits analysis is based used survey questions that identified individual values, without detailed inquiry into the individual’s motivations for those values. Thus, it is believed to comprehensively cover all values from activities and motivations that do not derive from those that are consumptive. This sub-section does not inquire deeply into the origins of non-consumptive values. Eco-tourism may fall into a grey area between consumptive and non-consumptive, since eco-tourism activities may disturb animals. However, the survey question is broad enough to include values motivated by eco-tourism, and any eco-tourism values are assumed to be included under the non-consumptive heading. Subsistence activities may also have been included within the ambit of the survey question. However, the survey sample frame is unlikely to have picked up significant numbers of subsistence hunters or others who share in the products of the hunt, so subsistence is treated here, as a practical matter, as not covered by the survey.

The economic benefits of protecting Steller sea lions are primarily the result of the non-consumptive values that individuals attribute to such protection, such as active use values associated with viewing them, passive use values from reading or seeing films about them, or from knowing they exist in their natural habitat. Consumptive values, such as those derived from hunting, may also be important, but are more limited in scope, as Steller sea lion hunting is restricted to a small number of subsistence users in Alaska.

[68] The survey discussed elsewhere in this section did not include Alaskans in the survey frame and did not include any questions designed to elicit information about the valuation of subsistence uses. To the extent that residents of the U.S. value subsistence uses and the existence of subsistence communities, the survey results may be interpreted as including this source of value.

According to economic theory, individuals choose between bundles of goods and services that maximize their well-being, referred to as *utility*. These bundles include private and government-provided goods and services, as well as quantities and qualities of goods and services from natural and environmental resources, like threatened and endangered species protection, which are not bought or sold in explicit markets. These latter goods and services are generally referred to as *non-market goods*. The trade-offs each individual makes between different bundles of goods and services provide an indication of the value people place on them.

Since the economic value of non-market goods cannot be readily measured, using conventional market valuation techniques, due to the absence of price information for the good to be valued (i.e., protection of the species in this case), researchers must employ other valuation methods to estimate them, specifically, revealed preference (RP) or stated preference (SP) valuation approaches. RP valuation methods use information on observed behavior to infer the value of the non-market good or service (Bockstael and McConnell 2007). As such, these methods require data on observable behavior to be linked to the non-market good in question.[69] SP methods, on the other hand, involve asking individuals carefully-worded hypothetical market questions to either directly or indirectly infer the value they place on a non-market good or service (Mitchell and Carson 1989; Carson, Flores, and Meade 2001). Thus, the principal difference between RP and SP methods is the data used. Revealed preference methods use data on observed behavior to infer economic values, while stated preference methods use data on stated or intended behavior, typically gathered through surveys, to infer economic values. Due to its reliance on observable behavior, revealed preference methods are generally not able to estimate major components of non-consumptive values, specifically those not tied directly to observable behavior, like non-use values. Thus, researchers generally utilize stated preference methods to estimate non-consumptive values.

In section 10.4, we are concerned with estimating the economic benefits, or value, of the results of protecting Steller sea lions under the alternative projection trajectory scenarios considered. The action alternatives are designed to ensure that the groundfish fisheries would not be likely to jeopardize the continued existence of the western population of Steller sea lions or adversely modify their critical habitat such that the likelihood of their survival and recovery in the wild is reduced appreciably (NMFS 2010b). By reducing potential competition for prey species in the western and central Aleutian Islands, the alternatives may lead to increased population sizes for the western stock of Steller sea lions, relative to the status quo alternative. The remainder of this section focuses on the task of evaluating the benefits that may accrue if the Steller sea lion population trajectory is improved.

Stated Preference Methods and Benefits Transfer

The most commonly-used and best known stated preference method is the contingent valuation method (CVM). In CVM, economic values for a non-market good or service are revealed through survey questions that set up hypothetical markets for a non-market good or service, and involve asking the respondent to indicate their willingness to pay (or willingness to accept) for the good or service. In a typical contingent valuation survey, a non-market good is described, such as a program to protect one or more threatened or endangered species, and respondents are asked questions to elicit their willingness to pay (WTP) for the good through a designated payment vehicle, like taxes or contributions to a trust fund

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[69] Included in the category of RP methods are travel cost methods (Parsons 2003), hedonic methods (Taylor 2003), and the avoidance expenditure approach (Dickie 2003). The appropriateness of each method depends upon how the non-market good enters individuals' preferences (utility), as discussed in Freeman (2003). In many of these methods, the economic value of the non-market good is measured through changes in the observable demand for a related good, such as a good that is consumed in conjunction with the non-market good (complement) or instead of the non-market good (substitute).

(Mitchell and Carson 1989; Arrow et al. 1993).[70] Contingent valuation methods are differentiated by the way they elicit WTP. Respondents are commonly asked to state their maximum WTP (an "open-ended" CVM question), choose the amount they are willing to pay from a list of values (a "payment card" CVM question), or accept or reject a specific amount (a "referendum," or "dichotomous choice," CVM question). Variations of these question formats exist, but these are the most frequently used. When asked properly, answers to CVM questions yield an estimate of WTP or willingness to accept payment (WTA) associated with the good being valued, depending upon the format of the question posed (Freeman 2003).

Although the CVM method has been criticized on several validity issues (e.g., Diamond and Hausman [1994] and Hausman [1993]), the NOAA Panel on Contingent Valuation, a distinguished panel of economists led by Nobel Laureates, Kenneth Arrow and Robert Solow, found that despite their problems, "CVM studies can produce estimates reliable enough to be the starting point of a judicial process of damage assessment, including lost passive-use values" (Arrow et al. 1993:43).[71]

CVM techniques are not the only SP methods available for estimating non-consumptive non-market values.[72] The stated preference choice experiment (CE), or stated choice approach, for eliciting economic values has been increasingly used by researchers due to its flexibility (Adamowicz, Louviere, and Williams 1994; Adamowicz et al. 1998; Alpizar, Carlsson, and Martinsson 2003; Hanley, Wright, and Adamowicz 1998). In the choice experiment approach, respondents are asked to choose between two or more alternatives that differ in one or more attributes, including cost.[73] Choice experiments offer a useful alternative to CVM for estimating a wider range of economic values. By decomposing environmental goods, in the form of choice alternatives (e.g., distinct species protection programs), into measurable attributes (e.g., specific outcomes of protection, such as resultant population size under each protection program), value can be estimated from an analysis of choices between different alternatives. Since choice alternatives are described by their attributes, and the effects of these attributes on choice are estimated in the model, it is possible to estimate WTP for alternatives not originally included in the CE questions seen by respondents. Hanley, Mourato, and Wright (2001) and Hanley, Wright, and Adamowicz (1998) argue that CE methods have several advantages over CVM, among them, the ability to estimate values of each attribute (often the policy variable of interest) and avoiding some biases in responses typically associated with CVM questions.

A growing field in non-market valuation is concerned with how to transfer economic value information from one or more previously completed studies to a new application (which we will refer to as the "policy

[70] While willingness-to-accept is sometimes the more relevant economic value measure, empirical and experimental application has primarily employed WTP welfare measures in stated preference surveys, owing to the presumed greater familiarity of study subjects with "paying" for a desired good or service, rather than estimating what they would "accept" in payment to forgo the good (e.g., Arrow et al. [1993]; Adamowicz, Bhardwaj, and McNab [1993]; Mansfield [1999]).

[71] The NOAA Panel provided a number of recommendations for designing and conducting CVM surveys that would lead to "reliable" estimates of value. A number of subsequent studies have been conducted to test the reliability of CVM estimates (see Boyle [2003] for a useful summary). In the report, passive use value is used synonymously with non-use value, which is generally a major component of the non-consumptive non-market value of a threatened or endangered species (or other environmental good and service) with limited associated use value. In recent literature, the term passive use value is used interchangeably with non-consumptive value.

[72] In addition to stated preference choice experiments and related conjoint analysis methods (contingent rating and contingent ranking), is a recent method that employs gathering small groups of people in a participatory process that involves some group processing as a means of determining non-use values (valuation workshops) (Alvarez-Farizo et al. 2007).

[73] Variants of the choice experiment include contingent rating and contingent ranking, where the respondent rates or ranks each choice alternative, respectively, instead of choosing between them. See, for example, Bateman et al. (2006).

application"). This process is called *benefits transfer*, or value transfer.[74] Benefits transfer offers an option for adapting economic value information from existing studies, provided several conditions hold. Specifically, benefits transfer can be considered a valid approach when there are one or more studies available that have measured a similar non-market good, the similarity of the non-market good from the original study(ies) and in the policy application is high, the methods used in data collection, economic modeling, and estimation are sound, and there is sufficient information to be able to customize the values to fit the policy scenario. The analysis in this appendix uses benefits transfer methods to apply the results of a Steller sea lion valuation study conducted in 2007 to the current policy problem.

Stated Preference Economic Values and Steller Sea Lions

In the last 30 years, there have been dozens of studies done to estimate the value of threatened and endangered species. Loomis and White (1996) and Richardson and Loomis (2009) provide useful summaries of over 30 stated preference studies that have estimated the value of protecting, preserving, or enhancing threatened, endangered, or otherwise rare species. Of these studies, all but one employed CVM to estimate values (the other study uses CE methods). Average annual per person or per household WTP estimates from these studies ranged from $8 for the striped shiner to $241 for anadromous fish populations (in 2006 dollars) (Richardson and Loomis 2009). Only a handful of these studies involve marine mammals, and most do not use national samples. Recent studies by Rudd (2009) and Olar et al. (2007) estimate public values for at-risk marine mammals in Canada using CE methods.

In the empirical literature, there are two non-market valuation studies focusing on Steller sea lions. The first is a study by Giraud et al. (2002), which used CVM to estimate the U.S. public's WTP for protecting Steller sea lions. The other is a recent study by Lew, Layton, and Rowe (2010) that used CE methods to estimate the WTP of U.S. households for improving Steller sea lion population sizes and listing statuses under the ESA.

In the study by Giraud et al. (2002:454), the CVM question in the survey asked respondents for their WTP for the "Enhanced Steller Sea Lion Recovery Program," which "doubled research funding and increased the restrictions of commercial fishing around the western stock of the Steller sea lion's [critical habitat] in the Gulf of Alaska, Bering Sea, and North Pacific Ocean." Thus, the WTP values in this case, estimated to be $100.22 (in 2000 dollars) for non-Alaska U.S. households, and $40.41 (in 2000 dollars) for Alaska households, are not measures of the public's value for recovering the species or specific improvements to the species, *per se*; but rather, the values for the program described (since it does not say the program will lead to any population increases or status changes). As a result, the Giraud et al. (2002) study results are not likely to be useful in the context of assessing the economic benefit of specific alternatives that increase the population size of the western stock or improve its ESA status.

In the second study, Lew, Layton, and Rowe (2010), hereafter referred to as LLR, estimate the public's willingness to pay for enhanced protection of Steller sea lions under several different assumed future population trajectories for the western and eastern stocks. They used CE methods to estimate a value function that depends, in general, upon the Steller sea lion population sizes and ESA status levels of the western stock and eastern stock. Three valuation functions were estimated, each corresponding to a different survey version that presented a different baseline future for the western stock population and its future ESA status. This set-up allows for the estimation of WTP for future improvements to the western stock under three different possible trajectories. The first, a Decreasing Version, assumes that without

[74] Benefits transfer has received considerable interest by researchers and policy analysts in the last two decades. Special issues of *Water Resources Research* (Volume 28, number 3) and *Ecological Economics* (Volume 60, number 2) have been dedicated to this subject. See also Brouwer (2000), Navrud and Ready (2007), and Rosenberger and Loomis (2003) for overviews and details about the methodology.

additional protection actions, the western stock will decline to 26,000 in 60 years and remain endangered. The second, or a Stable Version, assumes the western stock will remain listed as endangered and maintain its current population size in 60 years, which at the time the survey was developed was estimated at 45,000 animals. The third trajectory, or Increasing Version, assumes the western stock will increase over time resulting in a population of 60,000 and a change to "threatened," from "endangered" status. Note that at the time the surveys associated with this study were developed, the Steller sea lion recovery plan (National Marine Fisheries Service 2008) had not been fully developed, so numeric estimates of the likely population threshold for down-listing the western stock had not been determined.

Depending upon the version and the amount of improvement to the population size and ESA status of western stock Steller sea lions being measured, the mean economic benefits were estimated to range from $34 to $204 per household per year (in 2007 dollars). Importantly, note that the CE questions in the survey ask respondents for their WTP each year for 20 years, for a sea lion population size that will occur in 60 years. Thus, for example, if the total amount households are willing to pay over 20 years is converted to a present value amount and annualized to a constant payment over 60 years, the WTP estimates will be in the range of $24 to $141 per household per year (when using a discount rate of 5 percent). Or, equivalently, the discounted present value of WTP, assuming a 5 percent real discount rate, is $445 to $2,669 per household. Moreover, survey respondents were asked to value outcomes that would occur with certainty (i.e., 100 percent probability of the outcome occurring). Logically, the values respondents would place on a "certain" outcome would exceed the values they would place on "uncertain" outcomes. This is relevant in the present instance, when the potential outcomes under each of the three alternatives are highly uncertain.

For several reasons, the LLR study has been used to estimate the public's economic value associated with protection alternatives considered in this report.

1. The surveys were carefully conducted. The three survey versions used in LLR were developed using input from numerous focus groups and cognitive interviews, and underwent several peer reviews by experts in survey design, non-market valuation, and Steller sea lion biology.[75] The resulting surveys were implemented using a modified Dillman Tailored Design Method (Dillman 2007) that included multiple mailings and a telephone contact. This state-of-the-practice approach led to response rates for each survey version that ranged from a low of 59 percent for the Decreasing Version to a high of 64 percent for the Stable Version. The overall response rate across all versions was 60 percent. These response rates are good, relative to other similar stated preference surveys, and their size serves to minimize potential non-response bias that may be related to low response rates.

2. The econometric analysis used state-of-the-practice methods. LLR used panel rank-ordered mixed logit models to account for the fact that the data had a full rank ordering of respondents preferences among three choice alternatives, in three separate questions, and that not everyone in the sample expressed the same preferences for protecting or improving the state of the western Steller sea lion. These models had much better statistical fits compared to models without preference heterogeneity, and are generally preferred to fixed parameter logit models, typically used for analysis of CE data (Train 2003). In addition, the rank-ordered models improved statistical fit and precision of the model estimates.

[75] Throughout development and implementation, significant effort was invested to minimize any potential biases to the CE data, due to poor survey design, choice question wording and format, and survey implementation that researchers have identified in the literature as potential problems in SP studies.

3. The measured values are policy-relevant. The WTP estimates in LLR represent the value U.S. households place on a certain improvement in the population size and ESA listing status of Steller sea lion stocks. The Steller sea lion recovery plan (NMFS 2008) recognizes that a goal of the recovery programs is to increase the overall population size of the western stock and, in fact, requires a sustained increase of 1.5 percent to 3 percent per year for a number of years, to be eligible to be down-listed to "threatened-status" or, ultimately, "de-listed" entirely. Since the values are interpreted to be the WTP households place on an improvement from the status quo level of protection, which is what this chapter hopes to measure, the transfer error associated with using LLR's model results is likely to be small.

4. LLR presents sufficient information to enable the use of a benefits function transfer. Since a stated preference CE approach was utilized, the analysis of the CE data leads to a utility function that can be used to generate economic value estimates.[76] Even though the estimated models are functions of residual population sizes for the western stock (defined as the difference between a stated population size and the minimum population size needed to be listed in an ESA-listing category—endangered, threatened, or recovered, as used in LLR), under some assumptions, estimates of value can be made for policy scenarios involving different (but within the range) improvements to the population size of western Steller sea lions and their ESA listing status.

5. The study is recent. It was implemented in 2007, so estimates of public economic values generated from the model are likely to be less sensitive to potential systemic changes in preferences the public may have for Steller sea lions that may arise over long time periods, as cultural values and attitudes toward the environment and threatened or endangered species change. Still, it is possible that recent environmental disasters, such as the *Deepwater Horizon* oil spill, may have changed environmental awareness and attitudes toward threatened and endangered marine species, like the Steller sea lion, that would not be accounted for in using the LLR results in a benefits transfer.

In the next section, we estimate the economic benefits associated with several growth scenarios using the LLR results and a benefit function transfer approach.

Economic Benefits of Growth Scenarios Using LLR

To generate economic benefit estimates associated with non-consumptive values for western stock Steller sea lion protection, using a benefit function transfer approach with the LLR models, several key inputs are needed. First, the expected population size and ESA-listing status under each alternative must be estimated. Since the LLR models are functions of overall stock sizes, population sizes within specific areas of the western stock range are not needed, only the population size of the entire western stock. Second, since the model is based on residual population sizes for the western stock, the population sizes necessary to trigger changes from an endangered to threatened status and from a threatened to de-listed, or recovered, status, must be known.

The final Steller sea lion recovery plan (NMFS 2008) defines the criteria to be used when down-listing the western stock to threatened and when de-listing it. The criteria include meeting population and growth rate goals and eliminating or otherwise controlling threats to the western stock. To reclassify the western stock to a threatened status, the stock's overall population size must increase at an average annual rate of 1.5 percent for a period of 15 years, in addition to five of the seven sub-regions defined in the

[76] Technically, CE approaches model the probability of choices as trade-offs between conditional indirect utilities associated with each choice alternative. In the discussion of the valuation exercise later in the chapter, references to utility are intended to refer to these conditional indirect utilities.

recovery plan also displaying this consistent increasing trend. The recovery plan also lists threats that should be controlled, if not eliminated, so they do not re-emerge. Thus, these status-of-stock (population size) criteria alone are not sufficient. To de-list the western stock, more stringent requirements are laid out in the recovery plan. In terms of stock status, the total population must increase for 30 years, at an average rate of 3 percent per year, with five of seven sub-regions displaying this consistent and increasing population trend, without any significant declines in adjacent regions. Further, the threats to the western stock must be fully eliminated or controlled prior to de-listing.

In this chapter, we focus on estimating the economic benefits associated with three scenarios that lead to different western stock population growth rates: Scenario I, Scenario II, and Scenario III. Three alternative growth rates, each associated with a scenario, and the resulting population sizes and ESA listing status levels, are utilized to capture the likely range of outcomes from the alternatives considered in this RIR/EA. The alternative growth rates are annual average growth rates of -2 percent in Scenario I, +1 percent in Scenario II, and +2 percent in Scenario III. To generate scenarios that will be the basis of the economic value estimation, we assume these average growth rates will persist over the 60-year time horizon embodied by the choice experiment questions asked by LLR. Thus, under Scenario I, in which there is a -2 percent growth rate each year, the existing population size of 50,040[77] will decline to 14,890 by 2070. Under Scenario II, there is a positive growth rate of 1 percent per year, which will result in a western stock population of 90,908 in 2070. Finally, under Scenario III, an average annual growth rate of +2 percent leads to a western stock population of 164,183 in 2070.

To be used in the LLR model, these western stock population sizes must be translated into two pieces of information, the residual population and an associated ESA status level (i.e., endangered, threatened, or recovered). For Scenario I, the lower population size suggests the western stock will keep its current endangered status. For Scenarios II and III, however, the threshold population sizes associated with a change in status from “endangered” to “threatened” ($POP^{downlist}$) and with a change in status from “threatened” to “recovered” or de-listed (POP^{delist}) must be known to associate an ESA listing status with the population sizes in 60 years associated with the scenarios. Since these threshold population sizes depend upon when the western stock population has managed to average specific growth rates over specified periods of time (and is assumed to have successfully met the non-growth rate criteria), the thresholds will depend upon when the start and end years of these time periods are, as well as the initial population size in the start year.

To determine $POP^{downlist}$ and POP^{delist} for this analysis, one could infer from the recovery plan criteria that down-listing or de-listing would take place when population sizes had reached the level they would reach if, starting from today, the population grew at the rates designated for 15 years or 30 years, respectively. If one assumes that the down-listing population threshold should be based on the present western stock population and furthermore that for 15 years the average growth rate will be 1.5 percent (a Recovery Plan criterion for down-listing), then the threshold population size for the western stock to be re-classified to threatened from endangered will be 62,562 individuals. Similarly, assuming that the average annual growth rate over the next 30 years will average 3 percent (a Recovery Plan criterion for de-listing) means the threshold population size for the western stock to be de-listed will be 121,460. These two thresholds assume that the time period over which the growth rate is averaged begins immediately and the growth rate expectation is met exactly. Under these assumptions, in 60 years, the date posed for consideration by the survey respondents in the question, Scenario II would lead to a down-listing of the western stock to a threatened status, while Scenario III would lead to de-listing of the western stock, all else equal.

[77] This population estimate for the total western stock is based on discussions with Tom Gelatt and Lowell Fritz of the National Marine Mammal Laboratory, Alaska Fisheries Science Center, in Spring 2010.

The scenarios to be used in the economic valuation are summarized in Table 10-51, in terms of the expected annual growth rate over 60 years, and expected population size and ESA status in 60 years.

Table 10-51 Expected average annual growth rate, population size, and ESA status of growth scenarios.

Growth Scenario	Expected Average Annual Growth Rate	Expected Population in 60 years	Expected ESA Status in 60 years
I	-2%	14,890	Endangered
II	+1%	90,908	Threatened
III	+2%	164,183	Recovered

Applying the LLR Model using a Value Function Transfer Approach

To calculate economic benefit estimates for Scenarios I, II, and III from the LLR results, we note from LLR that the formula for expected WTP associated with additional protection that would lead to a change from the status quo (no change from the current protection) is the following:

(1) $E[WTP] = -(1/\gamma)\cdot[V_1 - V_0]$,

where E is the expectation operator
V_1 = utility associated with the improved state of the world
V_0 = utility associated with the status quo (state of the world without the improved protection)
γ = marginal utility of money (COST parameter in Table 10-52).

LLR specify utility of the *j*th choice alternative *as*

(2) $V_j = \beta_{WSTAT2}\cdot WSTAT2 + \beta_{WSTAT3}\cdot WSTAT3 + \beta_{ENDPOP}\cdot ENDPOP + \beta_{THRPOP}\cdot THRPOP + \beta_{RECPOP}\cdot RECPOP + \beta_{EPOP}\cdot EPOP + \beta_{COST}\cdot COST + \varepsilon_j$.

That is, utility is a linear function of the western stock ESA status level (dummy variables, WSTAT2 and WSTAT3, taking values of one for a threatened or recovered status, respectively, and zero otherwise), western stock residual populations (ENDPOP, THRPOP, and RECPOP), the eastern stock population size (a dummy variable, EPop, corresponding to a population size of 80,000; otherwise assumed 60,000) and cost (COST).[78] Note that the estimation model assumes the non-cost parameters (β's) follow a normal distribution; both a mean and standard deviation are estimated to describe those distributions. Table 10-52 reproduces Table 4 from LLR, and reports on these estimated mean and standard deviation parameters.

[78] In the CE questions used by LLR, cost is defined as the additional cost to the household each year resulting from an increase in prices of goods affected by Steller sea lion protection and by an increase in taxes.

Table 10-52 Model estimation results for LLR models.

Random Parameter Mean / Random Parameter Std Dev	Decreasing Version Parameter Estimate	Decreasing Version Asy. T-value	Stable Version Parameter Estimate	Stable Version Asy. T-value	Increasing Version Parameter Estimate	Increasing Version Asy. T-value
Western stock is threatened dummy variable (WSTAT2)	2.47817	10.76573	1.94421	11.65638	-	-
	4.56234	13.1196	2.9824	14.50215		
Western stock is recovered dummy variable (WSTAT3)	2.30689	4.83404	2.52087	8.45649	1.96102	7.09831
	1.17599	1.39657	-1.97212	-4.3139	2.72787	6.74361
W. stock population residual for endangered status (ENDPOP)	0.08119	12.16974	0.10383	6.90103	-	-
	0.02505	2.55294	-0.05528	-2.36026		
W. stock population residual for threatened status (THRPOP)	0.01714	3.07845	-0.01667	-3.48593	0.08709	9.36422
	-0.0019	-0.12868	0.0007	0.05268	0.09676	8.38644
W. stock population residual for recovered status (RECPOP)	0.00147	0.13689	-0.01789	-2.45925	0.00884	1.26077
	-0.01254	-0.93137	-0.00827	-0.56322	0.0118	0.94282
Eastern stock has population of 80,000 dummy variable (EPOP)	0.35287	3.30729	0.68995	5.90479	0.67988	5.56024
	-0.04929	-0.14362	-0.02351	-0.05867	-0.22552	-0.61935
Annual household cost (COST)	-0.01756	-14.8616	-0.01448	-18.3324	-0.02500	-13.2796
Sample size	717		648		587	
Maximized log-likelihood value	-2,719.93		-2,552.91		-2,249.47	
AICc	6,623.58		5,964.68		5,087.85	
BIC	5,623.95		5,287.09		4,594.57	

Notes: Estimates of the off-diagonal elements of the Choleski decomposition of the estimated random parameters covariance matrix are excluded from the table and were not needed for the welfare calculations. This table is adapted from Lew, Layton, and Rowe (2010).

For each version of the survey and associated model, V_0 is calculated for the status quo alternatives represented by the baseline scenario (see LLR for details) and V_1 is calculated for each of the three alternative growth scenarios (I, II, and III). There is no improvement under Scenario I, which means under the LLR model that WTP will always be zero regardless of the threshold scenario. The three scenarios are summarized in Table 10-53. The table also contains the values of ENDPOP, THRPOP, and RECPOP used in the benefit function transfer that are calculated by subtracting the expected population size in 60 years under each growth scenario from the threshold population level necessary to be down-listed to threatened (in the case of an improvement to threatened) or de-listed (in the case of an improvement to recovered). Since we assume there will be no change from the status quo level of protection with respect to the eastern stock population, EPOP = 0 in all scenarios (not displayed in the table).

Table 10-53 Growth scenario descriptions.

Scenario	WSTAT2 (threatened)	WSTAT3 (recovered)	ENDPOP	THRPOP	RECPOP
I	0	0	0	0	0
II	1	0	0	29,255	0
III	0	1	0	0	46,006

For each of the three LLR models corresponding to different baseline future assumptions, the expected mean annual household WTP is calculated for each of the three scenarios, and 95 percent confidence intervals are calculated for each estimated WTP value, using the simulation approach of Krinsky and Robb (1986).[79] Table 10-54 provides estimates of the mean annual household WTP for improvements to the western stock under each of the scenarios for the Decreasing Version, Stable Version, and Increasing Version models.

[79] Note that the expected WTP can be calculated with only the mean parameter estimates from LLR (and cost parameter) since we are interested in the mean WTP, and the variability of the parameter estimates suggested by the standard deviations do not play a role in the expected value.

Table 10-54 Estimated mean annual household willingness to pay for improvements to the western stock by version. 95% confidence intervals in parentheses.

Western Population Growth Scenario	Western stock growth and listing status	Survey instrument version		
		Decreasing baseline population version	Stable baseline population version	Increasing baseline population version
I	2% decline per year and endangered	$0.00	$0.00	$0.00
II	1% increase per year and is down-listed to threatened	$169 ($142, $199)	$100 ($72, $128)	$102 ($83, $121)
III	2% increase per year and is de-listed (recovered)	$134 ($90, $178)	$116 ($77, $157)	$94 ($69, $118)

Notes: Mean annual payments each year for 20 years, the period over which the survey question hypothesized payments. While these values have been rounded to the nearest whole dollar, later calculations are based on unrounded values.

Table 10-54 shows mean annual household values ranging from $0 to $169 per year, depending upon the scenario being valued and the version of the model used. Since the LLR models are used for valuing improvements to Steller sea lions, the public's WTP associated with a decline in the western stock is reported as zero in the table. The 2 percent decline does not constitute an improvement from baseline used in the decreasing baseline survey. As one would expect, given the differing baseline futures assumed in the different versions, the Decreasing Version model predicts mean WTP values that are larger than the Stable Version and Increasing Version mean values.[80] For Scenario III, the Stable Version model estimates mean WTP values greater than those from the Increasing Version model. For Scenario II, the models based on the Stable and Increasing Versions of the survey lead to very similar estimates with the Increasing Version estimate being slightly larger than the Stable Version estimate, although the difference between the WTP values does not appear to be statistically different (95 percent confidence intervals overlap).[81]

The Present Value of Household WTP

Recall that respondents to the LLR surveys were asked to indicate whether they would pay for programs with a specific cost per year for 20 years. At the same time, results being paid for through these hypothetical programs are expected to accrue in 60 years from the present. To understand the present value of the total WTP over the 20 years (and, hence, the sum total of what they are willing to pay in present day terms), one needs to discount the future annual payments, since there is a time preference for money and an opportunity cost of forgoing the benefit of having a dollar today, compared to in the

[80] Because the Decreasing Version is the most pessimistic in its assumption about the future western stock population size and ESA status, one would expect the value of a given improvement to be higher than for less pessimistic versions since what is being valued is a larger improvement.

[81] To formally test to see whether the differences in WTP between alternatives are statistically significant or not requires a more in-depth analysis along the lines of Poe, Giraud, Loomis (2005), although experience suggests these statements are likely to hold.

future.[82] For a constant payment, WTP_0, over 20 years, the present value of the sum of annual payments at a real discount rate *r* is denoted PV_{all}:

$$(3) \qquad PV_{all} = WTP_0 \times \sum_{t=1}^{20} \frac{1}{[1+r]^{t-1}} .$$

While it is generally agreed that in an intertemporal setting the stream of benefits and costs need to be discounted to a present value to enable useful comparisons in terms of net economic benefits, what discount rate to use is a matter of considerable debate in the economics and policy analysis literature.[83] Recent guidance from the Office of Management and Budget (OMB) (Circular A-4, September 17, 2003) recommends 3 percent and 7 percent as benchmarks for the discount rate. However, those rates are based on OMB's analysis of returns to capital investments with and without accounting for distortions caused by government regulation that affects private consumption, with the lower rate being approximated by the real rate of return on long-term government debt.[84]

Several challenges have been levied against the use of these benchmarks, most notably with regard to the use of discounting of environmental policies with very long time horizons. When environmental policies have effects that span multiple generations, decisions made today will affect future, unborn generations, which raise issues of intergenerational equity (e.g., Sumaila and Walters 2005). The U.S. Environmental Protection Agency (2000:52) provides a useful summary of the literature concerning discounting in this case and recommends using lower discount rates, in the range of 0.5 percent to 3 percent. Furthermore, recent economic analyses of climate change appear to favor discount rates ranging from 1.4 percent to 5.5 percent (Stern and Taylor 2007; Nordhaus 2008).

Since the effects of the growth scenarios considered in this chapter are expected to occur over the next 60 years, a lower discount rate range than the OMB recommended 3 percent to 7 percent range seems appropriate. For this analysis, we adopt the range recently used in analyses of climate change. To this end, Table 10-55 and Table 10-56 contain the present value of the total WTP over the 60-year time horizon (based on the mean WTP per year) under each scenario and the corresponding 95 percent confidence interval using 1.4 percent and 5.5 percent, respectively, for the social rates of time preference (i.e., real discount rate).[85] For r = 1.4%, present values of household WTP range from \$0 (Scenario I) to \$1,587 (Scenario II-A under the Decreasing Version). For r = 5.5%, the range in present values is \$0 to \$1,342 per household. These present values represent the sum total of what, on average, a U.S. household with only non-consumptive values would pay for the scenarios and the expected improvements associated with them in 60 years. Clearly, these results are indicative of a positive and significant willingness to pay for improvements to the western stock in terms of population size increases and improvements in ESA listing status.

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[82] Respondents say they are willing to pay a fixed amount each year for 20 years, but the future constant dollar payments will, presumably, not buy as much in 20 years as they do today because of inflation. Thus, a correction can be made to account for inflation. According to the latest estimates, the current annual inflation rate based on the consumer price index is 2.0%, though for 2009, the inflation rate was -0.4%. Due to the uncertainty of future inflation rates, OMB Circular A-94 (http://www.whitehouse.gov/omb/circulars_a094) recommends not making an explicit assumption about inflation rates in discounting benefits or costs. Given the variability of recent inflation rates, we follow this recommendation.

[83] For example, see the special issue of the *Journal of Environmental Economics and Management* (volume 18(2), part 2) that is devoted to this issue.

[84] See OMB Circular A-94 for details.

[85] This range is consistent with the results of a survey of 2,160 Ph.D. economists that recommended an approximate discount rate of 2% for projects with time horizons within 26 to 75 years (Weitzman 2001)

Table 10-55 Present value of mean household willingness to pay for improvements to western stock with 1.4% discount rate.

Scenario	Decreasing Version Lower Bound of 95% CI	Decreasing Version Estimated Mean	Decreasing Version Upper Bound on 95% CI	Stable Version Lower Bound of 95% CI	Stable Version Estimated Mean	Stable Version Upper Bound on 95% CI	Increasing Version Lower Bound of 95% CI	Increasing Version Estimated Mean	Increasing Version Upper Bound on 95% CI
I	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
II	$2,504.81	$2,968.13	$3,493.79	$1,269.94	$1,750.11	$2,253.35	$1,466.31	$1,788.88	$2,133.82
III	$1,576.70	$2,360.27	$3,127.69	$1,345.31	$2,041.45	$2,766.99	$1,208.41	$1,654.01	$2,066.19

Note: These are present values, calculated over a 20 year period. Thus they are not comparable to annual income estimates.

Table 10-56 Present value of mean household willingness to pay for improvements to western stock with 5.5% discount rate.

Scenario	Decreasing Version Lower Bound of 95% CI	Decreasing Version Estimated Mean	Decreasing Version Upper Bound on 95% CI	Stable Version Lower Bound of 95% CI	Stable Version Estimated Mean	Stable Version Upper Bound on 95% CI	Increasing Version Lower Bound of 95% CI	Increasing Version Estimated Mean	Increasing Version Upper Bound on 95% CI
I	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
II	$1,796.16	$2,128.40	$2,505.34	$910.65	$1,254.98	$1,615.84	$1,051.47	$1,282.78	$1,530.13
III	$1,130.63	$1,692.51	$2,242.82	$964.70	$1,463.89	$1,984.17	$866.53	$1,186.06	$1,481.63

Note: These are present values, calculated over a 20 year period. Thus they are not comparable to annual income estimates.

Aggregation Issues

Before discussing aggregating the household WTP values presented in Table 10-55 and Table 10-56, it is important to assess which of the three LLR models is likely most applicable. This depends upon the current status and population trend of the Steller sea lion western stock. The most recent stock assessment for the western stock (Allen and Angliss 2010:3) suggests that the "overall trend in the western population of adult and juvenile Steller sea lions in Alaska is stable or possibly declining slightly." This description is closest to the baseline future described in the Stable Version. As a result, the Stable Version model results are likely the most appropriate to apply to this analysis and will be the values used in the aggregation exercise that follows. From Table 10-46, these mean values range from $1,750 to $2,968 per household, using a real rate of time preference of 1.4 percent as our discount rate. The range is slightly less, from $1,186 to $2,128, for a real discount rate of 5.5 percent.

For the purposes of understanding the total non-consumptive value accruing to the U.S. public associated with adopting each of the alternatives, the household mean WTP values must be aggregated over the applicable population. To do this, we must define what population the WTP values should be applied to and determine the size of the population. According to the most recent American Community Survey conducted by the Census Bureau, there are 112,386,298 households in the United States.[86] An upper bound on a population-level total WTP estimate (WTP^{agg}) can be obtained by simply multiplying the total U.S. households (N^{us}) by the mean present value of WTP estimate (WTP^{mean}): $WTP^{agg} = N^{us} \times WTP^{mean}$. However, that assumes the mean WTP estimate is (a) representative of the population and (b) applicable to all U.S. households. These are two different assumptions worth discussing.

LLR note that there are (statistically significant) demographic differences between the sample of heads of households and the U.S. general population, particularly with respect to age, gender, ethnic composition, and income. Still, since the comparison is between heads of households and the general population, these dissimilarities may not be truly indicative of differences between the sample of heads of households and population of heads of households. Some models incorporating demographics in the utility specification have been estimated by LLR, but none have provided strong evidence that demographics play a major role in influencing WTP. As a result, the LLR mean WTP estimates are assumed to be appropriate for applying to the general population of U.S. households.[87]

A related issue is how many U.S. households to assume in the aggregation calculation. Loomis (1987) points to two common ways of calculating aggregate WTP that result in an upper bound and a lower bound. First, one can apply the mean WTP to all U.S. households, as mentioned above, to achieve an upper bound. Second, one can apply the mean WTP to a portion of the population, while assuming everyone else has a zero WTP. Typically, this approach involves using the survey response rate as the portion of the population to use. In this case, a 60 percent overall response rate implies assuming 60 percent of U.S. households should be used in the calculation of the aggregate WTP amount (i.e., about 67 million households).[88] In this latter approach, however, one may ask whether the survey response rate is the most appropriate measure of the proportion of the population to use, since there are often adjustments made to the sample prior to achieving the estimation data. In LLR, for instance, a portion of the data was excluded from the analysis, because the respondents indicated a lack of confidence in their stated

[86] From 2008 American Community Survey Data File available at: http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=ACS&_submenuId=&_lang=en&_ts=.

[87] The LLR utility specifications assume linear income effects, though piecewise linear income effects models have been estimated that approximate non-linear income effects. However, those results are preliminary and have not been published yet.

[88] Loomis (1987) advocates using aggregation methods that adjust welfare estimates from the sample to better match the population.

preference choice experiment question responses, did not provide any responses to the choice questions, or provided responses that indicated a lack of understanding about how to answer the questions. Assuming these individuals should likewise be excluded from the calculation, the proportion drops to 52 percent or less (see Table 10-57). Using this approach, in combination with the proportions in the last column of Table 10-57, results in 58.26 million U.S. households as the number of households in the population applicable for the Stable Version. The remainder of the 112 million households in the U.S., are assumed to have zero willingness to pay for the growth scenarios.

Table 10-57 Sample sizes and respondents used for estimation.

Survey version	Deliverable sample	Total survey respondents	Estimation sample	Estimation sample as proportion of deliverables
Decreasing	1,553	914	717	46.17%
Stable	1,250	801	648	51.84%
Increase	1,242	739	587	47.26%

As noted before, the public WTP associated with Scenario I is $0, since the public will not be willing to pay anything to achieve a result that is worse than what is currently expected (at least according to the LLR approach).

Under the 1.4 percent discount rate assumption, if each of the assumed 58.26 million households remaining in the population valuing these outcomes have, on average, a willingness to pay for Scenario II (in present value terms) of $1,750 (from the Stable Version), the total estimated public WTP would be about $102.0 billion (95% with a confidence interval (CI) = [$74.0 billion, $131.3 billion]). The total public WTP for Scenario III is approximately $118.9 billion (95% CI = [$78.4 billion, $161.2 billion]).

Under the 5.5 percent discount rate assumption, the total estimated public WTP for Scenario II would be about $73.1 billion (95% CI = [$53.1 billion, $94.1 billion]). The total public WTP for Scenario III for a 5.5 percent discount rate is approximately $85.3 billion (95% CI = [$56.2 billion, $115.6 billion]).

In summary, the total non-consumptive benefit for all U.S. households, associated with Growth Scenarios I, II, and III (under the model based on the Stable Version of the survey) are the following:

<u>Discount rate of 1.4%</u>
Scenario I (- 2 percent average growth): $0
Scenario II (+1 percent average growth): $102.0 billion
Scenario III (+2 percent average growth): $118.9 billion

<u>Discount rate of 5.5%</u>
Scenario I (-2 percent average growth): $0
Scenario II (+1 percent average growth): $73.1 billion
Scenario III (+2 percent average growth): $85.3 billion

Some Notes on the Benefits Transfer

The estimated public non-consumptive benefits associated with Growth Scenarios II and III are large, even under the Stable Version model results. Given the sheer number of applicable U.S. households, we would expect that even if each of these households would be willing to pay as little as $1 (in present value) for a given alternative protection program that would lead to an improvement in the western stock population or listing status, the annual public WTP would be over $58 million, and would have a present value of about a billion dollars with a 1.4 percent discount rate, and a present value of about threequarters of a billion at a 5.5 percent rate. Thus, considering the range of WTP values, it should not be surprising that the estimated public non-consumptive benefits associated with the scenarios are in the billions of dollars. Recall that Richardson and Loomis (2009) summarized a large portion of the non-market valuation literature, which includes studies of both consumptive and non-consumptive goods, and indicated that the annual WTP amounts for individual threatened and endangered species ranged from $8 to $241 (in 2006 dollars). If these annual amounts were to be put in present value terms as was done in this analysis, many would exceed the estimates derived here for the Steller sea lion.

Before turning to other issues, it is important to note several things about the use of LLR to estimate economic values for alternatives in this report.

First, even though the values estimated in LLR can generally be interpreted as applicable for all U.S. households, the random sample used was drawn from all U.S. households, *excluding* those in Alaska. A separate random sample was drawn from all households in Alaska to enable separate economic value estimates to be generated for Alaskans. The results of the analysis of the Alaska household data have not been published yet, but are not statistically different from the estimates reported in LLR. However, importantly, the confidence intervals are much larger for the Alaska WTP estimates, suggesting greater variability and uncertainty about the precise WTP values associated with Alaska households. For the purposes of this analysis, however, the "rest of the U.S." household results from LLR are applied to all U.S. households, including Alaska households. Because the Alaska State population is so small compared to the overall U.S. population (less than 0.2 percent of the U.S. population according to the 2000 Census numbers), using a different WTP estimate for the Alaska state population would not appreciably change the aggregate WTP estimates presented in the section above.

Second, to the extent that preferences for protecting Steller sea lions have remained unchanged since 2007, the estimated WTP will reflect current preferences. However, if there has been a shift in the public's preferences for protecting the species, the value estimates reported here may be inaccurate. Two important events since the survey was implemented in 2007 could contribute in different ways to a shift in societal preferences: the global recession and the *Deepwater Horizon* oil spill. The recession that began in December 2007 led to many Americans losing their jobs. Economic theory suggests lower willingness to pay will follow diminished incomes, and, therefore, the WTP estimated today for the U.S. public may be less than what it would have been prior to the recession.[89]

The *Deepwater Horizon* oil spill that began in April 2010 has drawn the public's attention on the marine environment and marine species in the Gulf of Mexico. Heightened public awareness of the oil spill and the effects it is having on marine mammals in the Gulf of Mexico may raise the concern for, and hence willingness to pay to protect, Steller sea lions. Thus, this oil spill is likely to have the opposite effect on preferences than the recession has had. In the preceding benefits transfer, no correction was made for these factors, as it is unclear what net effect these events have had on preferences.

Third, the aggregation of household WTP over U.S. households to generate a national-level estimate of non-consumptive benefits associated with the scenarios required several strong assumptions to be made. In particular, the mean WTP estimated from the Stable Version model was assumed to be applicable to all households determined to be in the population of households with a positive willingness to pay for Steller sea lion protection.

[89] For reasons discussed in an earlier footnote, WTP is typically employed in CVM, even when the theoretically appropriate measure is WTA. While it is true that a reduction in disposable income "should" reduce WTP bids, there is no equivalent influence on WTA.

Fourth, Growth Scenario III used in this analysis leads to a population size in 60 years that is larger than any population size seen by any respondent in the original LLR survey. The largest population size for the western stock seen in the LLR surveys was 120,000. Growth Scenario III is assumed to grow at a rate of 2 percent per year for 60 years, resulting in a population size above 120,000. As a result, it is possible that the marginal WTP associated with population increases above 120,000 may not be accurately measured by the LLR estimated models (this may occur if there is diminishing marginal utility associated with RECPOP occurring at levels at or exceeding 120,000 animals, which was not tested in the LLR model).

Fifth, the survey respondents were posed with questions that asked them to value alternative, and certain, Steller sea lion population trajectories. A certain trajectory of a given size will be given a higher value than an uncertain trajectory of the same size. In the present instance, the population trajectories, associated with each of the three alternatives, are highly uncertain. Thus, analysis based on the survey responses may overstate the true values of the trajectories.

And, finally, the accuracy of the WTP estimates is likely to be viewed with a critical eye, which is fair given the hypothetical nature of the questions used. However, as the NOAA panel on CVM (Arrow et al. 1993) and numerous others have argued, when carefully done, SP surveys can generate reliable estimates of WTP. In our view, the LLR study meets this criterion, as they used state-of-the-practice methods to develop the SP survey instruments, gather the data, and analyze it. Considerable time was spent developing instruments that reminded respondents at various places in the survey about other issues that may compete for their attention and money, such as other social issues (e.g., education, jobs), other seals and sea lions, and other threatened and endangered species. In addition, standard budget reminders were inserted to remind respondents that money they spend on protecting Steller sea lions in the CE questions could not be used to purchase other things. These things were tested extensively in a series of small group discussions (focus groups) and in-depth one-on-one interviews (cognitive interviews) with members of the public. Peer review also was sought at numerous stages of the study, from early review of survey materials by experts in survey methodologies and SP survey design, to expert review of the analytic methods by non-market valuation economists with particular expertise in econometric modeling of CE data, as well as peer review by anonymous reviewers at *Marine Resource Economics,* done as part of the publication process. Therefore, steps were taken to minimize the potential for biases and inaccuracies to enter, but of course, given the hypothetical nature of the CE questions and the inability to corroborate the values from observations of actual spending or behavior, it is possible the estimates may reflect some level of introduced bias.

10.5 Impacts on other ecosystem resources

Section 10.4 discussed the benefits the action alternatives may create by reducing possible conflicts between commercial fishing vessels and Steller sea lions. The action alternatives may also impact other environmental resources. The following resources were discussed in separate chapters in the EA:

- Fish stocks
- Marine mammals (in addition to Steller sea lions)
- Seabirds
- Habitat
- Ecosystem resources

The impacts of this action on fish stocks are discussed in chapters 3 and 4. The action alternatives will reduce harvests from Atka mackerel and Pacific cod stocks in the Aleutian Islands, and increase harvests from rock sole, yellowfin sole, and Pacific cod stocks in the Bering Sea. Some catches of some groundfish species taken incidentally or as bycatch to these targets may also change, as may mortality of prohibited species. Halibut PSC, especially, may change. Reduction in Atka mackerel and Pacific cod harvests should tend to contribute to increases in those stocks in the Aleutian Islands. Atka mackerel may be especially affected, since it is a localized species, and current harvests would be reduced considerably by this action. Changes in Atka mackerel stock size in the Aleutian Islands could have implications for future ABCs, TACs, and catch rates for the remaining fishery. Harvest increases of rock sole, yellowfin sole, and Pacific cod in the Bering Sea would tend to reduce future population sizes for those stocks, but, as noted in the EA, not significantly. Prohibited species impacts would remain limited, in an absolute sense, by restrictions on PSC, although halibut PSC may occur at an accelerated pace, risking earlier closures of some Bering Sea flatfish fisheries. These actions could affect human welfare through human interest in stock health in and of itself, through changes in the costs of harvest associated with changes in stock size, and through the role some fish species play in supporting bird and marine mammal populations that provide value. However, the EA does not find that this action will have significant impacts on fish stock resources. In general, it is likely that costs or benefits from this source will be small. The impact on halibut PSC has been discussed at length in section 10.3.

The impacts of this action on marine mammals are discussed in Chapter 5. The impacts on Steller sea lions, humpback whales, and sperm whales are discussed in detail in the draft FMP biop (NMFS 2010b) and in chapter 5. Non-consumptive and consumptive values exist for marine mammals, including subsistence harvests of some marine mammals. The non-consumptive benefits for other marine mammals found off Alaska have not been studied to the extent that Steller sea lion non-consumptive benefits have been studied (Lew, personal communication).[90] With respect to other marine mammals, the EA found little reason to believe that any of the actions under consideration would have a significant impact on incidental take or disturbance, or reduced prey availability, for marine mammals. In the Aleutian Islands, it is possible that shifting fishing away from near-shore areas may reduce disturbance of near shore mammals (e.g., harbor seals and northern sea otters). No significant environmental impacts on marine mammal populations were identified for the action alternatives. The actions under consideration here are, therefore, unlikely to have a large impact on values associated with these resources.

The impacts of this action on seabird populations were discussed in Chapter 6. Non-consumptive values exist for seabirds. One of them, value from bird-watching trips, could even have an economic impact within the Aleutian Islands. Seabirds are also harvested for sport and subsistence purposes. Chapter 6, however, suggests that the action alternatives may have relatively small impacts on seabird populations. Under the status quo, seabird takes, and disruptions to benthic habitat, and to prey availability, are low, and are mitigated to some degree by current spatial restrictions in the Aleutian Islands fisheries. The analysis found that there would be little, if any, impact to seabirds from additional closures or shifting fleets under the two action alternatives. Thus, it is likely that the action alternatives will have little impact on economic benefits from seabird populations.

In the late summer and fall of 2010, two endangered short-tailed albatross were taken with longline gear in the Bering Sea. These are the first takes of this species since 1998; including these, there have been a total of nine takes since 1983. The short-tailed albatross is protected in U.S. waters by the Endangered Species Act (ESA). As a result of consultation with the U.S. Fish and Wildlife Service (USFWS) under the ESA, USFWS issued an incidental take statement of 4 birds during each 2-year period for the BSAI and Gulf of Alaska (GOA) hook-and-line groundfish fisheries. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease, pending reinitiation of consultation with the USFWS. NMFS may choose to reinitiate consultation if/when the level of authorized incidental take is met, but not exceeded, in order to avoid potential delays in federally

[90] Daniel Lew, Ph.D. Economist. NMFS Alaska Fisheries Science Center. Seattle, Washington.

authorized fishing operations. To date, the incidental take levels have not been reached during the current or any previous Biological Opinions.

Seven of these short-tailed albatross takes were made with hook-and-line gear. Most have been made in the Bering Sea. While the proposed action may lead to a shift of hook-and-line vessels, from the Aleutian Islands, to the Bering Sea, due to the historical rarity of takes, this action is not expected to have implications for the short-tailed albatross population. NMFS would most likely reinitiate consultation with USFWS if/when the incidental take statement is reached, before it is exceeded. That hasn't happened under this biological opinion, and is highly unlikely to happen in the foreseeable future. (Mabry, personal communication; NMFS 2010c)[91]

The physical impacts of this action on habitat are discussed in Chapter 7. This action should reduce the amount of bottom trawling, longlining, pot deployment, and other activities that may impact bottom habitat in the Aleutian Islands. Conversely there should be some increase in these activities in the Bering Sea. Habitat may provide non-consumptive benefits to persons who enjoy learning about, thinking about, and, in some cases, viewing unique subsea habitats, such as coral gardens (although trawl impacts on coral gardens are believed to have been small, considering the trawl closures currently implemented). Habitat may also provide consumptive benefits, by contributing to the productivity of fish and shellfish stocks. Humans could benefit if healthier fish stocks contributed to the health of bird, or marine mammal populations, or of fish stocks harvested for human use. However, as noted elsewhere in this section, this action is not expected to have significant impacts on these. The shift in activity could further remove potential adverse impacts of fisheries in the Aleutian Islands and increase potential impacts of the fisheries in the Bering Sea, thereby contributing to the benefits provided by Aleutian Islands habitat, and reducing benefits provided by Bering Sea habitat. Actual physical impacts, and economic benefits and costs, are likely to be small, since much of the habitat is already protected by various measures and for reasons discussed above. The analysis in the EA found that there would be no environmentally significant impacts on habitat.

The impacts of this action on ecosystem relationships are discussed in Chapter 8. Due to the nature of this action, the Atka mackerel and Pacific cod fisheries as modified by the alternatives, are not predicted to have additional impacts on the ecosystem or change the ecological impacts described in the in the Aleutian Islands Fishery Ecosystem Plan. Therefore, the impacts of the alternatives on the Aleutian Island ecosystem are insignificant. Because the EA did not find environmentally significant ecosystem function impacts following from this action, associated costs and benefits, other than those discussed elsewhere in the RIR, are likely to be relatively small.

10.6 Costs Incurred by the fishing and processing industries

10.6.1 Introduction

Past Alaska Region analyses of spatial management measures have, using the most recent catch data available, estimated the volumes of fish that had been harvested from areas to be closed or restricted, monetized them using prices from a recent period (first wholesale and/or ex-vessel, depending on the fleet), and described these as “revenues at risk.” These revenues could be “at risk” because of uncertainty about the impact of the restrictions on catch in the area directly affected by the regulations, or because of uncertainty about the fleet’s ability to redeploy, substitute new fishing activities, and earn offsetting revenues, in other areas.

[91] Kristin Mabry, National Marine Fisheries Service, Alaska Regional Office. Juneau, Alaska. Personal communication, October 20, 2010.

Council and NMFS analysts have readily acknowledged that, ***by itself***, revenue at risk is, as Berman et al. (2008) suggest, a "completely inadequate measure of the losses that the industry—and society—would endure from such closures." It does, however, serve as a gross reference point (in the absence of appropriate cost and operational data pertaining to these vessels), from which to characterize the upper-bound of impacts on gross revenues resulting from competing alternative management actions. When appropriately interpreted within the broader context of, albeit largely qualitative, descriptions of "expected" costs, changes in fishing behavior, product output, market response, and income distributional changes (among other effects), "revenue-at-risk" yields insights that better allow differentiation among expected outcomes associated with the suite of alternatives under consideration. The inadequacies of the measure, in the context of a discussion of spatial measures, flow from its failure to focus on net returns, and from its failure to account for loss minimizing responses by fishing vessels. As Berman et al. point out, these reactions to regulatory change may impose new costs on fishing vessels, including "higher travel costs to reach open areas, higher operating costs from lower catch rates and interrupted trawls, search costs and costs of learning how to fish profitably in new areas" (Berman et al. 2008:3).

Clearly, the change in producer's surplus is the appropriate measure of the welfare effect of the proposed Aleutian Islands management action for an affected fishery participant (i.e., producer). Unlike "gross revenue-at-risk" estimates, producer's surplus is the difference between the gross revenues for a firm in the industry, and the total variable costs for that firm (Boardman et al. 1996; Just et al. 2004).[92] Producer's surplus can differ from the profits received by the firm. That is, producer's surplus is the difference between total revenues and total *variable* costs, while profits are the difference between total revenues and total costs (including both total variable costs and total fixed costs).

As discussed in section 10.3, in recent years a number of economists have developed statistical models of the choices fishermen make about where to fish. Several of these papers have applied these models to analyze spatial restrictions or closures. Because these models often use expected gross revenues from fishing in different areas to explain fishing location choices, it is possible to use these models to make inferences about the value placed on an opportunity to fish in an area, by the owners of the fishing firm. These values can then be used to estimate the cost to these operations, that is, the loss of producer's surplus, from losing access to the fishing area. The estimate of loss of producer's surplus would be based on a measure of costs that captured the impacts of a spatial closure, described by Berman et al. (2008), as incurred by the vessel's decision makers.[93] As discussed in section 10.3, however, it has been impractical to use this type of analysis for this RIR in the time available.

Amendment 80 Economic Data Reporting (EDR) data could, potentially, be used for estimating the average costs of fishing in an area, for example, the average costs per haul. These estimates could be combined with average revenue information to estimate the net returns per haul.[94] The EDR data are not available for several of the key fleet segments that will be impacted in this action: the F/V *Katie Ann*, the fixed gear catcher/processors, and the catcher vessels. Moreover, the cost that can be estimated is purely the immediate financial cost of actually making a haul and, if appropriate, processing the fish. It does not reflect all of the types of costs described by Berman et al. (2008), for example, the costs of shifting to, and

[92] Technically, this economic concept is called quasi-rent, and producer's surplus is a way of measuring it geometrically (Just et al. 2004). Here the term "producer's surplus" is used because of its parallelism with the later use of the term "consumer's surplus" in section 10.8.

[93] The cost estimates would still fall short of the actual total social costs, because the value placed on fishing in an area would not reflect the value forgone by the fishing operation through taxes paid to the public. While the fishing firm would see these as a cost, they are a transfer from a public cost-benefit accounting stance. Neither would it capture costs imposed on other users (e.g., consumers) whose welfare may be impacted.

[94] The EDR data might also be used to improve the models of decisions about where to fish, described in the preceding paragraph (Haynie, personal communication, October 22, 2010).

learning about, another fishing area. EDR data for 2008 has been used in this analysis to provide better descriptions of the Amendment 80 Atka mackerel fishing operations, and as a check on data available from other sources.

In the absence of more sophisticated approaches to estimating the welfare impacts of this action, the analysis proceeds as follows. Sub-section 10.6.2 provides estimates of the revenues that would be placed "at risk" in the Aleutian Islands. The shortcomings of this type of analysis have been discussed above. However, it is an analysis commonly used in the Alaska Region, and may provide a measure of impacts that many will find useful. Sub-section 10.6.3 discusses the potential for revenue offsets from other fisheries in the Bering Sea. This discussion is subject to the indeterminacy identified in the discussion of alternative fisheries in section 10.3. Sub-section 10.6.4 discusses the potential welfare impacts of the action, as distinct from the revenue changes. This section draws on recent academic literature on spatial choice, discussed above, for qualitative insights. Together, sub-sections 10.6.3 and 10.6.4 address the two major shortcomings of the revenue at risk approach. A final sub-section summarizes the impacts, by industry sector.

A subsequent section (section 10.7) reports on estimated income and employment "impacts" of the action. These must be sharply distinguished from the welfare discussion in the current section. The current section explores the benefits and costs of this action as defined for the purposes of a cost-benefit analysis.

Impacts on employment and income are important considerations, shedding valuable light on the distributional result of an action. These effects are of relevance to local or regional economies, describing transfers of economic activity between communities and/or regions.

However, estimates of these effects do not provide estimates of benefits and costs usable in a standard cost-benefit format, especially one taking a national, rather than a regional, accounting perspective. For example, the oil spill cleanup following the Exxon Valdez grounding in 1989 generated income and jobs for many persons in Alaska. Nevertheless, the accident was a bad thing from an efficiency or welfare point of view: it damaged Alaska's coast, and the workers and resources invested in the clean-up were taken from other useful activities. The forgone benefits from these other useful activities were a cost to the nation. Income to the workers involved in the cleanup should not have been included on the benefit side of a cost-benefit calculation. Similar considerations apply to the response to the Deepwater Horizon disaster in the Gulf of Mexico this year.

10.6.2 Adverse Impacts on Revenues in the Aleutian Islands

Alternatives 2, 3, and 4 will reduce fishing revenues in the Aleutian Islands. The impacts on retained catches for the trawl and fixed gear catcher/processors, and the catcher vessels, were discussed in detail in section 10.3.

In this sub-section, these impacts on catches are monetized. This is done by calculating a first wholesale gross value per metric ton of round weight, and multiplying this value by the number of metric tons harvested or forgone, depending upon the assumed outcome of an action. Separate gross first wholesale values have been used for fish processed by catcher/processors and fish processed by shoreside and floating processors. In some instances, prices have been further broken out into "A" and "B" season prices (for rock sole), for fixed and trawl gear (for Pacific cod), and within and outside critical habitat in Area 542 (Atka mackerel).[95] Ex-vessel prices per metric ton of round weight have also been prepared for catcher vessel deliveries.

[95] The Atka mackerel adjustment involves assumptions and calculations discussed in connection with Table 10-59.

The gross wholesale value per metric ton round weight estimates were prepared using 2009 first wholesale values for products, derived from Commercial Operator Annual Reports (COAR reports), divided by COAR and Catch Accounting System (CAS) based estimates of the round weight of retained catches. The procedure is the same used to prepare Table 27, in the 2009 Economic SAFE report.

A similar procedure was used for gross ex-vessel round weight values received by catcher vessels. In this case an ex-vessel value per metric ton of round weight was calculated based on prices obtained from the Alaska Commercial Fisheries Entry Commission and weights from Alaska fish tickets (data compiled and supplied by the Alaska Fisheries Information Network [AKFIN]).

The value[96] estimates used in this analysis are summarized in Table 10-58. In general, 2009 prices are used, since this is the most recent price information available at the time of analysis. Pacific cod prices were very high in 2008, and dropped to much lower levels in 2009. In the case of Pacific cod, the value has been approximated using an unweighted average of the estimated 2008 and 2009 values.

Table 10-58 First wholesale and ex-vessel "gross" values per metric ton round weight (2009 unless otherwise noted).

Sector	Species	Annual	A season	B season
Catcher/processor	Atka mackerel	$948		
wholesale	Arrowtooth	$547		
	Flathead sole	$712		
	Greenland turbot	$2,610		
	Rock sole		$750	$550
	Yellowfin sole	$646		
	Pollock	$1,329		
	Northern rockfish	$1,042		
	Rougheye	$1,423		
	Shortraker	$1,259		
	Pacific cod (trawl)*	$1,456		
	Pacific cod (fixed)*	$1,704		
Shoreside/floater	Pacific cod*	$1,643		
wholesale	Rock sole		$191	$206
	Atka mackerel	$62		
	Pollock	$1,272		
	Other species	$195		
Ex-vessel	AI Pacific cod*	$858		
	BS Pacific cod*	$789		
	Rock sole		$96	$103
	Atka mackerel	$31		
	Pollock	$636		
	Other species	$98		

*Pacific cod prices were very high in 2008 and very low in 2009. Trawl values were $1,775 in 2008 and $1,151 in 2009, while fixed gear values were $2,126 in 2008 and $1,284 in 2009. For the purposes of this section, the unweighted average of the two years' prices was used.
Source: NMFS AFSC COAR prices for wholesale. AKFIN reports using Alaska fish tickets for ex-vessel Pacific cod. Ex-vessel prices other than those for Pacific cod were approximated by one-half the shoreside wholesale price.

In some instances, changes in quantity are large, relative to the baseline quantities. In these instances, if retained catches of the species are not totally eliminated, the price received for the residual production may increase. This potential effect is discussed in sub-section 10.6.3, which deals with offsetting revenue impacts.

[96] The values represent the value of processed products at the first wholesale level per metric ton of round weight of catch used to produce them. These wholesale values are not actual prices. They do reflect prices for groundfish products at the first wholesale and ex-vessel levels, but they are not actual prices for any specific product, or prices paid for a metric ton of a groundfish species. While tonnage is transferred within cooperatives, and CDQ groups receive royalties in return for leasing a certain amount of metric tonnage, NMFS does not collect information on these prices.

This sub-section implicitly treats estimates of potential changes in fishery revenues as a gross proxy for the welfare impact of this action. As noted earlier, revenue changes are not a good measure of the welfare impact, because they do not take account of costs and are not equal to the change in net benefits from the action, and because they do not take account of changes industry will make to minimize the net costs of the action to themselves (that is, shift their vessels to a different location or into an alternative fishery). Gross revenues may be the same before and after an action, but if the industry fishes in a new area, with lower catch per unit of effort, overall costs may go up, reducing net returns.

Atka mackerel and Pacific cod fishing operations harvest and retain other groundfish species, incidental to their targeted species. The gross revenue estimates below take account of the value of these incidental species harvests. These have been valued using methods similar to those for the target species. Changes in incidental harvests were discussed in section 10.3.

In most instances, prices used to construct the gross wholesale value estimates are regional BSAI prices, not Aleutian Islands specific prices. In part, this reflects the procedures used to collect price information. The primary source of wholesale price information is the COAR, and this collects information on BSAI-wide prices. In part, it reflects concerns about inadvertently violating rules governing the confidentiality of data. In some instances, there are small numbers of buyers or sellers of fish caught in the Aleutian Islands.

This use of BSAI-wide prices may affect results. Industry sources report that there is a tendency to find larger, and more valuable, Atka mackerel in Area 541, with average size and value decreasing with a movement west through Areas 542 and 543. There are also additional regional price variations; for example, within Area 542, fish are said to be smaller, and to bring a lower price, on the Petrel Bank, outside critical habitat, than inside critical habitat (Gauvin, Swanson, Kercheval, personal communication).[97] Industry sources also report that Pacific cod tend to be larger in the Aleutian Island catches than in Bering Sea catches and, at least for some fleet sectors, bring a higher price in the Aleutian Islands. This may be associated with an increase in size and price moving east to west through the Aleutian Islands. (Jacobs, Down, Magnuson, Hosmer, personal communications)

The estimates in the following tables are indicative of the magnitude of annual gross revenue changes. The estimates are based on information about historical harvests and 2008 and 2009 values. There are many assumptions incorporated into these estimates, and a great deal of uncertainty associated with them. Changes in markets, prices, survey information about fish stock size and composition, uncertainty about ability to harvest fish outside of critical habitat, and any number of other factors, could lead to changes in these estimates. The large difference between Pacific cod prices in 2008 and 2009 is a useful reminder of the potential volatility in fish product markets (see footnote to Table 10-58). The estimates are best treated as a general indicator of the size and direction of changes in gross revenue. Where ranges are reported, these are a result of the estimation procedure and are not meant to be maximum upper, or minimum lower, bounds for the revenue change.

As discussed in section 10.3, the Amendment 80 fleet harvesting Atka mackerel in the Aleutian Islands will have its harvest severely restricted by all the alternatives to the status quo. Table 10-59 provides estimates of the potential revenue at risk directly associated with the harvest cutbacks. The metric tonnages in potentially forgone production for the Atka mackerel target and for incidental catches of other groundfish are based on Table 10-26 in section 10.3. Pacific cod and Pacific ocean perch are important incidental species in this fishery. However, revenues from these species are not reflected in this table.

[97] John Gauvin. Gauvin and Associates. Burien, Washington. Lori Swanson. Groundfish Forum. Seattle, Washington. Personal communications, August 9, 2010. Nancy Kercheval, President, Cascade Fishing, Inc. Personal communication, October 8, 2010.

Table 10-60 summarizes estimates of reduced revenues from targeted and incidental harvests of Pacific cod, and incidental catches of Pacific cod in the Atka mackerel fishery are covered there. To include them in Table 10-59 as well, would lead to double-counting. Pacific ocean perch is another Amendment 80 species, and the table is based on the assumption that the Amendment 80 quota not used to harvest Pacific ocean perch as an incidental catch in Atka mackerel fishery, will be used to target Pacific ocean perch.

The estimated annual revenue at risk is large. It ranges from about $37 million, to about $43 million for Alternative 2, and from about $31 million, to about $34 million for Alternatives 3 and 4. Rounding to the nearest million misses a difference between Alternatives 3 and 4. Alternative 4 includes a provision allowing some Atka mackerel to be taken inside critical habitat, under certain circumstances. This reduces the revenue at risk by about $400,000 (see text following Table 10-59). The impact of regional differences in Atka mackerel prices is hard to determine. A region-wide price estimate was used to value the production changes. Area 541 production is not changed, and these may be the largest and most valuable fish. Area 543 production is eliminated under all scenarios, and these may be the least valuable fish. Area 542 fish may have a mid-range size and average price, but the area with the most valuable fish (critical habitat) is largely closed under Alternatives 3 and 4, while an important area with relatively smaller and lower valued fish is left open. While there is some anecdotal information from industry about these relative prices, NMFS has no independent information with which to empirically evaluate these assertions.

Table 10-59 Estimated reduction in the Amendment 80 Aleutian Islands Atka mackerel gross harvest value due to harvest restrictions in Areas 542 and 543.

Baseline revenues (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Atka mackerel	53.9	66.2	53.9	66.2	53.9	66.2
Arrowtooth	0.1	0.1	0.1	0.1	0.1	0.1
Gturb	0.3	0.4	0.3	0.4	0.3	0.4
Nrock	0.5	0.6	0.5	0.6	0.5	0.6
Pollock	0.3	0.4	0.3	0.4	0.3	0.4
Total groundfish	55.1	67.7	55.1	67.7	55.1	67.7
Changes to revenues caused by the alternative (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Atka mackerel	-35.9	-41.6	-30.5	-33.8	-30.1	-33.4
Arrowtooth	0.0	0.0	0.0	0.0	0.0	0.0
Gturb	-0.2	-0.2	-0.1	-0.2	-0.1	-0.2
Nrock	-0.3	-0.4	-0.2	-0.3	-0.2	-0.3
Pollock	-0.2	-0.2	-0.1	-0.2	-0.1	-0.2
Total groundfish	-36.6	-42.5	-31.1	-34.4	-30.7	-34.0
Percentage changes to baseline revenues caused by the alternative						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
	-67%	-63%	-56%	-51%	-56%	-50%

Notes: The table shows the change in production, due to the new restrictions in Areas 542 and 543, compared to baseline production in all three Aleutian Island areas (541, 542, and 543). Area 541 is included in the baseline, because the Area 541 fishery is an integral component of the overall Aleutian Islands fishery. Incidental catch species, limited to important commercial species, generated baseline revenues and revenue changes of $100,000 or more. Does not include revenues for other Amendment 80 species, as the quota share that would have been used for these in this fishery is assumed to be used in another Amendment 80 fishery. Industry sources report that prices for Atka mackerel from different parts of Area 542 may bring significantly different prices. The fish from outside critical habitat on Petrel Bank are said to be significantly smaller than fish from within critical habitat, and to bring a price from 25% to 35% lower than fish from within critical habitat. Normal price data collection cannot pick up price differences on this spatial scale. For the purpose of this analysis, a price difference of 30% was assumed, around an average Area 542 price of $948. Thus, within Area 542, fish from within critical habitat are valued at $1,103 per metric ton round weight, while fish from outside critical habitat are valued at $772 per metric ton round weight.
Source: NMFS AKR calculations.

The estimated total residual revenues for Alternative 2 are about 32 percent to 37 percent of the baseline revenues. Total residual revenues are approximately the same for Alternatives 3 and 4, at about 44 percent to 49 percent of baseline revenues, respectively.

Under Alternative 4, 10 percent of the 47 percent of the ABC that may be harvested as a TAC may be harvested within critical habitat. This relaxes the restrictions in Alternative 3 somewhat, to allow trawlers, under certain circumstances, to access more highly valued Atka mackerel. Extrapolating from the 2011 specifications, this could be 1,222 metric tons of Atka mackerel. As discussed in section 10.2, and in the notes for Table 10-59, this shift may increase the value of the Atka mackerel by about $331 per metric ton. The total estimated gross value of the opportunity to harvest this Atka mackerel within critical habitat could be approximately $400,000. This change implies an additional two vessel-weeks of fishing activity in critical habitat, because vessels targeting Atka mackerel harvest about 600 metric tons a week in Area 542.

The trawl catcher/processor vessels (the Atka mackerel and non-Atka mackerel Amendment 80 fleets, and the F/V *Katie Ann*) would also find themselves forced to reduce their harvest of Pacific cod in the Aleutian Islands. Table 10-60, based on Table 10-24 in section 10.3, summarizes estimates of gross revenue at risk in the region, under Alternatives 2, 3, and 4. Low and high results for each alternative are presented, corresponding to the range of potential harvest reductions identified in section 10.3. Atka mackerel are taken as an incidental catch in this fishery. Table 10-59 summarized estimates of revenue at risk from targeted and incidental harvests of Atka mackerel, and incidental catches of Atka mackerel in the Pacific cod fishery are covered there. To include them in Table 10-60, as well, would lead to double-counting.

Gross revenue placed at risk range from about $7 million to about $16 million for Alternative 2, from about $4 million to about $11 million for Alternative 3, and from about $4 million to about $10 million for Alternative 4.[98] As noted in section 10.3, the Amendment 80 Pacific cod allocation is not an Aleutian Islands specific allocation. However, the fleet may have difficulty fully harvesting the same amount of Pacific cod in the Bering Sea. The revenue at risk implications of this are discussed in the next sub-section.

[98] The last line in Table 10-60 indicates that the low end of the range of potential percentage production reductions from the baseline in Alternative 4 is actually a little less than that under Alternative 3. This is an artifact of the procedure used to generate the potential range of impacts. As discussed in section 10.3, this involved examining the hypothetical impact of the action in different years, and choosing the years with the largest and smallest impacts to generate a range of potential impacts. In the current instance, the reduction in production under Alternative 4 is less than that under Alternative 3, but different years were used for the baseline, generating the somewhat incongruous percentage differences in impacts.

Table 10-60 Estimated annual reduction in the trawl catcher/processor Pacific cod gross harvest value due to the reduction in harvest in Areas 541, 542, and 543.

Baseline revenues (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Pacific cod	7.5	17.6	7.5	16.6	7.5	16.6
Pollock	0.1	0.3	0.1	0.3	0.1	0.3
Pacific ocean perch	0.0	0.1	0.0	0.1	0.0	0.1
Rock sole	0.1	0.2	0.1	0.2	0.1	0.2
Total groundfish	7.7	18.2	7.7	17.2	7.7	17.2
Changes to revenues caused by the alternative (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low		Low	High
Pacific cod	-6.4	-15.7	-3.6	-10.8	-3.6	-9.8
Pollock	-0.1	-0.2	-0.1	-0.2	-0.1	-0.2
Pacific ocean perch	0.0	-0.1	0.0	0.0	0.0	0.0
Rock sole	-0.1	-0.2	0.0	-0.1	0.0	-0.1
Total groundfish	-6.6	-16.3	-3.7	-11.2	-3.7	-10.1
Percentage changes to baseline revenues caused by the alternative						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	Low	High	Low
	-85%	-89%	-48%	-65%	-48%	-59%
Note: Incidental catch species limited to important commercial species generating baseline revenues and revenue changes of $100,000 or more. The wholesale value of catcher vessel deliveries is not included in this table. Wholesale value estimates for catcher vessel deliveries to catcher/processors are included under the estimates of the wholesale value of the catcher vessel catch in Table 10-62. Source: NMFS AKR calculations.						

Fixed gear catcher/processors

The fixed gear (hook-and-line and pot) catcher/processor fleet would also find itself forced to reduce its harvest of Pacific cod in the Aleutian Islands. Table 10-61, based on Table 10-41 in section 10.3, summarizes the estimates of at-risk first wholesale gross revenues in the region, under Alternatives 2, 3, and 4. Low and high results for each alternative are presented, corresponding to the range of potential harvest reductions identified in section 10.3. Gross revenue reductions range from about $10 million, to about $11 million, for Alternative 2; from about $8 million, to about $11 million, for Alternative 3; and from about $6 million, to about $7 million under Alternative 4. These estimates do not account for offsetting gross revenue that may accrue from redistribution of effort. The potential for an Aleutian Islands Pacific cod price premium means that, as discussed earlier, actual revenue impacts could be larger than the estimates made here.

[ERRATA: after this analysis was prepared in October 2010, the RPA was altered to provide more fishing time for fixed gear catcher/processors in the spring. That may have an impact on estimates of potential revenue losses. This issue is discussed in Section 10.9 Additional Issues.]

Table 10-61 Impacts of Alternatives 2, 3, and 4 on fixed gear catcher/processor gross revenues from targeted Pacific cod fishing in the Aleutian Islands.

Baseline revenues (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Pacific cod	10.4	11.5	10.4	11.5	10.4	11.5
Total groundfish	10.4	11.5	10.4	11.5	10.4	11.5
Changes to revenues caused by the alternative (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low		Low	High
Pacific cod	-9.9	-10.9	-8.4	-10.5	-6.3	-7.2
Total groundfish	-10.0	-10.9	-8.4	-10.6	-6.3	-7.2
Percentage changes to baseline revenues caused by the alternative						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	Low	High	Low
	-96%	-95%	-80%	-92%	-61%	-62%
Source: NMFS AKR calculations.						

Catcher vessel sector

Table 10-62, based on Table 10-47 in section 10.3, summarizes the estimates of at risk gross first wholesale revenues associated with production from catcher vessel deliveries. Low and high results for each alternative are presented, corresponding to the range of potential harvest reductions identified in section 10.3. Wholesale revenue reductions range from about \$11 million, to about \$21 million for Alternative 2; from about \$4 million, to about \$10 million for Alternative 3; and from about \$4 million, to about \$10 million for Alternative 4.

In this instance, an evaluation of the impact of this action on catcher vessels also requires a report of estimated ex-vessel revenues. These are also summarized in Table 10-62.[99] Ex-vessel revenue reductions range from about \$6 million to about \$11 million for Alternative 2, from about \$2 million to about \$5 million for Alternative 3, and from about \$2 million to about \$5 million for Alternative 4.

[99] Ex-vessel prices have little meaning for catcher/processors where the production process is a seamless whole, and there is no market where independent parties exchange largely unprocessed Pacific cod for money. Thus ex-vessel equivalent estimates have not been made for catcher/processors in this report.

Table 10-62 Impacts of Alternatives 2, 3, and 4 on catcher vessel ex-vessel and first wholesale gross revenues from targeted Pacific cod fishing in the Aleutian Islands.

Ex-vessel gross revenues for vessels targeting Aleutian Islands Pacific cod						
Baseline revenues (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Pacific cod	6.2	12.9	6.2	11.6	6.2	12.9
Total groundfish	6.3	12.9	6.3	11.6	6.3	12.9
Changes to revenues caused by the alternative (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Pacific cod	-5.8	-11.1	-2.3	-5.2	-2.0	-5.1
Total groundfish	-5.8	-11.1	-2.3	-5.2	-2.0	-5.1
Percentage changes to baseline revenues caused by the alternative						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
	-93%	-86%	-36%	-45%	-32%	-40%
First wholesale gross value of deliveries by vessels targeting Aleutian Islands Pacific cod						
Baseline revenues (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Pacific cod	12.0	24.8	12.0	22.2	12.0	24.8
Total groundfish	12.0	24.8	12.0	22.3	12.0	24.8
Changes to revenues caused by the alternative (millions of dollars)						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
Pacific cod	-11.2	-21.3	-4.3	-10.0	-3.8	-9.8
Total groundfish	-11.2	-21.3	-4.3	-10.0	-3.8	-9.8
Percentage changes to baseline revenues caused by the alternative						
	Alternative 2		Alternative 3		Alternative 4	
	Low	High	Low	High	Low	High
	-93%	-86%	-36%	-45%	-32%	-40%
Source: NMFS AKR calculations.						

Summary

Table 10-63 summarizes the potential reduction in groundfish fishing revenues from curtailing Atka mackerel and Pacific cod fishing in the Aleutian Islands. These at-risk revenues are large, ranging from about $64 million, to about $91 million for Alternative 2, from about $47 million, to about $66 million for Alternative 3, and from about $44 million, to about $61 million for Alternative 4. Since prices are BSAI-wide prices, and since Pacific cod prices are said to be higher in the Aleutian Islands than in the Bering Sea, the Pacific cod based revenue change estimates may understate the actual reduction in revenues. The revenue changes discussed here are the reductions of gross revenues in the Aleutian Islands. These estimates do not take account of potential increases in prices for Atka mackerel or Aleutian Islands Pacific cod as production decreases, or potential revenue offsets from moving vessels into alternative fisheries. These effects are discussed in section 10.6.4.

Table 10-63 Summary of estimated potential first wholesale gross revenues from restricted fisheries in the Aleutian Islands (in millions of dollars).

Species	Alternative 2 (millions of $)		Alternative 3 (millions of $)		Alternative 4 (preferred) (millions of $)	
	Low	High	Low	High	Low	High
Trawl catcher/processor Atka mackerel	-37	-43	-31	-34	-31	-34
Trawl catcher/processor Pacific cod	-7	-16	-4	-11	-4	-10
Total trawl catcher/processor sector losses	-43	-59	-35	-46	-34	-44
Fixed gear catcher/processor Pacific cod	-10	-11	-8	-11	-6	-7
Catcher vessel Pacific cod	-11	-21	-4	-10	-4	-10
Total first wholesale gross revenues	-64	-91	-47	-66	-44	-61

Notes: numbers drawn from tables in the RIR.
Source: NMF AKR SF estimates.

Another way to look at the gross revenues at risk is on the basis of the potential average reduction per participating vessel. To approximate these average values, the total at-risk gross revenues are divided by estimates of the average numbers of vessels active in 2009, taken from tables in section 10.2. The results are summarized in Table 10-64.

Table 10-64 Estimated average gross revenue at-risk per vessel in the Aleutian Islands due to the restrictions (in millions of dollars).

		Alternative 2 (millions of $)		Alternative 3 (millions of $)		Alternative 4 (preferred) (millions of $)	
	Estimated number of vessels (typical numbers, actual numbers vary by year	Low	High	Low	High	Low	High
Trawl catcher/processor Atka mackerel	7	-5.2	-6.1	-4.4	-4.9	-4.4	-4.9
Trawl catcher/processor Pacific cod	5	-1.3	-3.3	-0.7	-2.2	-0.7	-2.0
Fixed gear catcher/processor Pacific cod	10	-1.0	-1.1	-0.8	-1.1	-0.6	-0.7
Catcher vessel Pacific cod	34	-0.2	-0.3	-0.1	-0.2	-0.1	-0.2

Source: gross revenue changes from Table 10-63 and vessel counts from various tables in section 10.2. Seven vessels are used for the trawl catcher/processor Atka mackerel vessels instead of a larger number from a vessel count table which would also include vessels taking Atka as an minor incidental harvest.

Curtailment of fish production has implications for marketing chains and business relationships. Firms have invested in developing an understanding of how markets work, in developing an understanding of how to structure production to address market needs, in personal relationships with others downstream in the market network, in methods for on-going monitoring of market dynamics, and in product branding and distribution networks. A reduction or cessation of production may lead to a depreciation of this human and product capital. Moreover, a reduction in production may provide an opportunity for other firms to enter the market place, develop their own human capital, and take over market share. These factors may mean that, if and when production opportunities increase, firms may only be able to sell their product at a lower price than otherwise. These sources of potential loss are another element, not estimable in itself, that needs to be considered.

Industry sources indicate that the large Pacific cod from the Aleutian Islands are a relatively unique product. They are larger than cod from elsewhere in the North Pacific, and they are a different species from Atlantic cod. Firms utilizing and marketing these cod are unlikely to be able to find alternative sources of product with these unique characteristics. Atka mackerel production losses in the Aleutian Islands may not readily be made up from other American sources. Atka mackerel from Russia may be a potential substitute in Asian markets, as may other species of fish. Aleutian Islands Pacific cod and Atka mackerel production would not be eliminated under any of the action alternatives, but significant reductions in supply could still have adverse impacts, of unknown size, to this general category of marketing capital. (Magnuson, personal communication)

As discussed in section 10.3, vessels directly regulated by this action that shift from the Aleutian Islands to the Bering Sea in order to minimize their costs, will interact with fleets already operating in the Bering Sea in complex ways. They will potentially increase the costs or decrease the gross revenues of vessels already in the fishery. They can increase costs if they cause congestion, if they reduce the average catch per unit of effort for vessels already present, or if they encourage a derby approach to fishery, possibly by disrupting pre-existing formal or informal agreements among operators. They can reduce revenues if the reduced catch-per-unit-of-effort or congestion prevents existing vessels from harvesting as much as they had previously, if increased production drives down prices, or if their competition for a limited stock of fish or PSC allowance reduces the availability for other operations. Problems are especially likely to be a concern in fisheries that are not rationalized. In rationalized fisheries, the harvest privileges could be bought and sold, and operations would have the tools to integrate new capacity in an efficient manner. Congestion may be less of an issue for mobile gear and for fisheries conducted over a large area. Thus, this may be more of an issue for the longline catcher vessels, and for pot catcher vessels, and relatively less of an issue for the Amendment 80 trawl catcher/processors (with quota shares, and low cost opportunities to form cooperatives in the fisheries they are most likely to enter), fixed gear hook-and-line catcher/processors, and trawl and jig catcher vessels. Interactions may be complex and their outcomes are uncertain. It has not been possible to make estimates of revenue impacts on indirectly regulated fleets.

10.6.3 Review of Available Information on Net Impacts

Spatial choice models, in which choices depend in part on expected gross revenue from fishing in alternative areas, can be used to infer the expected net value (benefits minus costs accruing to the decision-maker) placed on fishing in an area. They can provide insights into the welfare changes associated with area management measures. The available economic data and research on North Pacific fisheries is not sufficient, as yet, to make it possible to infer the specific welfare changes from the actions being considered here. However, the research does shed some light on the impact of spatial closures on fishing operation welfare.

Haynie and Layton (2010) evaluated the short run impacts to inshore trawl catcher vessels of the judicially mandated closure of the sea lion conservation area to pollock trawling in the summer of 2000, and found that the closure was likely to have had an estimated cost of $6,995 per fishing trip (in 2000 dollars) for the vessels in their sample. The welfare change was estimated as “the amount of money that must be given or taken away” to leave the vessel operator indifferent to the policy change. In this example, a vessel operator would need to receive about $7,000 per trip, to be as well off with the closure as they would have been without it, all else equal.

The sample included trips by trawlers greater than or equal to 60 feet length overall. Haynie and Layton (2010) found that the welfare loss increased with measures of vessel size and power, but that the impact was proportionally worse for smaller vessels. They report that the vessels in their sample averaged about $48,000 per trip. Thus, an estimate of the welfare impact of losing a trip based on gross revenues would have been a multiple of the actual welfare cost, in this instance.[100]

Berman et al. (2008) applied a spatial model to evaluate the impact of 2001 Steller sea lion critical habitat closures in the GOA and BSAI on groundfish fishing operations. They found that in the GOA "the closures cost the Pacific cod trawl fishery about 38 percent of the profit per haul, and the pollock fishery about 28 percent. The cost to the other trawl fisheries was slight: 0.2 percent of the operating profits." (Berman et al. 2008:30). Thus, the costs of these actions to the two named fisheries were substantial.

Hicks and Schnier (2010) studied the Atka mackerel fisheries in the Aleutian Islands. Their study was designed to evaluate a new approach to the choice models, but not to conduct a policy analysis addressing the questions of concern here. They studied 100 unique cruises[101] in the Atka mackerel fishery between 2002 and 2006. The average number of hauls per cruise was about 43, and average gross revenues per haul were about $12,800; average cruise revenues were about $546,000 (2006 dollars).[102]

They report welfare impacts from a hypothetical spatial closure for three small-scale fishing zones or sites within the harvest limitation area (HLA) in Area 542. These sites were unusually productive, were the most visited sites within the Area, and were not typical of all areas within Area 542 or Area 543. The welfare costs of the closure of these areas, on the assumption that the vessel would have otherwise had the authority to fish within them, were about $3,000, $6,000, and $2,800 per haul. The analysis was not designed to evaluate the policy question discussed here, and a linear extrapolation of these results to other hauls in Area 542 is problematic. Therefore, this analysis has not been used to make estimates of the welfare impacts of the current actions.

Schnier and Felthoven (forthcoming) also studied the Atka mackerel fisheries in the Aleutian Islands using approximately the same data as Hicks and Schnier (2010). While they were also primarily interested in methodological questions, they carried out an explicit policy analysis corresponding to a part of the action under consideration here. They examined the welfare impact of a complete closure of the HLA in Area 543 for fishing operations, assuming the operations would have otherwise had the right to participate in the HLA fishery. The welfare costs resulting from removing the HLA areas within 543 ranged between a low of approximately $1,800, to a high of $3,300, depending on the modeling assumptions utilized, for each haul for which they are eligible. These values represent the compensation that fishermen within the Atka mackerel fishery would be required to be paid to not fish in the HLA regions of 543 and be just as well off as if they were able to fish in these regions. In this exercise, no other areas of the Aleutian Islands were closed to Atka mackerel fishing, so entities impacted by this action had more readily available substitutes than they would have in the current instance.

The Amendment 80 EDR data for 2008 shed light on the cost structures of the Amendment 80 vessels active in the Aleutian Islands and on the difference between revenues and costs (noting that 2008 was the first year after rationalization and the data reported for these vessels may not be representative of an

[100] This is an approximation. The vessel and trip characteristics on which the welfare impact and gross revenue per trip estimates are based appear to be slightly different, and Haynie and Layton (2010) do not make this comparison.

[101] Cruises were defined by information about location fished and estimates of the time between fishing hauls. A gap of three days between hauls separated one cruise from another.

[102] Figures are from Tables 1 and 4 (Hicks and Schnier 2010) and multiplied by two to address a unit conversion problem identified by Schnier in a personal communication July 7, 2010.

average year). Table 10-65 summarizes average reported revenues and costs for the seven vessels targeting Atka mackerel.[103]

Table 10-65 Reported average annual returns and costs for Amendment 80 vessels (2008 data only).

Revenue or cost category	Atka mackerel fleet (7 vessels) Average per vessel in 2008 (values in millions of dollars)
Reported Sales revenue	$18.6
Fisheries landing taxes	$0.2
Fuel and lubrication	$3.2
Labor compensation	$4.5
Recruitment, travel, benefits	$0.6
Other costs	$6.0
Capital expenditures	$0.3
Total costs	$14.8
Revenues available to pay principal and interest on debt, federal corporate taxes, royalties for the use of CDQ allocations, payments for the lease of Atka mackerel quota share from other Amendment 80 fishing firms, reinvestment in the business, and payments to firm owners or shareholders, other fixed costs not otherwise covered.	$3.8
Source: Amendment 80 EDR report for 2008. Haynie, personal communication; Garber-Yonts, personal communication.[104] Note: Average annual revenues and costs for the seven vessels in all their 2008 fisheries (not just Aleutian Islands Atka mackerel or Pacific cod).	

Finally, it may be possible to make an inference about net returns from fishing Atka mackerel by drawing on information submitted as a public comment on the draft FMP biop and the draft EA/RIR. Representatives of Cascade Fishing indicated that they are APICDA's partner for the harvest of APICDA's CDQ. They indicated that, since 1999, when the relationship began, they had paid APICDA $750,000 in royalties, and that in 2009 they paid royalties equal to $189,000 to fish the APICDA CDQ. If it is possible to interpret this value as the value to Cascade Fisheries of harvesting this quota share, it may be possible to infer from this the value per metric ton, and to extrapolate to an overall value for Atka mackerel TAC. These calculations imply a value of the 2009 Atka mackerel harvest of about $5.7 million.[105]

None of these studies was prepared to evaluate the policy issues in this analysis. However, it is believed that several inferences can be drawn from these papers:

- Two studies (Haynie and Layton [2010] and Berman et al. [2008]) provide documentation of the common-sense idea that net returns impacted by an action are less than the gross returns. In the case of Haynie and Layton, the difference appears to be a large one.
- One would want to be careful in extrapolating proportions between net and gross revenues implied in the preceding point to the current situation. Those studies were done to evaluate different actions that were taken years ago, and to evaluate different fleets than those that may be affected by the current action.

[103] Table 10-65, and other discussions of 2008 EDR data in this analysis, are based on summaries from the EDR. Crew compensation and other expenses are discussed in more detail in section 10.7, which describes income and employment impacts of this action.

[104] Brian Garber-Yonts, Ph.D., Economist, NMFS Alaska Fisheries Science Center. Personal communication August 2010.

[105] In 2009, the CDQ reserve of Atka mackerel was 8,175 metric tons. APICDA was entitled to 30 percent of this, or 2,452.5 metric tons. If this was leased for a royalty payment of $189,000, the average price was about $75 per metric ton. In 2009, the total Atka mackerel TAC was 76,400 metric tons. Evaluating this at $75 per metric ton generates an estimated value of about $5.7 million.

- These models estimate the benefits to operation owners (assuming the decisions about fishing location are made in their interests), and, thus, would understate the social benefits to the extent that these operations pay taxes. A tax payment is normally treated as a transfer payment in cost-benefit analysis, and in this instance, a part of the benefit of fishing that is transferred to other parties. Rental payments to certain factor inputs, including Amendment 80 quota share lease payments and CDQ royalties, may also raise a similar issue.
- The evidence in Haynie and Layton (2010) suggests that the impacts of a closure may vary by vessel size; in their study, smaller vessels experienced proportionately greater adverse impacts.

10.6.4 Potential Offsetting Revenue Impacts

As discussed in section 10.3, fishing operations whose production is restricted in the Aleutian Islands by the proposed Steller sea lion protection measures may redeploy their vessels to fisheries in the Bering Sea. Trawl catcher/processors may be shifted into rock sole, yellowfin sole, and Pacific cod fisheries in the Bering Sea, while fixed gear catcher/processors and catcher vessels may also shift their focus to Pacific cod fishing in the Bering Sea. To some extent, the revenue generated in Bering Sea fisheries would offset the gross revenue at risk in the Aleutian Islands.

The estimates of gross revenue at risk in the Aleutian Island fisheries in sub-section 10.6.2 were necessarily rough approximations of potential losses. The dollar estimates of potential offsets, discussed in this section, are even more speculative, since it is very hard to project exactly how the fishing fleets will respond. The halibut PSC issue is an especially large uncertainty in the trawl catcher/processor and catcher vessel fleets. Halibut PSC may preclude these fleets from fully pursuing all the available alternative fisheries; if cooperative arrangements allow the fleet to make more efficient use of halibut PSC, the constraint created by the PSC allowance may be less limiting for Amendment 80 vessels.

As shown in Table 10-21, Atka mackerel harvests are projected to drop by about 41,800 metric tons under Alternative 2, and by about 30,500 metric tons under Alternatives 3 or 4. In the absence of this action, given the current 2011 TACs and the percentage of the TAC allocations that have been harvested in 2008 and 2009, the total Atka mackerel harvest would have been about 62,300 metric tons. Thus, Alternative 2 would reduce the harvest by about 67 percent, and Alternatives 3 or 4 would reduce the harvest by about 49 percent. Changes in harvest of this magnitude may affect the price received for the remaining Atka mackerel harvests. These price impacts, if they occur, could offset part of the potential gross revenue at risk from the reduction in overall harvest, described in Table 10-49.

In order to estimate the potential price change, it would be desirable to have a statistical model of the Atka mackerel market, with estimates of the responsiveness of price to quantity changes. A market model of this sort is not available, however,[106] so it is not possible to estimate the size of this source of increased gross revenues. One uncertainty is the potential for Russian supplies of Atka mackerel to serve as a substitute in U.S. markets. One person knowledgeable about Asian markets has speculated that there might be little or no price impact, as Russian Atka mackerel production might offset a loss in United States production. This observer thought prices might increase over the longer term, if the Russian Atka mackerel stocks were depleted.[107] This is, however, only one person's casual observation. It is certainly possible that there could be a significant price impact in the short run.

[106] No econometric analysis of Atka mackerel markets was identified in the literature. Efforts to estimate simple ad hoc models for this analysis failed to identify a plausible demand curve.

[107] Thoughts of a Korean fish buyer, as reported by Quentin Fong of the University of Alaska Fairbanks, School of Fisheries in a personal communication on July 13, 2010.

As discussed in section 10.3, Amendment 80 firms may be able to use their trawl catcher/processors in rock sole and/or yellowfin sole fisheries in the Bering Sea. Tables 10-56 and 10-57 in section 10.3 provided estimates of potential volumes of fish that might be caught.

Table 10-66 Possible Impacts of Alternatives 2, 3, and 4 on Amendment 80 rock sole and yellowfin sole harvest values in the Bering Sea.

Species	Alt 2 (millions of $)	Alt 3 (millions of $)	Alt 4 (millions of $)
Rock sole target fishery			
Rock	3.2	3.2	3.2
Flathead	0.2	0.2	0.2
Yellowfin	0.7	0.7	0.7
Pacific cod	0.7	0.7	0.7
Arrowtooth	0.0	0.0	0.0
Total groundfish	4.9	4.9	4.9
Yellowfin sole target fishery			
Rock	1.3	0.6	0.6
Flathead	0.6	0.3	0.3
Yellowfin	14.1	6.0	6.0
Pacific cod	2.5	1.1	1.1
Arrowtooth	0.2	0.1	0.1
Total groundfish	18.8	8.0	8.0
Source: NMFS AKR calculations.			

These estimates of increased rock sole and yellowfin sole are likely to reflect the upper bound of potential gross revenues from this source for the Amendment 80 catcher/processors. First, as discussed in sub-section 10.3.3, halibut PSC is likely to be a constraint on the ability of this fleet to harvest additional rock sole and yellowfin sole, and additional Pacific cod. Moreover, increases in rock sole and yellowfin sole production in the Bering Sea may reduce the prices for products produced from those species, reducing the potential gross revenues to the Amendment 80 vessels making the shift into these fisheries, as well as reducing the gross revenues for non-Atka mackerel Amendment 80 vessels that are already active in these fisheries.

The trawl catcher/processor fleet could also fish for Pacific cod allocations in the Bering Sea and thereby potentially offset some of the gross revenues at risk attributable to the reduction in Aleutian Island fishing opportunities. There are, however, factors which may prevent the vessels from fully accomplishing this. Halibut PSC is much higher in the Bering Sea than it is in the Aleutian Islands, and the constraint this may impose on increased Bering Sea production was just mentioned in connection with rock sole and yellowfin sole. If the Amendment 80 portion of the trawler catcher/processor sector cannot harvest its Pacific cod quota share in the Bering Sea, some of the Amendment 80 Pacific cod allocation may not be harvestable. Provisions do not currently exist allowing the reallocation of potentially unharvested Pacific cod from this sector to other sectors.

In some instances, Amendment 80 trawl catcher/processor firms may not hold the Amendment 80 quota shares necessary to harvest additional rock sole, yellowfin sole, or Pacific cod. In this case, the firm would have to acquire unused Amendment 80 quota share and associated PSC allowances from another Amendment 80 firm, or lease CDQ from a CDQ group. Thus, in these instances, even if the firms could acquire the quota shares making it possible to fish in the Bering Sea, a significant portion of the gross revenues they might generate would go, as rental payments, to other firms or CDQ groups. One industry source notes, “This would require compensating those companies at the opportunity cost of the A80 company with more flatfish harvesting history and efficiency, making purchasing or leasing relatively expensive” (Orr, 2010).

Industry sources also confirm, as pointed out above, that there are cost considerations associated with a shift to the Bering Sea, that are hidden by a focus on gross revenues. To some extent, these are costs associated with reconfiguring vessels to operate in new fisheries. In addition, firms may face the cost of learning and developing marketing networks for new sets of species and new markets. A firm accustomed to marketing large volumes of Atka mackerel may find itself having to deal with finding marketing channels for a variety of species (Kercheval, personal communication, October 8, 2010).

It may not be possible to reconfigure some vessels to operate profitably in Bering Sea fisheries. One industry source notes, the bigger Amendment 80 vessels have specialized in Atka mackerel and Aleutian Islands cod fisheries, because they are relatively better at these high volume fisheries. These boats are likely to be high cost operators in flatfish, because flatfish catch rates are generally lower and catches are more mixed, so sorting and processing facilities on mackerel boats are not as efficient. Operating costs go up in the flatfish fishery outside of the peak season, in the spring, when fish are schooled up prior to spawning. As a result, in the fall, when yellowfin sole catch rates are low, vessels would only cover expenses, rather than operate profitably (Orr, 2010).

There is no satisfactory way to project Bering Sea Pacific cod catches and incidental catches for the Amendment 80 trawl catcher/processors active in the Aleutian Islands. These vessels have a limited history of targeted Pacific cod fishing in the Bering Sea. A table based on their incidental catch rates in the Bering Sea would be distorted by cases in which they actually targeted another species and, because of fishing circumstances, ended up with a predominance of Pacific cod in a given haul. An alternative would be to project Amendment 80 catcher/processor trawl incidental catch rates on the basis of incidental catch rates for catcher vessel trawlers fishing for Pacific cod, but, given the difference in operational types, this is not an attractive alternative. Moreover, the situation is complicated by the introduction of rules facilitating the creation of cooperatives, under Amendment 80, and by the potential for cooperatives to internally manage halibut PSC allowances. Therefore, this analysis does not make explicit Pacific cod catch projections for this fleet sector in the Bering Sea. This fleet can fish for Pacific cod there, and may do so.

As discussed in sub-section 10.3.3, the fixed gear catcher/processor fleet is the impacted sector with the greatest potential to make up Pacific cod harvest reductions in the Aleutian Islands by shifting to the Bering Sea. Table 10-67 shows estimated revenues from the target and incidental catches in the Bering Sea, if the fixed gear fleet does harvest the equivalent amount of Pacific cod in the Bering Sea, as it previously harvested in the Aleutian Islands. The gross revenue changes are based on 2009 first wholesale prices, and species tonnage changes, summarized in Table 10-38 in section 10.3.

Industry sources have strongly indicated that the average size of Pacific cod in the Bering Sea is smaller than the size of the Pacific cod in the Aleutian Islands, and that because of this, product recovery is less in the Bering Sea, marketing channels are different, and average values per metric ton round weight of harvest are less (Park, 2010; Magnuson, personal communication, September 16, 2010, September 16, 2010) NMFS statistical analysis of price information was unable to confirm this, but the power of the statistical analysis was weak, so this is not conclusive. The revenue estimates in Table 10-67 are based on BSAI-wide Pacific cod prices for fixed gear catcher/processors; thus, this table does not reflect this consideration and may overstate the size of the gross revenues this fleet could recover in the Bering Sea, if it were unable to offset the production volume loss.

Table 10-67 Possible fixed gear catcher/processor gross revenues from potential targeted Pacific cod fishing in the Bering Sea under Alternatives 2 and 3.

Species	Alternative 2 (million $)		Alternative 3 (million $)		Alternative 4 (preferred) (million $)	
	Low	High	Low	High	Low	High
Pacific cod	9.9	10.9	8.4	10.5	6.3	7.2
Greenland turbot	0.0	0.0	0.0	0.0	0.0	0.0
Other species	0.1	0.1	0.1	0.1	0.0	0.0
Rougheye rock	0.0	0.0	0.0	0.0	0.0	0.0
Total groundfish	10.0	11.0	8.4	10.6	6.3	7.2
Source: NMFS AKR estimates						

Because the Aleutian Islands Pacific cod and the Bering Sea Pacific cod enter different marketing channels and meet the demands of different customers, cod from the two sources may be imperfect substitutes in the market place. This may mean that the "value" of the residual Pacific cod harvest in the Aleutian Islands could increase, offsetting some of the volume loss there. But, this could also mean that increased production in the Bering Sea could cause prices there to decline. A decline in prices in the Bering Sea would further contribute to potential overestimate of gross revenue recovery in Table 10-67, and could create an adverse economic impact for vessels currently harvesting Pacific cod in the Bering Sea.

In addition to possible gross revenue impacts associated with variation in Pacific cod product quality and price between the Aleutian Islands and the Bering Sea, there may also be cost impacts. For example, the Bering Sea is said to be more of a volume fishery, requiring a larger amount of bait, and consequently, a greater expenditure (Hosmer, personal communication, August 2010).

As discussed in section 10.3, the catcher vessels displaced from the Pacific cod fishery in the Aleutian Islands may be able to offset the losses in Pacific cod harvests in the Bering Sea. Table 10-68 shows estimated gross revenues from the target and incidental catches in the Bering Sea, if the catcher vessel fleet harvests the equivalent amount of Pacific cod in the Bering Sea as it previously harvested in the Aleutian Islands. The gross revenue changes are based on 2008–2009 first wholesale prices, and species tonnage changes summarized in Table 10-34 in section 10.3.

Table 10-68 Possible catcher vessel ex-vessel and first wholesale gross revenues from potential targeted Pacific cod fishing in the Bering Sea under Alternatives 2 and 3.

Es-vessel revenues						
Species	Alternative 2 (millions of $)		Alternative 3 (millions of $)		Alternative 4 (preferred) (millions of $)	
	Low	High	Low	High	Low	High
Pacific cod	5.4	10.2	2.1	4.8	1.8	4.7
Pollock	0.2	0.4	0.1	0.2	0.1	0.2
Total groundfish	5.6	10.6	2.2	5.0	1.9	4.9
Wholesale revenues						
Species	Alternative 2		Alternative 3		Alternative 4 (preferred)	
	Low	High	Low	High	Low	High
Pacific cod	11.2	21.3	4.3	10.0	3.8	9.8
Pollock	0.4	0.7	0.2	0.3	0.1	0.3
Total groundfish	11.6	22.1	4.5	10.3	4.0	10.2
Source: NMFS AKR estimates						

As discussed in sub-section 10.3.4, halibut PSC is much higher for trawl catcher vessels in the Bering Sea than it is in the Aleutian Islands. This may prevent these vessels from fully compensating, in volume terms, for lost Pacific cod fishing opportunities in the Aleutian Islands. An examination of State of Alaska fish ticket data suggests catcher vessels tend to receive somewhat higher prices for Pacific cod in the Aleutian Islands than they do in the Bering Sea. A comparison of average ex-vessel prices per metric ton round weight for the years 2003 to 2009 shows consistently higher prices in the Aleutian Islands. The difference rose as high as 34 percent in 2003, but was between four percent and ten percent in the other years.

As a final consideration, the reduction in the harvests of Atka mackerel and Pacific cod may allow these stocks to increase through time. This, in turn, may result in increases in harvest ABCs and TACs for these species. This may be more likely for Atka mackerel than for Pacific cod under current management, since the Atka mackerel ABC and TAC are Aleutian Islands specific, while the Pacific cod ABC is a BSAI-wide measure. If an increase in TAC permits a future production increase, revenues may increase. Dollar for dollar, uncertain future revenues would be weighted less heavily in a cost benefit analysis than current and relatively certain losses.

10.6.5 Time frame

The gross revenue impacts in this analysis are estimates of annual impacts. The impacts summarized in Table 10-63, or similarly large impacts, would recur annually, unless underlying conditions (such as species prices, target species population biology, or other factors) changed, or until the measures associated with this proposed action are replaced in a future regulatory action. It is impossible to estimate the length of time for which the proposed actions would remain in place. The FMP biop does not provide information on the impact the action is expected to have on the growth rate of the western Steller sea lion population segment, and does not provide estimates of a recovery time frame.

In the short run, alternative measures may be identified at some time in the future that allow the Secretary to act to authorize more Atka mackerel and Pacific cod fishing in the Aleutian Islands, without creating a risk of jeopardy or adverse modification of habitat. Alternatively, the actions could be in place for many years, pending down-listing or delisting of the western population. Because of the difficulty of identifying an appropriate time frame for this action, this analysis does not include an estimate of the present value of the revenue at risk from this action.[108]

10.7 Employment and income impacts

10.7.1 Introduction

For analytical purposes, it is convenient to divide the employment and impact effects associated with fishery policy changes into direct, indirect, and induced effects.[109] The direct effects are those reflected in changes in jobs and income directly attributable to participation in the fisheries. In this instance, these are changes in the direct employment of the crew of the fishing vessels and of workers in processing plants, and direct income to various participants in the fishing and processing firms: wages, salaries, or shares for crew, profits for vessel owners, or lease or royalty payments to quota share holders or to holders of CDQ fishing privileges, acquired and used by a participating fishing firm.

[108] The July 2010 draft of this analysis, prepared for the Council's special August 2010 Council meeting on the draft FMP biop, included an estimate of present value. That has not been included in this draft.

[109] As explained in section 10.6, the analysis in this section is not a cost-benefit analysis, and is not provided as an input into a cost-benefit analysis.

The indirect effects are those reflected in changes generated in other businesses, by the changes in purchases of the fishing firms. In this instance, indirect effects would accrue to businesses supplying fuel and supplies, fishing gear and fishing gear repairs, ship construction and repairs, insurance, banking, legal, and accounting services, and lobbying and consulting. In the discussion that follows, activity in a fishing firm's corporate office (overall management and strategic direction, marketing, accounting, human resources, and legal services)[110] will be treated as an indirect employment impact. There is no bright line between the production of many of these services by the fishing firm itself, and their purchase in the market place. The goods and services above are "backward" linkages. Jobs and income may also be associated with "forward" linkages, in firms providing subsequent reprocessing, warehousing, cold storage, brokering, and distribution services.

Alaska's fisheries taxes, the receipts of which are shared with the communities in which fish are landed, is another source of indirect fishery impacts. Changes in "fish" tax receipts may lead to reductions (increases) in community sales tax or property tax assessments, to additional (reduced) municipal expenditures on goods and services within the community, purchases of goods and services outside the community, or some combination of these. Employment and community member income impacts would differ, depending on which of these ways, or which combination of these ways, the tax revenues influenced spending patterns.

Induced effects are those generated in an economy when directly or indirectly employed persons spend (or withhold spending) their earnings. These employment and income effects are created when people receiving income from fisheries—through shares or wages, profits, or royalties—spend their money on such things as groceries, gas, cars, car repairs, rent, home repairs, home construction, insurance. As the preceding descriptions suggest, these effects can be either positive (increases in direct, indirect, and induced economic activity in the economy of interest) or negative (loss of economic activity in the subject economic unit, e.g., village, community, region).

It is customary to think of these impacts in terms of *multipliers* showing the total employment and income impacts of changes in direct sector jobs, or of direct sector income, as the direct income circulates. Multiplier estimates for Alaskan economies are typically lower than those for other regions of the nation, because of their relative lack of depth. Alaska imports a large proportion of the goods and services that are used there, and a large part of the fishing labor force in the Aleutian Islands is seasonal, transient, and from outside Alaska.[111] In general, the smaller the region or community economy examined, the smaller the multiplier, since more goods and services would be purchased from sources outside of the subject economy.

The communities primarily expected to be impacted by changes in direct employment and income associated with this action are: the Alaskan communities of Adak and Unalaska, where catcher vessel and catcher/processor deliveries are made; other communities elsewhere in Alaska, which serve as home ports to affected vessels and many of their crew; and communities on the Pacific Northwest coast, particularly in the Puget Sound area, which serve as home ports to affected vessels, corporate headquarters to many parent companies directly participating in the fisheries of interest, and residence for a substantial portion of the fishing and processing labor force.

Vessel home port, as shown in vessel licensing records, is a possible indicator of the location of direct, indirect, and induced impacts associated with vessels active in the Aleutian Islands fisheries. The home

[110] For example, the F/T *Ocean Peace* employs 7 to 9 persons in its home office (Gleason 2010). These, and the office employees of other fishing firms, will be treated as indirect employment in this discussion.

[111] This is, by-in-large, based upon anecdotal information, because good statistics for crew place-of-residence are not available.

port may see a significant portion of a vessel's purchases, and may identify the place of residence for a significant portion of its crew members. This is not a strong indicator, however. Vessel home port is not a well defined variable, is self-reported, and is not systematically verified by fisheries agencies. Lags in data updates may occur when licensing is not annual or fishermen are provided with pre-printed forms. Moreover, little information—other than anecdotal—is available on the distribution of vessel expenditures by location.

10.7.2 Income and employment effects

Direct employment effects

Estimates of current catcher vessel and catcher/processor sector crew positions were provided in section 10.2, for the impacted fleets. In summary, the trawl catcher/processor fleet was estimated to have 557 crew positions in 2008, the fixed gear (longline and pot) catcher/processor fleet was estimated to have had 215 crew in 2008, and 166 in 2009, and the catcher vessel fleet (jig, pot, longline, and trawl gears, but primarily trawl gear) was estimated to have had 300 in 2008, and 150 crew positions in 2009. These estimates include processing crew on catcher/processors, but not the processing employees of shoreside processors or floating shoreside processors. In a typical year, (prior to the bankruptcy and plant closure) the processing plant at Adak had averaged 60 employees during the "A" season, with a peak of 150 around March 1 (EDAW 2005:3–65), while the M/V *Independence* normally carries a crew of 235 (Soper, personal communication)[112].

The practice in the Amendment 80 fleet is to rotate crewmembers within the fishing year, so that the entire crew can turnover two, or possibly three, times during the course of a year. This increases the number of separate employees during a year, but not the number of crew positions.

Based on these estimates, direct employment in the Aleutian Islands Atka mackerel and Pacific cod fisheries and directly associated processing was an estimated 1,072 catcher vessel and catcher/processor crew in 2008, and an estimated 873 in 2009. This drop in numbers of crew reflects a drop in the number of active vessels, and this, in turn, may have been associated with the large decline in Pacific cod prices from 2008 to 2009. These estimates may be taken as an indicator of the range within which the number of affected catcher vessel and catcher/processor jobs might lie. In addition, another 385 persons could be employed in processing fish delivered by catcher vessels to Adak (assuming the plant was operating) and the M/V *Independence*.[113] The total direct employment figure potentially affected by this action would, thus, have been about 1,300 to 1,500 jobs in recent years.

Not all of these jobs will be lost because of this action. As discussed in section 10.3, Atka mackerel and Pacific cod fishing opportunities will remain in the Aleutian Islands, and the fleet sectors have opportunities to redeploy and fish elsewhere.

Indirect and induced employment effects

Purchases and sales by catcher/processors and catcher vessels will generate additional indirect employment in Alaska and in the Pacific Northwest. Within Alaska, these will likely be concentrated in Adak (assuming the plant would have been operating in the absence of the action) and Unalaska, the two fishing communities closest to the Aleutian Islands fishing grounds which are involved with the species

[112] Paul Soper, Manager with the Trident company, personal communication, September 27, 2010.

[113] Processing employees on catcher/processors acting as motherships are accounted for in the crew estimates for trawl catcher/processors. This estimate of processing employment will be understated to the extent that fish are processed in Unalaska, Akutan, or elsewhere. This estimate is based on Adak employment about 2005.

being restricted. The Pacific cod market in Adak has been an uncertain one, since the Adak Fisheries filed for bankruptcy in 2009. As described in sub-section 10.2.8, parts of the fleet are home-ported in ports in Southwest, South Central, and Southeast Alaska, and these ports may experience impacts. Additional expenditures by CDQ groups will generate additional indirect employment in western Alaska. Expenditures of fisheries business taxes by the State of Alaska, and by communities receiving a share of the taxes, would also contribute to indirect employment.

Induced employment impacts would occur due to change in household spending caused by direct and indirect effects in the regions, but may also be more broadly spread, to the extent that crew members have a more diverse distribution of residences, and to the extent that people purchase goods and services from outside the region in which they live.

Atka mackerel TAC is allocated to the Western Alaska Community Development Quota (CDQ) Program, and further allocated among six CDQ groups. The CDQ groups receive allocations on behalf of 65 small western Alaska communities. Atka mackerel CDQ allocations are unevenly distributed among these CDQ groups. Thus, potential indirect and induced employment impacts from this action in western Alaska may be distributed unevenly in the region (the distribution may also be affected by different CDQ group policies with respect to expenditures). The APCIDA group receives 30 percent of the CDQ program allocation of Atka mackerel. The Central Bering Sea Fisherman's Association (CBSFA), with 8 percent of the allocation, would likely be the least affected. The other associations receive between 14 percent and 18 percent of the allocations.

Indirect and induced income effects

The principles underlying the discussion of employment impacts in the preceding section are also applicable to income impacts.

The Amendment 80 Atka mackerel and Pacific cod fisheries are limited access fisheries (i.e., Amendment 80) and allocations of Atka mackerel and Pacific cod are fished under the authority of quota shares issued to 23 firms. Not all of these firms actively fish their quotas. Only four firms fish Atka mackerel quota share. However, the remaining firms and their owners receive income from the fisheries by leasing their quota share fishing privileges to the firms that are actively fishing Atka mackerel. Reduced revenue to fishing operations would affect the incomes of owners of quota allocations in this fishery.

Estimated income and employment impacts

There are different models available to study employment and income impacts in a regional economy. Economic base models are relatively simple, dividing regional industries into base industries producing for export, and other industries dependent on economic activity in the base industry. Input-output models are more sophisticated, working out a complex network of purchases and sales between all industries in a subject economy, and relating these to final demands for that particular economy's output. Social accounting matrix models build on the input-output structure, adding elements that permit a more detailed examination of "the distributional impacts of fisheries, such as impacts on value added, households, or state and local governments" (Seung and Waters 2005). Economic base models, input-output models, and social accounting matrix models incorporate a "fixed price" assumption: prices do not vary in response to changes in the quantities demanded and transacted in the models. An alternative modeling approach, computable general equilibrium modeling, builds on a social accounting matrix framework, but allows prices to vary. A computable general equilibrium model offers the opportunity to move beyond estimates of income and employment impacts, to make statements about the more generalized impacts of policy actions. Models of all of these types exist for the Alaska and Washington State economies (for Alaska, see Seung and Waters [2005, 2006, 2009, and 2010]).

There are significant difficulties in estimating employment and income effects associated with Alaska's fisheries. Definitional issues are created by the significant non-resident component of the working population. Many people working on catcher/processors in the waters off of Alaska may have limited involvement with the Alaskan economy. Many of the productive assets and businesses active in Alaska are owned by persons who reside outside of the state, and income flows from those assets leave the state. Many of the crew members on catcher vessels with Alaskan home ports actually reside elsewhere, as do many of the production workers in fish processing plants. These circumstances create difficult issues for employment and income modeling of the Alaska economy.

The model used in this analysis is a variant of the supply-driven social accounting matrix (SDSAM) model, described in Seung and Waters (2009). That model was based on (1) 2004 IMPLAN (IMpact analysis for PLANning, Minnesota IMPLAN Group) data for non-fishery sectors; and (2) fishery data for the same year from a variety of state and federal sources (The Research Group 2007). Based on these data, a 2004 social accounting matrix (SAM) for the State of Alaska was generated. The SDSAM model was based on this SAM. This model has subsequently been modified to improve the integration of the sectors directly impacted by the action, with sectors upstream in the product flow.[114]

This is primarily an Alaska regional model and does not provide information about the location *within* Alaska where impacts will occur. In some instances, impact estimates from this model can be interpreted as national U.S. impacts; in these cases, however, information on the Alaska/non-Alaska distributions is not available from the model. Section 10.7.3 provides a qualitative discussion of the regional distribution of impacts.

The impact analysis is based on four scenarios derived from the analysis of fleet impacts in sections 10.3 and 10.6. These four scenarios are applied to the direct gross revenue impact estimates, prepared in section 10.6, for Alternative 4, to generate 4 sets of impact results.[115] Scenarios reflect the estimated gross revenue at risk accruing to a fleet sector in the Aleutian Islands, and the considerable uncertainty about the extent to which those revenues will be offset by price changes or increased production in alternative fisheries. Differences among the outputs reflect (a) differences in the Aleutian Islands gross revenue at risk associated with each alternative, and (b) differences in the scenario assumptions about the extent to which the revenue at risk will be offset, through price changes and fishery redeployment. The four scenarios are:

1. The three sectors forgo all the fishing revenues and are unable to offset any portion of the revenue loss by fishing elsewhere. This scenario is meant to provide an upper bound to potential employment and income impacts. This is a "worst case" scenario, and, as noted earlier, there are reasons to believe that the sectors <u>will</u> be able to offset some revenues at risk, although to an unknown extent.
2. The trawl catcher/processor sector is unable to fully compensate for lost fishing opportunities in the Aleutian Islands. It is, however, able to fish more rock sole and yellowfin sole, earning the revenue levels identified in Table 10-66. It is not, however, able to make up any of its Aleutian

[114] To overcome the problem in estimating the forward linkage effects generated by the Ghosh approach (1958) in Seung and Waters (2009), and to avoid the double counting problem often encountered in final demand-driven input-output (IO) model, regional purchase coefficients (RPCs) for seafood-related industries (i.e., fish harvesting and processing industries in the present analysis) are set equal to zero. Setting the RPCs at zero prevents other industries from purchasing output from seafood-related industries and, thus, explicitly avoids the double counting problem in this assessment.

[115] The scenarios were also applied to Alternatives 2 and 3. However, they may not have been appropriate for Alternative 2. The resulting employment impact estimates for the more optimistic scenarios were smaller than those for Alternatives 3 and 4 (although they remained larger for the more pessimistic scenarios). Pending further investigation, the results for Alternatives 2 and 3 are not presented fully here.

Islands Pacific cod revenues at risk, by fishing in the Bering Sea. The fixed gear catcher/processor sector is assumed to be able to offset 75 percent of the revenues at risk from Pacific cod in the Aleutian Islands. This reflects an assumption that the sector is fully able to offset the volume lost in the Aleutian Islands, but, reflecting industry comments, the fish will be smaller and bring a lower price. The 25 percent price reduction is an assumption for the purpose of this impact analysis, although that specific number does not have support in available price data. The catcher sector is assumed to be able to compensate for one half of its revenue at risk from Aleutian Islands Pacific cod fishing opportunities. A full offset is assumed to be prevented by higher halibut PSC. In this scenario, and in the following scenarios, the fleets are assumed to be able to offset revenues at risk without imposing losses on indirectly affected fleets (likely, as noted earlier, an unrealistic assumption).

3. The trawl catcher/processor sector impacts are the same as in Scenario No.2. Both fixed gear catcher/processor and catcher sectors are assumed to be able to fully compensate for Aleutian Islands Pacific cod fishing opportunities, by increasing harvests in the Bering Sea.
4. The trawl catcher/processor sector increases rock sole and yellowfin sole, and completely offsets it Aleutian Islands Pacific cod revenues at risk by increased harvests in the Bering Sea. Note, these offsets do not fully compensate for the sector's losses in the Aleutian Islands, even under this relatively optimistic scenario. Fixed gear catcher/processor and catcher sectors compensate for lost Aleutian Islands Pacific cod revenues. Offsets are not reduced by equivalent losses in other fleet sectors.

The selection of these scenarios for analysis does not imply any intent to assign relative probabilities to them, either compared to each other, or to possible scenarios that have not been included. Scenarios 1 and 4 were designed to bound the range of possibilities, based on the earlier analysis. However, as discussed below, there are uncertainty bounds associated with both the estimates of gross revenue changes, coming from section 10.6, and with the parameters of the SDSAM model, used to generate the range of impacts presented. Thus, when uncertainty is considered, the bounds for impacts are wider, to an unknown extent, than those presented in the tables. Scenarios 2 and 3 were developed to provide plausible mid-range scenarios that differed significantly between themselves.

The results of the analysis are summarized in Table 10-69. The following notes may help in the interpretation of the results:

- Rows 1 and 2 list and describe the four scenarios.
- Rows 3, 4, and 5 describe the direct output impacts of this action (measured as the change in first wholesale gross revenues or ex-vessel gross revenues) for each of the three fleet sectors used in this analysis. These are calculated by adjusting the revenues at risk in the Aleutian Islands for different assumptions about offsets, as described above. The categories used in sector analysis in section 10.6 had to be adapted to the categories used in the SDSAM model. The trawl and fixed gear catcher/processor sectors were grouped into a single catcher/processor sector for use in the SDSAM model, the wholesale revenues for catcher vessels were divided equally between SDSAM mothership and shorebased processing sectors, and catcher vessel production was assigned to the SDSAM model trawl catcher vessel sector (since most of the revenues for catcher vessels in section 10.6 originates with trawlers).
- Row 6 describes the total direct output impact of the action. This is the sum of the wholesale impacts in the trawl and fixed gear catcher/processor sectors, the wholesale impact of shoreside revenues, and the impact on ex-vessel revenues. The output change is not a measure of change in value added, as used in national income accounting, for example, since both catcher vessel ex-vessel revenues, and the wholesale revenues of their shoreside customers, are counted equally. In national income accounting, the value of catcher vessel purchases by the processing sector would be subtracted from the processor output to determine value added. This is a measure or index of

aggregate output that is specific to the institutional arrangements that govern the fishery. For example, if the catcher vessels were wholly owned by the shoreside plants, so that there were no ex-vessel markets, the analysis might proceed based simply on shoreside wholesale revenues, without adding in the ex-vessel revenues. In that case, the index would have a different base.

- Row 7 provides an estimate of indirect and induced output. This estimate flows from the SDSAM model. As discussed earlier, indirect impacts are those created in the industries *supplying* goods and services to the fishing and processing sectors directly, and in those dependent on the fishing and processing industries. Induced impacts are those created in businesses dependent on incomes earned in the fishing and processing and indirectly impacted businesses. The estimates in row 7 are estimates of indirect and induced output changes in Alaska. Indirect and induced output changes in other states are not included in these estimates.
- Row 8 provides the total output impact. The output measures should be interpreted as aggregate changes in Alaska output, including direct, indirect, and induced output. Output changes in other states (indirect and induced) are not included in these estimates.
- Rows 9, 10, and 11 provide estimates of employment impacts. The employment impacts are discussed in more detail below, and further description is left until that point.
- Row 12 provides SDSAM model estimates of the impact of the action on state and local revenues. These include changes in fish tax and non-fish tax revenues in Alaska. Taxes received by other states are not included.
- Rows 13 through 16 provide estimates of impacts on (1) different sources of income or compensation from fishing and processing activities (for residents only) and (2) different sources of such income from non-seafood industries (for both residents and non-residents), including employee compensation received as wages and shares, income to the firm's owners, and other property income. This last category includes royalty or lease revenues paid for the use of fishing privileges. These are not total income impacts, but are income impacts accruing to Alaska residents from harvesting and processing, and to U.S. residents from employment in non-seafood industries in Alaska. The difference in treatment is caused by industry sector differences in the treatment of labor imports to the state.
- Rows 17 through 20 provide estimates of household income impacts. These are broken out for three income categories. A low income category includes households with income up to $25,000; a medium income category includes households with income from $25,000 to $75,000; and a high income category includes households with incomes in excess of $75,000. These income flows represent income flows to Alaska residents and not flows to non-residents.

The estimates are reported without associated confidence intervals or other measures of the extent of uncertainty associated with them. The statistical underpinnings of the underlying models are complex and, in many cases, parameter estimates depend on the informed judgment of the analyst. Moreover, the underlying parameters are used in relatively complex ways that make it difficult to compute standard statistical confidence intervals. The underlying models generally incorporate assumptions of linearity that may be very rough approximations to what will actually happen. Data underlying the model is historical and may not reflect conditions that would be obtained in the future. The model is based on underlying parameter estimates derived from experience across a wide range of fisheries in and off Alaska, and is being applied here to a subset of those fisheries that may not be fully representative of the broader group of fisheries. There are, therefore, many reasons to believe that there is considerable uncertainty associated with the point estimates provided in the table.

These concerns will be associated with any effort to estimate employment impacts. The estimates in this section are based on results from a well-documented, data-based, internally consistent model. These model characteristics should "discipline" the model outputs in a way that should make them a useful complement to alternative assessments of income and job impacts. A review of the table suggests several things.

A significant part of the impacts attributable to the respective proposed action's aggregate output and employment change is associated with the indirect and induced impacts of the action. These are just over 30 percent of the impacts in all four scenarios.

Alaska state and local tax revenue impacts vary, ranging from $1.4 million to $4 million. These include impacts to State of Alaska fish tax receipts, and other state and local receipts in Alaska. Taxes are "transfer" payments, and may be interpreted as net gains to the state, when they are generated by firms owned by non-residents, and using non-resident crews. Washington State community and state receipts, as well as sales tax receipts received in fishery worker places of residence, which may be far removed from Alaska, are not included.

Direct employment impacts are the changes in the numbers of jobs in fishing or fish processing caused by this action. The job estimates in this model are annual, but are not otherwise defined. From the nature of the model, these are jobs during the year in which the restrictions are in place. However, they may be part time, or full time, or they may be temporary, seasonal, or a full year's employment. The model, as any IMPLAN-based model, does not provide this information. Neither does this output indicate the number of unique individuals employed. One or many individuals may have occupied each job during the course of the year.

The direct component of job impacts includes impacts to fishing and fish processing jobs for both residents and non-residents. The impacts on employment, whether they are direct, indirect, or induced, are for all the workers, including both residents and non-residents, as long as the non-residents are working in Alaska, for Alaska industries. In all regional economic models including the present model, employment is place-based, and includes both residents and non-residents. It is not possible to estimate separately the direct impacts accruing to Alaska residents and residents of other states. The model impacts will almost certainly overstate the impacts accruing to Alaska residents because of the large numbers of non-residents working on catcher/processors, shoreside floating processors, and in processing plants. On the other hand, the estimates will almost certainly understate the impacts accruing in the national U.S. job market, because indirect (e.g., shipyard employment in Seattle) and induced employment in other states is not included in the estimates.

From the point of view of potential workers, the change in jobs would include a combination of actual layoffs, failure to obtain a job that is normally available each year, and a loss of jobs that no specific person had an expectation of doing.

One would expect that these job impacts would decline through time, as consumers redirected demand from Aleutian Islands fish products to other goods and services, and as U.S. employment in other sectors responded to the demand shift. Currently (October 2010), unemployment is high, and, once laid off, persons are spending a longer time than normal unemployed.

Total job loss estimates under Alternative 4 ranges from 247 positions under the scenario where fleets are most successful in offsetting revenue losses, to 748 positions in the scenario where they are least successful. Since there are unknown levels of uncertainty associated with these estimates, actual numbers could be higher or lower. The employment impacts of the two central scenarios range between 338 jobs and 431 jobs, suggesting that employment impacts can be reduced significantly, if the fleets are able to shift to other fisheries. Direct impacts account for just over 70 percent of the employment impacts, while indirect and induced impacts account for just under 30 percent.[116]

[116] As noted in footnote 115, the scenarios were also applied to Alternatives 2 and 3, but those results are not fully reported here. However, the employment estimates for scenario 1 probably are the most reliable and have the least uncertainty associated with them. Using this "worst case" scenario to measure the change in employment impacts, the total employment impact under Alternative 2 is 1,127 jobs, while the total impact under Alternative 3 is 787 jobs. The shift from Alternative 3 to Alternative 4 brings a relatively modest change in employment, from 787 to 748, or about 5 percent. Thus, on the basis of this comparison, Alternative 4, the preferred alternative, is likely to have the smallest impact on jobs, although much will depend on how fleets adjust.

Table 10-69 Summary of impact analysis for Alternative No.4 (Preferred alternative) under four hypothetical scenarios.

1		Scenario No.1**	Scenario No.2**	Scenario No.3**	Scenario No.4**
2	Description	A80 sector loses many Atka mackerel and Pacific cod fishing opportunities in the Aleutian Islands, and is unable to compensate with increased harvests of rock sole, yellowfin sole, or Pacific cod. Similarly, fixed gear catcher/processor and catcher sectors are unable to find offsetting Pacific cod fishing opportunities in the Bering Sea.	A80 sector is unable to fully compensate for lost fishing opportunities in the Aleutian Islands. It is able to fish more rock sole and yellowfin sole. The fixed gear catcher/processor sector is assumed to be able to offset the volume of Pacific cod lost in the Aleutian Islands, but only 75% of the revenues at risk, and the catcher sector is assumed to be able to compensate for one half of its lost Pacific cod fishing opportunities.	The A80 sector impacts are the same as in Scenario No.2. Fixed gear catcher/processor and catcher sectors compensate for lost Pacific cod fishing opportunities by increasing harvests in the Bering Sea.	A80 sector increases rock sole and yellowfin sole, and completely makes up Pacific cod revenue at risk by increased harvests in the Bering Sea. Fixed gear catcher/processor and catcher sectors fully compensate for their Aleutian Islands Pacific cod revenues at risk.
3	Direct impact on Trawl Catcher/Processors Gross Earnings	39	26	26	19
4	Direct impact on Fixed Gear Catcher/Processors Gross Earnings	7	2	0	0
5	Direct impact on Catcher Vessel sector and associated Processors Gross Earnings (wholesale revenue impact first, followed by ex-vessel revenue impact)	7/4	3/2	0/0	0/0
6	Direct output gross earnings impact	57	33	26	19
7	Indirect and induced output gross earnings impact	26.2	15.3	12.3	9
8	Total output gross earnings impact	83.2	48.3	38.3	28
9	Direct employment impact	542	310	240	175
10	Indirect and induced employment impact	206	121	98	72
11	Total employment impact	748	431	338	247
12	State and local tax revenue impacts	4.0	2.4	1.9	1.4
13	Employee compensation impact	11.8	6.9	5.7	4.1
14	Proprietary income impact	2.1	1.2	0.9	0.7
15	Other property income impact	4.6	2.7	2.2	1.6
16	Indirect business tax impact	1.4	0.8	0.6	0.5
17	Low income household income impact	0.6	0.4	0.3	0.2
18	Medium income household income impact	5.3	3.1	2.5	1.8
19	High income household income impact	6.9	4.0	3.2	2.4
20	Total household income impact	12.8	7.5	6.0	4.4

**Notes: All value estimates are in millions of dollars; all employment estimates are in numbers of jobs.
Sources: direct revenue impacts on sectors from tables in sub-sections 10.6.2 and 10.6.3; impact estimates prepared by NMFS AKFSC.

10.7.3 Regional distribution of employment and income impacts

The model discussed in the preceding section does not provide a finer regional or community breakdown of impacts. Because of this, the following analysis is qualitative.

This discussion examines six possible ways the industry, in responding to the proposed action, could impact a community (crew transfers, other logistical support, processed product transfers, raw product deliveries, home port services, and induced impacts) for five groups of communities (Adak, Atka, Unalaska, other Alaskan communities, coastal Pacific Northwest). This section draws heavily on sub-sections 10.2.8, 10.2.9, and 10.7.2.

Adak

Adak is a small community. State of Alaska estimates indicate a 2009 population of 165. The economy remains relatively limited. Attempts to diversify into nearby fisheries and sources of deliveries for processing have had limited success to this point. Similarly, there has been limited success in developing other industries.

As discussed in section 10.2.8, Adak has received Pacific cod for processing from the federal and state parallel fisheries and from the state GHL fishery. These fisheries take place at separate times. The GHL fishery is closed when the federal fishery is open. In 2006, the first year of the state fishery, the processing plant at Adak received 15 percent of its raw cod product from the GHL fishery and the remainder from the federal and parallel fishery. In 2007 and 2008, the plant received 23 percent from the GHL fishery, and the remainder from the federal and parallel fisheries. The Pacific cod from the federal and parallel fisheries comes predominately from Area 541. Over the period from 2002 to 2008, Adak received 88 percent of its raw cod product from Area 541, and the remainder from Area 542.

Area 541 is the least affected by the proposed management measures. An examination of Table 10-29 in section 10.2.8 shows that, if Alternative 4 had been in place in the years 2004 through 2008, estimated Area 541 production would have been from 80 percent to 98 percent of its actual levels, depending on the year. Area 542 production would be reduced by larger proportions. Thus, in the area of Adak, production levels are likely to be reduced, but by significantly smaller amounts than in areas further to the west. Assuming the Adak plant is capable of processing Pacific cod at historical levels in the future, catcher vessels delivering to Adak may face increased competition, for the available Pacific cod, from vessels displaced from the fishery farther to the west. This may reduce potential deliveries to Adak. On the other hand, catcher/processors acting as motherships, and shoreside floating processing capacity, may no longer find it worthwhile to operate in the region, reducing market competition for available product.

Adak also serves as a home port for several small vessels, and these may be affected.

In addition to direct impacts in fishing and processing, the Atka mackerel and Pacific cod fisheries generate local indirect job and employment impacts as well. Catcher/processors use Adak to transfer product to tramp steamers, and for logistical support. The closure of the Atka mackerel and Pacific cod fisheries in Area 543, and the significant restrictions on fishing in Area 542, are likely to reduce the demand for these services. As noted in sub-section 10.2.8, these services include support for crew rotations, fuel supplies, and emergency medical services at the local clinic. The local fuel distributor has indicated that the large volume of fuel sold to fishing vessels allows the firm to sell fuel to residential and commercial customers in Adak at lower prices than it otherwise would be able to. This could increase living costs and the costs of doing business in the community (Tsukada 2010).

Because of Adak's small size, its residents must import a very large proportion of the goods they consume. Moreover, a large part of the processor work force are temporary workers who come to town for the season and who leave when it is over. They spend money in the town while they are there, but a significant part of their income would be spent elsewhere. Thus, the induced impacts of this action may be more limited in size than elsewhere. Other sources of personal income and induced impacts may be so limited, however, that induced impacts (sales at the local grocery store for home consumption, for example) may have importance. As discussed in sub-section 10.2.9, Adak shares in the state's fisheries business tax revenues and its fishery resource landing tax revenues. The loss of part of these municipal revenues would reduce municipal expenditures, and be an additional source of induced effects.

Of all the communities discussed here, Adak may have the most at risk from this action. The fish processing plant in Adak entered bankruptcy in late 2009, and there is considerable uncertainty about its future. The action likely reduces the potential viability of future processing activity. It also reduces the demand for support services. Both elements are relatively important, given the small size of the community and relatively limited alternative base industries.

Atka

The action will have much smaller impacts on Atka. Atka Pride Seafoods does not currently take deliveries of, or process, Pacific cod or Atka mackerel, and representatives of the company indicate that it has no plans to do so. These representatives indicate that Pacific cod is a low margin product, requiring high volumes of production to be viable. This is not consistent with the company's business model. Fishing vessels from the town primarily target halibut and sablefish, and not Pacific cod and Atka mackerel. Atka does not serve as a significant logistical support base and is not impacted by transfers of product from catcher/processors to tramp steamers. The largest impact on Atka may be a change in the number of crew rotations carried out through Atka in connection with Atka mackerel fishing operations. However, there are not currently many of these a year, and each involves small numbers of persons, interacting minimally with the community (Kyle, Snigaroff, Lokanin, personal communications).[117] Atka shares in the state's fisheries business tax and fishery resource landing tax revenues, and the loss of these revenues may be an additional source of impact. While Atka has a 2 percent raw fish tax, little Pacific cod is delivered there, so this is not likely to be an impact source. Because of the limited involvement in the Pacific cod and Atka mackerel fisheries and the small size of the community, induced impacts are likely to be small.

Unalaska

Unalaska is the largest community in the region.

As discussed in sub-section 10.2.8, catcher vessel deliveries to Unalaska are relatively insignificant. However, an unknown number of catcher/processors enter the port and transfer product, either at the dock or in the harbor. Even deliveries in the harbor will generate impacts the community, because of a requirement to use longshore workers.

Unalaska, and its port of Dutch Harbor, is a base for logistical support for the fishing industry in the Aleutian Islands. The range of services was discussed in sub-section 10.2.8 and included support for crew rotations, repairs, gear storage, refueling, and watering. The demand for these services would be reduced by this action, generating indirect impacts.

[117] Joe Kyle, Chief Operating Officer of Aleutian Pribilof Islands Community Development Association. Personal communication, September 3, 2010. Mark Snigaroff, Atka. Personal communication, September 3, 2010. Leonty Lokanin, Mayor of Atka. Personal communication, September 24, 2010.

Table 10-21 indicates that from one to four vessels fishing in the impacted fisheries have reported a Dutch Harbor home port in the years from 2004 to 2009. Table 10-23 indicates that from zero to one permit holder from Unalaska/Dutch Harbor from 2003 to 2009, depending on the year, reported a Unalaska residence. These estimates point to some participation by local residents in these fisheries. The extent to which local residents earn income from wages, salaries, shares, investments, entrepreneurship, or fishing privileges holdings cannot be determined at present.

A commenter has pointed out that fisheries support businesses in Unalaska are diversified, and support operations in different fisheries. This diversification provides some income stability from year to year, as different fisheries are more or less lucrative for fishermen and as participation in them rises and falls. Within the course of a year, the different seasonality of fisheries can help stabilize demand and cash flow during the year. Moreover, having a multi-fishery base could allow some businesses to justify a presence in Unalaska. Restrictions on fishing activity in the Aleutian Islands may reduce this diversification for shoreside firms (Benton 2010). The potential impacts of the fishing restrictions in the Aleutian Islands may also affect other fisheries in the Bering Sea, as noted in sub-sections 10.3.2, 10.3.3, and 10.3.4. If increased harvest of PSC by trawler catcher/processors operating in rock sole, yellowfin sole, and Pacific cod fisheries, for example, led to earlier closures of some of these fisheries, the seasonal pattern of demand, and perhaps aggregate demand, for shoreside services in Unalaska could be affected (Kelty 2010).

Unalaska is larger than the communities to the west, and the local economy is more developed. Induced impacts may be larger here, although as before, goods and services are probably imported from outside the community in larger proportions than they would be from a similarly sized community, say, the Puget Sound area. Unalaska shares in the state's fisheries business tax and fishery resource landing tax revenues, and the loss of these revenues may be an additional source of impact. While Unalaska has a 2 percent raw fish tax, little Aleutian Islands Pacific cod is delivered there, so this is not likely to be an impact source. Unalaska also has a 2 percent sales tax, a 5 percent bed tax, and a 1 percent capital tax. Reduced support activity associated with reduced fishing in the Aleutian Islands may affect this source of revenue and create additional induced effects.

It seems likely that this action will have a non-trivial impact on the Unalaska economy. Given the large number of significant fisheries supported from Unalaska, this impact is likely to be far less severe than that in Adak, but proportionately greater than that in Atka.

Other Alaskan communities

An examination of the lists of vessel home ports and permit holder residences in sub-section 10.2.8 shows that communities from Ketchikan to Sand Point may be home ports for vessels and/or persons involved in the Aleutian Islands Atka mackerel and Pacific cod fisheries. Small amounts of Aleutian Islands Pacific cod have also been delivered to one community not listed, Akutan. As noted in that section, home port and residence information from administrative sources may be imprecise. Communities not listed may be involved, and the reports may provide a mis-leading picture of the relative importance of the fisheries to the different communities.

Aside from Akutan, these communities are not affected by raw product deliveries, and it is unlikely that any would be affected by catcher/processors transferring processed product to trampers.

In general, these communities earn direct income from the earnings of crew members, vessel owners, and fishing privilege owners, indirect incomes from the provision of support services to the fishing operations, and induced incomes as direct and indirect income earners spend locally. Anchorage is listed as a home port, but the fishery would also generate income for Anchorage, since Anchorage is a transit point for crew rotations and the shipment of supplies for operations in the Aleutian Islands and the Bering Sea.

This action could affect incomes in these communities. In most of these "other" Alaskan communities, this impact should be relatively small, but many are small communities. In some, it may be significant.

Pacific Northwest

As shown in the tables in sub-section 10.2.8, a large number of the vessels used in the Atka mackerel and Pacific cod fisheries in the Aleutian Islands are reported to have home ports in Washington and Oregon. Seattle alone accounted for over half of the vessels in 2008, and for almost two-thirds in 2009 (Table 10-19). Moreover, Washington and Oregon residents hold a large proportion (almost two-thirds in 2008, and just over 70 percent in 2009) of the State of Alaska entry permits, used to fish in the region. Thus, the Pacific Northwest is likely to be the locus for a significant share of the employment and income impacts of this action.

This region is likely to experience a significant share of the direct income and employment impacts, as the number of crew positions is reduced, and payments to labor, capital, Amendment 80 quota share ownership privileges, and entrepreneurial skills are all reduced.

However, the region is an important supplier of logistical services to the fleet, including corporate headquarters support, shipyard services, other repairs and maintenance, supplies, and services support, including the provision of financial, legal, and other services, marketing, and product shipment and storage. The region has seafood reprocessing plants that receive and reprocess catcher/processor deliveries from BSAI fisheries. Many crew rotations originate in the Pacific Northwest.

The regional economy is a large one, and persons with direct and indirect sources of income associated with the fishery probably spend a larger proportion of it regionally. In addition, persons living in Alaska and earning incomes associated with the fishery spend a relatively large proportion in the Pacific Northwest, as well, as they travel through the region, purchase goods and services produced in the region, and purchase goods and services that transit the region. Thus, this area probably receives a large proportion of the induced impacts associated with the action.

While all impacts are probably relatively large when compared in absolute terms to impacts in other areas, they are likely to be smaller proportionally that those in Adak and Dutch Harbor, because of the large size of the regional economy.

10.7.4 CDQ Revenues

Significant amounts of Atka mackerel, Pacific cod, rock sole, and yellowfin sole TAC is allocated to CDQ groups. In 2011, the following amounts of these species are allocated to CDQ groups under the Council's current 2011 specifications (75 FR 11778; March 12, 2010):

- Area 541/Bering Sea Atka mackerel: 2,236 metric tons
- Area 542 Atka mackerel: 2,782 metric tons
- Area 543 Atka mackerel: 1,937 metric tons
- Bering Sea and Aleutian Islands Pacific cod: 22,211 metric tons
- Bering Sea and Aleutian Islands rock sole: 9,630 metric tons
- Bering Sea and Aleutian Islands yellowfin sole: 22,791 metric tons

These CDQ allocations are distributed among the CDQ groups, but not in equal amounts. Different CDQ groups have different levels of exposure to this action. Table 10-70 reproduces part of the CDQ group quota allocation matrix for 2010.

Table 10-70 CDQ group exposure to direct impacts of Steller sea lion protection measures.

Species	Area	2011 CDQ allotment (mt)	APICDA (%)	BBEDC (%)	CBSFA (%)	CVRF (%)	NSEDC (%)	YDFDA (%)
Atka mackerel	541	2,236	0.3	0.15	0.08	0.15	0.14	0.18
Atka mackerel	542	2,782	0.3	0.15	0.08	0.15	0.14	0.18
Atka mackerel	543	1,937	0.3	0.15	0.08	0.15	0.14	0.18
Pacific cod	BSAI	22,211	0.15	0.21	0.09	0.18	0.18	0.19
Rock sole	BSAI	9,630	0.24	0.23	0.08	0.11	0.11	0.23
Yellowfin sole	BSAI	22,791	0.28	0.24	0.08	0.06	0.07	0.27
Species	Area	2011 CDQ allotment (mt)	APICDA (mt)	BBEDC (mt)	CBSFA (mt)	CVRF (mt)	NSEDC (mt)	YDFDA (mt)
Atka mackerel	541	2,236	671	335	179	335	313	402
Atka mackerel	542	2,782	835	417	223	417	389	501
Atka mackerel	543	1,937	581	291	155	291	271	349
Pacific cod	BSAI	22,211	3,332	4,664	1,999	3,998	3,998	4,220
Rock sole	BSAI	9,630	2,311	2,215	770	1,059	1,059	2,215
Yellowfin sole	BSAI	22,791	6,381	5,470	1,823	1,367	1,595	6,154
First wholesale value equivalent of CDQ holdings (not royalty payments)								
Species	Area	First Wholesale Gross Value per metric ton round weight ($)	APICDA ($)	BBEDC ($)	CBSFA ($)	CVRF ($)	NSEDC ($)	YDFDA ($)
Atka mackerel	541	948	635,918	317,959	169,578	317,959	296,762	381,551
Atka mackerel	542	948	791,201	395,600	210,987	395,600	369,227	474,720
Atka mackerel	543	948	550,883	275,441	146,902	275,441	257,079	330,530
Atka mackerel subtotal			1,978,002	989,001	527,467	989,001	923,068	1,186,801
Pacific cod	BSAI	1,463	4,874,204	6,823,886	2,924,522	5,849,045	5,849,045	6,173,992
Rock sole	BSAI	750	1,733,400	1,661,175	577,800	794,475	794,475	1,661,175
Yellowfin sole	BSAI	646	4,122,436	3,533,517	1,177,839	883,379	1,030,609	3,975,206
Total			12,708,042	13,007,578	5,207,628	8,515,900	8,597,196	12,997,174
Source: 2011 TAC specifications; CDQ group allocation matrix for 2010; prices from AFSC.0								

Table 10-70 shows the CDQ entitlements in 2011, for each of the CDQ groups for each of the four species (Atka mackerel, Pacific cod, rock sole, and yellowfin sole) most likely to be affected by this action. Of these four species, only Atka mackerel is primarily harvested in the areas that would be affected by this action. Most Pacific cod, yellowfin sole, and rock sole are harvested in the Bering Sea.

The values in Table 10-70 report the first wholesale equivalent gross value for the CDQ holdings. These were obtained by multiplying the quota holding, in metric tons, by the first wholesale gross value per round ton, used in earlier sections. These values will exceed the royalty payments to the CDQ groups, as those are the amounts CDQ groups are willing to accept to permit their allocated quota to be harvested by someone else. Leasing allows the CDQ groups to avoid the "risk" associated with capturing, delivering, and marketing the fish; avoid the "capital investment" of acquiring, staging, maintaining, and supporting the physical plant (e.g., vessels, processing facilities) to capture, process, deliver, and sell the quota amount of fish; and avoid the "operational costs" of actually utilizing the vessels, processing machines, fishing gear, etc., maintaining the physical plant, and successfully manning and deploying it to capture the assigned quota. Estimates of royalty payments for these species of CDQ are not generally reported or available.

Atka mackerel is the one species whose production will definitely decline by a significant amount, because of this action. APICA is clearly the CDQ group most likely to be adversely impacted by this, as it is allotted 30 percent of the Atka mackerel CDQ. CBSFA is the CDQ group with the least impact. The other CDQ groups differ in their Atka mackerel holdings (these range from 14 percent to 18 percent), and the impacts on these fall into an intermediate range.

CDQ groups will lose royalties from the lease of Atka mackerel CDQ, which can only be fished in the Aleutian Islands. They are less likely to lose royalty income from the lease of Pacific cod CDQ, which tends to be leased to freezer longliners, which can operate in the Bering Sea as well as the Aleutian Islands. Furthermore, not all Aleutian Islands Pacific cod fishing opportunities are being withdrawn. That said, Bering Sea Pacific cod may be worth less than Aleutian Islands CDQ, and this could affect royalties. It is possible that an increase in rock sole and yellowfin sole production in the Bering Sea would decrease prices for those species, and decrease the value of CDQ for those species (Samuelson, 2010). However, in recent years, most rock sole and yellowfin sole CDQ has gone unfished, and Amendment 80 vessels shifting to these fisheries may increase the demand for it, tending to increase its value. The net effect on royalties cannot be determined.

On balance, CDQ revenues would be expected to decline for all alternatives, but with very different implications across the six groups.

10.8 Impacts on consumers

As described in section 10.3, this action may change the supplies of several fish species:

- The production of Atka mackerel from the Aleutian Islands will decrease by about two-thirds under Alternative 2, and by about one-half under Alternatives 3 and 4. This is the primary source for Atka mackerel in the United States (noting that nearly all catch of this species is exported for consumption).

- The production of Pacific cod may decrease, if fishing vessels are unable to offset their loss of Aleutian Islands fishing opportunities with catches in the Bering Sea. Even if the industry is able to offset the production in aggregate volume, industry sources indicate that Bering Sea and Aleutian Islands Pacific cod are not perfect substitutes and have somewhat different markets. In the absence of authority to reallocate unfished portions of the Amendment 80 allocation, if it appears as if it will go unfished, some of this Pacific cod may go unharvested. Moreover, it is generally acknowledged that Pacific cod from the Aleutian Islands are unique, in being unusually large, and this may limit the availability of substitutes.

- The production of rock sole may increase, compared to what it would otherwise have been.

- The production of yellowfin sole may increase, compared to what it would otherwise have been.

Changes in the quantities of these species of fish supplied to the market may affect consumer welfare. The appropriate measure of this welfare change is consumers' willingness to pay to get an outcome that they consider a benefit, or to pay to avoid an outcome that they would consider a harm. As a practical matter, in many cost and benefit analyses, consumers' surplus is used as a proxy for the theoretically correct measure (Boardman et al. 1996, chapter 3). In order to calculate the change in consumers' surplus, it is necessary to have an estimate of the consumers' demand curve, usually obtained as part of a larger multi-equation econometric model. Because models of this sort are not available for the four key species whose supply may change, the analysis in this section is necessarily qualitative.

Anecdotal reports indicate that most Atka mackerel is exported to consumer markets in East Asia, principally Japan. Relatively little is said to be consumed in the United States (Fong, personal communication).[118] If this is the case, the consumers' surplus impact of the reduction in Atka mackerel supplies would be felt in Asia and not in the United States. Since a Regulatory Impact Review cost-benefit analysis is required to focus on impacts experienced by U.S. domestic consumers, the relevant consumers' surplus impact of the reduction in Atka mackerel supplies is probably close to zero.

As discussed in section 10.3, the alternatives under consideration may reduce the amount of Pacific cod produced. Aleutian Islands production has accounted for no more than a fifth of the total BSAI Pacific cod harvest over the period 2000 through 2009. Significant amounts of the reduction of harvest in the Aleutian Islands may be offset by increased production in the Bering Sea. The fixed gear catcher/processors should be able to make up a large part, or all, of the reduction by fishing more intensively in the Bering Sea. The trawl catcher vessels and catcher/processors may be hobbled to a greater extent by the lack of a history of Bering Sea activity, and by higher halibut PSC rates in the Bering Sea. However, they may be able to make up part of their Aleutian Islands harvests. It is possible that, if catcher vessels are unable to harvest their Pacific cod allocations, the cod may be reallocated to other sectors. This is not the case for catcher/processors.

Part of the Pacific cod harvests are destined for foreign consumption. As noted in section 10.6, much of the product from the Aleutian Islands, for example, is destined for dried salted cod markets in Brazil and Portugal. The loss of consumers' surplus in these markets is not a factor in this analysis. Some of this product also enters U.S. markets, as previously discussed, and may lead to some loss of domestic consumers' surplus.

Industry sources note that the size distribution of Pacific cod in the Aleutian Islands is skewed towards larger fish than are available in the Bering Sea. As noted in section 10.2, the F/V *Katie Ann*, which targets Pacific cod in the Aleutian Islands on her own behalf, and which accepts deliveries from catcher vessels targeting Pacific cod, serves a U.S. market of restaurants serving fish and chips. Ivar's, a chain of 60 restaurants in the Pacific Northwest, has come to use Pacific cod from the F/V *Katie Ann* for most of its fish and chips product, citing the large size of the fish, and the resulting quality of the product. The large size of Pacific cod from the Aleutian Islands may limit its substitutability with other products

[118] Fong, Quentin, Ph.D. Assistant Professor; Seafood Market Specialist. University of Alaska Fairbanks, School of Fisheries and Ocean Sciences. Kodiak, Alaska. Personal communication, July 2010.

(Donegan 2010; Jacobs, personal communication). If this source of Pacific cod was limited by an alternative under consideration in this action, firms selling products whose quality depends on the size of the fish would be likely to substitute alternative and less desirable sources of whitefish, leading to a possible loss in domestic consumers' surplus.[119]

Fisheries off the coast of Alaska appear to account for most or all of the world production of rock sole and yellowfin sole. The rock sole fishery is, predominately, a roe fishery. A report by Northern Economics, in Hiatt et al. (2009), reports that rock sole females are exported to Japan (historically, most males have been discarded). Northern Economics also reports that rock sole males have increasingly been exported to China for filleting and re-export to the United States. The Japanese market for rock sole roe has been declining. Northern Economics explains that this may be due to preference changes associated with generational change.

Whole yellowfin sole has a consumer market in Korea. Headed and gutted yellowfin is exported to China for processing and re-export, mostly to the United States, Canada, and also, increasingly, to European markets. China evidently has an advantage in the relatively labor intensive process of filleting the relatively small fillets of the yellowfin (Northern Economics 2008).

An increase in rock sole production does not appear likely to produce significant amounts of consumers' surplus for U.S. consumers. An increase in yellowfin sole production may produce some U.S. consumers' surplus. In both cases, potential benefits are impossible to estimate.

Any losses of consumers' surplus that occur would be greatest from Alternative 2 and least from Alternative 4, reflecting the relative impacts on fishing opportunities in the Aleutian Islands.

10.9 Additional issues

In-season management

The action alternatives involve normal in-season management measures, and do not impose new requirements on that branch. Elements of the alternatives would actually reduce the in-season management work load in small ways. Under Alternatives 2, 3, and 4 there would be no need to take steps to close Atka mackerel fishing in Area 543, and under Alternative 2 there would be no need to take these steps in Area 542. The elimination of the HLA platoon registration and lottery will eliminate one task for inseason managers and for the Alaska Region's Restricted Access Management Program. None of the alternatives would change staffing requirements.

[119] In comments on the action, solicited by NMFS, an industry representative has cited a Congressional Research Service report noting that several species of seafood, including cod (without further species or fishery identification), imported from China had been refused entry to the U.S. by the Food and Drug Administration in the past, and suggested a potential consumer safety issue if firms using Aleutian Islands Pacific cod were to substitute cod from China (Jacobs, personal communication, August 2010; Jacobs 2010; Becker, 2008: 11). Industry sources indicate that trawl caught Aleutian Islands Pacific cod entering the U.S. market is a premium product (Donegan 2010; Jacobs 2010); it seems improbable that codfish products with a dubious reputation for quality control would be regarded by purchasing firms as a close substitute for Aleutian Islands product in this market.

Enforcement

Enforcement of critical habitat no fishing and directed fishing closures is conducted utilizing vessel monitoring systems (VMS), embarked observers, vessel reporting/eLandings, aerial/surface patrols and at sea boardings, and audits of product offloads.

Compared to the status quo, Alternatives 2, 3, and 4 would result in substantially reduced vessel opportunity and effort in Areas 541, 542, and 543 for Atka mackerel and Pacific cod. Generally, the alternatives would result in a more straightforward regime of traditional closures. Per the enforcement precepts, this type of closure regime is easier to enforce than more complex closure regimes. The alternatives would shift vessels currently operating in the western regulatory areas, generally more eastward, and would likely concentrate effort. This may result in a greater likelihood of vessels fishing in closer proximity to each other, and may result in increased self policing of existing closures. The alternatives would result in fewer overall vessel-days in the more westward areas, possibly reducing the necessary VMS monitoring inputs and, thus, enforcement costs. An eastward shift in fishing effort would also likely result in reduced transit times for U.S. Coast Guard aerial and surface patrol units, and may result in increased patrol coverage. In total, enforcement of the alternatives would result in decreased enforcement input needs, may result in decreased costs, would present a more straightforward closure regime, and would present less enforcement difficulties compared to status quo.

Safety

In general, both of the alternatives will shift vessels active in the western and central Aleutian Islands towards the east, and into the Bering Sea. Such a shift will bring the vessels closer to Coast Guard search and rescue bases. The Coast Guard maintains seasonal search and rescue support facilities at Cold Bay in the late fall, and at St. Paul Island at the start of the year. Otherwise, aircraft responding to a distress call in the western or central Aleutian Islands would have to start from the Coast Guard base in Kodiak. Operational restrictions on the distance unescorted aircraft are allowed to fly over open water mean that planes originating from any of these locations would probably travel by way of Unalaska and Adak. Travel time from Kodiak to Kiska could be eight hours for a C130, and 12 hours for a helicopter. Thus both alternatives would tend to shorten travel times to vessels that shift their operations to waters closer to these bases. Moreover, a shift in operations to the east increases the density of fishing vessels, increasing the likelihood of "good Samaritan" assistance if trouble occurs (Lawrenson, personal communication).[120] Alternative 2, which is more restrictive in the central Aleutian Islands than Alternative 3, would probably shift more fishing activity to the east.

A shift of fishing activity to the Bering Sea, by increasing fishing vessel density, may also increase competition among vessels in the Bering Sea for good fishing locations and opportunities. In an unrationalized fishery, increased competition for relatively desirable fishing locations, or for opportunities to set gear on fish aggregations, and the costs of failing to win such a competition, may increase the opportunity costs to fishermen of taking appropriate safety measures. This may lead to less safe operations. This is much more likely to be an issue in an unrationalized fishery, and thus more likely to be a concern with the fixed gear catcher/processors and catcher vessels targeting Pacific cod. (Lawrenson, personal communication) A shift of vessels to the Bering Sea may increase vessel traffic in the heavily traveled Unimak Pass area which, in addition to local fishing activity, is an important transit point for ships traveling between America and Asia on the Great Circle Route. This may accentuate existing safety concerns in that area (Varner 2010).

[120] Ken Lawrenson, United States Coast Guard. Commercial Fishing Vessel Safety Coordinator, US Coast Guard, 17th District Juneau, Alaska. Personal communication, July 26, 2010.

The three action alternatives do appear to have the potential for significant adverse impacts on operational gross revenues. Large losses are expected from forgone Atka mackerel and Pacific cod harvests in the Aleutian Islands; offsetting additional revenues are expected in the Bering Sea, but there is less certainty about the size of these. In recent years, the Amendment 80 fleet has been cooperating with the Coast Guard to upgrade the safety status of its vessels through the Coast Guard's Alternative Compliance Safety Agreement. These upgrades were ultimately a response to changes in vessel function induced by fisheries regulations. Anecdotal evidence from industry sources suggests that, in some cases, these upgrades can cost up to a half a million dollars. To the extent that the motivation to undertake these upgrades was the stability and revenue opportunities presented by the quota allocations under the Amendment 80 program, and to the extent that this action reduces those opportunities for the Amendment 80 fleet, this action may reduce the incentive to undertake the upgrades, or to replace vessels with newer vessels (Lawrenson, personal communication).

Science

This action may affect the scientific information available for fisheries management, or change the cost of collecting that information. With respect to the availability of scientific information, the action may affect information on the condition of Atka mackerel and Pacific cod stocks in the Aleutian Islands, and it may affect information on other aspects of the ecosystem. The biennial summer trawl survey would continue as before. Local sources have indicated that if the action affects future Pacific cod production sufficiently at Adak, there may be adverse impacts on the availability of support services there. It's not clear if this would affect the cost of surveys. The reduction in harvests would mean a reduction in the amount of observer information on Atka mackerel and Pacific cod age and length. This would make it harder to interpolate biomass estimates between years, and may increase the uncertainty associated with biomass estimates. The stock assessment would be less informed and less precise, and may lead to more conservative ABC determinations for any given biomass estimate (Lowe, personal communication). If these were to happen, harvests would be lower than otherwise. Forgone net benefits from lower harvests, were they to occur, would provide an estimate of the cost of this source of loss in scientific information.

The action may lead to some loss of scientific information related to other ecosystem elements, although the impact of this loss is harder to describe, even in qualitative terms. Observer-collected information on stomach contents provides valuable information on what is eating what and in what quantities. This information is valuable for modeling energy flows through the ecosystem (Aydin, personal communication).[121]

Federal mandates, grants, etc.

In 2007 the Freezer Longline fleet borrowed $35 million in federal buyback loans to reduce overcapacity in the fleet. Freezer Longline Coalition members used these funds to buy out three vessels with LLPs and Pacific cod endorsements and one latent LLP permit. The members are currently involved in submitting another latent permit into the buyback program in further efforts to reduce over-capacity (K. Down). This action may affect the ability of the Coalition members to repay the loan, but not in a clear-cut way. Industry sources indicate that a shift of production into the Bering Sea may reduce revenues as Bering Sea fish tend to be smaller, and to bring a lower price. On the other hand, if the action makes it impossible for the trawl catcher vessel fleet to fully harvest its Pacific cod allocation (because of higher halibut PSC in the Bering Sea) end of the year reallocations to Coalition members may increase.

The federal and state governments have taken steps to support the creation of a civilian community at Adak. These include transportation subsidies to Alaska Airlines (under the federal Essential Air Service

[121] Kerim Aydin, Alaska Fisheries Science Center, Seattle, Washington. Phone call October 4, 2010.

Program)[122], and allocations of pollock and crab to support fishing and processing at Adak. This action may adversely affect Adak's economy in important ways, potentially making it harder to achieve community development objectives of the support.

Balance of trade

Because almost all Atka mackerel and a substantial amount of Pacific cod, are exported, some persons may be concerned about a welfare impact associated with changes in the U.S. balance of trade in goods and services. The balance of trade in goods and services is equal to the difference between exports and imports. The factors that determine the size of the trade deficit or surplus are much broader than production in any one industry. They include all the factors that determine aggregate employment and production, decisions to divide income between consumption and savings, and similar decisions in other countries. A reduction in Atka mackerel or Pacific cod production in the U.S. would be one factor entering into this determination, but there would be many others, and there would not be a clear-cut, dollar-for-dollar, change in the deficit associated with the change.

ERRATA

An additional element has been added to the RPA that has the effect of allowing fixed gear vessels, including both catcher vessels and catcher/processors, to fish for Pacific cod in critical habitat in Areas 541 and 542 between three and six miles, from March 1 through June 10. This modification to the proposed RPA was made after the RIR was completed, and its analysis is not incorporated into the remainder of the RIR. Hook-and-line catcher vessels and catcher/processors took an average of about 11percent of their Area 541 harvests, and little or none of their Area 542 harvests, from this zone of critical habitat between these dates, over the period from 2004 through 2009. Confidentiality provisions prevent the reporting of specific volumes. The result of this action will be to reduce the burden of the RPA on fixed gear catcher/processors and catcher vessels. Estimates of revenue reductions in the remainder of the analysis would be somewhat smaller if the analysis of this action had been incorporated.

10.10 Summary

Atka mackerel and Pacific cod harvests from federal fisheries in the Aleutian Islands have had an average wholesale value of about $83 million in recent years. In 2009, there were 10 trawl catcher/processors harvesting Atka mackerel and 5 harvesting Pacific cod (there is some overlap in these two groups). Seven of the trawl catcher/processors could be considered to target Atka mackerel. In addition, 7 hook-and-line catcher/processors, 3 pot catcher/processors, and 34 catcher vessels participated in the harvest. In recent years, catcher vessels have fished these species with trawl, jig, hook-and-line, and pot gears.

Four fleets were defined for the analysis: the trawler catcher/processors, fixed gear (hook-and-line and pot) catcher/processors, catcher vessels (including vessels using jig, pot, hook-and-line, and trawl gear), and vessels fishing in the state waters fishery.

Impacts on fishing fleets

The trawler catcher/processor sector is estimated to see its Atka mackerel production drop to about 45 percent of its status quo catch level (based on the mean of the sector's estimated experience during the years 2004 through 2009). The actual drop would vary significantly from year to year, depending on

[122] This program is described at this website: http://ostpxweb.dot.gov/aviation/x-50%20role_files/essentialairservice.htm.

year-specific circumstances. The sector's Pacific cod production is estimated to drop to 50 percent of its status quo level. The sector is expected to respond by shifting fishing activity into the rock sole, yellowfin sole, and Pacific cod fisheries in the Bering Sea. Its success in those fisheries is expected to be mixed. Halibut PSC rates are much higher in the Bering Sea than they are in the Aleutian Islands, and this is likely to constrain the sector's ability to increase its harvests of those species.

The fixed gear catcher/processor sector includes both hook-and-line and pot gear and targets Pacific cod in the Aleutian Islands. This sector is likely to shift to harvesting Pacific cod in the Bering Sea. While this sector is more likely than the trawler fleets to be able to fully offset its Aleutian Islands losses in volume terms, industry sources indicate that Bering Sea Pacific cod are smaller, have a lower product recovery rate, and enter different market channels. These factors make them less valuable, and as a result, the revenues from any given volume of production are likely to be less.

The catcher vessel sector includes trawlers, hook-and-line vessels, pot vessels, and jig vessels. A majority of the vessels are trawlers, and these account for most of the production. This fleet is expected to shift towards more Pacific cod production in the Bering Sea. Halibut PSC rates for this fleet is much higher in the Bering Sea than in the Aleutian Islands, and this is likely to constrain this fleet from fully offsetting its Pacific cod losses.

The three sectors just listed fish in the federal fisheries and in the State's parallel waters fishery. Another sector fishes in the State's GHL fishery at times when the federal fishery is closed. This sector would not be directly regulated by this action.

As operators directly regulated by this action redeploy fishing effort into other fisheries in, for example, the Bering Sea, in an effort to reduce their catch reductions and revenues at risk from this action, they may impact other vessels that are already operating in the fisheries there. Interactions may be complex, and may include increased congestion, reduced market prices for some species, and competition for PSC allowances.

Potential benefits

The estimates of the benefits of Steller sea lion protection are discussed in section 10.4, which presents the results of recent survey research into the willingness of U.S. households to pay for an improvement in the population growth rate of the western population of Steller sea lions. The survey research concluded that the potential benefits from recovery of the western population of the Steller sea lion were large. In addition, the section notes that recovery could bring benefits to subsistence hunters, who continue their cultural practices associated with harvesting Steller sea lions from the western Aleutian population.

Because of uncertainty about the level of impact of the Alternative 4, proposed action, on Steller sea lion population trajectories, the RPA does not connect the action to specific population changes. And given that the impact of this action on the Steller sea lion population trajectory is not quantified, neither are net benefits in terms of cost-benefit accounting measures. Nonetheless this action is necessary to ensure the effects of the groundfish fisheries are not likely to result in jeopardy of extinction or adverse modification or destruction of critical habitat, as required by the ESA.

Impacts on other ecosystem elements

Benefits or costs may accrue from this action because of interactions with other elements of the ecosystem (aside from Steller sea lions), such as other marine mammals, seabirds, fish stocks, habitat impacts, and ecosystem impacts. Impacts on these sources are likely to be small in relation to impacts to the industry or the values accruing from sea lion stock health.

Costs to the industry

Sub-section 10.6.2 provides estimates of the potential revenues at risk in the Aleutian Islands associated with this action. Alternative 4, the preferred alternative, represented the smallest revenue at risk, but these were still substantial. In aggregate, the annual Alternative 4 gross fishing revenue placed at risk appears to be on the order of $44 million to $61 million dollars (depending on assumptions about the volume of fish that would have been harvested in the absence of the restrictions). The largest part of this annual gross revenue at risk, on the order of $34 million to $44 million, would be incurred by the trawl catcher/processor sector. The fixed gear catcher/processor sector would face gross revenues at risk on the order of $6 million to $7 million, while the first wholesale gross product value from catcher vessel raw fish deliveries would be on the order of $4 million to $10 million. These estimated gross values do not account for any offsetting effects (e.g., price response, cost reduction, gross earnings from redeployed effort).

The actual potential costs to industry are not gross revenues, but the producers' surplus and factor rents that may be lost because of the area closures and fishing restrictions of the proposed measures. The information that would make it possible to estimate the value of the lost producers' surplus and factor rents is not available.

As discussed above, the industry is likely to respond to the restrictions in the Aleutian Islands by redeploying effort to minimize the losses the restrictions would impose. The success in minimizing losses will almost certainly be met with mixed results. Halibut PSC constraints are likely to prevent the trawl catcher/processor and catcher vessel sectors from fully offsetting Aleutian Islands gross revenue at risk. Both trawl and fixed gear catcher/processor operators indicate that Bering Sea Pacific cod have lower product recovery rates and are traditionally destined for markets in which prices are lower. Despite these factors, the shift into the Bering Sea will allow sectors to offset some of their Aleutian Islands gross revenues at risk. Reductions in Atka mackerel and Aleutian Island Pacific cod harvests are likely to lead to increased prices for these products, and this may also partially offset revenue losses.

Employment and income impacts

The fleets, and associated processing operations, participating in the three different federal fisheries that are the subject of this action provide 1,300 to 1,500 jobs. In addition, jobs and income would be affected in industries supporting the fishery and induced in businesses serving the personal needs of persons directly and indirectly employed. None of the proposed actions would lead to the loss of all of these jobs; some fishing would continue in the Aleutian Islands for Atka mackerel and Pacific cod, and fleets would be able to redeploy into target fisheries in the Bering Sea, although the ability to offset losses is not likely.

Of the three action alternatives, Alternative 4, the Council's preferred alternative, is likely to have the smallest potential adverse impacts on employment. A range of potential job losses on the order of about 250 persons to about 750 persons was identified, depending on the assumptions were made about the ability of fleets to redeploy. These losses include direct losses in the fishing and processing industries, indirect losses in businesses servicing the fishing and processing industries, and in businesses depending on incomes earned by persons directly and indirectly employed.

The available models do not allow for the allocation of job losses among regions or communities. Job losses are most likely to occur in Alaskan coastal communities in the Aleutian Islands, in small communities spread along Alaska's Gulf of Alaska coast, in communities in Western Alaska served by CDQ groups, and throughout the west coast of the United States, especially in the Puget Sound region of the Pacific Northwest. Adak is likely to be particularly vulnerable, given its small size, limited economy, and multifaceted dependence on the Atka mackerel and Pacific cod fisheries. It should be noted, however, that present and near-term adverse employment and income impacts in Adak are not principally associated with, nor attributable to, the proposed Steller sea lion action, but stem from more fundamental structural difficulties with the community's economic base (e.g., bankruptcy of local seafood processing plant, lack of economic diversity, physical remoteness and aging physical plant, global recession-caused transportation cost increased and general demand weakness).

Consumers

Almost all of the Atka mackerel, and a significant part of the large Pacific cod from the Aleutian Islands, are exported to Asian markets. Consumer welfare effects, deriving from supply changes in these markets, are not considered in a standard cost-benefit analysis. Parts of the Aleutian Pacific cod production are consumed in the United States, where the large fish are used to produce premium products. The reduction in the supply of this product, and the need for firms to find substitutes, will create welfare losses for U.S. consumers, although the magnitude cannot be estimated at present.

Additional issues

The analysis examined a number of additional issues. The action does not result in significant changes in the workload for NMFS inseason management staff. It may ease demands on enforcement staff as activity in the western Aleutians is reduced. Safety could be affected by a number of factors: a shift in the fleet's center of activity to the east brings it closer to U.S. Coast Guard search and rescue resources and to potential "good Samaritan" assistance; if profits are reduced, there may be reduced investments in safety; it may be that relatively greater congestion on fishing grounds will encourage a derby fishery mentality, increasing the opportunity costs of safe operation; the action may cause vessels shifting out of the Aleutian Islands to spend more time in the high traffic Unimak Pass area. Scientific information may be lost as observer information obtained from commercial fishing operations is reduced. The action may affect entities receiving federal grants and subsidies as fishing activity and revenue opportunities are affected. Given its small size, and the large number of other relevant factors, it is likely to have little discernable impact on the U.S. balance of trade.

A part of this action that closes waters within three miles of Kanaga Island to groundfish fishing should have small costs to industry. Elimination of the HLA will have little impact, given other measures to restrict fishing in the HLA areas. The emergence of cooperatives under Amendment 80 provides an alternative to the HLA for slowing harvest.

Conclusions

This action will impose relatively heavy costs on the fishing and processing industry that targets Atka mackerel and Pacific cod in the Aleutian Islands. The reduction in industry gross revenues—even after taking account of actions by firms to minimize their losses, shifting target fisheries, and potential increases in prices of species whose production has declined—are likely to be measured in millions of dollars. The analysis identified, for the preferred action, potential job losses of from about 250 to about 750 positions, depending on the success of the industry in finding new target fisheries. The preferred alternative is likely to have a substantial impact on the community of Adak, and to adversely affect Unalaska, and, to a greater or lesser extent, other communities in coastal Alaska. Some communities in Western Alaska participating in the CDQ program are also likely to be adversely impacted, depending upon their CDQ group's allocation of Atka mackerel and Pacific cod TACs.

Based on survey research, it is possible that this action, by contributing to improved growth of the western stock of the Steller sea lion, and by helping to address other criteria for down-listing identified in the Revised Recovery Plan, may create benefits that exceed the losses. However, the uncertainty of the impact of this action on western stock growth is sufficient that the FMP biop and RPA do not quantify the improvement in population growth as a result of the protection measures. However, this action is legally necessary under the provisions of the ESA. The Secretary cannot take action to authorize fishing in the Atka mackerel and Pacific cod fisheries in the Aleutian Islands under the status quo if, that action is likely to jeopardize the continued existence of the Steller sea lion stock or adversely modify its critical habitat.

The action alternatives discussed here would permit a fishery to proceed without creating these unacceptable risks. As discussed in the analysis, the preferred alternative disrupts fishing and reduces fishery gross revenues the least, reduces the number of jobs the least, and, consequently, imposes the least adverse impact on affected communities, all else equal.

10.11 Comments by the SSC

The SSC received a presentation on the EA/RIR on August 16, 2010, and made the following remarks about the RIR in its minutes. Alaska Region responses are italicized.

> With specific respect to the RIR, the SSC wished to acknowledge the efforts of all the Alaska Region and Alaska Fisheries Science Center staff who contributed to this analysis. With the timely data support by Terry Hiatt (AFSC), the analyst has prepared a broad-based economic and socioeconomic assessment, addressing critical considerations that are often overlooked or incompletely treated. Specifically, the SSC appreciates efforts to draw on recent published research on: (1) option and bequest values associated with alternative Steller sea lion rebuilding trajectories (Lew, Layton, Rowe, Garber-Yonts); (2) direct, indirect, and induced regional impacts (Seung, Waters); and (3) fishing site choice models (Haynie, Layton). While these models did not lend themselves to direct application in this analysis, they did provide a useful underpinning for the qualitative analyses that are presented. The SSC is particularly pleased that the analysts intend to incorporate cost-earnings survey data in the next draft RIR.
>
> *The revised version of the analysis has added Economic Data Reporting (EDR) data collected from the Amendment 80 trawl catcher/processor fleet to describe the portion of the Amendment 80 fleet that targets Atka mackerel and Pacific cod in the Aleutian Islands, and to contrast it with the remainder of the Amendment 80 fleet (sub-section 10.2.2), to describe the net revenues earned by the Aleutian Islands portion of the Amendment 80 fleet from all its fisheries (sub-section 10.6.4), and to describe the number of crew positions, the number of employees, and crew compensation for this fleet (sub-section 10.7.2). The EDR data was used to revise the employment estimates for this fleet presented in the August draft of this analysis.*
>
> *Sub-section 10.7.2 has been revised to incorporate direct, indirect, and induced employment and income impacts estimates using a regional economic impact model, developed at the Alaska Fisheries Science Center. The SSC was briefed on the availability of this model and shown selected preliminary results at the August Council meeting.*
>
> While the SSC acknowledges limitations in data available for analysis and limitations associated with confidentiality of some of the data that is available, there is nevertheless a need to provide a more detailed discussion of the likely impacts of the alternatives on the communities of Adak, Atka, and Unalaska. The impacts on these communities are distinct from impacts on the four fishing fleets discussed in the RIR.
>
> *The initial analysis described, in general the nature of indirect and induced fishery impacts on affected regions, and identified Adak and Unalaska/Dutch Harbor as two communities that were potentially primarily impacted by the action (sub-section 10.7.2). The revised analysis includes*

two new sub-sections on this topic: sub-section 10.2.8 provides descriptive background information on the three communities and a discussion, based on state and federal vessel licensing records, and state permit records, of other communities that may be impacted; sub-section 10.7.3 provides a discussion of impacts in these communities.

Additional discussion is also needed on how MRA's, PSC's, and possible fishing ground interactions may be factors precluding sectors from re-deploying elsewhere in an effort to maximize catch and minimize losses.

The analysis provides quantitative estimates of potential PSC changes associated with the alternatives, and includes an analysis of the impact of halibut PSC on the ability of Amendment 80 trawlers to redeploy into fisheries in the Bering Sea. In addition, discussions have been added of the implications of crab PSC, potential implications of the action on MRA harvest of Atka mackerel in the Bering Sea, and implications of the action for vessels fishing in the Bering Sea and Gulf of Alaska. The additional material is based heavily on issues raised by the AP and Council in the special August meeting, in discussions with industry sources, and in comments received during the public comment period in August and September 2010.

The SSC urges the analysts to carefully qualify the values reported for changes in revenues, costs, and nonmarket values so that the public is not misled into inappropriate direct comparisons of these values. Where possible, the values should be expressed in similar time frames. Similar care should be given to community-level impacts, such as employment and income multipliers.

The estimates of revenue, output, and employment impacts in the analysis are generally annual estimates. The document has been reviewed to ensure that language has been added to that to that effect. The chief exception is the use of present values in the appendix on the benefits to the public from the improvement to Steller sea lion populations. These are properly marked as such.

Critical to understanding the context under which this Steller sea lion management action will be implemented is a recognition that Amendments 79/80 (GRS and Co-ops) have been, and are presently in the process of being, amended (e.g., FMP A.93). While the Amendment 93 analyses supporting the proposed structural changes in Amendment 80 cooperative formation criteria are substantially advanced, that action is not final. Therefore, Amendment 93 will very likely be deployed (sic) [delayed] until the amendment analysis is brought into agreement with the Steller sea lion action.

The analysis discusses the steps being taken to amend and repeal the GRS (sub-section 10.2.2) and the role Amendment 80 cooperatives may play, as the Amendment 80 fleet redeploys in response to this action. (sub-sections 10.2.2 and 10.3.2).

Amendment 93 addresses concerns by some participants in the Amendment 80 sector that current cooperative formation standards may leave them disadvantaged. The action alternatives under consideration for Amendment 93 would relax cooperative formation standards in various ways. A public review draft analysis was presented to the Council at its April 2009 meeting (NPFMC 2009). NMFS understands that the SSC's concern in this comment is to highlight the potential relevance of the present action for the Council's ongoing consideration of Amendment 93.

10.12 References

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11.0 CONSISTENCY WITH APPLICABLE LAW AND POLICY

11.1 Magnuson-Stevens Act National Standards

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

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

National Standard 2 - Conservation and management measures shall be based upon 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.

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.

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.

National Standard 6 - Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

National Standard 7 - Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

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.

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.

National Standard 10 - Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

This action would revise the Steller sea lion protection measures in the Aleutian Islands subarea for the Atka mackerel and Pacific cod fisheries and to a small extent for the groundfish fisheries near Kanaga Island/Ship Rock rookery. The changes by this action on the management of the fisheries are consistent with national standards 3, 4, 9, and 10. Chapter 10 provides information on fairness and equity with its economic analysis of the action.

This action does not change the management of the Atka mackerel or Pacific cod fisheries in a way that would result in overfishing of these stocks and was designed to provide for as much harvest as possible while protecting Steller sea lions prey. This meets national standard 1 to prevent overfishing while achieving optimum yield for the fisheries to the extent practicable while complying with the ESA.

The action is based on the FMP biop which uses the best scientific and commercial information available to determine appropriate actions to ensure that the groundfish fisheries are not likely to cause jeopardy or adverse modification of critical habitat for Steller sea lions. The EA/RIR for this action also uses the best available scientific information to describe the effects of the action on the human environment, including socioeconomic effects. These analyses ensure the action meets national standard 2.

This action takes into consideration the requirements of national standards 5, 6, 7, and 8. The differences among fishery participants, their locations, fishing practices used for harvesting Atka mackerel and Pacific cod, impacts on the various sectors, amounts and locations of catch and the dependence on these harvests were all considered in the development of the RPA. NMFS developed the RPA to provide as much fishing opportunity while balancing the need to ensure the groundfish fisheries could be implemented by January 1, 2011, in compliance with the ESA.