INITIAL REVIEW DRAFT

Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis

For Proposed Amendment to the
Fishery Management Plan for the Gulf of Alaska Management Plan to

Require Trawl Sweep Modification in the Flatfish Fishery in the Central Gulf of Alaska

Prepared by staff of the:

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Executive Summary

ES.1 Introduction

This document analyzes a proposed gear modification to require nonpelagic trawl vessels targeting flatfish in the Central Gulf of Alaska (GOA) to use elevating devices on trawl sweeps to raise them off the seafloor.

ES.2 Purpose and Need

The purpose of this action is to reduce unobserved crab mortality in the Central Gulf of Alaska from the potential adverse effects of nonpelagic trawl gear used for flatfish fishing. This would be achieved by modifying nonpelagic trawl gear used for flatfish fishing by raising the majority of the gear off the sea bottom. Studies in the Bering Sea (BS) have shown that elevating the trawl sweep can reduce trawl sweep impacts effects on *C. bairdi*, *C. opilio* and red king crabs by reducing the unobserved mortality of these species. In addition, elevating the trawl sweep can reduce impacts on benthic organisms, such as basketstars and sea whips. The Council initiated this action in conjunction with final action on the GOA Tanner crab bycatch measures, which created area closures around Kodiak to protect Tanner crab (GOA Amendment 89). Further research was needed in the GOA in order to identify the appropriate specifications for the modification in order to meet the Council's desired performance standard, and implementation issues needed to be resolved. Field testing of the modification has now been completed, demonstrating that the modification is workable in the Central GOA flatfish fishery.

Provided is a draft problem statement for this analysis, adapted from the GOA Tanner crab bycatch analysis (NPFMC 2010a):

> *Tanner crab is a prohibited species in the Gulf of Alaska groundfish fisheries. Directed fisheries for Tanner crab in the Gulf of Alaska are fully allocated under the current limited entry system. The Council recently recommended conservation measures in the Gulf of Alaska to address adverse interactions with Tanner crab by trawl and fixed gear sectors targeting groundfish. Elevated trawl sweeps could provide further conservation in reducing unobserved crab mortality in the Gulf of Alaska. Research has shown that sweep modifications can reduce unobserved crab mortality while maintaining flatfish catch rates.*

ES.3 Alternatives

Provided are the alternatives evaluated in this analysis.

Alternative 1: Status quo

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

Elevating devices combined with proper spacing raises the trawl sweep off of the seafloor to reduce unobserved crab mortality and reduce damage to bottom habitat. The proposed action would be to combine a gear and performance standard to raise the elevated section of the sweep at least 2.5 inches. To achieve this performance standard, elevating devices would be required along the entire length of the elevated section of the sweep spaced no less than 30 feet apart. To allow for some flexibility around the performance standard and to allow for wear and tear that might occur during a tow, there would be two

different sweep configurations to choose from that specify the maximum spacing of elevating devices. The first configuration uses elevating devices that have a minimum clearance height of 3.5 inches or less with a required spacing between the elevating devices of no more than 65 feet apart. The second configuration uses elevating devices that have a minimum clearance height greater than 3.5 inches need to space these elevating devices no more than 95 feet apart. Either configuration combined with the minimum spacing of elevated devices no less than 30 feet would meet the combined gear and performance standard for the use of elevating devices on trawl sweeps while targeting Central GOA flatfish.

ES.4 Impacts of the Alternatives

The alternatives were analyzed for their impacts on habitat, target and non-target species, marine mammals, seabirds, and the ecosystem (Section 1.8), and for their economic and socio-economic impacts. The impacts on the socio-economic environment are analyzed in the Regulatory Impact Review (Section 2) and the Initial Regulatory Flexibility Analysis (Section 3). Impacts are summarized in the following section.

C. bairdi Tanner crab

The trawl sweep modification has proven to be effective in the BS flatfish fisheries at reducing unobserved mortality of crab from the trawl sweeps. It is also likely to provide protection to Tanner crab in the Central GOA flatfish fisheries. It is not possible to quantify a benefit to crab stocks in the Central GOA from modified trawl sweeps without further testing to understand how sediment conditions in the Central GOA flatfish fisheries compare to the areas in which BS experiments occurred. However, the general similarity of GOA trawl gear to that used in the BS indicates that while the benefits may be smaller, they would still be substantial. While requiring this modification for vessels fishing in the Central GOA flatfish fisheries could certainly provide benefit to crab stocks, by reducing unobserved mortality, it would not be likely to change reported PSC totals from trawl fishing, which account only for PSC that comes up in the trawl net.

Groundfish and incidental catch species

The effects of the proposed action on target and incidental groundfish species are limited to those effects that may occur on habitat that supports target species and their prey. All fishing done under the proposed alternative would be done within the annual harvest specifications and within the management measures currently applied to the target fisheries. Based on the research in the BS by the Alaska Fishery Science Center (AFSC) in conjunction with BSAI Amendment 94, which implemented elevated sweeps in the BS flatfish fisheries (NMFS 2009), the proposed action is not expected to have any net decrease in the target catch rates in the Central GOA flatfish fishery compared to that of status quo. The catch of target flatfish species with the modified gear was not significantly different than the catch of unmodified gear, when using 8-to 10-inch diameter disks. Based on maintaining the current harvest management and on the potential effects of the modified gear on benthic target species, the effects of the proposed action are insignificant for stock biomass, fishing mortality, temporal distribution, and change in prey availability.

Marine Mammals

The proposed action would institute elevated trawl sweeps in the Central GOA flatfish fisheries. In general, the timing and general location of effort in the Central GOA flatfish fisheries is unlikely to change as a result of the trawl sweep modification. There would be no changes to the harvest specifications process or management of the fisheries relevant to Steller sea lion protection measures. Annual mortality of Steller sea lions is not expected to change under the proposed action, because fishing

effort will remain similar to status quo. The proposed action is not likely to change fishery activities in a way that would affect the potential for competition for prey, disturbance, or incidental takes of marine mammals. Thus, this action would not likely have any effects on marine mammals beyond those already analyzed for the GOA groundfish fisheries in previous biological opinions and environmental impact statements (NMFS 2001, NMFS 2007, and NMFS 2010).

Seabirds

The proposed action would institute modified trawl sweeps in the Central GOA flatfish fisheries to reduce unobserved crab mortality. In general, the timing and general location of effort in the flatfish fisheries is unlikely to change as a result of the trawl sweep modification. The hook and line sector is responsible for the majority of seabird take in the GOA, and this sector is not impacted by the proposed trawl sweep modification. Thus, this action would likely not have any effects on seabird bycatch beyond those already analyzed for the GOA groundfish fisheries in previous biological opinions and environmental impact statements (USFWS 2003a,b; NMFS 2007).

Habitat

The proposed trawl sweep modification may have beneficial effects on the amount of biological structure in the GOA compared to the status quo, due to the reduction in the amount of contact of the trawl sweeps to the sea bed. These structures can be protected by relatively small increases in clearance between the gear and the seafloor, such as proposed under the trawl sweep modification. As noted in BSAI Amendment 94 (NMFS 2009) analysis, the trawl sweep modification resulted in a decrease of the trawl sweeps contact with the seabed by about 90%, and was effective in reducing trawl sweep impact effects on sea whips, with indications of reduced impacts to basketstars, sponges, and polychaetes. Based on the results in the BS from modified trawl sweeps, adoption of the trawl sweeps in the Central GOA flatfish fisheries is expected to decrease mortality or damage to living habitat species. Test results from BS modified trawl sweeps also indicated that the proposed action would provide no further decreases to non-living species' habitat complexity and would likely provide some benefit to non-living substrates, depending on the substrate and the intensity of fishing. The trawl sweep modification would reduce damage to several components of community structure, including living structure animals and other, smaller epibenthos (such as other crab, sea stars, or shrimp). This reduction in damage would likely be a positive effect compared to status quo.

Ecosystem

The GOA groundfish fisheries potentially impact the GOA ecosystem by relieving predation pressure on shared prey species (i.e., species which are prey for both groundfish and other species), reducing prey available for groundfish predators, altering habitat, imposing bycatch mortality, or by "ghost fishing" caused by lost fishing gear. Trawl sweep modification will result in the same level of groundfish harvest as status quo, so the proposed action is not likely to have a significant impact on the GOA ecosystem.

ES.5 Regulatory Impact Review

The Regulatory Impact Review is in Section 2 of this document.

	Alternative 1	Alternative 2
Description	No action (status quo)	Require vessels targeting flatfish in the Central GOA to use modified sweeps, as specified in regulation
Protection of habitat: value to	Baseline	Use of the gear will reduce adverse impacts to

commercial fishermen, value to other users, non-use value		benthic habitat. Benthic communities will change somewhat, but not as greatly as they would in the absence of this gear requirement. Reduction in impacts of nonpelagic trawling may provide an incremental improvement to the ecological services provided by that habitat beyond what they would have been under the status quo. Specific economic benefits, however, cannot be empirically measured. Persons may have non-use values for incremental change in benthic habitat. No estimates of this are available.
Crab and crab fisheries	Baseline	Proper, consistent, and comprehensive use of the gear is expected to result in less crab mortality, which may improve the sustainability of crab stocks and increase the catch per unit effort in crab fisheries.
Cost of gear	Baseline	Estimated to be about $3,000--$3,500 annually. This could be greater or less depending on the type of gear and length of sweeps in use. Annual cost of the modified gear may be offset if using the elevated disks increases the useful life of trawl sweeps, lengthening the time before replacement of the gear and/or reducing the net wear and tear on the equipment. There may be a one-time cost for modifying the vessel to accommodate the modified trawl gear. Estimates of this cost may range between zero and $25,000* depending on the vessel and its existing configuration. Vessels differ from each other so much that it is not possible to provide an average or aggregate cost.
Cost of fishing with modified gear	Baseline	It may take longer to set and retrieve nets. Industry sources believe that this may be a cost during transitional years, as learning takes place and gear improvements are implemented. Research shows little or no difference in catchability with gear using the proposed regulatory standards.
Enforcement	Baseline	Enforcement personnel will need to verify that the modified gear meets the regulatory requirements when conducting regular vessel inspections.
Net benefits to the Nation		The annual cost to fishermen of purchasing and using more expensive modified gear is balanced against the reduced impact to benthic habitat and the potential for increased, sustained, future productivity of species as a result.

- Albert Geiser, personal communication, December 22, 2011.

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List of Acronyms

ADF&G	Alaska Department of Fish and Game
AFA	American Fisheries Act
AFSC	Alaska Fisheries Science Center
AI	Aleutian Islands
BS	Bering Sea
BSAI	Bering Sea and Aleutian Islands
CBD	Center for Biological Diversity
CDQ	Community Development Quota
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHPZ	Crab and Halibut Protection Zone
Council	North Pacific Fishery Management Council
C/P	Catcher/processor
CPUE	catch per unit effort
CW	carapace width
DPS	distinct population segment
EA	Environmental Assessment
EBS	eastern Bering Sea
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
ESI	environmental sensitivity index
F/V	Fishing Vessel
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRFA	Final Regulatory Flexibility Analysis
ft	foot or feet
GHL	guideline harvest level
GOA	Gulf of Alaska
HAPC	Habitat Area of Particular Concern
HCA	Habitat Conservation Area
IRFA	Initial Regulatory Flexibility Analysis
LEI	long-term effect index
LLP	license limitation program
m	meter or meters
Magnuson-Stevens Act	Magnuson-Stevens Fishery Conservation and Management Act
MESA	most environmentally sensitive areas
MGTZ	Modified Gear Trawl Zone
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum stock size threshold
mt	metric ton
NAO	NOAA Administrative Order
NBSRA	Northern Bering Sea Research Area
NEPA	National Environmental Policy Act
nm	nautical mile
NMFS	National Marine Fishery Service
NOA	Notice of Availability
NOAA	National Oceanographic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
NPGOP	North Pacific Groundfish Observer Program
OLE	NOAA's Office of Law Enforcement
PBR	potential biological removal
PSC	prohibited species catch
PSEIS	Programmatic Supplemental Environmental Impact Statement
QS	quota share
RACE	NOAA AFSC Resource Assessment and Conservation Engineering
RFA	Regulatory Flexibility Act
RFFA	reasonably foreseeable future action
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation Report
SAR	stock assessment report
Secretary	Secretary of Commerce
SMIHCA	St. Matthew Island Habitat Conservation Area
STAL	short-tailed albatross
TAC	total allowable catch
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system

1 Environmental Assessment

This document analyzes a proposed gear modification to require nonpelagic trawl vessels targeting flatfish in the Central Gulf of Alaska (GOA) to use elevating devices on trawl sweeps to raise them off the seafloor. The action follows from GOA Amendment 89, area closures for GOA Tanner crab (NPFMC 2010a).

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

1.1 Purpose and Need

The purpose of this action is to reduce unobserved crab mortality in the Central Gulf of Alaska from the potential adverse effects of nonpelagic trawl gear used for flatfish fishing. This would be achieved by modifying nonpelagic trawl gear used for flatfish fishing by raising the majority of the gear off the sea bottom. Studies in the Bering Sea (BS) have shown that elevating the trawl sweep can reduce trawl sweep impacts effects on *C. bairdi*, *C. opilio* and red king crabs by reducing the unobserved mortality of these species. In addition, elevating the trawl sweep can reduce impacts on benthic organisms, such as basketstars and sea whips. The Council initiated this action in conjunction with final action on the GOA Tanner crab bycatch measures, which created area closures around Kodiak to protect Tanner crab (GOA Amendment 89). Further research was needed in the GOA in order to identify the appropriate specifications for the modification in order to meet the Council's desired performance standard, and implementation issues needed to be resolved. Field testing of the modification has now been completed, demonstrating that the modification is workable in the Central GOA flatfish fishery.

1.2 Council Problem Statement

Provided is a draft problem statement for this analysis, adapted from the GOA Tanner crab bycatch analysis (NPFMC 2010a):

> *Tanner crab is a prohibited species in the Gulf of Alaska groundfish fisheries. Directed fisheries for Tanner crab in the Gulf of Alaska are fully allocated under the current limited entry system. The Council recently recommended conservation measures in the Gulf of Alaska to address adverse interactions with Tanner crab by trawl and fixed gear sectors targeting groundfish. Elevated trawl sweeps could provide further conservation in reducing unobserved crab mortality in the Gulf of Alaska. Research has shown that sweep modifications can reduce unobserved crab mortality while maintaining flatfish catch rates.*

1.3 History of this Action

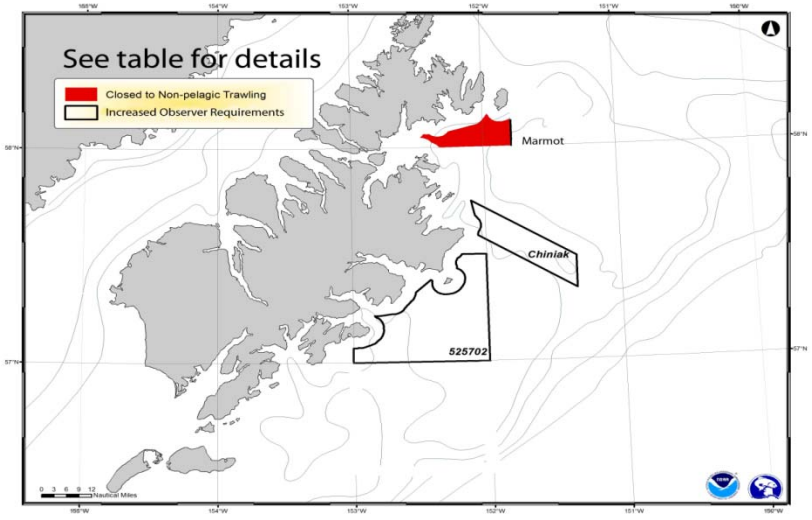
In October 2010, the Council initiated a trailing amendment to require trawl sweep modifications on nonpelagic trawl vessels fishing in the Central GOA (e.g., flatfish, Pacific cod, pollock, and rockfish fisheries). The action was initiated in conjunction with final action on the GOA Tanner crab area closures (NPFMC, 2010a), which analyzed requiring the trawl sweep modification in the proposed area closures.

A similar gear modification, which requires elevating devices to be placed on the trawl sweeps to lift the sweep off the seafloor, was implemented beginning in 2011 for flatfish vessels in the Bering Sea (BSAI Amendment 94, NMFS 2009). BS research has demonstrated that elevated sweeps can reduce unobserved mortality of crab from interacting with the trawl sweeps. However, unlike the BS modification, which is limited to flatfish fisheries, the proposed Central GOA trawl sweep modification would have applied to all nonpelagic fisheries. The Council reconsidered the scope of the proposed amendment following a brief discussion paper presented at the February 2011 meeting. The paper focused on the practicality of trawl sweep modification for different GOA nonpelagic trawl fisheries, the effectiveness of the modification at reducing prohibited species catch of crab in the GOA nonpelagic trawl fisheries, and a tentative outline of the proposed steps for verifying sweep elevation on GOA vessels by Dr. Craig Rose, an Alaska Fisheries Science Center researcher. After reviewing the discussion paper and taking public comment on the issue, the Council narrowed the proposed sweep modification action to flatfish fisheries in the Central GOA.

1.4 Summary of GOA Tanner crab bycatch reduction amendment

GOA Amendment 89 (NPFMC 2010a) includes three area closures around Kodiak, to reduce prohibited species catch (PSC) of Tanner crab in the GOA groundfish fisheries. These areas included Marmot Bay, Chiniak Gully, and Alaska Department of Fish and Game (ADF&G) statistical area 525702 (see Figure 1-1). The Council recommended Marmot Bay be permanently closed to fishing with trawl gear, except for those vessels using pelagic trawl gear to fish for pollock. The remaining two areas are closed to all vessels using nonpelagic trawl gear unless they have 100% observer coverage. For pot vessels, all vessels, regardless of size, are required to have 30% observer coverage in order to fish in any of the three identified closure areas. Finally, as noted above, the Council also initiated a trailing amendment to implement trawl sweep modifications for nonpelagic trawl vessels fishing in the Central GOA.

Figure 1-1 Amendment 89 area closures around Kodiak Island



	Trawl	Pot
Marmot Bay	Closed (vessels using pelagic trawl gear to fish for pollock are exempt)	Closed to pot gear unless 30% observer coverage
Chiniak Gully	Closed to nonpelagic trawl gear unless 100% observer coverage	
ADFG statistical area 525702		

1.5 Statutory Authority and Relationship of this Action to Federal law

National Marine Fisheries Service (NMFS) manages the U.S. groundfish fisheries of the GOA management area in the Exclusive Economic Zone (EEZ) under the Fishery Management Plan for Groundfish of the Gulf of Alaska Management Area (NPFMC 2011a). The Council prepared, and the Secretary approved, the FMP under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801, *et seq*.).

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

Magnuson-Stevens Fishery Conservation and Management Act, including Sustainable Fisheries Act of 1996, and the Magnuson-Stevens Reauthorization Act of 2008, (Magnuson-Stevens Act)

National Environmental Policy Act (NEPA)

Endangered Species Act (ESA)

Marine Mammal Protection Act (MMPA)

Administrative Procedure Act (APA)

Information Quality Act (IQA)

E.O. 12866

Regulatory Flexibility Act (RFA)

The Alaska Groundfish Harvest Specifications Final Environmental Impact Statement (FEIS) provides details on the laws and executive orders directing this analysis (NMFS 2007).

1.6 Description of Alternatives

The alternatives evaluated in this analysis were adopted by the Council in February 2011.

Alternative 1: Status quo

Alternative 2: Require trawl vessels targeting flatfish in the Central Gulf of Alaska with non-pelagic trawl gear to use elevating devices on trawl sweeps to raise them off the seafloor.

Elevating devices combined with proper spacing raises the trawl sweep off of the seafloor to reduce unobserved crab mortality and reduce damage to bottom habitat. The proposed action would be to combine a gear and performance standard to raise the elevated section of the sweep at least 2.5 inches. To achieve this performance standard, elevating devices would be required along the entire length of the elevated section of the sweep spaced no less than 30 feet apart. To allow for some flexibility around the performance standard and to allow for wear and tear that might occur during a tow, there would be two different sweep configurations to choose from that specify the maximum spacing of elevating devices. The first configuration uses elevating devices that have a minimum clearance height of 3.5 inches or less with a required spacing between the elevating devices of no more than 65 feet apart. The second configuration uses elevating devices that have a minimum clearance height greater than 3.5 inches need to space these elevating devices no more than 95 feet apart. Either configuration combined with the minimum spacing of elevated devices no less than 30 feet would meet the combined gear and

performance standard for the use of elevating devices on trawl sweeps while targeting Central GOA flatfish.

1.7 Affected Environment

The marine environment of the GOA is made up of physical, biological, and human components that may be affected by the groundfish fisheries off Alaska. The physical components include geological, oceanographic, and climatic conditions. The proposed alternatives address modification of the nonpelagic trawl gear targeting flatfish in the Central GOA. The alternatives could potentially affect the biological and human components of the marine environment because the alternatives propose changes to fisheries management measures. These measures could affect the biological component by reducing unobserved crab mortality and socioeconomic component by modifying factors associated with gear usage in the fisheries affected by this action.

1.7.1 *C. bairdi* Tanner crab stocks

Tanner crab is a member of the genus *Chionoecetes*, and is found from subtidal areas to 437 m (Jadamec et. al. 1999). Tanner crabs feed on a wide assortment of marine life including worms, clams, mussels, snails, crabs, other crustaceans, and fish parts. They are fed upon by bottomfish, pelagic fish, and humans. The top 5 predators of Tanner crab in the GOA are Pacific cod, Pacific halibut, sculpin spp., flathead sole, and walleye pollock.

Migration patterns are not well understood; however, it is known that the sexes are separated during much of the year and move into the same areas during the reproductive season. Donaldson (1983) found that mean movement of male Tanner crab in the Kodiak area was approximately 24.0 km. In addition, male Tanner crab in bays tended to move to deeper offshore waters while those in offshore areas tended to remain offshore (Donaldson 1983).

Females mate with an adult male for the first time during her last molt (maturity molt). The male crab is attracted by a chemical attractant (pheromone) released by the female. Females molt to sexual maturity and mate in the soft shell condition while grasped by the male. Older hard shelled females are also mated by adult males, but in the absence of a male they are capable of producing an egg clutch with sperm stored from a previous mating.

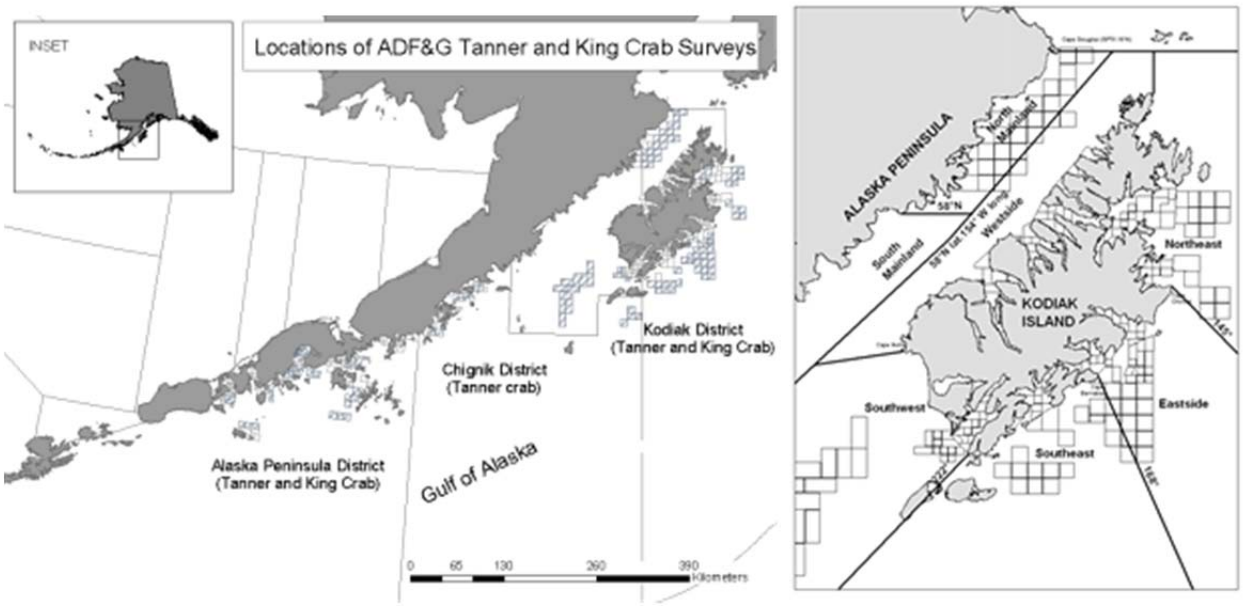
Fertilization is internal, and the eggs are usually extruded within 48 hours onto the female's abdominal flap where they incubate for a year. Hatching occurs late the following winter and spring with the peak hatching period usually during April to June.

The young, free-swimming larvae molt many times and grow through several distinct stages. Growth during this period is usually dependent on water temperature but lasts about 63 to 66 days, after which the larvae lose their swimming ability and settle to the ocean bottom. After numerous molts and several years of growth, females mature at approximately 5 years of age. Males will mature at about 6 years.

Tanner crab live to an estimated maximum age of 14 years. Males of commercial size range from 7 to 11 years of age.

Crab fisheries in the GOA are managed by the State of Alaska. Abundance estimates are produced by region (where possible). For most regions, actual abundance estimates are limited and commercial fishing has been closed. An annual trawl survey is conducted by ADF&G. The survey methodology is designed to concentrate sampling in areas of historical king and Tanner crab abundance (Figure 1-2).

Figure 1-2 ADF&G trawl survey stations for Tanner and king crab abundance, and fishery management districts around Kodiak Islands

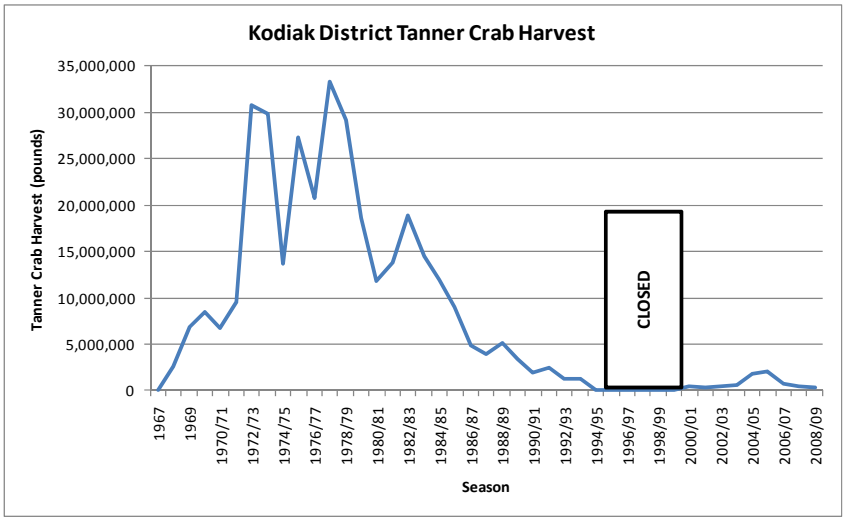


For purposes of crab management, the Central GOA (620 and 630 reporting area) is composed of four ADF&G shellfish management districts, which include Chignik, Kodiak, Cook Inlet, and Prince William Sound districts. In the Chignik district, commercial fishing for Tanner crab has been closed since 2006. Prior to 2006, the Chignik Tanner crab fishery was open for commercial Tanner crab fishing during the 2004/05 and 2005/06 seasons, but was closed to commercial fishing as far back as 1990. In recent years, Tanner crab abundance has increased.

In the Cook Inlet and Prince William Sound districts, commercial fisheries for Tanner crab have been closed since 1994 and 1988, respectively. Note also, federal regulations prohibit nonpelagic trawling in Cook Inlet waters north of the line from Cape Douglas to Point Adam §679.22(b)(7). Overall Tanner crab abundance has remained relatively low throughout these areas since their closure, but abundance has increased sufficiently to provide for noncommercial Tanner crab seasons in both Cook Inlet and PWS. ADF&G has not directly assessed red king crab within the Cook Inlet and PWS management areas and very little red king crab were present in the recent surveys. ADF&G does conduct trawl surveys for Tanner crab in Kamishak and Kachemak Bays within Cook Inlet but do not survey Northern GOA waters along the outer Kenai Peninsula. Similarly, ADF&G survey the Eastern and Northern portions of PWS but do not perform a comprehensive survey in Prince William Sound outside waters.

Of the Central GOA management districts, the Kodiak district has a majority of the Tanner crab and red king crab population. Commercial Tanner crab harvests in the Kodiak District date back to the late 1960s (Brown 1971; Figure 1-3). As Tanner crab fisheries grew in economic importance, Tanner crab populations were indexed using a pot survey starting in 1973 (Colgate and Hicks 1983). The annual trawl survey did not begin until the early 1980s (Colgate and Hicks 1983) after the Tanner crab population had declined. Since implementation of the trawl survey, the highest harvest of Tanner crab was just over 5 million pounds (1989), and has averaged less than 2 million pounds.

Figure 1-3 Kodiak District Commercial Tanner crab harvest, 1967 through 2008/2009.



Because of the differences in survey methods, it is difficult to make direct comparisons pre- and post-1988 survey data. Harvests prior to the start of the trawl survey often exceed 10 million pounds, suggesting that populations in the 1970s were much larger (Stichert *in press*).

From 1997 through 2009 the total Tanner crab population in the Kodiak District ranged from just over 19 million crabs to over 186 million crabs (Spalinger 2010; Table 1-1). The average Tanner crab population estimate from 2003 through 2009 is approximately 109 million crabs. The management section that consistently has had the highest population of Tanner crab is the Eastside Section, which has averaged over 48 million crabs from 2003 through 2009. The section with the second highest abundance is the Northeast Section which has averaged over 17 million crabs from 2003 through 2009.

Table 1-1 Population estimates for total numbers of Tanner crab for Kodiak District, by section from the ADF&G bottom trawl survey

Year	Northeast	Eastside	Southeast	Southwest	Westside	North Mainland	Kodiak District
1997	3,550,650	4,578,002	1,379,455	1,172,719	2,113,986	6,754,956	19,549,768
1998	10,685,184	18,270,254	4,784,391	801,642	2,883,401	8,554,251	45,979,123
1999	6,075,563	17,913,837	8,859,587	2,126,585	2,591,322	9,741,951	47,308,845
2000	15,698,017	19,832,495	8,275,551	6,658,290	3,402,796	11,889,904	65,757,053
2001	42,326,627	61,399,533	25,240,766	21,281,118	5,824,141	13,655,815	169,728,000
2002	16,294,283	39,331,894	15,151,262	9,262,329	3,196,077	18,627,785	101,863,630
2003	13,443,591	36,166,904	6,058,690	3,141,350	4,593,172	7,013,798	70,417,505
2004	16,321,335	26,352,608	12,333,843	3,575,099	1,804,194	10,356,807	70,743,886
2005	17,403,505	19,113,246	10,974,042	3,011,422	3,947,639	13,226,334	67,676,188
2006	21,906,413	68,461,704	33,083,614	15,342,283	9,334,219	16,914,410	165,042,643
2007	18,653,830	98,433,348	35,342,446	25,861,206	4,582,398	3,382,721	186,255,949
2008	21,179,965	50,858,092	10,731,234	23,520,341	8,397,115	4,825,933	119,512,680
2009	16,992,570	39,006,970	7,768,620	9,716,347	5,623,343	5,283,555	84,391,405
97-09 average	16,963,964	38,439,914	13,844,885	9,651,595	4,484,139	10,017,555	93,402,052
03-09 average	17,985,887	48,341,839	16,613,213	12,024,007	5,468,869	8,714,794	109,148,608

Source: Spalinger *in press*

1.7.2 *C. bairdi* Tanner crab PSC in Federal flatfish fisheries

In this section, a summary of Tanner crab PSC in the Federal groundfish fisheries by reporting area is provided. A more detailed explanation of Tanner crab PSC is provided in Section 3.3 of GOA Amendment 89 (NPFMC 2010a).

Table 1-2 identifies *C. bairdi* Tanner crab bycatch for 2003 through 2010 for nonpelagic trawl gear for Central GOA. Nonpelagic trawling contributes the majority of Tanner crab PSC in the Federal groundfish fisheries in the Central GOA, ranging from 53% to 97% from 2003 through 2010, and averaging 77% over the time period. Also included in the table is estimated Tanner crab mortality for trawl gear using an estimated 80% mortality rate for trawl gear.[1] Table 1-3 depicts the PSC of Tanner crab in proportion to overall groundfish catch for nonpelagic trawl gear. The average rate of Tanner crab PSC per metric ton of groundfish catch for 2003 through 2010 was 2.35 crab per metric ton of groundfish for the nonpelagic trawl fisheries. Looking at PSC mortality for nonpelagic trawl gear, the rate of crab mortality averages 1.88 crab per metric ton of groundfish for the nonpelagic trawl fisheries. It should be remembered when evaluating these PSC numbers that they are extrapolated to the fleet as a whole from PSC recorded on observed vessels, which account, on average, for about one third of groundfish catch in the Central GOA.

The three flatfish target fisheries that took the highest proportion of Tanner crab during 2003 through 2010 were arrowtooth flounder at 18% to 73%, shallow-water flatfish at 7% to 43%, and rex sole at 5% to 62% (Table 1-4). Nonpelagic trawl vessels targeting pollock and Pacific cod also intercepted Tanner crab in some years, but always account for less than 10% of the gear's total PSC, with the exception of Pacific cod fishery in 2008 (11%). PSC in the rockfish target fishery was less than 3% of the total in 2004, and has been very low since the implementation of the rockfish program in 2007.

Table 1-2 Tanner crab PSC in the Central GOA for nonpelagic trawl in GOA Federal groundfish fisheries, 2003 through 2010

	Tanner crab PSC nonpelagic trawl		Total PSC all gears	Tanner crab mortality nonpelagic trawl
Year	Number of crab	% of total bycatch		Number of crab
2003	135,380	0.96	141,150	108,304
2004	53,017	0.97	54,800	42,413
2005	91,906	0.78	118,353	73,525
2006	223,463	0.69	325,581	178,771
2007	197,150	0.71	277,734	157,720
2008	126,928	0.61	207,911	101,542
2009	226,099	0.96	236,576	180,879
2010	89,760	0.53	169,681	71,808
Average 2003 - 2010	142,963	0.77	191,473	114,370

Source: NMFS Catch Accounting System. Data compiled by AKFIN, July 2011. Excludes PSC attributed to the State Pacific cod fishery

[1] Since this analysis originated from GOA Tanner crab closure and since the Council requested an 80% mortality rate be used in that analysis, this analysis uses the same 80% mortality rate for trawl gear.

Table 1-3 Rate of Tanner crab PSC and PSC mortality per metric ton of groundfish catch in Central GOA for nonpelagic trawl in Federal groundfish fisheries, 2003 through 2010

Year	PSC	PSC Mortality
2003	1.90	1.52
2004	0.97	0.78
2005	1.76	1.40
2006	4.78	3.83
2007	3.30	2.64
2008	1.73	1.38
2009	3.20	2.56
2010	1.21	0.97
Average 2003-2010	2.35	1.88

Source: NMFS Catch Accounting System. Data compiled by AKFIN, July 2011. Excludes PSC attributed to the State Pacific cod fishery

Table 1-4 PSC of Tanner crabs in the Central GOA for nonpelagic trawl by target fishery, 2003 through 2010

Target Fishery	2003	2004	2005	2006	2007	2008	2009	2010	Average 2003 through 2010
Arrowtooth Flounder	28,189	33,265	66,944	86,859	42,126	34,606	39,723	47,174	47,361
Flathead Sole	17,383	2,315	12,540	23,470	24	6,510	7,647	5,504	9,424
Other Species	20	0	189	0	0	5	1	0	27
Pacific Cod	1,532	894	270	532	11,922	14,439	1,456	837	3,985
Pollock - bottom	0	555	0	7,744	19,346	235	6,579	75	4,317
Rex Sole - GOA	29,467	5,888	4,398	70,913	44,797	47,993	140,311	14,235	44,750
Rockfish	171	1,517	1,620	830	71	62	205	100	572
Shallow Water Flatfish	58,618	8,583	5,946	33,115	78,697	22,903	30,087	21,780	32,466

Source: NMFS Catch Accounting System. Data compiled by AKFIN, July 2011. Excludes PSC attributed to the State Pacific cod fishery

1.7.2.1 Composition of PSC

The PSC composition of Tanner crab caught and sampled on observed vessels within reporting area 630 was evaluated for 2001 through 2009 (Table 1-5). Overall, the majority of PSC is comprised of sublegal males (i.e., males less than 140 cm in carapace width), averaging 69% of the observed, sampled PSC for 2001 through 2009 (ranging from 54% to 85% in individual years). Approximately one fifth of PSC is mature crab (10% legal males and 11% female crab with eggs), and an average of 8% of crab caught as PSC are females without eggs. The distribution of PSC by sex and size/maturity is fairly consistent by month, although the number of PSC samples is considerably lower in June, August, November, and December.

Table 1-5 Estimate of PSC composition of Tanner crab for 2001 through 2009, in reporting area 630

Sex		2001	2002	2003	2004	2005	2006	2007	2008	2009	Average 2001-2009
Male	Legal	8%	1%	2%	6%	12%	12%	19%	8%	6%	10%
	Sublegal (<140cm)	60%	68%	68%	85%	80%	74%	54%	77%	66%	69%
Female	Adult (with eggs)	8%	13%	24%	5%	4%	10%	17%	6%	19%	11%
	Sublegal (no eggs)	21%	17%	5%	4%	4%	4%	8%	8%	6%	8%
Unknown		3%	1%	0%	1%	0%	1%	3%	0%	1%	1%
Total number of samples		868	1,176	1,098	524	1,916	1,701	2,336	1,370	470	1,273

1.7.3 *C. bairdi* Tanner crab directed fisheries

The Tanner crab fishery in the Kodiak District began in 1967 when 110,961 pounds were landed. The fishery quickly expanded, and over 34 million pounds were harvested from 1968 through the 1971/72 season. In response to increased demand and larger harvests, ADF&G initiated a pot survey in 1973 to estimate relative abundance, predict recruitment trends, and develop annual harvest levels. The fishery continued to grow with annual harvests increasing to a peak of 33 million pounds in the late-1970s. ADF&G implemented an April 30 season closure date in 1975 to protect crab at the onset of the mating and molting season. A minimum carapace width (CW) of 5.5 inches was additionally established in 1976. In the early 1980s, Tanner crab stocks and commercial harvests began to decline, and by the early 1990s, annual harvests averaged less than two million pounds. The fishery was closed for the 1994/95 season, and remained closed until the 2000/01 season. During the six-year closure, a harvest strategy was developed by ADF&G and adopted by the Alaska Board of Fisheries (BOF) in 1999. This harvest strategy has a number of conservation measures to help sustain the Tanner crab population as well as a number of provisions to slow the pace of the fishery. The plan has minimum population levels (biological thresholds) and minimum guideline harvest levels (management thresholds) to open a commercial fishery. Each section must have a GHL of at least 100,000 pounds and the entire district GHL must be at least 400,000 pounds to open. In order to slow the pace of the fishery, fishing is restricted to daylight hours; gear may only be operated from 8:00 AM to 5:59 PM, although gear may be left to soak from 6:00 PM until 7:59 AM. The fishery also has pot limits. Vessels are restricted to 20 pots until harvest levels exceed 2 million pounds, and from 2 to 4 million pounds the pot limit is 30 per vessel. The Kodiak District is designated superexclusive, which means vessels may not participate in any other Tanner crab fishery in the same calendar year. The number of permits is limited through the limited entry program to approximately 180 permits; although in recent years actual participation has been much lower.

In addition to the mandatory escape mechanism ("bio-twine"), pots are also required to have either 4 escape rings or one third of on vertical surface composed of 7 ¼ inch stretch mesh webbing. Escape rings (or escape mesh) have been shown to reduce the amount of sub legal and female Tanner crab (Pengilly 2000). Vessels must register for individual sections so that ADF&G can track effort and harvest. Most of the fleet participates in a voluntary reporting program where vessels are contacted on a daily basis for information on harvest, effort, and CPUE. This voluntary reporting is the primary method ADF&G uses to manage the fishery. The distribution of the harvest generally matches stock distributions observed on the trawl survey, and ADF&G closes waters to fishing when inseason targets are achieved. At times, ADF&G will keep areas of a section closed for protection. For example, in 2010, Danger Bay in the Northeast Section was kept closed because the population of crab during the survey was very low. Ugak Bay in the Eastside Section was also kept closed. While there was a fishable population of legal crab in

Ugak Bay, the proportion of legal males to sublegal males was high, and ADF&G kept the bay closed to minimize sorting on sub-legal crab.

Since adoption of the Tanner crab management plan in 2001, only the Northeast, Eastside, Southeast, and Southwest sections have opened to commercial fishing. The majority of the harvest has occurred in the Eastside Section. Total Kodiak District harvests from 2003 to 2009 have averaged just under a million pounds, and harvests from the Eastside Section over the same time span have averaged approximately 500,000 pounds (232,602 crab).

Table 1-6 Commercial fishery harvest for Kodiak district, 2003-2009

Kodiak District Tanner crab commecial fishery														
Sections	Northeast		Eastside		Southeast		Southwest		Westside		N. and S. Mainland		TOTAL	
	pounds	no. of crab	pounds	no. of crab	pounds	no. of crab	pounds	no. of crab	pounds	no. of crab	pounds	no. of crab	pounds	no. of crab
2003	162,494	67,706	348,830	145,346	no fishery		no fishery		no fishery		no fishery		511,324	213,052
2004	259,572	117,987	219,980	99,991	86,666	39393.64	no fishery		no fishery		no fishery		566,218	257,372
2005	467,516	203,268	665,339	289,278	92,398	40,173	574,944	249,976	no fishery		no fishery		1,800,197	782,694
2006	519,730	216,554	1,302,378	542,658	130,292	54,288	168,984	70,410	no fishery		no fishery		2,121,384	883,910
2007	88,584	36,910	676,508	281,878	no fishery		no fishery		no fishery		no fishery		765,092	318,788
2008	87,774	35,110	335,815	134,326	no fishery		no fishery		no fishery		no fishery		423,589	169,436
2009	88,598	35,439	336,839	134,736	no fishery		no fishery		no fishery		no fishery		425,437	170,175
Average	239,181	101,853	555,098	232,602	103,119	44,618	371,964	160,193					944,749	399,347

Source: http://www.cf.adfg.state.ak.us/geninfo/shellfsh/shellfish_harvest.php for commercial harvest.

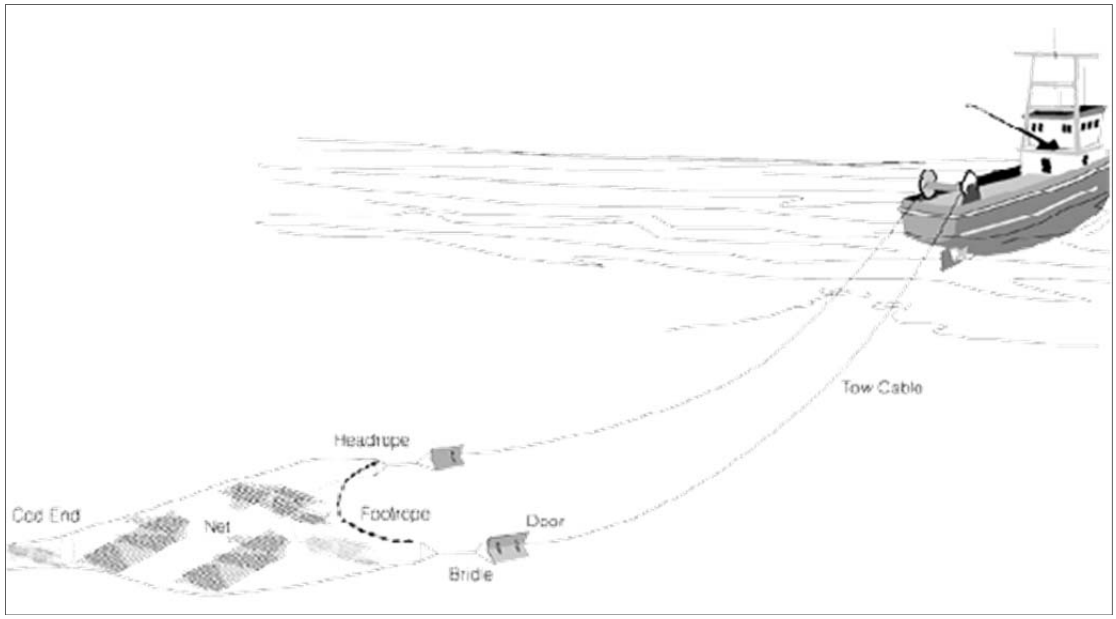
1.7.4 Traditional and modified nonpelagic trawl flatfish gear

1.7.4.1 Description of traditional nonpelagic trawl flatfish gear

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

A typical flatfish fishery is prosecuted with otter trawls (Figure 1-1) rigged to fish effectively for flatfish, which live on or very near the substrate. During the 2003 through 2010 period, approximately 12 trawl catcher processors and 48 catcher vessels targeted flatfish in the Central GOA. All of the trawl catcher processors targeting flatfish in Central GOA are also Amendment 80 vessels and as such, they are already using the modified sweeps in the BS. As for flatfish catcher vessels, they are generally smaller, lower horsepower vessels. To assist in determining the differences between a BS trawl catcher processor and GOA trawl catcher vessels, the Alaska Groundfish Data Bank surveyed their members. Alaska Fishery Science Center (AFSC) scientists compiled and summarized the data from the returned survey forms. Fourteen vessels responded to the survey, describing 22 nets used to target flatfish. The survey indicated that GOA non-pelagic trawl gear used to target flatfish in the GOA is similar to that used in the BS. The following description highlights the differences between a BS catcher processors and a GOA non-pelagic trawler.

Figure 1-4 Depiction of otter trawl gear



Otter board or doors are used to spread the net and keep it open during towing. Steel trawl doors, ranging spread the nets horizontally. Door spread varies with fishing depth and rigging style, but generally ranges from 100 m to 200 m (328 ft to 656 ft). The rigging between the net and the doors includes bridles and sweeps, with GOA vessels using shorter sweeps than those used by the larger BS trawlers. While BS sweeps cover approximately 90% of the area affected by the trawls, similar calculations for GOA gear yield 75%. Most GOA sweeps used 3 inch diameter rubber disks strung over a steal cable instead of the 2 inch diameter combination rope (polyethylene-wrapped steel) used in the BS fisheries. Some GOA vessels reported using combination rope. Some also reported using widely spaced (90 to 120 ft) devices that raised the sweeps above the seafloor. Most of the GOA trawlers reported diameters of footrope bobbins from 16 to 18 inches in diameter in the center and 14 to 16 inches in the wings (sides of the trawl footrope) while BS trawlers use footrope bobbins and disks from 18 to 23 inches in diameter.

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

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

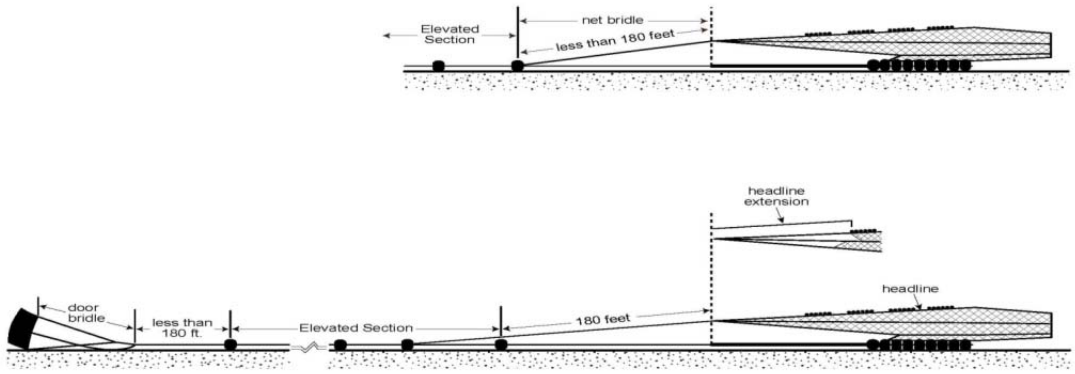
1.7.4.2 Sweep modification for non-pelagic trawl vessels

1.7.4.2.1 Bering Sea sweep modification for non-pelagic trawl vessels

Since the beginning of 2011, elevating devices on trawl sweeps have been required for the flatfish vessels operating in the BS. These elevating devices must be installed at regular intervals, in order to raise the sweeps off the seafloor and reduce adverse impacts on benthic animals. Figure 1-5 illustrates where the sweeps are on the trawl gear, and Figure 1-6 provides an example of elevating devices. In order to provide a standard that is enforceable, the regulations define minimum and maximum distances for the spacing between elevating devices, as well as a minimum clearance height for the sweep measured adjacent to the elevating device[2] (see Appendix A for a copy of modified nonpelagic trawl gear regulations).

There are two different configurations included in the regulations: vessels using elevating devices that have a minimum clearance height of 3.5 inches or less (e.g., 8 inch disks or bobbins attached to 2 inch wire) need to space the elevating devices no more than 65 ft apart. Vessels using elevating devices that have a minimum clearance height greater than 3.5 inches (e.g., 10 inch bobbins or disks on 2 inch combination wire) need to space these elevating devices no more than 95 ft apart. The regulations were purposefully written to allow a degree of flexibility around these parameters, to allow for wear and tear that might occur during a tow. Field testing in the Bering Sea showed that these parameters would result in a seafloor clearance across the entire length of the sweep which reduced unobserved mortality of crab.

Figure 1-5 Location of elevating devices in the elevated section of modified nonpelagic trawl gear



[2] The clearance of the sweep at the elevating device is used because it can easily be measured by vessel operators and enforcement agents. Field testing in the Bering Sea identified the relationship between clearance height at the elevating device, and the clearance of the sweep from the seafloor at its lowest point between elevating devices.

Figure 1-6 Example of elevating devices

1.7.4.2.2 Central Gulf of Alaska sweep modification for non-pelagic trawl vessels

The process for implementing the sweep modification in the BS required extensive testing and discussion between the industry and NMFS, in order to identify in regulation a configuration of the gear that was both practicable and enforceable. However, unlike BS flatfish vessels where trawl vessels are primarily catcher processors, in the Central GOA flatfish fisheries there are trawl catcher vessels operating in the these fisheries, which tend to be smaller than the BS trawl catcher processors. In addition, sediments and bathymetry of the Central GOA flatfish fishery grounds may be different from the BS flatfish fishery grounds. Recognizing these differences, research and field testing was conducted to ensure that the BS tests and regulation requirements are applicable in the Central GOA flatfish fisheries. Dr. Rose and scientists from the Alaska Fisheries Science Center Resource Assessment and Conservation Engineering (RACE) Division field tested the modified trawl sweeps with the Central GOA flatfish fishing industry during the summer of 2011.

Verification and comparative work in the GOA focused on disc or bobbin (sweep elevation device) height and spacing (between elevating devices) so that the same degree of elevation from the seafloor (approximately 3 inches at lifting devices and at least 1.5 inches midway between them) is achieved given the specifics of the Central GOA flatfish fisheries. Factors affecting whether sufficient lift can be achieved in the Central GOA flatfish fisheries as compared to the BS include: towing power and/or speed of GOA vessels, styles and/or sizes of trawl doors, rigging of trawl nets, bridle and sweep materials (e.g., cookie sweeps rather than combination rope), and sediments and bathymetry of the GOA flatfish fishing grounds as compared to the BS grounds.

During spring and summer of 2011, four Kodiak-based trawl vessels took aboard personnel from the Alaska Fisheries Science Center and the Alaska Groundfish DataBank to measure seafloor clearances achieved with the proposed sweep modifications. This was to assure that such clearances were comparable to those achieved during Bering Sea tests demonstrating reductions in crab mortality and damage to sea whips. Clearances during fishing were measured with tilt meters attached to triangular, steel frames affixed over the sweeps (Figure 1-7). As the lower corner of the frames rode on the seafloor, frame tilt indicated the distance between the sweep and the seafloor. Tilt frames were installed both adjacent to lifting devices (bobbins or disks) and midspan between devices to measure the range of clearances. Operations during these trips represented a range of conditions encountered during Gulf of Alaska flatfish trawling including towing speeds, tides, substrate types, and species of flatfish targeted.

The sweeps used included both rubber disks on cable (mud gear) and combination rope, with several of the alternative lifting device diameters and spacings considered for the regulations.

Figure 1-7 Devices to measure sweep-seafloor clearances used in 2011 tests aboard Gulf of Alaska trawlers

Forty six sets of bobbin and midspan frames were set, 32 of which provided valid data throughout the tows on both devices. These included five tows with 8 inch disks at 60 foot spacing, four tows with 10 inch bobbins (2 at 30 foot and 2 at 60 foot spacings) and 22 tows with 12 inch bobbins at 90 foot spacing, the configuration expected to be used most often. Average clearances near the lifting devices ranged from 2.4 to 4.0 inches and midspan clearances from 1.3 to 2.4 inches (Table 1-7). The smallest clearances occurred with 8 inch disks on 3 inch sweeps (a combination providing barely the minimal allowable clearance) and on soft mud substrates, where the lifting devices could press into the substrate surface. These clearances were not substantially different than those during the Bering Sea studies of sweep modifications and their effects.

Table 1-7 Sweep configurations tested and measured sweep-seafloor clearances for Gulf of Alaska bottom trawls

Lift Device Diameter	Sweep Diameter	Device Spacing	Minimum Clearance Measure	Clearance Measure per Regs	Seafloor Clearance at device	Seafloor Clearance at midspan	Number of tows	Substrate
(inch)	(inch)	(feet)	(inch)	(inch)	(inch)	(inch)	#	
8	3	60	2.5	2.5	2.4	1.3	5	
10	2	30	2.5	3.625	3.8	2.0	2	
10	2	60	2.5	3.625	2.7	1.6	2	
12	3	90	3.5	4.125	3.3	1.9	14	sand/mud
12	3	90	3.5	4.125	2.4	1.4	6	soft mud
12	2	90	3.5	4.625	4.0	2.4	3	

From a practical perspective, using the BS spacing and elevation requirements would help to avoid potentially unnecessary costs for vessels that have already made investments in meeting the sweep modification regulations that are in place for the BS flatfish fishery. The spacing that was implemented in the BS reflects what was feasible given the net reel capacity of the larger BS flatfish vessels.

1.7.4.2.3 Effects on crab mortality using sweep modification for non-pelagic trawl vessels

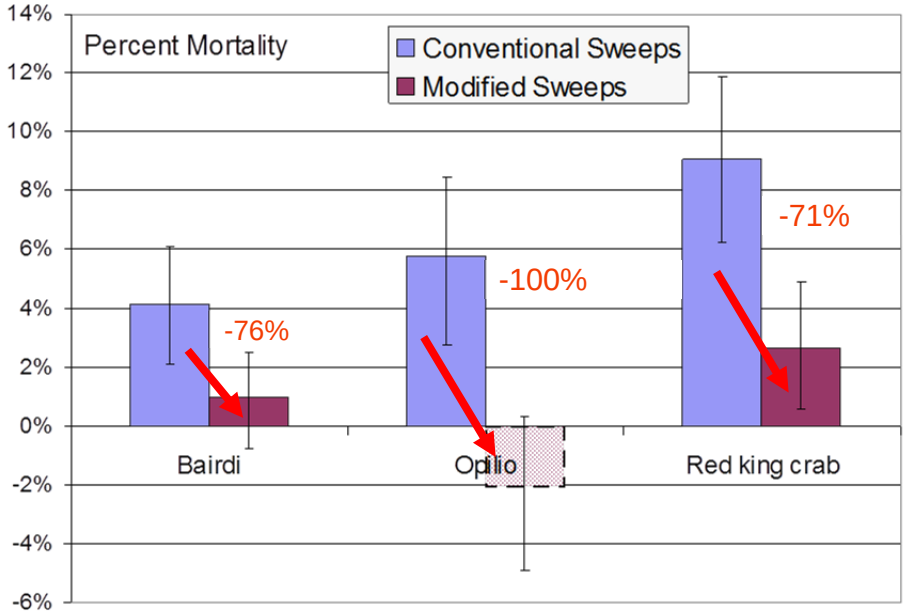
In the summer of 2008, researchers conducted a study in the Bering Sea, funded by the North Pacific Research Board, to estimate the mortality rates for snow and Tanner crabs that encounter non-pelagic trawls, but remain on the seafloor. That study estimated mortalities for both species for conventional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

Estimates of mortality for crabs encountering conventional sweeps were approximately 5 percent for both species Figure 1-8. Mortality rates dropped to nearly zero for crab encountering the modified sweeps. Significance levels for these decreases (conventional versus modified) were 0.002 for *Chionoecetes bairdi* and <0.001 for *C. opilio*. While overall crab mortality varied significantly by sex and size after gear effects had been accounted for, there were no significant interactions between these factors and gear effects. Thus, the mortality reduction due to the sweep modification persisted across sizes and sexes.

A similar study, also funded by the North Pacific Research Board, was conducted in summer of 2009 in Bristol Bay to estimate mortality rates for red king crab encountering non-pelagic trawls. Results indicate a similar trend in reduced mortality rates for king crab encountering the modified sweeps. The demonstrated reductions in mortality to crabs likely indicate that any mortality of other, smaller epibenthos (such as other crab, sea stars, or shrimp) would also be reduced.

Figure 1-8 Estimated mortalities of *Chionoecetes opilio, C. bairdi,* and red king crab after contact with conventional and modified sweeps

Rates have been adjusted for handling mortality based on mortality estimates from a control net. (Apparent negative mortality is a non-significant artifact of the control adjustment).



Overall, the trawl sweep modification has been tested to be effective in the Bering Sea flatfish trawl fishery in reducing trawl sweep impact effects on *C. bairdi, C. opilio*, and red king crabs by reducing the unobserved mortality of these species. Additionally, the trawl sweep modification has proven effective on the Bering Sea shelf at reducing effects on sea whips (a long-lived species of primary concern), and did not substantially reduce catches of target flatfish. Tests for reduced impacts on basketstars, sponges, and polychaete siphons were positive in direction, but non-significant.

The relevance of that study to crabs in the GOA depends largely on the similarities in sediment type in the Bering Sea and GOA, and between the non-pelagic trawl gear tested in the Bering Sea and those used in the GOA. The sediment in the Bering Sea where the flatfish fishery occurs consists mainly of sand, muddy sand, or gravelly muddy sand (NMFS 2009), and such was the sediment in the areas of the research study. Sediment in the GOA flatfish fisheries is variable, with similar sand and gravelly sand substrates, but also gravelly mud and silty clay areas.

The general similarity of GOA trawl gear to that used in the Bering Sea tests indicates that the results of those tests should approximate mortality rates in GOA fisheries. The smaller area swept by the sweeps in the GOA indicates that the benefits of sweep modifications would be somewhat smaller than those for Bering Sea fisheries, but still substantial.

1.8 Probable Environmental Impacts

This section analyzes two alternatives, the status quo and the proposed action alternative that would modify the trawl sweeps for trawlers fishing for flatfish in the Federal groundfish fishery in the Central GOA. Only those environmental components that occur in the Central GOA are likely to be affected by this proposed action. These components include crab species, especially *C. bairdi* crab, target and nontarget fish species, marine mammals and seabirds, bottom habitat, and ecosystem components. Section

1.8.1 addresses the impacts of the alternatives on *C. bairdi* crab. Section 1.8.2 looks at impacts on groundfish and incidental catch, and Section 1.8.3 describe the impacts on marine mammals and seabirds. Sections 1.8.4 and 1.8.5 address impacts on habitat and the ecosystem, respectively. The socio-economic impacts of this action are described in detail in the RIR and IRFA portions of this analysis.

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

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

For the most part, the discussion of past and present cumulative effects is addressed with the analysis of direct and indirect impacts for each resource component below. The cumulative impact of reasonable foreseeable future actions is addressed in Section 1.8.6.

Section 1.9 addresses the enforcement considerations of the proposed alternatives and options.

The criteria listed in Table 1-8 are used to evaluate the significance of impacts. If significant impacts are likely to occur, preparation of an Environmental Impact Statement (EIS) is required. Although economic and socioeconomic impacts must be evaluated, such impacts by themselves are not sufficient to require the preparation of an EIS (see 40 CFR 1508.14).

Table 1-8 Criteria used to evaluate the alternatives

Component	Criteria
Fish species	An effect is considered to be significant if it can be reasonably expected to jeopardize the sustainability of the species or species group.
Habitat	An effect is considered to be significant if it exceeds a threshold of more than minimal and not temporary disturbance to habitat.
Seabirds and marine mammals	An effect is considered to be significant if it can be reasonably expected to alter the population trend outside the range of natural variation.
Ecosystem	An effect is considered to be significant if it produces population-level impacts for marine species, or changes community- or ecosystem-level attributes beyond the range of natural variability for the ecosystem.

1.8.1 *C. bairdi* Tanner crab

A discussion of crab stock abundance and bycatch in the groundfish fisheries is addressed in Section 1.7.1. This section draws on this information to evaluate the effects of the alternatives.

The impact of status quo Tanner crab bycatch in the groundfish fisheries on Tanner crab stocks was analyzed in the Alaska Groundfish Fisheries Harvest Specifications EIS (NMFS 2007), and the Alaska Groundfish Fisheries Programmatic SEIS (NMFS 2004). Sections 1.7.1 and 1.7.3 describe that the Tanner crab population around Kodiak has been rebounding from lows in the mid-1990s, despite continued PSC in the groundfish fisheries throughout this period (Section 1.7.2). Since 2000/01, crab abundance has met the minimum population levels to support a commercial fishery. Overall abundance since that time has been variable, with peaks in 2001 and 2006-07 (Table 1-1). As described in Section 1.7.1, ADF&G conducts annual surveys of the crab stocks in the GOA (Spalinger 2010). The surveys are partial, and

concentrate on the historically most important areas of crab abundance. In 2009, the estimate of Tanner crab in the Kodiak District was approximately 84 million animals, lower than the 3 preceding years (Table 1-1). The estimated average Tanner crab PSC during 2003 through 2010 in the groundfish fisheries for the Central GOA was 142,963 animals. This represents approximately 0.17 percent of the surveyed abundance of the Kodiak District for 2009. Approximately two-thirds of the PSC is composed of sublegal males (Table 1-5). The Harvest Specifications EIS concludes that PSC of this magnitude is not considered to have an impact on stocks of Tanner crab in the GOA (NMFS 2007).

Section 1.7.4 discussed modification of the trawl sweep that might be used in the Central GOA flatfish fisheries to reduce unobserved crab mortality. The trawl sweep modification has proven to be effective in the BS flatfish fisheries at reducing unobserved mortality of crab from the trawl sweeps. It is also likely to provide protection to Tanner crab in the Central GOA flatfish fisheries. It is not possible to quantify a benefit to crab stocks in the Central GOA from modified trawl sweeps without further testing to understand how sediment conditions in the Central GOA flatfish fisheries compare to the areas in which BS experiments occurred. However, the general similarity of GOA trawl gear to that used in the BS indicates that while the benefits may be smaller, they would still be substantial. While requiring this modification for vessels fishing in the Central GOA flatfish fisheries could certainly provide benefit to crab stocks, by reducing unobserved mortality, it would not be likely to change reported PSC totals from trawl fishing, which account only for PSC that comes up in the trawl net.

1.8.2 Groundfish and incidental catch species

Fishing occurs in the Central GOA flatfish fishery primarily with nonpelagic trawl gear. All groundfish harvest during the Central GOA flatfish fisheries is counted toward the TAC for that species or species group. Groundfish stocks are assessed annually and are managed using conservative catch quotas. Incidental catch in the groundfish fisheries, including prohibited species (crab, halibut, herring, and salmon), is also monitored. Further information describing the groundfish fisheries affected by the proposed action can be found in Section 1.7.2.

The Groundfish PSEIS (NMFS 2004) and the Harvest Specifications Environmental Impact Statement (NMFS 2007) both conclude that the groundfish species targeted and caught incidentally during the Central GOA flatfish fisheries are currently at sustainable population levels and are unlikely to be overfished under the current management program. Prohibited species catch is not at levels that are likely to jeopardize the sustainability of these species. As a result, impacts on these species under the status quo alternative are not expected to be significant.

The effects of the proposed action on target and incidental groundfish species are limited to those effects that may occur on habitat that supports target species and their prey. All fishing done under the proposed alternative would be done within the annual harvest specifications and within the management measures currently applied to the target fisheries. Based on the research in the BS by the Alaska Fishery Science Center (AFSC) in conjunction with BSAI Amendment 94, which implemented elevated sweeps in the BS flatfish fisheries (NMFS 2009), the proposed action is not expected to have any net decrease in the target catch rates in the Central GOA flatfish fishery compared to that of status quo. The catch of target flatfish species with the modified gear was not significantly different than the catch of unmodified gear, when using 8-to 10-inch diameter disks. Based on maintaining the current harvest management and on the potential effects of the modified gear on benthic target species, the effects of the proposed action are insignificant for stock biomass, fishing mortality, temporal distribution, and change in prey availability.

1.8.3 Marine mammals and seabirds

Marine mammals occur in diverse habitats in the GOA, and include both resident and migratory species. Marine mammal species that occur in the GOA are in Table 1-9 (Allen and Angliss 2010 and NMFS 2007). The Groundfish PSEIS (NMFS 2004) provides descriptions of the range, habitat, and diet for these marine mammals. Annual stock assessments reports prepared by the National Marine Mammal Laboratory provide population estimates, population trends, and estimates of potential biological removals (Allen and Angliss 2010).

Direct and indirect interactions between marine mammals and the groundfish fisheries result from temporal and spatial overlap between commercial fishing activities and marine mammal occurrence. Direct interactions include injury and mortality due to entanglement in fishing gear and disturbance. Indirect interactions include overlap in the size and species of groundfish important both to the fisheries and to marine mammals as prey. The GOA groundfish fisheries are classified as Category III fisheries under the Marine Mammal Protection Act (2012 List of Fisheries (76 FR 73912, November 29, 2011)). Category III fisheries are unlikely to cause morality or serious injury to more than 1% of the marine mammal's potential biological removal level, calculated on an annual basis (50 CFR 229.2). Taking of marine mammals is monitored by the North Pacific observer program.

Marine mammals listed under the Endangered Species Act (ESA) that may be present in the GOA are listed in Table 1-9. All of these species are managed by NMFS, with the exception of Northern Sea Otter, which is managed by U.S. Fish and Wildlife Service. A Biological Opinion (BiOp), evaluating impacts of the groundfish fisheries on the endangered species managed by NMFS, was completed in November 2000 (NMFS 2000). The western population segment of Steller sea lions was the only ESA-listed species identified as likely to be jeopardized or to have adverse modification of designated critical habitat from the Alaska groundfish fisheries. A 2001 biological opinion on the Steller sea lion protection measures for the groundfish fisheries determined that the fisheries were not likely to result in jeopardy of extinction or adverse modification or destruction of critical habitat for Steller sea lions (NMFS 2001). Because of new information on Steller sea lions and potential fishery interactions, and new information on humpback and sperm whales, a new Section 7 consultation was initiated in 2006. The new Biological Opinion was implemented in January 2011. The effect of the new Biological Opinion is new protection measures that significantly restrict Pacific cod fishing in the Aleutian Islands. Specifically, these measures include prohibiting retention of Pacific cod in the Western Aleutian Islands and limiting the amount of Pacific cod that can be harvested in Eastern and Central Aleutian Islands by trawl and non-trawl gear, without reinitiating another Endangered Species Act consultation (NMFS, 2010).

NMFS also completed informal consultation on northern sea otters in 2006 and found that the Alaska fisheries were not likely to adversely affect northern sea otters (Mecum 2006). Critical habitat for sea otters has been designated and is located primarily in nearshore waters (74 FR 51988, October 8, 2009) and is not likely affected by Federal fisheries.

Table 1-9 Marine Mammal Stocks Occurring in Gulf of Alaska

NMFS Managed Species		
	Species	**Stocks**
Pinnipedia	Steller sea lion*	Western U.S (west of 144° W long.) and Eastern U.S. (east of 144° W long.)
	Northern fur seal**	Eastern Pacific
	Harbor seal	Southeast Alaska, Gulf of Alaska, Bering Sea
	Ribbon seal	Alaska
	Northern elephant seal	California
	Species	**Stocks**
Cetacea	Beluga Whale*	Cook Inlet
	Killer whale	Eastern North Pacific Northern Resident, Eastern North Pacific Alaska Resident, Eastern North Pacific GOA, Aleutian Islands, and Bering Sea transient, AT1 transient**, West Coast Transient
	Pacific White-sided dolphin	North Pacific
	Harbor porpoise	Southeast Alaska, Gulf of Alaska, and Bering Sea
	Dall's porpoise	Alaska
	Sperm whale*	North Pacific
	Baird's beaked whale	Alaska
	Cuvier's beaked whale	Alaska
	Stejneger's beaked whale	Alaska
	Gray whale	Eastern North Pacific
	Humpback whale*	Western North Pacific, Central North Pacific
	Fin whale*	Northeast Pacific
	Minke whale	Alaska
	North Pacific right whale*	North Pacific
	Blue whale*	North Pacific
	Sei whale*	North Pacific
USFWS Managed Species		
	Species	**Stock**
Mustelidae	Northern sea otter*	Southeast Alaska, Southcentral Alaska, Southwest Alaska

Source: Allen and Angliss 2010.

* ESA-listed species.

** Listed as depleted under the MMPA.

The impacts of the GOA groundfish fisheries on Steller sea lions were analyzed in the Programmatic SEIS (NMFS 2004) and in the EA/RIR of the BSAI groundfish FMP BiOp (NMFS 2010). Current management practices for GOA groundfish fisheries were found to have no adverse impacts on marine mammals, including Steller sea lions. As a result, the status quo alternative is not expected to have a significant impact on Steller sea lions or other marine mammals.

The proposed action would institute modification of trawl sweeps in the Central GOA flatfish fisheries. In general, the timing and general location of effort in the Central GOA flatfish fisheries is unlikely to change as a result of the trawl sweep modification. There would be no changes to the harvest specifications process or management of the fisheries relevant to Steller sea lion protection measures. Annual mortality of Steller sea lions is not expected to change under the proposed action, because fishing effort will remain similar to status quo. The proposed action is not likely to change fishery activities in a way that would affect the potential for competition for prey, disturbance, or incidental takes of marine mammals. Thus, this action would not be expected to have any effects on marine mammals beyond those already analyzed for the GOA groundfish fisheries in previous biological opinions and environmental impact statements (NMFS 2001, NMFS 2007, and NMFS 2010).

Seabirds

Various species of seabirds occur in the GOA, including resident species, migratory species that nest in Alaska, and migratory species that occur in Alaska only outside of the breeding season. A list of species is provided below[3]. The Groundfish PSEIS (NMFS 2004) provides descriptions of the range, habitat, diet, abundance, and population status for these seabirds.

Species nesting in Alaska

Tubenoses-Albatrosses and relatives: Northern Fulmar, Fork-tailed Storm-petrel, Leach's Storm-petrel
Kittiwakes and terns: Black-legged Kittiwake, Red-legged Kittiwake, Arctic Tern, Aleutian Tern
Pelicans and cormorants: Double-crested Cormorant, Brandt's Cormorant, Pelagic Cormorant, Red-faced Cormorant
Jaegers and gulls: Pomarine Jaeger, Parasitic Jaeger, Bonaparte's Gull, Mew Gull, Herring Gull, Glaucous-winged Gull, Glaucous Gull, Sabine's Gull
Auks: Common Murre, Thick-billed Murre, Black Guillemot, Pigeon Guillemot, Marbled Murrelet, Kittlitz's Murrelet, Ancient Murrelet, Cassin's Auklet, Parakeet Auklet, Least Auklet, Wiskered Auklet, Crested Auklet, Rhinoceros Auklet, Tufted Puffin, Horned Puffin

Species that visit Alaska waters

Tubenoses: Short-tailed Albatross, Black-footed Albatross, Laysan Albatross, Sooty Shearwater, Short-tailed Shearwater
Gulls: Ross's Gull, Ivory Gull

Several species of conservation concern occur in the GOA as well (Table 1-10). Short-tailed albatrosses are listed as endangered under the ESA, while Kittlitz's Murrelet is a candidate species for listing under the ESA, and the U.S. Fish and Wildlife Service (FWS) is currently working on a 12-month finding for black-footed albatrosses.

Table 1-10 ESA-listed and candidate seabird species that occur in the GOA

Common Name	Scientific Name	ESA Status
Short-tailed Albatross	*Phoebaotria albatrus*	Endangered
Steller's Eider	*Polysticta stelleri*	Threatened
Kittlitz's Murrelet	*Brachyramphus brevirostris*	Candidate
Black-footed Albatross	*Phoebastria nigripes*	FWS working on 12 month finding

FWS has primary responsibility for managing seabirds, and has evaluated effects of the BSAI and GOA FMPs and the harvest specifications process on currently listed species in two Biological Opinions (USFWS 2003a and 2003b). Both Biological Opinions concluded that the groundfish fisheries, including the GOA Pacific cod fishery, are unlikely to jeopardize populations of listed species or adversely modify or destroy critical habitat for listed species.

The groundfish fisheries have direct and indirect impacts on seabirds. Seabird take is the primary direct effect of fishing operations. Seabirds are taken in the hook-and-line fisheries in two ways. While hooks are being set, seabirds attracted to bait may become entangled in fishing lines. Seabirds are also caught directly on baited hooks. Seabirds are taken in the trawl fisheries when they are attracted by offal or discarded fish and become entangled in fishing gear. Indirect effects include impacts to food sources. The groundfish fisheries may reduce the biomass of prey species available to seabird populations.

[3] Source: (USFWS web site "Seabirds. Species in Alaska. Accessed at http://alaska.fws.gov/mbsp/mbm/seabirds/species.htm on August 31, 2007).

Fishing gear may also disturb benthic habitat used by seabirds that forage on the seafloor and reduce available prey. Fishing activities may also create feeding opportunities for seabirds, for example when catcher processors discard offal.

Hook-and-line gear accounts for up to 85% of seabird bycatch in the BSAI and GOA groundfish fisheries combined (NMFS 2011). In the GOA, Northern Fulmars comprised the majority of the bycatch by trawl vessels during 2007 through 2010. Pelagic and nonpelagic trawl bycatch consisted of 91 Northern Fulmars in 2007, 39 in 2008, and 122 in 2010. There was not bycatch of seabirds in 2009 for trawl gear. Overall, the average annual take by trawl vessels in the GOA from 2007 through 2010 was 63 Northern Fulmars (NMFS 2011).

The Groundfish PSEIS (NMFS 2004) concluded that the current groundfish fisheries are not adversely impacting ESA-listed seabird species. Biological Opinions by the USFWS (2003a and 2003b) concluded that the groundfish fisheries are unlikely to jeopardize populations of listed species or adversely modify or destroy critical habitat for listed species. Based on current estimates of seabird bycatch, the status quo alternative is not likely to have a significant impact on seabird populations.

The proposed action would institute modified trawl sweeps in the Central GOA flatfish fisheries to reduce unobserved crab mortality. In general, the timing and general location of effort in the flatfish fisheries is unlikely to change as a result of the trawl sweep modification. The hook and line sector is responsible for the majority of seabird take in the GOA, and this sector is not impacted by the proposed trawl sweep modification. Thus, this action would not be expected to have any effects on seabird bycatch beyond those already analyzed for the GOA groundfish fisheries in previous biological opinions and environmental impact statements (USFWS 2003a,b; NMFS 2007).

1.8.4 Habitat

The issues of primary concern with respect to the effects of fishing on benthic habitat are the potential for damage or removal of fragile biota within each area that are used by fish as habitat and the potential reduction of habitat complexity, benthic biodiversity, and habitat suitability. Habitat complexity is a function of the structural components of the living and nonliving substrate and could be affected by a potential reduction in benthic diversity from long-lasting changes to the species mix. Many factors contribute to the intensity of these effects, including the type of gear used, the type of bottom, the frequency and intensity of natural disturbance cycles, history of fishing in an area and recovery rates of habitat features. This process is presented in more detail in Section 3.2 of the HAPC EA (NMFS 2006) as well as Section 3.4.3 of the EFH EIS (NMFS 2005). A specific description of the effects of nonpelagic trawl on habit is in Section 3.2.1 of the HAPC EA and is adopted here by reference.

Based on the information available to date, the predominant direct effects caused by nonpelagic trawling include smoothing of sediments, moving and turning of rocks and boulders, resuspension and mixing of sediments, removal of seagrasses, damage to corals, and damage or removal of epibenthic organisms (Auster et. Al. 1996; Heifetz 1997; Hutchings 1990; ICES 1973; Lindeboom and de Groot 1998; McConnaughey et. Al. 2000). Trawl gear affect the seafloor through contact of the doors and sweeps, footropes and footrope gear, and the net sweeping along the seafloor (Goudey Loverich 1987). Trawl doors leave furrows in the sediments that vary in depth and width depending on the shoe size, door weight, and seabed composition. The footropes and net can disrupt benthic biota and dislodge rocks. Larger seafloor features or biota are more vulnerable to fishing contact, and larger diameter, lighter footropes may reduce damage to some epifauna (Moran and Stephenson 2000).

The GOA has a variety of seabed types such as gravely sand, silty mud, and muddy to sandy gravel, as well as areas of hardrock (Hampton et al. 1986). Investigations of the northeast GOA shelf (less than

200 meters [m]) have been conducted between Cape Cleare (148º W) and Cape Fairweather (138º W) (Feder and Jewett 1987). The shelf in this portion of the GOA is relatively wide (up to 100 km). The dominant shelf sediment is clay silt that comes primarily from either the Copper River or the Bering and Malaspina glaciers. When the sediments enter the GOA, they are generally transported to the west. Sand predominates nearshore, especially near the Copper River and the Malaspina Glacier. Most of the western GOA shelf (west of Cape Igvak) consists of slopes characterized by marked dissection and steepness. The shelf consists of many banks and reefs with numerous coarse, clastic, or rocky bottoms, as well as patchy bottom sediments. In contrast, the shelf near Kodiak Island consists of flat relatively shallow banks cut by transverse troughs. The substrate in the area from Near Strait and close to Buldir Island, Amchitka, and Amukta Passes is mainly bedrock outcrops and coarsely fragmented sediment interspersed with sand bottoms.

The effects of the GOA groundfish fisheries on benthic habitat and EFH were analyzed in the EFH EIS (NMFS 2005). Current protection measures provide minimal long-term impacts on benthic habitat and essential fish habitat. These effects are likely to continue under Alternative 1, and are not considered to be significant.

The proposed trawl sweep modification may have beneficial effects on the amount of biological structure in the GOA compared to the status quo, due to the reduction in the amount of contact of the trawl sweeps to the sea bed. These structures can be protected by relatively small increases in clearance between the gear and the seafloor, such as proposed under the trawl sweep modification. As noted in BSAI Amendment 94 (NMFS 2009) analysis, the trawl sweep modification resulted in a decrease of the trawl sweeps contact with the seabed by about 90%, and was effective in reducing trawl sweep impact effects on sea whips, with indications of reduced impacts to basketstars, sponges, and polychaetes. Based on the results in the BS from modified trawl sweeps, adoption of the trawl sweeps in the Central GOA flatfish fisheries is expected to decrease mortality or damage to living habitat species. Test results from BS modified trawl sweeps also indicated that the proposed action would provide no further decreases to non-living species' habitat complexity and would likely provide some benefit to non-living substrates, depending on the substrate and the intensity of fishing. The trawl sweep modification would reduce damage to several components of community structure, including living structure animals and other, smaller epibenthos (such as other crab, sea stars, or shrimp). This reduction in damage would likely be a positive effect compared to status quo.

Finally, the modified trawl sweep tests in the BS indicate that the proposed action would provide no further decreases to habitat suitability and may provide some benefit to habitats, particularly substrates, thus overall habitat suitability may benefit over time. The current level of knowledge allows only broad connections to be drawn between effects on habitat features and the life history processes of some managed species. While the trawl sweep modification proposed should reduce effects on habitat features, because the current level of effects is rated insignificant for habitat suitability, any decrease in effect is also insignificant.

1.8.5 Ecosystem

Ecosystems consist of communities of organisms interacting with their physical environment. Within marine ecosystems, competition, predation, and environmental disturbance cause natural variation in recruitment, survivorship, and growth of fish stocks. Human activities, including commercial fishing, also influence the structure and function of marine ecosystem. Fishing may change predator-prey relationships and community structures, introduce foreign species, affect trophic diversity, alter genetic diversity and habitat, and damage benthic habitats.

The GOA groundfish fisheries potentially impact the GOA ecosystem by relieving predation pressure on shared prey species (i.e., species which are prey for both groundfish and other species), reducing prey available for groundfish predators, altering habitat, imposing bycatch mortality, or by "ghost fishing" caused by lost fishing gear.

An evaluation of the effects of the GOA groundfish fisheries on the ecosystem is conducted annually in the Ecosystem Assessment section of the Stock Assessment and Fishery Evaluation report (NPFMC 2010a) and the Harvest Specifications SAFE report (NPFMC 2010b). These analyses conclude that the current GOA groundfish fisheries do not produce population-level impacts to marine species or change ecosystem-level attributes beyond the range of natural variation. Consequently, the status quo alternative is not expected to have a significant impact on the GOA ecosystem. Trawl sweep modification will result in the same level of groundfish harvest as status quo, so the proposed action is not likely to have a significant impact on the GOA ecosystem.

1.8.6 Cumulative effects

Analysis of the potential cumulative effects of a proposed action and its alternatives is a requirement of NEPA. Cumulative effects result from the incremental impact of the proposed action in addition to past, present, and reasonably foreseeable future actions. The Alaska Groundfish Fisheries PSEIS (NMFS 2004) assesses the potential direct and indirect effects of groundfish FMP policy alternatives in combination with other factors that affect physical, biological, and socioeconomic components of the BSAI and GOA environment.

Beyond the cumulative impacts analysis document in the Groundfish PSEIS, no additional past, present, or reasonably future negative impacts on the natural and physical environment (including fish stocks, essential fish habitat, ESA-listed species, marine mammals, seabirds, or marine ecosystems), fishing communities, fishing safety, or consumers have been identified that would occur as a result of the proposed action. The proposed action, in combination with other actions, may have additional economic effects on sectors participating in the Central GOA flatfish fisheries. In recent years, several regulatory changes implemented to protect Steller sea lions have had economic effects on participants in the GOA groundfish fisheries. Several recent or reasonably foreseeable future actions, are expected to have additional social and economic effects on participants in the GOA groundfish fisheries. These future actions include GOA and BSAI trawl LLP recency, GOA Pacific cod sector allocations, GOA halibut PSC limits, and GOA *C. bairdi* area closures. Economic impacts of this proposed action are discussed further in Section 2.

1.9 Enforcement

The intent of the proposed action is to ensure clearance of the sweep off the seafloor to reduce unobserved mortality of Tanner crab. However, the clearance must be able to be easily checked for compliance by both vessel operators and enforcement personnel. The regulations for the Central GOA flatfish fishery will likely be based on the regulations generated from the BS trawl sweep modification (Amendment 94). During the development of Amendment 94 regulations for the modified trawl sweeps in the BS, NMFS, North Pacific Groundfish Observer Program (NPGOP), U.S. Coast Guard (USCG), NOAA Office for Law Enforcement (OLE) and General Council Enforcement, and the industry worked collaboratively to provide a regulation with sufficient flexibility to allow the use of gear modifications on diverse vessel and gear type configurations that are currently employed in the BS flatfish fishery, while still ensuring the intent of action is met and can be verified.

From an enforcement perspective, it was resolved that the intent of the BS flatfish action would be best met by regulating the clearance standard and spacing requirements, and that by leaving the other details

out of the regulation, the fleet would have more flexibility to individualize the gear as appropriate to their vessel and gear type configurations. It is likely the same approach could be utilized in developing the regulations for the proposed trawl sweep modification for the Central GOA flatfish fishery. Fishers will be responsible to ensure their sweeps meet the standards, and compliance with the standards may be randomly checked by several methods. Agency enforcement activities will focus on ensuring compliance with the regulation that prohibits targeting flatfish without using a modified trawl gear in the Central GOA subarea. An at-sea observer may observe the deployment or retrieval of the net to determine the presence or absence of the modified gear. The OLE would be notified if the modified gear may not meet the standard or if no modified gear is detected. OLE may follow-up with a more intensive dockside inspection. The USCG may conduct at-sea inspections to determine if a modified sweep is present or absent. The details of the types of inspections, the design and use of various devices such as "wear indicators" on the bobbins to enable visual detection of worn or inadequate modified trawl gear, and the actual procedures to be used by the vessels and the monitoring bodies in undertaking an inspection of modified trawl gear will be developed prior to implementation of the gear modification requirement, likely copying procedures in place in the BS.

In implementing Amendment 94 in the BS, enforcement personnel agreed that boarding a vessel at sea and inspecting the gear for compliance with the regulatory requirements is feasible and likely to be successful for larger trawl vessels. For smaller trawl catcher vessels, an ancillary device may be necessary to allow for an accurate measurement of spacing between the bobbins, such as the use of a pre-determined length of string that can be attached to the bobbin, and run alongside the sweep as the gear is hauled up to measure the spacing to the next bobbin. Alternatively, enforcement of bobbin spacing may occur while the vessel is dockside, and the gear be stretched out. As for the elevating devices, they are easy to see and measure while the sweeps are being set or hauled back, and worn devices should be easy to replace. Onboard observers should also be able to see and note gross violations, such as the vessel not using the modified gear for flatfish fishing.

2 Regulatory Impact Review and Probable Economic and Socioeconomic Impacts

This Regulatory Impact Review (RIR) evaluates the costs and benefits of two alternatives that evaluate a proposed gear modification to require nonpelagic trawl vessels targeting flatfish in the Central GOA to use elevating devices on trawl sweeps to raise them off the seafloor. The action follows from GOA Amendment 89, area closures for GOA Tanner crab.

2.1 What is a Regulatory Impact Review

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

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

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

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

2.2 Purpose and Need

The purpose of this action is to reduce unobserved crab mortality in the Central Gulf of Alaska from the potential adverse effects of nonpelagic trawl gear used for flatfish fishing. This would be achieved by modifying nonpelagic trawl gear used for flatfish fishing by raising the majority of the gear off the sea bottom. Studies in the Bering Sea (BS) have shown that elevating the trawl sweep can reduce trawl sweep impacts effects on *C. bairdi*, *C. opilio* and red king crabs by reducing the unobserved mortality of these species. In addition, elevating the trawl sweep can reduce impacts on benthic organisms, such as basketstars and sea whips. The Council initiated this action in conjunction with final action on the GOA Tanner crab bycatch measures, which created area closures around Kodiak to protect Tanner crab (GOA Amendment 89). Further research was needed in the GOA in order to identify the appropriate specifications for the modification in order to meet the Council's desired performance standard, and

implementation issues needed to be resolved. Field testing of the modification has now been completed, demonstrating that the modification is workable in the Central GOA flatfish fishery.

2.3 Problem Statement

Provided is a draft problem statement for this analysis, adapted from the GOA Tanner crab bycatch analysis (NPFMC 2010a):

> *Tanner crab is a prohibited species in the Gulf of Alaska groundfish fisheries. Directed fisheries for Tanner crab in the Gulf of Alaska are fully allocated under the current limited entry system. The Council recently recommended conservation measures in the Gulf of Alaska to address adverse interactions with Tanner crab by trawl and fixed gear sectors targeting groundfish. Elevated trawl sweeps could provide further conservation in reducing unobserved crab mortality in the Gulf of Alaska. Research has shown that sweep modifications can reduce unobserved crab mortality while maintaining flatfish catch rates.*

2.4 Description of the Alternatives

The alternatives evaluated in this analysis were adopted by the Council in February 2011.

Alternative 1: Status quo

Alternative 2: Require trawl vessels targeting flatfish in the Central Gulf of Alaska with non-pelagic trawl gear to use elevating devices on trawl sweeps to raise them off the seafloor.

Elevating devices combined with proper spacing raises the trawl sweep off of the seafloor to reduce unobserved crab mortality and reduce damage to bottom habitat. The proposed action would be to combine a gear and performance standard to raise the elevated section of the sweep at least 2.5 inches. To achieve this performance standard, elevating devices would be required along the entire length of the elevated section of the sweep spaced no less than 30 feet apart. To allow for some flexibility around the performance standard and to allow for wear and tear that might occur during a tow, there would be two different sweep configurations to choose from that specify the maximum spacing of elevating devices. The first configuration uses elevating devices that have a minimum clearance height of 3.5 inches or less with a required spacing between the elevating devices of no more than 65 feet apart. The second configuration uses elevating devices that have a minimum clearance height greater than 3.5 inches need to space these elevating devices no more than 95 feet apart. Either configuration combined with the minimum spacing of elevated devices no less than 30 feet would meet the combined gear and performance standard for the use of elevating devices on trawl sweeps while targeting Central GOA flatfish.

2.5 History of this Action

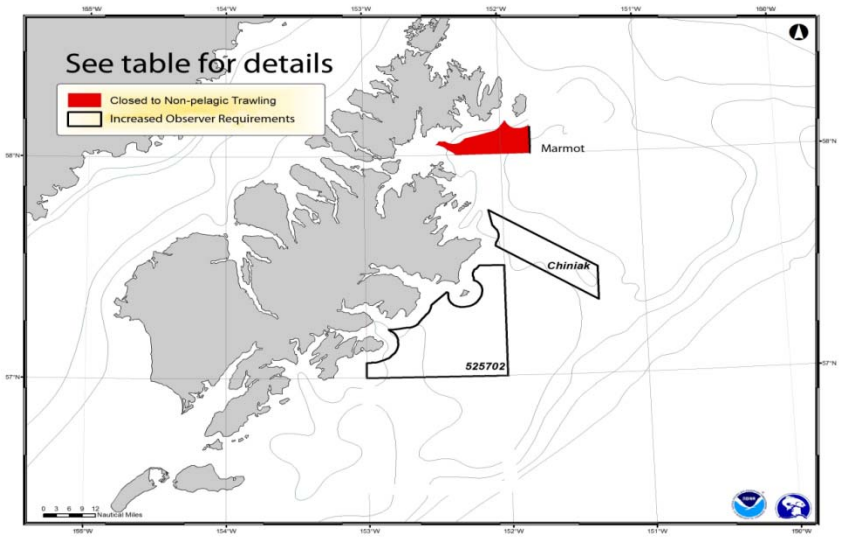
In October 2010, the Council initiated a trailing amendment to require trawl sweep modifications on nonpelagic trawl vessels fishing in the Central GOA (e.g., flatfish, Pacific cod, pollock, and rockfish fisheries). The action was initiated in conjunction with final action on the GOA Tanner crab area closures (NPFMC, 2010a), which analyzed requiring the trawl sweep modification in the proposed area closures. A similar gear modification, which requires elevating devices to be placed on the trawl sweeps to lift the sweep off the seafloor, was implemented beginning in 2011 for flatfish vessels in the Bering Sea (BSAI Amendment 94, NMFS 2009). BS research has demonstrated that elevated sweeps can reduce unobserved

mortality of crab from interacting with the trawl sweeps. However, unlike the BS modification, which is limited to flatfish fisheries, the proposed Central GOA trawl sweep modification would have applied to all nonpelagic fisheries. The Council reconsidered the scope of the proposed amendment following a brief discussion paper presented at the February 2011 meeting. The paper focused on the practicality of trawl sweep modification for different GOA nonpelagic trawl fisheries, the effectiveness of the modification at reducing prohibited species catch of crab in the GOA nonpelagic trawl fisheries, and a tentative outline of the proposed steps for verifying sweep elevation on GOA vessels by Dr. Craig Rose, an Alaska Fisheries Science Center researcher. After reviewing the discussion paper and taking public comment on the issue, the Council narrowed the proposed sweep modification action to flatfish fisheries in the Central GOA.

2.6 Summary of GOA Tanner crab bycatch reduction amendment

Amendment 89 includes three area closures around Kodiak, to reduce PSC of Tanner crab in the GOA groundfish fisheries. These areas included Marmot Bay, Chiniak Gully, and Alaska Department of Fish and Game (ADF&G) statistical area 525702 (see Figure 2-1). The Council recommended Marmot Bay be permanently closed to fishing with trawl gear, except for those vessels using pelagic trawl gear to fish for pollock. The remaining two areas are closed to all vessels using nonpelagic trawl gear unless they have 100% observer coverage. For pot vessels, they are required to have 30% observer coverage in order to fish in any of the three identified closure areas. Finally, as noted above, the Council also initiated a trailing amendment to implement trawl sweep modifications for nonpelagic trawl vessels fishing in the Central GOA.

Figure 2-1 Amendment 89 area closures around Kodiak Island



	Trawl	Pot
Marmot Bay	Closed (vessels using pelagic trawl gear to fish for pollock are exempt)	Closed to pot gear unless 30% observer coverage
Chiniak Gully	Closed to nonpelagic trawl gear unless 100% observer coverage	
ADFG statistical area 525702		

2.7 Description of the Central GOA Flatfish Fisheries

2.7.1 Central Gulf of Alaska Flatfish Trawl Fisheries

The "flatfish" species complex previous to 1990 was managed as a group in the GOA and included the major flatfish species inhabiting the region with the exception of Pacific halibut. The Council divided the flatfish complex into three categories (deep-water flatfish, shallow-water flatfish, and arrowtooth flounder) in 1990 due to significant differences in halibut bycatch rates, biomass and commercial value in directed fisheries for shallow and deep-water flatfish. Flathead sole was separated out from the deep-water flatfish complex in 1991 due to its distributional overlap between both shallow and deep-water groups. In 1993, rex sole was separated from the deep-water flatfish complex due to concerns regarding Pacific Ocean Perch (POP) bycatch.

Shallow-water flatfish complex is comprised of eight flatfish species, which are generally harvested with trawl gear. Northern rock sole, southern rock sole, butter sole and yellowfin sole account for the majority of the current biomass of shallow-water flatfish, with rock sole being the predominate target species in the complex. Since 1988, the majority of shallow-water flatfish harvest has occurred on the continental shelf and on the slope east of Kodiak Island in the Central GOA.

Deep-water flatfish complex is comprised of three flatfish species. These species include Greenland turbot, Dover sole, and deep-sea sole. Dover sole constitutes the majority of the survey biomass and deep-water flatfish catch (generally over 98%). In recent years, Dover sole have been taken primarily in the Central GOA, as well on the continental slope off Yakutat Bay in the Eastern GOA. Fishing seasons are driven by seasonal halibut PSC apportionments, with fishing occurring primarily in April and May because of higher catch rates and better prices. In addition to directed fishing, deep-water flatfish are also caught in pursuit of other bottom-dwelling species as bycatch. They are taken as bycatch in Pacific cod, bottom pollock, and other flatfish fisheries. Annual catches of deep-water flatfish have been well below the TACs in recent years.

GOA rex sole are caught in a directed fishery and in fisheries targeting other bottom-dwelling species such as Pacific Ocean perch, Pacific cod, and bottom pollock. Fishing seasons are driven by seasonal halibut PSC apportionments, with approximately 7 months of fishing occurring between January and November. Catches of rex sole occur primarily in the Western and Central GOA.

GOA flathead sole are also caught in a directed fishery using non-pelagic trawl gear. Typically 25 or fewer catcher vessels participate in this fishery, as do 5 catcher processor vessels. Fishing seasons for flathead sole are also driven by seasonal halibut PSC apportionments, with approximately 7 months of fishing occurring between January and November. Based on observer data, the majority of the flathead sole catch in the GOA is taken in the Shelikof Strait and on the Albatross Bank near Kodiak Island, as well as near Unimak Island. Most of the catch is harvested in the first and second quarters of the year. In addition to directed fishing, flathead sole are also caught in the pursuit of other species as bycatch, which include the Pacific cod, bottom pollock, and other flatfish fisheries.

Although in the past, arrowtooth flounder was of little value, catch as a directed fishery has increased in recent years. In the GOA, arrowtooth flounder is exclusively prosecuted by catcher vessels and catcher processors using non-pelagic trawl gear. Catcher processors take arrowtooth flounder predominately in arrowtooth flounder target, followed by rex sole, flathead sole, and small amounts in the rockfish target. Catcher vessels take the majority of their arrowtooth flounder in the arrowtooth flounder target followed by pollock, shallow-water flatfish, rockfish, and Pacific cod.

All flatfish species under the GOA groundfish FMP are regulated through permits, limited entry, catch quota (TACs), seasons, in-season adjustments, gear restrictions, closed waters, requirements and observer monitoring. GOA flatfish species or complexes are managed with area-specific ABC and TAC apportionments to avoid the potential for localized depletions.

Provided below are tables showing annual flatfish catch by species in the Central GOA and total GOA flatfish catch and groundfish for the trawl catcher vessels (Table 2-1) and trawl catcher processors (Table 2-2) from 2003 through 2010.

Table 2-1 Total catch (mt) of Central GOA flatfish by target for catcher vessels using nonpelagic trawl gear, 2003 through 2010

Year	Shallow-water flats	Deep-water flats	Flathead sole	Arrowtooth flounder	Rex sole	GOA flatfish	Total groundfish
2003	5,189	489	1,497	*	*	8,094	121,896
2004	2,469	725	477	6,285	0	9,956	126,514
2005	5,633	*	*	7,792	0	13,690	128,554
2006	7,881	*	*	12,125	0	20,272	123,164
2007	9,898	0	157	11,282	0	21,337	122,058
2008	10,386	*	420	15,034	*	26,018	112,234
2009	11,285	*	337	13,961	*	26,131	94,357
2010	6,074	*	850	13,337	*	20,431	122,566

Source: ADF&G fish tickets. Data compiled by AKFIN, September 2011.
* Withheld for confidentiality

Table 2-2 Total catch (mt) of Central GOA flatfish by target for catcher processor using nonpelagic trawl gear, 2003 through 2010

Year	Shallow-water flats	Flathead sole	Arrowtooth flounder	Rex sole	GOA flatfish	Total groundfish
2003	*	*	3,427	2,565	7,930	44,888
2004	*	*	0	686	2,194	45,169
2005	*	*	1,518	1,100	4,278	46,139
2006	*	*	3,007	*	6,194	49,409
2007	0	*	2,054	*	5,378	52,500
2008	0	*	2,791	*	5,231	73,971
2009	*	*	*	4,008	5,721	73,331
2010	*	*	*	2,706	5,791	81,597

Source: Weekly Processor Reports. Data compiled by AKFIN, September 2011.

Note, there was no reported catch of deep-water flatfish

* Withheld for confidentiality

Table 2-3 depicts the proportion of GOA groundfish catch contributed by Central GOA flatfish catch. Overall, the proportion has ranged from a low of 5% to a high of 18% for the catcher processors and from a low of 7% to high of 28% for the catcher vessels.

Table 2-3 Proportion of Central GOA flatfish catch contributes towards total GOA groundfish catch

Year	Catcher Processor	Catcher Vessel
2003	18%	7%
2004	5%	8%
2005	9%	11%
2006	13%	16%
2007	10%	17%
2008	7%	23%
2009	8%	28%
2010	7%	17%

Source: CV data from ADF&G fish tickets and CP data from Weekly Processor Reports.

2.7.2 Prohibited species catch in the flatfish fisheries

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

2.7.2.1 Crab prohibited catch

In this section, a summary of Tanner crab PSC in the Federal groundfish fisheries by reporting area is provided. A more detailed explanation of Tanner crab PSC is provided in Section 3.3 of GOA Amendment 89. In Amendment 89, Section 3.3.1 describes the proportion of groundfish fishing effort which is observed in the Central GOA. The reported numbers of total PSC are extrapolated based on the rates of PSC on observed vessels. Section 3.3.2 of the Amendment 89 analysis provides information about the various studies of crab PSC mortality rates that have been conducted for various gear types.

Table 2-4 identifies *C. bairdi* Tanner crab PSC for 2003 through 2010 for nonpelagic trawl gear for Central GOA. Non-pelagic trawling is responsible for the majority of Tanner crab PSC in the Federal groundfish fisheries in the Central GOA, ranging from 53% to 97% from 2003 through 2010, and averaging 78% over the time period. Also included in the table is estimated Tanner crab mortality using trawl gear with an estimated 80% mortality rate for trawl gear.[4] Table 2-5 depicts the PSC of Tanner crab in proportion with overall groundfish catch for nonpelagic trawl gear. The average rate of Tanner crab PSC per metric ton of groundfish catch for 2003 through 2010 was 2.36 crab per metric ton of groundfish for the nonpelagic trawl fisheries. Looking at PSC mortality for nonpelagic trawl gear, the rate of crab mortality averages 1.89 crab per metric ton of groundfish for the nonpelagic trawl fisheries. It should be remembered when evaluating these PSC numbers that they are extrapolated to the fleet as a whole from PSC recorded on observed vessels, which account, on average, for about one third of groundfish catch in the Central GOA.

[4] Since this analysis proceeded from GOA Tanner crab closure and since the Council requested an 80% mortality rate be used in that analysis, this analysis uses the same 80% mortality rate for trawl gear.

Table 2-4 Tanner crab PSC in Central GOA for nonpelagic trawl in GOA Federal groundfish fisheries, 2003 through 2010

Year	Tanner crab PSC nonpelagic trawl		Total PSC all gears	Tanner crab mortality nonpelagic trawl
	Number of crab	% of total PSC		Number of crab
2003	135,380	0.96	141,150	108,304
2004	53,017	0.97	54,800	42,413
2005	91,906	0.78	118,353	73,525
2006	223,463	0.69	325,581	178,771
2007	197,150	0.71	277,734	157,720
2008	126,928	0.61	207,911	101,542
2009	226,099	0.96	236,576	180,879
2010	89,760	0.53	169,681	71,808
Average 2003 - 2010	142,963	0.78	191,473	114,370

Source: NMFS Catch Accounting System. Data compiled by AKFIN, July 2011. Excludes PSC attributed to the State Pacific cod fishery

Table 2-5 Rate of Tanner crab PSC and PSC mortality per metric ton of groundfish catch in Central GOA for nonpelagic trawl in Federal groundfish fisheries, 2003 through 2010

Year	Rate of Tanner crab PSC	PSC Mortality
2003	1.90	1.52
2004	0.97	0.78
2005	1.76	1.40
2006	4.78	3.83
2007	3.30	2.64
2008	1.73	1.38
2009	3.20	2.56
2010	1.21	0.97
Average 2003-2010	2.36	1.89

Source: NMFS Catch Accounting System. Data compiled by AKFIN, July 2011. Excludes PSC attributed to the State Pacific cod fishery

Table 2-6 provides PSC of Tanner crabs by target fishery in the Central GOA for those vessels using nonpelagic trawl from 2003 through 2010. The three target flatfish fisheries that contributed the highest number of Tanner crab during 2003 through 2010 were arrowtooth flounder, rex sole and shallow water flatfish. On average, the arrowtooth flounder fishery intercepts 33% of the Central GOA Tanner crab PSC using nonpelagic trawl gear, while rex sole and shallow-water flatfish fisheries intercepts 31% and 23%, respectively. Nonpelagic trawl vessels targeting pollock and Pacific cod also took Tanner crab PSC in some years, but on average account for less than 10% of the gear's total PSC.

Table 2-6 PSC of Tanner crabs in Central GOA for nonpelagic trawl by target fishery, 2003 through 2010

Target Fishery	2003	2004	2005	2006	2007	2008	2009	2010	Average 2003 through 2010
Arrowtooth Flounder	28,189	33,265	66,944	86,859	42,126	34,606	39,723	47,174	47,361
Flathead Sole	17,383	2,315	12,540	23,470	24	6,510	7,647	5,504	9,424
Other Species	20	0	189	0	0	5	1	0	27
Pacific Cod	1,532	894	270	532	11,922	14,439	1,456	837	3,985
Pollock - bottom	0	555	0	7,744	19,346	235	6,579	75	4,317
Rex Sole	29,467	5,888	4,398	70,913	44,797	47,993	140,311	14,235	44,750
Rockfish	171	1,517	1,620	830	71	62	205	100	572
Shallow Water Flatfish	58,618	8,583	5,946	33,115	78,697	22,903	30,087	21,780	32,466

Source: NMFS Catch Accounting System. Data compiled by AKFIN, July 2011. Excludes PSC attributed to the State Pacific cod fishery

2.7.2.2 Pacific halibut prohibited catch

Halibut PSC limits in the GOA trawl fishery are divided into deep-water and shallow-water complexes that are made available to the fleet during five seasons throughout the year (

Table 2-7). Based on this distribution of halibut PSC and the scheduling of target fisheries openings, fishermen must determine when and where to utilize the halibut PSC in various target fisheries. These individual decisions are often based on generating the greatest return from fishing effort given the available target fisheries and halibut PSC. A variety of factors influence the return that may be realized from fisheries and halibut PSC usage. Local processing markets vary for the different species. Timing of fish aggregations may affect choices of when to prosecute those fisheries, as increased aggregation typically result in cost savings from increased catch per unit of effort and from the decrease in halibut PSC.

In considering the overall fishing activity relative to halibut PSC, it is useful to examine halibut PSC usage seasonally. In general, most of the halibut PSC usage in the first season is utilized in the Pacific cod fishery, with slightly less used in the deep-water and shallow-water flatfish fisheries. In the second halibut PSC season, halibut is used almost exclusively in the flatfish fisheries. Small amounts of deep-water complex halibut PSC are also used in the limited access rockfish target fishery in the Central GOA. In the third season, halibut PSC usage in the deep-water complex is primarily by rockfish program. In the shallow-water complex, halibut PSC usage is almost exclusively in the shallow-water flatfish fisheries (which are almost exclusively in the Central GOA). In the fourth season, flatfish fisheries in both complexes use halibut PSC, but substantially less than the cod fishery. Fifth season halibut PSC usage is dominated by deep-water and shallow-water flatfish.

Table 2-7 Final 2011 and 2012 apportionment of Pacific halibut PSC trawl limits between the trawl gear deep-water species complex and the shallow-water species complex (values are in metric tons)

Season	Shallow-water	Deep-water[1]	Total
January 20 - April 1	450	100	550
April 1 - July 1	100	300	400
July 1 - September 1	200	400	600
September 1 - October 1	150	Any remainder	150
Subtotal January 20 - October 1	900	800	1,700
October 1 - December 31[2]			300
Total			2,000

[1] Vessels participating in cooperatives in the Central GOA Rockfish Program will receive a portion of the third season (July 1 - September 1) deep-water category halibut PSC apportionment. This amount is not currently known but will be posted later on the Alaska Region web site (http://alaskafisheries.noaa.gov) when it becomes available.

[2] There is no apportionment between shallow-water and deep-water trawl fishery categories during the fifth season (October 1 - December 31).

2.8 Participants in the Flatfish Fisheries

2.8.1 Participants by sector

GOA nonpelagic groundfish vessels participate in various targets including flatfish, Pacific cod, pollock[5], and rockfish in both Central and Western GOA.

[5] Note, while the majority of vessels participating in the GOA pollock fishery use pelagic gear, there are small number of vessels that use non-pelagic gear (generally due to size or horsepower constraints of the vessels).

Table 2-8 identifies the number of vessels fishing in the Central GOA flatfish fisheries from 2003 through 2010. As shown in the table, the flatfish fisheries are prosecuted by catcher processors and catcher vessels using nonpelagic trawl gear. For catcher processors, the number of vessels targeting flatfish in the Central GOA has ranged from a low of 10 in 2010 to a high of 12 during the 2003 through 2008 seasons. Flatfish fisheries with the largest number of catcher processors were the rex sole and arrowtooth flounder fisheries. As for the trawl catcher vessels, the number of vessels targeting Central GOA flatfish has ranged from a low of 40 in 2009 to a high of 48 in 2003. The largest number of trawl catcher vessels participated in the shallow-water flatfish and arrowtooth flounder fisheries.

Table 2-8 Vessel count for catcher vessels and catcher processors targeting Central GOA flatfish, 2003 through 2010

Year	Shallow-water flats		Deep-water flats		Flathead sole		Arrowtooth flounder		Rex sole		Central GOA flatfish	
	CV	CP	CV	CP	CV	CP	CV	CP	CV	CP	CV	CP
2003	27	1	9	0	15	2	6	11	1	7	48	12
2004	23	1	7	0	11	1	22	0	0	4	46	12
2005	24	1	3	0	4	1	24	4	0	5	43	12
2006	27	2	1	0	7	1	27	7	0	3	43	12
2007	27	0	0	0	5	1	26	7	0	3	44	12
2008	30	0	1	0	6	3	31	5	2	3	43	12
2009	30	2	1	0	5	1	28	2	5	6	40	11
2010	24	1	1	0	11	2	25	2	1	5	41	10

Source: CV data from ADF&G fish tickets and CP data from Weekly Processor Reports.
Data compiled by AKFIN, September 2011.

2.8.2 Dependency of participants on flatfish fisheries

Table 2-9 and Table 2-10 provide the estimated value of Central GOA flatfish harvests by target species and the total groundfish revenue for nonpelagic catcher processors and catcher vessels. Of the Central GOA flatfish species, the shallow-water flatfish and arrowtooth flounder provide the largest proportion of total groundfish revenue for the trawl catcher vessels and the rex sole and arrowtooth flounder fisheries provide the largest proportion of total groundfish revenue for the trawl catcher processors.

Table 2-9 Exvessel revenue of Central GOA flatfish by target for catcher vessels using nonpelagic trawl gear, 2003 through 2010

Year	Shallow-water flats	Deep-water flats	Flathead sole	Arrowtooth flounder	Rex sole	Total groundfish
2003	$1,525,183	$203,981	*	$121,615	*	$40,665,222
2004	$694,949	$283,700	$120,552	$1,022,122	$0	$38,936,080
2005	$2,282,933	*	*	$1,281,554	$0	$45,038,950
2006	$3,608,324	*	*	$2,615,322	$0	$47,832,378
2007	$5,329,239	$0	$67,572	$2,744,680	$0	$50,353,006
2008	$5,873,481	*	$153,418	$3,678,324	*	$60,168,804
2009	$4,230,087	*	*	$2,831,390	$262,209	$37,697,525
2010	$2,248,279	*	$285,704	$3,203,743	*	$49,196,808

Source: ADF&G fish tickets. Data compiled by AKFIN, September 2011.
* Withheld for confidentiality

Table 2-10 First wholesale revenue of Central GOA flatfish by target for catcher processors using nonpelagic trawl gear, 2003 through 2010

Year	Shallow-water flats	Flathead sole	Arrowtooth flounder	Rex sole	Total groundfish
2003	*	*	$3,628,355	$5,026,857	$64,192,572
2004	*	*	$0	$1,483,145	$75,276,754
2005	*	*	$2,694,071	$2,665,260	$83,483,840
2006	*	*	$4,959,364	*	$100,871,934
2007	$0	*	$2,873,613	*	$104,112,816
2008	$0	*	$4,086,633	*	$124,166,026
2009	*	*	*	$7,521,744	$100,924,579
2010	*	*	*	$5,479,952	$120,100,195

Source: Weekly Processor Reports. Data compiled by AKFIN, September 2011.

Note, there was no reported catch of deep-water flatfish

* Withheld for confidentiality

2.8.3 Community Information

The fishing communities that may potentially be directly impacted by the proposed action are those communities which serve as homeports to the flatfish vessels, offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. The catcher vessel flatfish fleet is primarily associated with the Kodiak, whereas catcher processors that target Central GOA generally have homeports in Seattle. Although the Central GOA flatfish fisheries harvested by the catcher processors may be important to the Seattle-based participants in these fisheries, the effects of these fisheries are largely overshadowed by both the large fishing and processing industry in Seattle, and the N.W. Washington regional economy, as a whole. Therefore, the community information will focus on the community of Kodiak.

Kodiak is a large community by Alaska standards and is the seventh largest community in the state in terms of population.[6] Accompanying this size is a relatively diversified economy compared to other fishing communities in the southwestern part of the state. In terms of direct employment in the fishery being the overriding factor in residency decisions, the population of Kodiak could be viewed as less directly tied to the fishing economy than, for example, is the case for Unalaska, Akutan, or King Cove. Much of the economic diversity seen in Kodiak, however, links back to commercial fisheries in one way or another, with commercial fishing underpinning much of the apparent diversity, generating secondary and indirect employment, and otherwise driving a wide range of related activities. For example, there is a considerable U.S. Coast Guard presence in the community. While not a direct fisheries activity, the base would not exist in Kodiak if it were not driven by commercial fishing-related demands.

The Kodiak fleet is primarily composed of multigear and multispecies boats. Vessels in this fleet usually have a handshake agreement with a shore processor for the delivery of fish. The vessel is said to "work for" the shoreplant and sometimes the plant operators refer to "their boats" meaning those with which working relationships exist. These vessels deliver to that plant on a regular basis. The size and composition of processor fleets vary, depending on the plant's capacity and product mix, as noted in the processor discussion below. Most of the boats that deliver to Kodiak processors are multipurpose vessels that can change fisheries to meet the current market and fishing circumstances. For example, some vessels

[6] The six largest communities in Alaska, in order, are Anchorage, Juneau, Fairbanks, Sitka, Ketchikan, and Kenai. There are two different basic types of local governance in these communities: Anchorage, Juneau, and Sitka are unified Home Rule Municipalities (i.e., unified city/boroughs), while Fairbanks, Ketchikan, and Kenai, like Kodiak, are Home Rule Cities (Kodiak Chamber of Commerce 2004).

will switch between crab, halibut, and Pacific cod, or crab, halibut, and pollock. The size of a processor's fleet depends on what season it is and what they are targeting at the time. It is not uncommon, however, for a plant to have a fleet of 8 to 16 boats fishing groundfish and crab. Among plants that run pollock, there is a bimodal distribution of trawl fishing power. The larger plants typically have 8 to 10 trawlers working with them, whereas the smaller plants typically have 4 or fewer trawlers in their pollock fleet. Most plants also have 6 to 10 fixed gear vessels in their fleet. Most of the fixed gear boats are pot boats fishing for Pacific cod and/or Tanner crab (when openings occur). There is a small fleet that fishes for Dungeness crab as well.

Some information concerning the impacts of fisheries on the community can be gleaned from examining the residence of participants in the fisheries. Participation by residence estimates can be generated for each of the primary participating sectors, catcher vessels, catcher processors, and processors. In each case, care should be taken in evaluating the importance of the estimates, as the information available to estimate participation by residence will not fully reflect the distribution of regional and local impacts. For example, a vessel owner may not reside in the community that is used as a registered mailing address. In addition, participants in all sectors likely purchase inputs and hire crew from outside of their communities of residence. In addition, impacts of similar magnitudes will have differing importance with the size of the local and regional economy. Small communities could be greatly affected by impacts that are likely to go unnoticed in large communities.

As one of the largest ports of Alaska, vessels home ported in Kodiak participate in many of the State's largest fisheries. Nearly 550 fishing permit holders and over 190 owners of federally permitted vessels resided in Kodiak as of 2008. In excess of 98,000 metric tons of groundfish were delivered into Kodiak in 2008. Table 2-11 shows total landings by Kodiak-based vessels from 1995 through 2008. Table 2-12 shows total exvessel gross revenues of Kodiak-based vessels from 1995 through 2008. Comparing the total catch and exvessel revenues with catch and revenue from the rockfish fisheries, it is apparent that groundfish harvests are a relatively small portion of the total fishing activity in Kodiak. Notwithstanding this apparently small contribution to overall catch of Kodiak catcher vessels, some participants report that the fishery is important to their operations. These participants suggest that the supplemental income from the fishery is important to their overall returns. As such, the fishery could also be of some importance to the trawl catcher vessel contribution to the Kodiak economy, to the extent that it is important to the operations of these Kodiak groundfish vessels. Table 2-13 shows first wholesale gross revenues of Kodiak processors by species from 2000 to 2010.

Table 2-11 Landings by Kodiak vessel owners (in metric tons) (1995-2008)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Groundfish (fixed gear)	14,907	15,348	16,521	15,033	17,785	14,173	10,293	12,045	12,273	15,307	14,648	16,007	14,571	
Groundfish (Trawl)	58,778	59,685	55,673	53,626	49,592	46,912	45,056	44,130	44,886	47,407	45,847	45,082	43,717	
Halibut and Sablefish	4,070	4,667	5,984	5,906	6,164	6,036	6,038	5,711	5,587	5,571	5,260	4,972	4,844	1,027
Herring	4,626	5,519	6,521	5,919	4,337	3,628	3,820	4,121	3,619	4,285	5,409	5,330	4,524	8,640
Crab and Other Shellfish	5,353	5,625	9,228	17,160	13,770	3,410	3,059	3,111	3,029	2,717	3,097	2,920	3,177	5,984
Salmon	37,395	10,259	11,626	23,087	17,666	14,285	22,232	19,180	16,192	20,568	25,464	26,458	22,513	10,771
Total	125,129	101,104	105,552	120,731	109,314	88,445	90,497	88,298	85,586	95,854	99,726	100,770	93,346	26,422

Source: Fish ticket data

Table 2-12 Exvessel gross revenue of Kodiak vessels (in $1,000) (1995-2008)

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Groundfish (fixed gear)	7,475	6,751	7,872	6,739	11,774	11,101	6,282	6,465	8,078	9,339	10,108	14,410	15,988	
Groundfish (Trawl)	14,519	13,790	14,992	10,208	13,929	13,182	11,189	10,421	11,100	11,202	13,449	14,024	14,142	
Halibut and Sablefish	17,794	21,912	27,861	16,859	27,443	32,264	26,113	27,369	33,766	33,470	31,974	38,196	41,268	6,403
Herring	5,139	6,599	2,127	2,129	2,144	1,192	1,503	1,329	1,152	1,563	2,166	1,056	1,526	3,566
Crab and Other Shellfish	29,137	23,736	24,953	29,868	41,366	19,400	17,239	19,866	20,075	18,333	18,552	12,240	18,279	31,651
Salmon	24,281	12,873	9,385	14,953	16,848	11,560	10,528	6,350	7,790	9,458	11,817	15,009	15,041	12,022
Total	98,346	85,661	87,191	80,756	113,504	88,699	72,854	71,801	81,960	83,365	88,066	94,936	106,244	53,641

Source: Fish ticket data

Table 2-13 First wholesale revenues of Kodiak processors by species (in dollars) (2000-2010)

Species	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Flatfish	8,703,027	4,494,330	6,770,761	4,869,938	5,186,147	9,479,724	14,580,195	16,384,285	19,638,564	14,557,125	11,222,938
Groundfish (Other)	69,444,865	65,126,104	53,673,744	51,121,624	67,663,590	79,214,328	83,058,225	85,996,300	96,400,727	60,780,873	96,460,354
Halibut	20,041,830	21,658,436	20,906,215	26,844,151	29,147,979	31,234,902	26,410,221	40,745,651	38,954,737	29,529,978	40,333,811
Herring	*	1,853,842	1,404,470	1,949,958	4,280,851	3,896,177	1,824,505	2,011,010	3,189,873	4,410,602	3,678,207
Other	544,993	608,004	941,448	2,560,270	1,410,876	1,778,488	1,790,907	2,818,375	3,573,617	2,308,416	3,595,656
Sablefish	7,697,693	6,957,882	6,539,977	9,824,702	9,718,848	8,797,827	9,948,903	12,461,062	11,902,161	12,312,105	17,142,236
Salmon	60,272,913	60,539,810	34,569,861	43,148,424	43,771,152	57,311,337	60,448,534	70,136,721	58,239,415	77,735,119	72,567,448
Shellfish	8,135,008	7,351,452	8,803,535	7,988,373	8,759,989	9,678,968	9,850,730	9,770,104	15,360,902	10,275,166	12,927,704
Total	176,217,861	168,589,860	133,610,011	148,307,441	169,939,432	201,391,752	207,912,221	240,323,507	247,259,995	211,909,383	257,928,355

Source: COAR Data

*Withheld for confidentiality

Kodiak's shoreplants have played a significant role in the history of community, influencing its economic and demographic patterns over the years. Even among the eight major contemporary processing plants there is a considerable amount of diversity in the size, volume, and species processed. It is this diversification that best characterizes Kodiak's ability to weather the ebbs and flows of an industry dependent upon changes in the viability of the resource being harvested, the market itself, and past/future regulatory shifts. Locally based processors vary in product output and specialization, ranging from large quantity canning of salmon, processed at several different locations within Kodiak, to fresh and fresh-frozen products, as well as niche markets servicing the sports-fishing industry.

While the presence of local processing has been a constant in the community, individual operations have substantially different histories and have undergone a variety of changes in recent years. For example, among the large plants processing groundfish and salmon in the community, the facility now operated by Trident Seafoods centers around a converted World War II "Liberty Ship" that was reportedly brought to the community by previous owners (Alaska Packers) in the wake of the devastating 1964 earthquake to become the first plant up and running after that disaster. (This facility apparently later operated under the names All Alaskan and Tyson Seafoods, before being acquired by its present owner.) Ocean Beauty, on the other hand, operates in a facility originally built in 1911, which was the oldest and largest seafood production facility in Kodiak when it was purchased in the 1960s. In 1967, B&B Fisheries opened its doors, which became Western Alaska Fisheries in the early 1970s, and is still in existence today. Ownership type also varies widely. For example, International Seafoods of Alaska (ISA) is a wholly owned subsidiary of True World Group, Inc., which is in turn owned by the Unification Church. In contrast, Alaska Fresh Seafoods (AFS), a smaller plant, has been in operation since 1978 and is owned, in part, by Kodiak and other Alaska fishermen.

All plants experience busy and slow periods during the year, but these peaks and valleys differ at least slightly for each processor, based upon the dependence of processor to fishery or the relationship between fleet and processor. This seasonal pattern has also changed with changes in the fisheries. For example, earlier (2004) interviews with processing plant personnel pointed out how the role of halibut has changed in terms of local processing since the implementation of the halibut IFQ management program, with three-quarters or more of all halibut going to market as a fresh product, as opposed to perhaps one-quarter before IFQs. This has not only changed the role of halibut in individual operations, it has also resulted in a different pattern of landings, with the economics of the fresh market favoring road-connected ports over Kodiak for at least some harvest areas. More recently, BSAI crab rationalization has shifted the periods when BSAI crab is run at the local processors.

With regard to the workforce among Kodiak processors, the large majority of plant workers in Kodiak are drawn from the local labor pool. While some workers still come to the community specifically for processing work opportunities, in the past 20 years, the importation of short-term workers by the processing companies themselves has become less and less common. As of 2008, among all major Kodiak plants, only Trident reports bringing workers into the community on a 6-month contract basis and providing them bunkhouse quarters, similar to the pattern seen in the years before the development of a

large local workforce. In the not-too-distant past, Ocean Beauty and Western Alaska Fisheries both utilized bunkhouse facilities during peak seasons, but neither continues to do so. (Alaska Pacific Seafoods [APS] has retained a small bunkhouse, but this is used only as transitional housing for workers new to the community; ISA has a bunkhouse, but rents out spaces to workers as a more-or-less traditional landlord rather than providing living quarters as part of a room-and-board living arrangement; Western Alaska Fisheries will rent housing on a temporary basis for transient student workers during peak seasons but otherwise does not provide housing for its workers.) This high reliance on the processing workers from a local labor pool differentiates Kodiak from other major processing communities in the southwestern part of the state, such as Unalaska, Akutan, King Cove, and Sand Point. Major processors in each of these communities still retain a relatively transient labor force approach to staffing processing plants. In January 2005, however, in a departure from the local pattern, Western did hire seasonal workers from outside the community for the early peak Pacific cod season, but did not offer housing as part of the employment agreement. This ended up causing considerable concern in the community as, according to local newspaper accounts, about 80 people hired through Alaska Job Service in Anchorage arrived in the community prior to the start of the season, without having made housing arrangements (despite knowing that they needed to do so) and without sufficient resources to care for themselves prior to earning their first processing paycheck. This, in turn, proved to be a challenge for local service providers, as the unprepared workers utilized local shelters for immediate food and housing needs. While this may have been an isolated incident, it illustrates the continually changing nature of attempting to meet peak processing demands over time.

2.9 Cost of Modifying the Gear to Elevate the Sweeps

The process for implementing the sweep modification in the BS required extensive testing and discussion between the industry and NMFS, in order to identify in regulation a configuration of the gear that was both practicable and enforceable. However, unlike the BS flatfish vessels where trawl vessels are primarily catcher processors, the majority of the vessels participating in the Central GOA flatfish fisheries are smaller catcher vessels. In addition, sediments and bathymetry of the Central GOA flatfish fishery grounds are likely different from the BS flatfish fishery grounds. Recognizing these differences, research and field testing have been needed to ensure that the BS tests and regulation requirements are applicable in the Central GOA flatfish fisheries. Dr. Rose and scientists from the Alaska Fisheries Science Center Resource Assessment and Conservation Engineering (RACE) Division worked with the Central GOA flatfish fishing industry to test modified groundfish trawl sweeps during the 2011flatfish fishery.

Verification and comparative work in the Central GOA was focused on disc or bobbin (sweep elevation device) height and spacing (between elevating devices) so that the same degree of elevation from the seafloor in the BS is achieved in the Central GOA given the specifics of the flatfish fisheries. Factors affecting whether sufficient lift can be achieved in the Central GOA flatfish fisheries as compared to the BS include: towing power and/or speed of GOA vessels, styles and/or sizes of trawl doors, rigging of trawl nets, bridle and sweep materials (e.g., cookie sweeps rather than combination rope), and sediments and bathymetry of the GOA flatfish fishing grounds as compared to the BS flatfish grounds. The starting point of the Central GOA research was the BS spacing and disc height requirements as described in the sweep modification regulations (e.g., the equivalent of 10 inch elevating devices for 2 inch combination rope sweeps and 90 foot spacing). This would show if the GOA physical environment and/or vessel and gear differences in the GOA affect sweep lift, compared to the BS. From a practical perspective, using the BS spacing and elevation requirements helped to avoid potentially unnecessary costs for vessels that have already made investments in meeting the sweep modification regulations that are in place for the BS flatfish fishery. The spacing that was implemented in the BS reflects what was feasible given the gear configuration and the net reel capacity of the larger BS flatfish vessels.

GOA flatfish catcher vessels are generally smaller, lower horsepower vessels relative to the catcher processors targeting Central GOA flatfish. With respect to gear type for the catcher vessels, specifically flatfish gear, Alaska Groundfish Data Bank surveyed their members in 2010 to describe the most relevant characteristic of the trawl gear used in the GOA flatfish fisheries. Alaska Fishery Science Center scientists compiled and summarized the data from the returned survey forms. Fourteen vessels responded to the survey, describing 22 nets used to target flatfish. The survey indicated that GOA nonpelagic gear used to target flatfish in the GOA is similar to that used in the BS. It consists of non-pelagic trawls with footropes equipped with large diameter bobbins or disks. Most of the area affected by these trawls is covered by sweeps, long cables between the trawl doors and the net that herds the flatfish into the path of the capture net. The differences in the gear used in the Central GOA include:

- Most of the GOA catcher vessels reported diameters of footrope bobbins from 16 to 18 inches diameter in the center and 14-16 inches in the wings (sides of the trawl footrope) while BS catcher processors use footrope bobbins and disks from 18-23 inches in diameter.
- Most GOA sweeps used 3 inch diameter rubber disks strung over a steal cable instead of the 2 inch diameter combination rope (polyethylene-wrapped steel) used in the BS fisheries. Some GOA vessels reported using combination rope. Some also reported using widely spaced (90-120 ft) devices that raised the sweeps above the seafloor.
- Finally, GOA vessels used shorter sweeps than those used by the larger BS trawlers. While BS sweeps cover approximately 90% of the area affected by the trawls, similar calculations for GOA gear yield 75%.

A major difference in vessel configuration with respect to the use of modified sweeps is whether a vessel has a net reel, or uses a main line winch to set the trawl doors and sweeps. To initially assess the capacity of the Central GOA flatfish fleet to accommodate modified trawl sweeps, the Alaska Groundfish Data Bank surveyed the vessel captains. Alaska Fishery Science Center scientists compiled and summarized the data from the survey. In the survey, captains were asked whether their vessel is capable of accommodating the required modified trawl sweeps onto their net reels and if not or unsure, rate their ability to modify their vessel to accommodate the modified sweeps (see Appendix B for results). Of the 28 captains that replied to the survey, 8 replied they can currently accommodate the modified trawl sweeps, 9 stated their vessels cannot currently utilize modified trawl sweeps, while 11 were unsure if their vessels could accommodate modified trawl sweeps. Comments concerning the modification generally divided between vessels that use net reels to store sweeps and those vessels that use their main winches for sweep storage. Those vessels using net reels to store sweeps were better able to accommodate the modified sweeps without major vessel modification. Those vessels using their main winches for their sweeps would likely require more extensive modification and in many cases would require structural modification. Cost estimates associated with the modified gear are provided below for each scenario. When possible, estimates of the cost of purchasing and installing modified trawl sweeps have been obtained with assistance from representatives of vessel operators and the gear manufacturers that supply the fleet.

2.9.1 Vessels with Net Reels

Nearly all of the catcher processors targeting flatfish in the Central GOA also target Bering Sea flatfish which require modified trawl sweeps. Most of these catcher processors use net reels. For most dedicated flatfish Amendment 80 vessels, lengths of combination rope sweeps are between 50 and 200 fathoms, depending on their door size and spread and their horsepower and catch needs. Bigger flatfish boats may use approximately 150 to 200 fathoms of sweep, and smaller boats use approximately 50 to 90 fathoms. A hypothetical average case of a vessel deploying 90 fathom sweeps is discussed below, comparing the cost for modified versus unmodified sweeps. It is assumed that the sweeps are replaced on an annual basis.

Costs of modified trawl sweeps in the Central GOA would be similar to costs of modified trawl sweeps in the Bering Sea. The cost of a typical spool (50-fathom shot) of the 52-mm combination rope is $2,400. When splice "eyes" are added to this, this spool makes 45 fathoms of combination rope sweep. To replace the gear, a vessel would need four spools of combination rope (two 45-fathom shots on each side), at a cost of 4 times $2,400, equaling $9,600 per year for annual unmodified sweep replacement on a typical, dedicated flatfish boat. To comply with the modified trawl sweep requirements, a vessel may choose to purchase the modified sweeps in 15-fathom sections (eyes at 15-fathom, or 90-foot, sections), with the connections and 10-inch bobbins. According to a Seattle gear manufacturer who has been closely involved with the development of the modified sweeps, each 15-fathom shot will cost approximately $1,050 with the tackle and bobbins. Six of those sections would be needed for each side, in the hypothetical case, representing 12 times $1,050, or a total of $12,600. In the hypothetical average scenario, the difference for using the modified sweeps would be approximately $3,000 per year.

Since most of the catcher processors targeting flatfish in the Central GOA already utilize modified trawl sweeps in the Bering Sea, these vessels likely do not require structural modification. However, for those GOA-only catcher processors and those catcher vessels that utilize net reels, some of these vessels may require structural changes that add additional costs to compliance with the modified sweep requirement. Vessels need to have sufficient capacity on their net reels to accommodate the additional bulk of the elevating devices. Additionally, the experimental research and testing has shown that it is easier to fish with the modified sweeps if the vessel has a split net reel with independently operated hydraulic controls. If a boat is currently using an amount of sweep that is close to the limit of their net reel, then without modification to the net reel, the boat would have to reduce the amount of sweep it uses. This would reduce the area swept by the net, and fishing capacity (catch rates) would be expected to be reduced proportionally.

If reel capacity is an issue, the affected vessel is likely to consider alternatives to regain its target production output and efficiency. A likely solution is for vessels to modify their net reel to regain lost sweep capacity by raising the net reel and adding to the flange of the reel to increase available capacity. This would require the hydraulics and the driver on the net reel to be increased, to make the new net reel size workable.

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

It is not known how frequently the bobbins will wear down on the modified sweeps, but it is likely that vessels may choose to carry spare bobbins to avoid being out of compliance with the modified trawl sweep requirement. The cost of individual 10-inch bobbins is estimated at $50, so a full set of 14 replacement bobbins for the hypothetical case discussed above would cost approximately $700. For some of the smaller trawl catcher vessels with standard reels, the loss of a bobbin on one sweep will add to the difficulty of winding the gear evenly on the net reel, which is important to prevent tearing or racking the net out of shape when winding the net.

Some cost savings may accrue from using the modified sweeps, because there is some evidence from experimental testing that using the bobbins to elevate the sweeps may reduce the wear on the sweep, and extend the length of time before the sweeps need to be replaced. If, for example, the sweeps only need replacing every 1.5 to 2 years, a cost saving from the gear could accrue in the long term.

2.9.2 Vessels Using Main Line Winches to Set and Haul Back the Sweeps

Most of the vessels fishing flatfish in the Central GOA are equipped with both main deck winches and a net reel. The trawl sweeps can be wound on the net reel during trawl net retrieval. However, as many as 5 vessels currently wind their trawl sweeps onto the main deck winches and use the aft net reels to store their bridles, net, and codend. A vessel that continues to use their main deck winch to accommodate the modified trawl sweeps will likely have change their trawl blocks to allow passage of an 8 inch or 10 inch bobbin or disk and increase the capacity of the drum on the main deck winches (see Figure 2-4 and Figure 2-2). For vessels that would switch storage of sweeps to the aft net reels, the net reels would likely not be able to accommodate the additional space necessary for the modified sweeps without first raising the net reel and adding larger flanges to the net reel (see Figure 2-3). In addition to the modifications, the vessel would likely require a new stability report. The estimated cost of these modifications and a new stability report could be $20,000 to $25,000 or higher[7].

Figure 2-2 Crew spooling new wire on main deck winch of the F/V Hazel Lorraine. The dark line on the outside flange is the sweeps would begin and they nearly fill this winch to the top.

[7] Albert Geiser, personal communication, December 22, 2011.

Figure 2-3 Trawl net and codend on the aft net reel of the F/V Hazel Lorraine

Figure 2-4 Trawl block on the F/V Hazel Lorraine

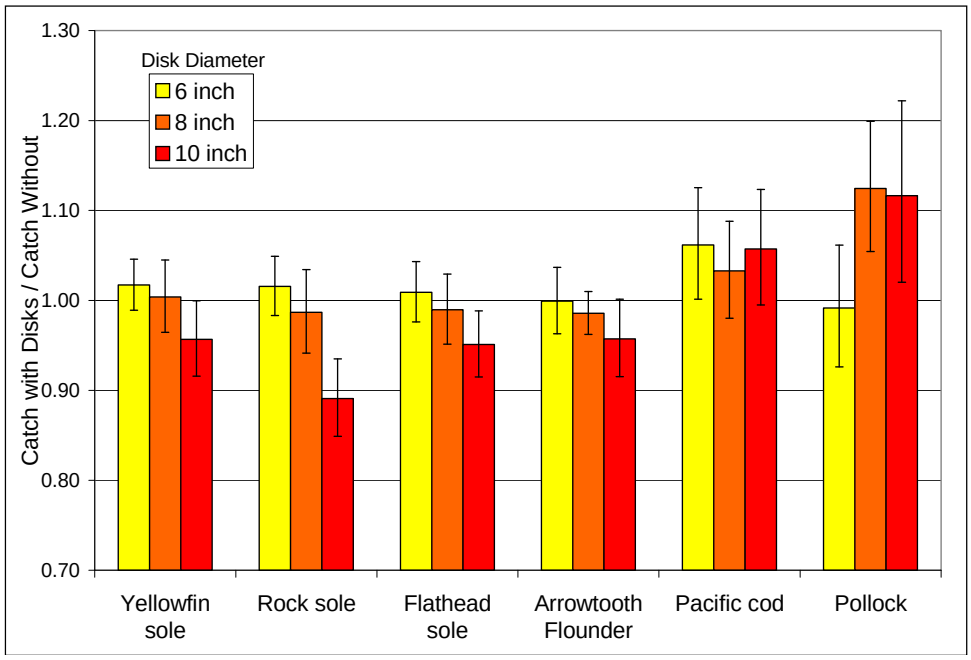
These vessels are likely to use the regulatory option that allows the use of 8-inch disks at 60-ft spacing. An estimate of costs for a vessel using a main line winch to set and haul back the sweeps is as follows. The vessel owners or operators anticipate replacing the sweeps twice annually. The cost of cable for each of the two 328-ft sweep sections on the vessel is $1,142, for a total annual cost of $4,568 for unmodified sweeps. To comply with the regulations, the vessel might now purchase two 164-ft sections of sweep for each side of the vessel, complete with connections and elevating devices. Given two complete sets per season, the cost for the modified sweeps is 8 times $994/section, or an annual cost of $7,952. Therefore, the increased cost of using the modified sweeps is $3,384, on an annual basis**.**

2.10 Effects of Modified Trawl Sweeps on Flatfish Capture

The effects of modified trawl sweeps on flatfish capture in the Central GOA flatfish fisheries relies on similarity of modified trawl sweeps and the research results in the Bering Sea in 2008. During that year, researchers conducted a study in the Bering Sea, funded by the North Pacific Research Board, to estimate the mortality rates for snow and Tanner crabs that encounter bottom trawls, but remain on the seafloor. That study estimated mortalities for both species for conventional and modified sweeps. Research results from the testing of the modified trawl sweeps are summarized in Section 1.7.4.2.3 and in the quarterly *Fishery Bulletin* (Rose 2010). A brief synopsis of the results of the gear testing on catch of target species, including flatfish, follows.

Herding tests were conducted with a twin trawl system, fishing two identical trawls simultaneously, side-by-side with different sweep configurations. The resulting catches were then compared to test whether the sweep modifications reduced flatfish capture. Sixty-one successful tows were completed, 19 with the 6-inch disks, 26 with the 8-inch disks, and 16 with the 10-inch disks. The ratio of flatfish catches (modified versus conventional) did not change significantly using either of the two smaller sized disks (52), while the 10-inch disks decreased rock sole and flathead sole catches by 11 percent and 5 percent, respectively. Flatfish catches were allocated to three or four size classes, depending on species, to test for size selectivity. Comparisons by size class did not detect differences from overall catch ratios for any of the flatfish species. A manuscript based on these studies has been submitted to Fisheries Bulletin.

Figure 2-5 Ratios of Catch Rates with and without 6- to 10-inch-diameter Disk Clusters Placed at 30-foot Spacing.



2.11 Analysis of Alternatives

2.11.1 Alternative 1 Status Quo

Under Alternative 1, the status quo, there is no regulatory requirement for vessels to use elevating devices on the trawl sweeps.

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

2.11.2 Alternatives 2: Trawl Sweep Modification

Under Alternative 2, the Council would require elevating disks on nonpelagic trawl sweeps used to target flatfish in the Central GOA, to reduce seafloor contact and/or increase clearance between the sweep and substrate in order to reduce unobserved mortality of Tanner crab. A performance standard of at least 2.5 inches elevation of the sweep from a hard, flat surface, measured next to the devices, would be required. Devices that meet the minimum 2.5 inches of clearance may be used at 60-ft spacing, or devices that achieve at least 3.5 inches of clearance may be used at 90-ft spacing.

This action relies on the extensive testing of modified trawl sweeps in the BS during 2006, 2007, and 2008 in association with BSAI Amendment 94. This BS testing of modified trawl sweeps showed reduced estimates of unobserved mortality for *C. bairdi* and *C. opilio* crabs from 5 percent with conventional sweeps to nearly zero for the modified sweeps. For red king crab, the modified sweeps reduced mortality from approximately 9 percent to 3 percent. Given the similarities between the BS trawl sweep modification and the Central GOA trawl sweep modification and the similarities in sediment type, there is likely to be significant reduction in crab mortality in the Central GOA flatfish fishery.

The research results in the BS also demonstrated that the catch of target flatfish species with unmodified gear was not significantly different than the catch of the modified gear equipped with 8-inch diameter disks, when tested over 30-ft spacing (Rose 2010). For 10-inch disks at 30-ft spacing, catchability was somewhat reduced. Over the longer 90 ft spacing, however, the catchability of 10-inch disks was likely to be similar to that of 8-inch disks over 30-ft spacing, as the seafloor clearance is comparable. Consequently, the difference in catchability of flatfish in the Central GOA from using the modified gear versus non-modified gear is not expected to be significant, and thus there would likely not be any cost from lost revenue using modified trawl gear.

The proposed trawl sweep modifications will likely result in additional equipment costs for vessels to comply with the requirement for disks on the trawl sweeps, and on some vessels the requirement may result in modification to operations and/or the cost of additional deck equipment. For all vessels, the additional cost of purchasing the modified gear appears to be in the range of $3,000 to $3,400, annually, which is anywhere from a 25 percent to 75 percent increase over the current cost of sweeps. There may, however, be some potential for offset of this cost, or even overall savings, if the use of the elevating devices reduces wear on the sweep rope or cable. Additionally, for vessels with net reels, there may be an

additional cost for keeping replacement bobbins on board, at a cost of approximately $700 for a full replacement set.

For vessels requiring a structural change to accommodate the modified trawl sweeps and continue to maintain the same catch rates, the cost to modifying the vessel may be significant. Estimates in the range of $20,000 to $25,000 have been suggested by industry. Given the extensive nature of the structural modification that could be required to accommodate modified trawl sweeps, the Council could modify the proposed action to allow for sufficient time to modify vessels without having to forego participation in the fishery. The Council took similar action during final action for Amendment 94 (Bering Sea trawl sweep modification) in October 2009 when it recommended that the action become effective no sooner than the beginning of the 2011 fishing sea thus allowing vessel owners sufficient time to modify their vessels if necessary.

2.11.3 Passive Use and Habitat Productivity Benefits

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

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

With respect to benthic habitat, the values at stake are what economists refer to as marginal values; that is, the values are associated with changes in the characteristics of habitat, not in the presence or absence of the habitat itself. Any region will have a wide range of characteristics. These may include the relative

proportions of different sea bed types, locations of corals or other living structures, water temperature, salinity, and distribution of vegetation. Fishing activity may change the nature, productivity, and value of the habitat by altering these characteristics in different ways. For example, unrestricted use of a bottom tending gear type may totally eliminate corals and alter the relative proportions of vegetation types, but leave salinity unchanged. The passive use values that society places on different regions of habitat will depend on these characteristics and can be expected to change as various combinations of characteristics of a particular region change.

While it is not possible at this time to provide an empirical estimate of the social value attributable to protection of fish habitat in the EEZ off Alaska, it is implicit in the fishing impact minimization measure in the action alternative relative to the status quo (i.e., Alternative 1) would be expected to yield an a social benefit over the baseline condition. That is, it is assumed that the action alternative yield some additional protection for benthic habitat from fishing gear impacts, compared to retention of the status quo, and that people know and care about protecting these natural, national assets.

In addition to these passive-use benefits, there may be benefits resulting from increased productivity of fish populations, as a result of habitat conservation actions. As discussed in the EFH EIS (NMFS 2005), current knowledge permits only a highly conditional evaluation of the effects of fishing on general classes of habitat features and allows only broad connections to be drawn between these features and the life history processes of some managed species. The level of effects on the stocks or potential yields of these species cannot be estimated with current knowledge. An expectation of substantial recoveries, directly attributable to implementation of measures to minimize the effects of fishing on benthic habitat, would require the presence of a species with a clear habitat limitation and consequent poor stock condition. Alaska fisheries include no such clear cases. Therefore, no quantifiable or even qualitative measure of sustained or increased yield in production or biomass of FMP species is available for this analysis. That is, based upon currently available scientific data and understanding of these fishery and habitat resources, it is not possible to empirically measure specific economic benefits linked to the biological or ecological changes attributable to the alternatives considered. That does not mean they do not exist, nor does it mean they can be ignored or otherwise dismissed as unimportant.

2.11.4 Net Benefits to the Nation

Assuming successful, consistent, and enforceable attainment of the performance standard, an overall net benefit to the Nation is likely to accrue from the reduced impacts to benthic habitat and reduced bycatch of crab resulting from the trawl sweep gear modification requirement. The modified gear requirement will be in effect for any and every nonpelagic trawl fishing operation targeting Central GOA flatfish, which reduces the degree to which an adverse impact on benthic habitat may occur.

3 Initial Regulatory Flexibility Analysis

3.1 Introduction

This IRFA evaluates the impacts on directly regulated small entities of the proposed action, to require nonpelagic trawl vessels targeting flatfish in the Central GOA to use elevating devices on trawl sweeps to raise them off the seafloor to reduce unobserved crab mortality. This IRFA addresses the statutory requirements of the Regulatory Flexibility Act (RFA) of 1980, as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (5 U.S.C. 601-612).

3.2 The Purpose of an IRFA

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

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

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

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

3.3 What is Required in an IRFA?

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

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

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

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

    3. The use of performance rather than design standards; and

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

3.4 What is a Small Entity?

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

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

The SBA has established size criteria for all major industry sectors in the United States, including fish harvesting and fish processing businesses. A business involved in fish harvesting is a small business if it is independently owned and operated and not dominant in its field of operation (including its affiliates) and if it has combined annual receipts not in excess of $4.0 million for all its affiliated operations

worldwide. A seafood processor is a small business if it is independently owned and operated, not dominant in its field of operation, and employs 500 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide. A business involved in both the harvesting and processing of seafood products is a small business if it meets the $4.0 million criterion for fish harvesting operations. Finally a wholesale business servicing the fishing industry is a small business if it employs 100 or fewer persons on a full-time, part-time, temporary, or other basis, at all its affiliated operations worldwide.

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

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

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

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

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

3.5 What is this Action?

This document analyzes two alternatives that evaluate a proposed gear modification to require nonpelagic trawl vessels targeting flatfish in the Central GOA to use elevating devices on trawl sweeps to raise them off the seafloor.

The alternatives evaluated in this analysis were adopted by the Council in February 2011.

Alternative 1: Status quo

Alternative 2: Require trawl vessels targeting flatfish in the Central Gulf of Alaska using non-pelagic trawl gear to use elevating devices on trawl sweeps to raise them off the seafloor.

Elevating devices combined with proper spacing raises the trawl sweep off of the seafloor to reduce unobserved crab mortality and reduce damage to bottom habitat. The proposed action would be to combine a gear and performance standard to raise the elevated section of the sweep at least 2.5 inches. To achieve this performance standard, elevating devices would be required along the entire length of the elevated section of the sweep spaced no less than 30 feet apart. To allow for some flexibility around the performance standard and to allow for wear and tear that might occur during a tow, there would be two different sweep configurations to choose from that specify the maximum spacing of elevating devices. The first configuration uses elevating devices that have a minimum clearance height of 3.5 inches or less with a required spacing between the elevating devices of no more than 65 feet apart. The second configuration uses elevating devices that have a minimum clearance height greater than 3.5 inches need to space these elevating devices no more than 95 feet apart. Either configuration combined with the minimum spacing of elevated devices no less than 30 feet would meet the combined gear and performance standard for the use of elevating devices on trawl sweeps while targeting Central GOA flatfish.

3.6 Objectives and Reasons for Considering the Proposed Action

The purpose of this action is to reduce unobserved crab mortality in the Central Gulf of Alaska from the potential adverse effects of nonpelagic trawl gear used for flatfish fishing. This would be achieved by modifying nonpelagic trawl gear used for flatfish fishing by raising the majority of the gear off the sea bottom. Studies in the Bering Sea (BS) have shown that elevating the trawl sweep can reduce trawl sweep impacts effects on *C. bairdi*, *C. opilio* and red king crabs by reducing the unobserved mortality of these species. In addition, elevating the trawl sweep can reduce impacts on benthic organisms, such as basketstars and sea whips. The Council initiated this action in conjunction with final action on the GOA Tanner crab bycatch measures, which created area closures around Kodiak to protect Tanner crab (GOA Amendment 89). Further research was needed in the GOA in order to identify the appropriate specifications for the modification in order to meet the Council's desired performance standard, and implementation issues needed to be resolved. Field testing of the modification has now been completed, demonstrating that the modification is workable in the Central GOA flatfish fishery.

Provided is a draft problem statement for this analysis, adapted from the GOA Tanner crab bycatch analysis (NPFMC 2010a):

> *Tanner crab is a prohibited species in the Gulf of Alaska groundfish fisheries. Directed fisheries for Tanner crab in the Gulf of Alaska are fully allocated under the current limited entry system. The Council recently recommended conservation measures in the*

Gulf of Alaska to address adverse interactions with Tanner crab by trawl and fixed gear sectors targeting groundfish. Elevated trawl sweeps could provide further conservation in reducing unobserved crab mortality in the Gulf of Alaska. Research has shown that sweep modifications can reduce unobserved crab mortality while maintaining flatfish catch rates.

3.7 Legal Basis for the Proposed Action

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

3.8 Number and Description of Small Entities Directly Regulated by the Proposed Action

This action would directly regulate all vessels conducting directed fishing for flatfish in the Central GOA subarea. The analysis has identified approximately 51 such vessels operating in one or multiple years in the Central GOA subarea targeting flatfish, from 2003 to 2010.

Fishing vessels, both catcher vessels and catcher/processors, are considered small, for RFA purposes, if their gross receipts, from all their economic activities combined, as well as those of any and all their affiliates anywhere in the world, (including fishing in federally managed non-groundfish fisheries, and in Alaska-managed fisheries), are less than or equal to $4.0 million annually. Further, fishing vessels were considered to be large if they were affiliated with AFA or Amendment 80 fishing cooperative. The members of these cooperatives had combined revenues that exceeded the $4.0 million threshold.

In 2010, 8 catcher processors targeting flatfish in the Central GOA exceeded the $4.0 million threshold, when considering their combined groundfish revenues, and would be considered large entities for purposes of the RFA, while 2 catcher processors were considered small entities for purposes of the RFA. As for trawl catcher vessels targeting flatfish in the Central GOA, 33 are considered large entities, while 8 are considered small entities for purposes of the RFA. It is likely that some of these vessels also are linked by company affiliation, which may then qualify them as large entities, but information is not available to identify ownership status of all vessels at an entity level. Therefore, the IRFA may overestimate the number of small entities directly regulated by the proposed action.

3.9 Recordkeeping and Reporting Requirements

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

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

3.10 Federal Rules that may Duplicate, Overlap, or Conflict with Proposed Action

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

There do not appear to be any federal rules that duplicate, overlap, or conflict with the proposed action. Some current federal regulations will need modification to implement the proposed action.

3.11 Description of Significant Alternatives

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

The Council considered two alternatives for this action. Alternative 1 is the status quo, which does not meet the objectives of the action. Alternatives 2 would require modified gear for vessels directly fishing for flatfish in the Central GOA subarea. The alternatives accepted by the Council for consideration in this EA/RIR/IRFA are described in detail in Section 1.6 of the EA and in Section 2.4 of the RIR. The RIR for this action analyzes potential economic impacts of the suite of available alternatives and options. A complete discussion of significant alternatives will be included in this section once the Council has finalized their recommendation to the Secretary of Commerce.

4 FMP and Magnuson-Stevens Act considerations

4.1 Magnuson-Stevens Act National Standards

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

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

The proposed action would impose gear modifications on the nonpelagic trawl fishery for Central GOA flatfish fisheries to reduce unobserved crab mortality and impacts of fishing on Central GOA fish habitat. Central GOA flatfish are not currently in danger of overfishing and are considered stable. In terms of achieving "optimum yield" from the fishery, the Act defines "optimum", with respect to yield from the fishery, as the amount of fish which—

(A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;

(B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduce by any relevant economic, social, or ecological factor; and

(C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overall benefits to the Nation may be affected by the proposed action, though our ability to quantify those effects is quite limited. Overall net benefits to the Nation would not be expected to change to an identifiable degree between the alternatives under consideration.

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

Information in this analysis represents the most current, comprehensive set of information available to the Council, recognizing that some information (such as operational costs) is unavailable. Information previously developed on the Central GOA trawl flatfish fisheries, as well as the most recent information available, has been incorporated into this analysis. It represents the best scientific information available.

National Standard 3 — To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The annual TAC is set for Central GOA shallow-water flatfish, deep-water flatfish, flathead sole, rex sole, and arrowtooth flounder according to the Council and NMFS's harvest specification process. NMFS conducts the stock assessments for these species and makes allowable biological catch recommendations to the Council. The Council sets the TAC for these species based on the most recent stock assessment and survey information.

National Standard 4 — Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fishermen, (B) reasonably calculated to promote conservation, and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

Nothing in the alternatives considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and states of the Pacific Northwest, participate in the major sectors affected by these allocations. No discriminations are made among fishermen based on residency or any other criteria.

National Standard 5 — Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose.

The wording of this standard was changed in the recent Magnuson-Stevens Act authorization, to consider rather than promote efficiency. Efficiency in the context of this change refers to economic efficiency, and the reason for the change, essentially, is to de-emphasize to some degree the importance of economics relative to other considerations (Senate Report of the Committee on Commerce, Science, and Transportation on S. 39, the Sustainable Fisheries Act, 1996). The analysis presents information relative to these perspectives and provides information on the economic risks associated with the proposed gear modifications.

National Standard 6 — Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

All of the alternatives under consideration in the proposed action appear to be consistent with this standard.

National Standard 7 — Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

All of the alternatives under consideration appear to be consistent with this standard.

National Standard 8 — Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.

Many of the coastal communities in Alaska and the Pacific Northwest participate in the Central GOA groundfish fisheries in one way or another such as homeport to participating vessels, the location of processing activities, the location of support businesses, the home of employees in the various sectors, or as the base of ownership or operations of various participating entities. As noted elsewhere in this analysis, however, the sector that will be exclusively or nearly exclusively directly affected by the different management alternatives is the flatfish fleet. As detailed in the RIR, the vessels in this sector that have recently fished in the areas potentially affected by the alternatives, and the related activities of those vessels while working in the Central GOA, are closely associated with two communities: Seattle, Washington, and Kodiak, Alaska. A summary of the level of fishery engagement and dependence in these communities is provided in the RIR.

An analysis of the alternatives suggests that while impacts may be noticeable at the individual operation level for at least a few vessels, the impacts at the community level for any of the involved fishing communities would be well under the level of significance. The sustained participation of these fishing communities is not put at risk by any of the alternatives being considered. Economic impacts to participating communities would not likely be noticeable at the community level, so consideration of efforts directed at a further minimization of adverse economic impacts to any given community is not relevant.

National Standard 9 — Conservation and management measures shall, to the extent practicable, (A) minimize bycatch, and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

All of the alternatives under consideration in the proposed action appear to be consistent with this standard.

National Standard 10 — Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The alternatives under consideration appear to be consistent with this standard. None of the alternatives or options proposed to modify the fishing grounds or gear of the flatfish fleet would change safety requirements for fishing vessels.

4.2 Section 303(a)(9) – Fisheries Impact Statement

Section 303(a)(9) of the Magnuson-Stevens Act requires that any plan or amendment include a fishery impact statement which shall assess and describe the likely effects, if any, of the conservation and management measures on (a) participants in the fisheries and fishing communities affected by the plan or amendment; and (b) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants taking into account potential impacts on the participants in the fisheries, as well as participants in adjacent fisheries.

The alternative actions considered in this analysis are described in Section 1.6. The impacts of these actions on participants in the fisheries and fishing communities are the topic of Sections 2.11 and 3, in the RIR and IRFA.

Fishery Participants

The proposed actions directly impact the participants in the Central GOA flatfish fisheries. GOA nonpelagic groundfish vessels participate in various nonpelagic targets including flatfish, Pacific cod, pollock[8], and rockfish in both Central and Western GOA.

[8] Note, while the majority of vessels participating in the GOA pollock fishery use pelagic gear, there are small number of vessels that use non-pelagic gear (generally due to size or horsepower constraints of the vessels).

Table 2-8 identifies the number of vessels fishing in the Central GOA flatfish fisheries from 2003 through 2010. As shown in the table, the flatfish fisheries are prosecuted by catcher processors and catcher vessels using nonpelagic trawl gear. For catcher processors, the number of vessels targeting flatfish in the Central GOA has ranged from a low of 10 in 2010 to a high of 12 during the 2003 through 2008 seasons. Flatfish fisheries with largest number of catcher processors was the rex sole and arrowtooth flounder fisheries. As for the trawl catcher vessels, the number of vessels targeting Central GOA flatfish has ranged from a low of 40 in 2009 to a high of 48 in 2003. The largest number of trawl catcher vessels participated in the shallow-water flats and arrowtooth flounder fisheries. GOA flatfish catcher vessels are generally smaller, lower horsepower vessels relatively to the catcher processors.

Fishing Communities

The fishing communities that may potentially be directly impacted by the proposed action are those communities which serve as homeports to the flatfish vessels, offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. The catcher vessel flatfish fleet is primarily associated with the Kodiak, whereas catcher processors that target Central GOA generally have homeports in Seattle.

Information on the residence of the vessel crew and processing crew that work aboard the potentially affected vessels is not readily available; however, generally companies operating vessels in the Central GOA flatfish sector tend to recruit crew from many locations, including Kodiak, Seattle, the Pacific Northwest, and urban centers elsewhere in the West and Midwest. Workers are also drawn from a number of foreign countries, such that location of residence is not tightly concentrated in Seattle, or one or even a few communities outside of the Seattle area.

Detailed information on the range of fishing communities relevant to the proposed action may be found in a number of recently produced documents, including the *Alaska Groundfish Fisheries Final Programmatic Supplemental EIS* (NMFS 2004), *Sector and Regional Profiles of the North Pacific Groundfish Fishery* (Northern Economics and EDAW 2001), and in a technical paper (Downs 2003) supporting the *Final EIS for Essential Fish Habitat Identification and Conservation in Alaska* (NMFS 2005) as well as that EIS itself. These sources also include specific characterizations of the degree of individual community and regional engagement in, and dependency upon, the North Pacific groundfish fishery.

Participants in Fisheries in Adjacent Areas

Neither the proposed action nor alternatives considered would significantly affect participants in the fisheries conducted in adjacent areas under the authority of another Council.

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Appendix A

§ 679.24(f) Modified nonpelagic trawl gear

Nonpelagic trawl gear modified as shown in Figure 26 to this part must be used by any vessel required to be federally permitted and that is used to directed fishing for flatfish, as defined in §679.2 in any reporting areas of the BS or directed fish for groundfish with nonpelagic trawl gear in the Modified Gear Trawl Zone specified in Table 51 to this part. Nonpelagic trawl gear used by these vessels must meet the following standards.

(1) Elevated section minimum clearance.
Except as provided for in paragraph (f)(3)(iii) of this section, elevating devices must be installed on the elevated section shown in Figure 26 to this part to raise the elevated section at least 2.5 inches (6.4 cm), as measured adjacent to the elevating device contacting a hard, flat surface that is parallel to the elevated section, regardless of the elevating device orientation, and measured between the surface and the widest part of the line material. Elevating devices must be installed on each end of the elevated section, as shown in Figure 26 to these part. Measuring location to determine compliance with this standard are shown in Figure 25 to this part.

(2) Elevated section minimum clearance.
Elevating devices must be secured along the entire length of the elevated section shown in Figure 26 to this part and spaced no less than 30 feet (9.1 m) apart; and either

(i) If the elevating devices raise the elevated section shown in Figure 26 to this part 3.5 inches (8.9 cm) or less, the space between elevating devices must be no more than 65 feet (19.8 m); or

(ii) If the elevating devices raise the elevated section shown Figure 26 to this part more than 3.5 inches (8.9 cm), the space between elevating devices must be no more than 95 feet (29 m).

(3) Clearance measurements and line cross sections.

(i) The largest cross section of the line of the elevated section shown in Figure 26 to this part between elevating devices shall not be greater than the cross section of the material at the nearest measurement location, as selected based on the examples shown in Figure 25 to this part. The material at the measurement location must be —

(A) The same material as the line between elevating devices, as shown in Figures 25a and 25d to this part;

(B) Different material than the line between elevating devices and used to support the elevating device at a connection between line sections (e.g., on a metal spindle, on a chain), as shown in Figure 25b to this part; or

(C) Disks of a smaller cross section than the elevating device, which are strung continuously on a line between elevating devices, as shown in Figure 25c to this part.

(ii) Portions of the line between elevating devices that are braided or doubled for section terminations or used for line joining devices are not required to be a smaller cross section than the measuring location.

(iii) Required minimum clearance for supporting material of a larger cross section than the cross section of the line material. When the material supporting the elevating device has a larger cross section than the largest cross section of the line between elevating devices, except as provided for in paragraph (f)(3)(ii) of this section, based on measurements taken in locations shown in Figure 27 to this part, the required minimum clearance shall be as follows:

(A) For elevating devices spaced 30 feet (9.1 m) to 65 feet (19.8 m), the required minimum clearance is ≥ [2.5 inches - ((support material cross section - line material cross section)/2)], or

(B) For elevating devices spaced greater than 65 feet (19.8 m) to 95 feet (29 m), the required minimum clearance is ≥ [3.5 inches - ((support material cross section - line material cross section)/2)].

Figure 25 to Part 679 – Elevating Device Clearance Measurement Locations for Modified Nonpelagic Trawl Gear

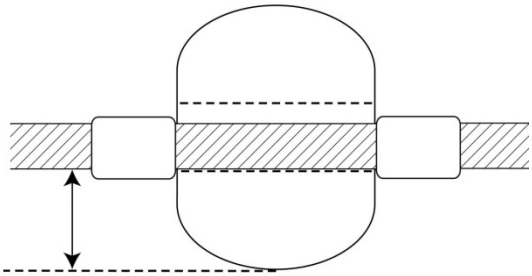


Figure 25a Line Clamps Flush to Elevating Device Material Different from Line Material

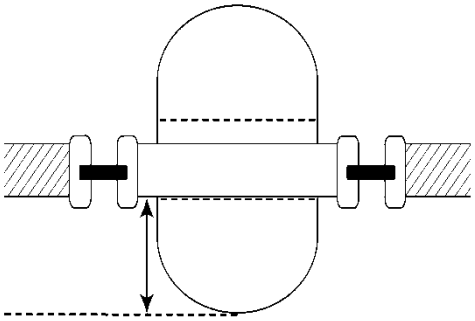


Figure 25b Elevating Device Supported by

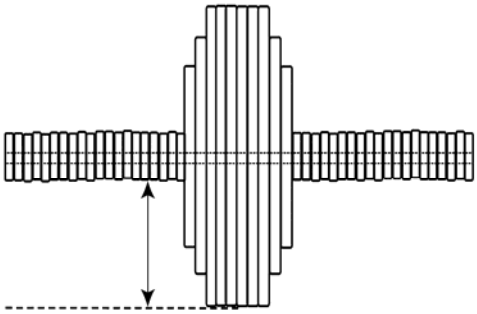


Figure 25c Cookie Gear

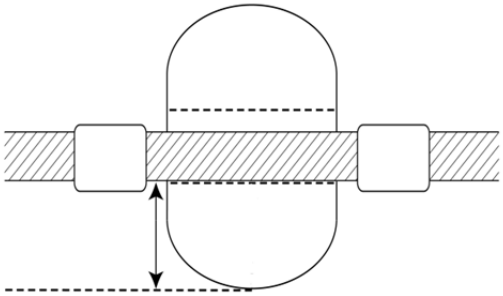


Figure 25d Line Clamps Not Flush to Elevating Device

Measuring points are shown for a variety of elevating devices located on the elevated section shown in Figure 26 to part 679. The measuring location is indicated on each figure by the arrow. The measurement is made from where the line contacts the inside surface of the device.

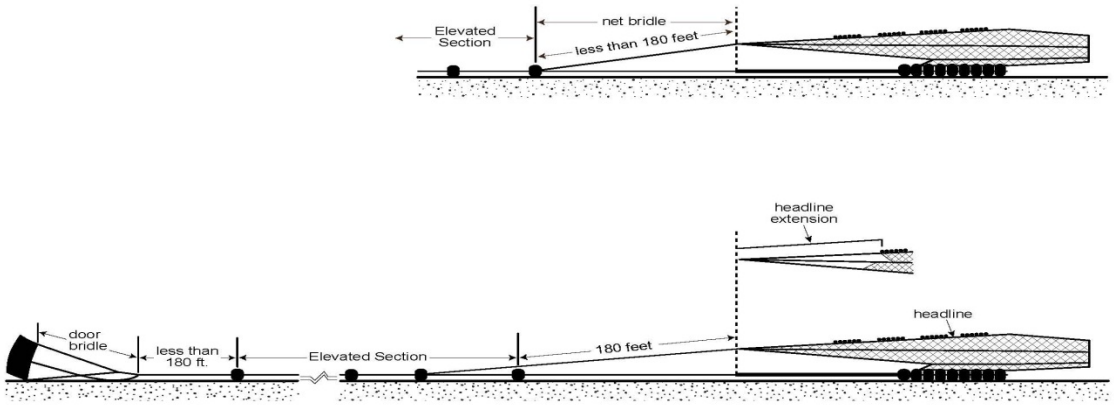
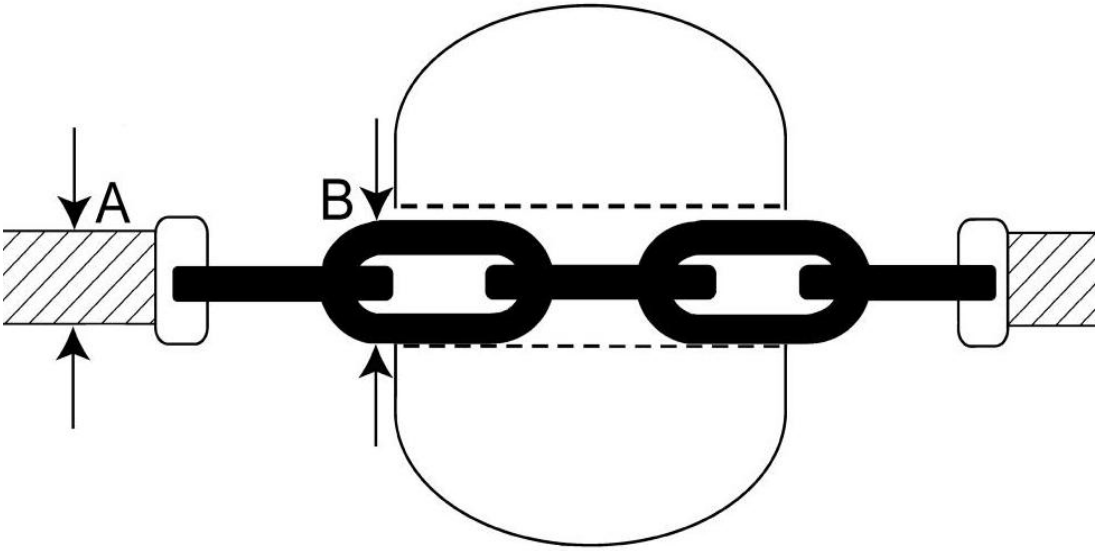


Figure 26 to Part 679 – Modified Nonpelagic Trawl Gear

This figure shows the location of elevating devices in the elevated section of modified nonpelagic trawl gear, as specified under § 679.24(f). The top image shows the location of the end elevating devices in the elevated section for gear with net bridles less than 180 feet. The bottom image shows the locations of the beginning elevating devices near the doors and the end elevating devices near the net for gear with net bridles greater than 180 feet.

Figure 27 to Part 679 Locations for Measuring Maximum Cross Sections of Line Material (shown as A) and Supporting Material (shown as B) for Modified Nonpelagic Trawl Gear.



Note: The location for measurement of maximum line material cross section does not include any devices or braided or doubled material used for section termination

Appendix B

Provided below are the results from an informal Alaska Groundfish Data Bank survey of Central GOA flatfish captains concerning use of modified trawl sweeps in the flatfish fisheries.

Table Summary	
No	8
Yes	8
Unsure	11
"Problem"	1
Total	28

Is your vessel capable of getting all the required bobbins/disks onto the net reel? (Yes, No, Unsure)	If no or unsure, please rate your ability of getting the disks/bobbins onto your net reel. Zero means not much of a problem, 5 means you would not be able to fish if having the devices on your sweeps is required.	Please comment in detail on what difficulties you would expect in complying with the modified (eleveated) sweeps regulation and any changes to your operation or equipment that might be required.
Capable	**Ability scale**	**Comment**
No	4	I would need a bigger and more powerful net reel
No	4	Would need to add to flanges of the net reel
No	0	No comment
No	5	We put our sweeps on the trawl winches. The bobbins (disks) will not fit through our trawl blocks
No	0	6" on 90 ft possible
No	5	Mud gear goes onto the winches as it is safer, more efficient for vessel
No	5	Mud gear goes onto winches. No forward net reel. Bigger flanges or another net reel - boat too heavy (safety issue and stability). Engine may not accommodate larger flanges. Bigger flanges $4-5,000. New net reel $15000.
No, Unsure	4	Depends on 12" or 8" - We would have to change our net reel
Unsure	3	No comment
Unsure	3	Wear on the bobbins and disks - keeping it legal
Unsure	0	Less sweep capacity on the reel - less likely to have a decent level wind on the reel - more dangerous for the crew as they will have to handle the trawl gear in front of the stern ramp - more costly as it will take twice as much hardware to rig sweep bobbins - more time wasted as far as dealing with the Coast Guard measuring sweeps on the grounds.
Unsure	3	No comment
Unsure	3	But possible, makes it more difficult to get all your gear back on the boat straight
Unsure	4	No comment
Unsure	x	Never had to do it yet
Unsure	3	No comment
Unsure	3	Depends on fishery and what gear, such as codends you are using for net reel space
Unsure	4	We feel we are using our net reel to the max extent now. If we put more net and mudgear on, we risk net reel failure. The net reel is designed to operate with a certain size net.
Unsure	1	It would depend on how long we wanted the sweeps to be. If we used less length, it would be easier
Unsure	2	Need lead time to comply. We have invested a substantial investment with a modified sweep that may need to be changed to do new regulations
Yes	1	Some modifications will be needed. Space on the net reels
Yes	0	Already fishing using Bering Sea regs Standard
Yes		Building all new gear
Yes		It will be slower to deal with it on deck, but manageable
Yes	4	I don't see a problem
Yes	2	I would not be able to pack midwater and bottom gear at the same time. Note: some boats have their sweeps on winches - they're screwed
Yes		Smaller disks will be easier, more expensive
Yes		We are using modified trawl sweeps right now with 10" disks on 90 ft mudgear and 10" on 180 spacing on combi gear. The problem we are seeing is that the disks or bobbins are collapsing on the sweeps. This is due to more strain on the gear that is making contact with the bottom.
Yes		No comment
Yes		No comment
Yes, A problem		I use 8" "eye saver" bobbins in between my sweep. Larger disks make it very difficult to wind the gear on evenly.
		Sweeps with disks will not fit on same net reel. Must use 2 net reels.