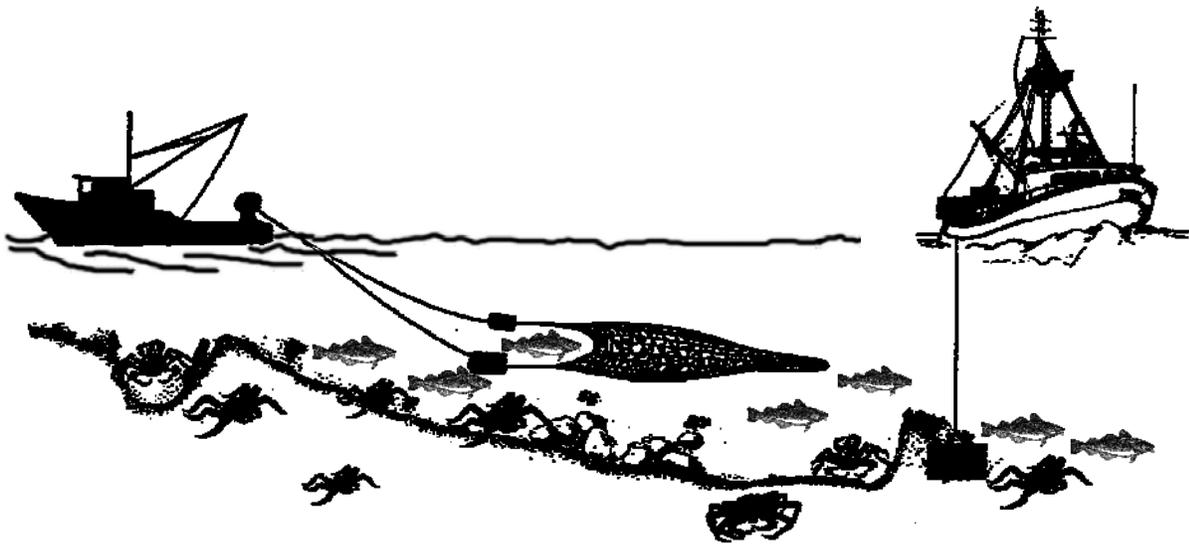


Environmental Assessment/ Regulatory Impact Review/ Initial Regulatory Flexibility Analysis for
Proposed Amendment to the Fishery Management Plan for Groundfish of the Gulf of Alaska

Area closures for *Chionoecetes Bairdi* Crab Protection in Gulf of Alaska Groundfish Fisheries

March 2009

Initial Review



Executive Summary

ES.1 Introduction

This document analyzes proposed area closures to protect *C. bairdi* crab around Kodiak Island. Included in the alternatives are options to apply the closures year round or seasonally, and to some or all gear types. Additionally, some vessels may be exempted from the area closures if they meet specific conditions such as using approved gear modifications, or a 100% observer coverage requirement.

ES.2 Purpose and Need

The purpose of this action is to provide additional protection to Gulf of Alaska (GOA) Tanner crab from the adverse effects of groundfish fisheries, in order to facilitate rebuilding of Tanner crab stocks. This would be achieved by closing areas around Kodiak Island that are important to the Tanner crab stocks. Areas would be closed to some or all groundfish fishing, depending on the vessel's gear type or gear configuration. An alternative in the analysis would allow a vessel to be exempt from the closures if the vessel carries 100% observer coverage. This would provide the Council with a high level of confidence in the assessment of any bycatch caught in the closed area, as a basis for future management action as necessary.

The Council formulated the following problem statement in October 2009, to initiate this analysis:

Tanner crab are a prohibited species bycatch in the Gulf of Alaska (GOA) groundfish fisheries. Directed fisheries for Tanner crab in the GOA are fully allocated under the current limited entry system. No specific conservation measures exist in the GOA to address significant, adverse interactions with Tanner crab by trawl and fixed gear sectors targeting groundfish. Tanner crab stocks have been rebuilding since peak fisheries occurred in the late 1970s. Specific protection measures should be advanced to facilitate stock rebuilding.

ES.3 Alternatives

The alternatives evaluated in this analysis were adopted by the Council in October 2009.

Alternative 1: Status Quo – No action

Alternative 2: Close areas (see description of areas in Section 2.1) to all groundfish (trawl, pot, and longline) fisheries.

Option 1: Year round

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Option 2: Seasonally (January 1 – July 31)

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Alternative 3: In order to fish in these areas (see description of areas in Section 2.1), require 100% observer coverage on all groundfish (trawl, pot, and longline) vessels

Area closures around Kodiak Island considered in Alternatives 2 and 3

ADF&G Northeast Section

- Statistical Area 525807
- Chiniak Gully (Four corners at 152°19'34" W x 57°49'24" N by 57°29' N x 151°20' W by 57°20' N x 151°20' W by 57° x 152°9'20' W)

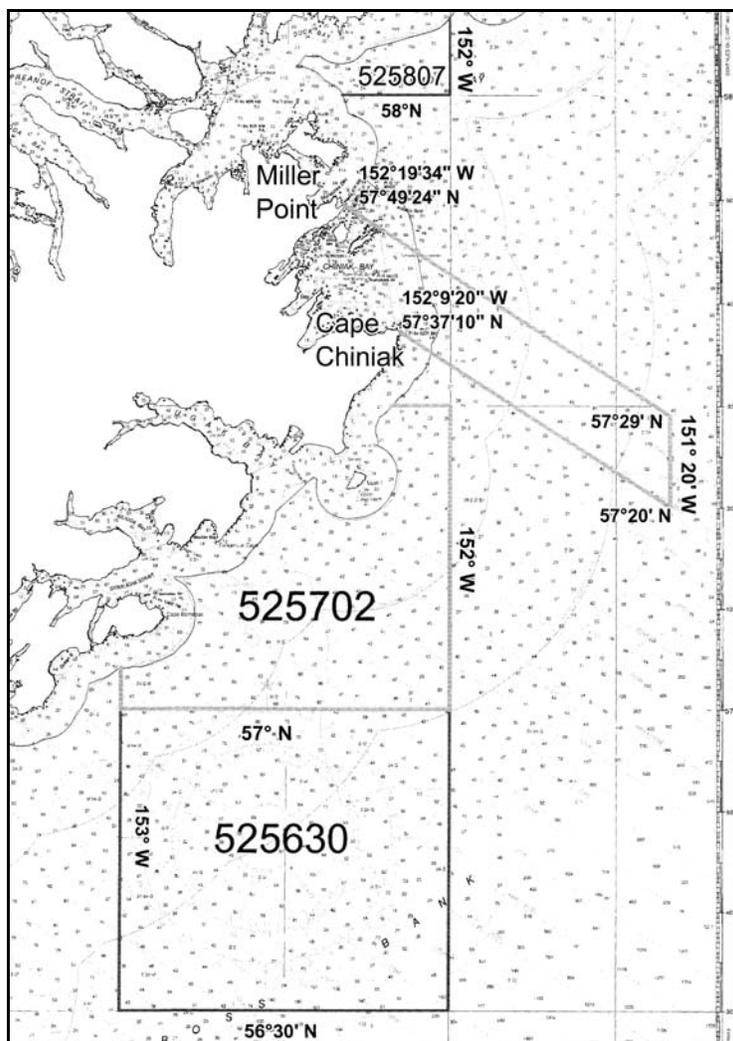
ADF&G Eastside Section

- Statistical Area 525702

ADF&G Southeast Section

- Statistical Area 525630

ES Figure: Area closures around Kodiak Island considered in Alternatives 2 and 3



ES.4 Impacts of the Alternatives

The alternatives were analyzed for their impacts on crab, groundfish and other fish species, marine mammals and seabirds, habitat, and the ecosystem, and for their economic and socio-economic impacts. The impacts on the socio-economic environment are analyzed in the Regulatory Impact Review (Section 6) and the Initial Regulatory Flexibility Analysis (Section 7) and are summarized in the following section.

The proportion of the surveyed abundance of Tanner crab around Kodiak which is taken as bycatch in the groundfish fisheries represents approximately 0.2% of the total abundance of crab. In the Eastside Section, which is identified as an important area for Tanner crab, groundfish bycatch represents a maximum of 0.3% of the Eastside surveyed abundance of Tanner crab, average over 2003-2009. Consequently, groundfish bycatch impacts on the sustainability of Tanner crab in the Kodiak District under the status quo, Alternative 1, are considered as adverse, but are not likely to be significant to the sustainability of the crab population.

Alternative 2, closing the proposed areas to groundfish fishing, would benefit crab stocks by reducing a source of mortality. Benefits to crab would be greatest by closing the areas to nonpelagic trawl fishing, as this gear type is observed to catch most of the crab in these areas. While pot vessels also contribute to the overall Tanner crab bycatch in reporting area 630, and to some extent in the proposed area closures, observed crab bycatch in the pot fisheries occurred predominantly elsewhere in reporting area 630. Pelagic trawl and hook and line vessels account for very little crab bycatch, and closing the proposed areas to these gear types would provide little benefit to the crab stocks.

The impacts of suboption 4 under Alternative 2, which would exempt vessels from the closures if using approved gear modifications, are difficult to assess as proposed gear modifications have not been tested in the GOA. To the extent that they reduce unobserved mortality of crab, or reduce bycatch, they are likely to be beneficial to crab stocks. Alternative 3, which exempts vessels from the closures if they have 100% observer coverage, does not provide any benefit to crab stocks over the status quo, for those vessels that take advantage of the exemption.

The impact of the alternatives on other resource categories analyzed in the EA, including groundfish and other fish species, marine mammals, seabirds, habitat, and the ecosystem, are not expected to be significant. The timing, general location, and overall level of fishing effort in the GOA groundfish fisheries is not expected to change, as the proposed area closures are small and fishing will likely continue to occur in neighboring areas.

ES.4 Management and Enforcement Considerations

The boundaries of the proposed closed areas under Alternatives 2 and 3 are defined by existing ADF&G statistical areas and by polygons defined by latitude and longitude coordinates. Closed areas defined in this manner are easier for both the regulated industry to understand and comply with, as well as enforcement entities to patrol and enforce. The proposed closure areas present no noteworthy enforcement challenges. The proposed closed areas would be principally enforced by using information from VMS units aboard vessels required to carry VMS. NMFS recommends that all vessels with FFPs that are allowed to fish in these closure areas be required to carry VMS at all times while directed fishing for groundfish in these areas. With respect to Options 1 and 2, enforcement of year round versus seasonal closures presents no additional monitoring challenges.

Proposed modified gear requirements under Suboption 4, such as trawl sweep modifications or pot escapement mechanisms, would likely be enforced in the same manner as the existing requirements for tunnel eyes on pot gear and trawl sweeps in the flatfish fisheries of the Bering Sea.

Under Suboption 5, regulations would specifically prohibit operation of nonpelagic trawl (NPT) gear in the closed areas, but would allow pelagic trawl gear. Currently, the only method of enforcing unlawful “bottom trawling” (for pollock only) in areas closed to NPT gear is by using a “trawl gear performance standard” (50 CFR 679.7(a)(14)). Under this standard, it is unlawful to possess aboard a vessel, at any point in time, 20 or more crab of any species, with a carapace width of more than 1.5 inches. Enforcement of this standard on any vessel (observed or unobserved) is difficult, and it is virtually impossible to monitor and enforce on unobserved vessels.

For Alternative 3, NMFS has identified three areas of concern about increasing observer coverage for vessels currently not required to carry 100 percent coverage requirement in the proposed closure areas. The first relates to potential shifts in areas and fisheries observed: observer coverage taken to comply with the 100 percent coverage requirement within these areas would accrue towards the vessel’s overall 30 percent coverage requirement for the quarter, management area, and fishery category. This could result in decreased coverage from existing levels in areas and fisheries outside the closure areas. The second concern relates to extrapolation of observer samples inside the closure areas. If disproportionate estimates of incidental catch of Tanner crab from small areas of high crab abundance were extrapolated to unobserved vessels fishing in areas of lower crab abundance, the result could be a higher estimate of incidental catch of Tanner crab for the larger federal reporting area as a whole. Finally, the proposed 100 percent observer coverage requirement being considered by this area closure action is inconsistent with the sample design proposed in the Observer Restructuring action.

ES.5 Regulatory Impact Review

The Regulatory Impact Review is in Section 6 of this document, and describes the economic impacts of the alternatives. Under the closures proposed under Alternatives 2 and 3, groundfish vessels that are subject to the closures will be required to forego fishing in the proposed areas. The impact on these vessels will be proportional to the extent that they rely on the area for target fishing. Based on observer data, the nonpelagic trawl flatfish fishery will be most impacted by the area closures, followed by the pelagic trawl pollock fishery. It is assumed that vessels would be able to fully harvest groundfish TACs despite the proposed area closures. In some areas, however, there may be lower catch per unit effort, which would increase costs for fishers and could result in increased bycatch of crab or other incidental species. The biggest impact for nonpelagic trawl gear would result from the closure of 525702 and 525630, where the central portions of those statistical areas are heavily used fishing grounds; for pelagic trawl vessels, the biggest impact would result from closing 525702. For pot vessels, the proposed area closures have a smaller impact on groundfish fishing because, according to observer data, the area is not as much fished as other parts of reporting area 630. For hook and line vessels, the areas are very little fished, and the impact on vessels would likely be very low. Under Option 2, the seasonal closure, adverse impacts from the area closures on groundfish fishers would be reduced compared to Option 1, as vessels could fish in the areas for the remainder of the year.

The impacts of Alternative 3 are the same as Alternative 2 for all vessels that do not choose to take advantage of the exemption for 100% observer coverage. Vessels exceeding 125 ft LOA already meet the 100% observer coverage requirement; in effect, this alternative would be equivalent to status quo for this category of vessels. Vessels 60-125 ft LOA would be able to count any observed fishing within the closed areas towards their 30% observer coverage requirement. For some vessels that fish extensively within the closed areas, their fishing time may exceed their observer requirement needs, in which case those vessels would either have to incur the daily observer fee, or change their fishing practices to fish elsewhere.

Vessels less than 60 ft that routinely fish in the proposed closed areas are likely to incur the greatest cost. These vessels have no observer coverage requirement, so taking an observer onboard in order to continue fishing in these areas would incur a daily observer fee expense that is not present in the status quo. Additionally, some vessels of this size class may not be equipped to carry an observer physically or safely. Alternatively, these vessels could choose to fish in neighboring areas, and impacts would be similar to Alternative 2.

ES.6 Initial Regulatory Flexibility Analysis

This action could directly regulate all vessels, except those using jig gear, participating in Federal groundfish fisheries around Kodiak Island in the Central Gulf of Alaska. From 2003 to 2009, there were 606 hook and line vessels, 74 nonpelagic trawl vessels, 53 pelagic trawl vessels, and 129 pot vessels with reported Tanner crab bycatch, participating in one or multiple years in the groundfish fisheries in reporting area 630. Of the vessels fishing in reporting area 630, from 2003-2009, with reported Tanner crab bycatch, 294 hook and line vessels, 26 nonpelagic trawl vessels, 12 pelagic trawl vessels, and 97 pot vessels are considered small for RFA purposes. A complete discussion of significant alternatives will be included in this section once the Council has finalized their recommendation to the Secretary of Commerce.

ES.7 Organization of the Document

There are four required components of an environmental assessment. The need for the proposal is described in Section 1, and the alternatives in Section 2. Section 4 discusses the environmental impacts of the proposed action and alternatives. A list of agencies and persons consulted is included in Section 10.2.

Management and enforcement considerations are addressed in Section 5. A Regulatory Impact Review (Section 6) discusses economic impacts of the action, and an Initial Regulatory Flexibility Analysis (Section 7) evaluates the impact of the action on small businesses. Sections 8 and 9 discuss the alternatives with respect to other analytical considerations.

Color figures mapping the distribution of bycatch and groundfish catch are included at the end of the document, in Appendix B Color Figures.

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1 Introduction and purpose

This document analyzes proposed area closures to protect *Chinocetes bairdi* Tanner crab around Kodiak Island. Included in the alternatives are options to apply the closures year round or seasonally, and to some or all gear types. Additionally, some vessels may be exempted from the area closures if they meet specific conditions such as using approved gear modifications, or a 100% observer coverage requirement.

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 provide additional protection to Gulf of Alaska (GOA) Tanner crab from the potential adverse effects of groundfish fisheries, in order to facilitate rebuilding of Tanner crab stocks. This would be achieved by closing areas around Kodiak Island that are important to the Tanner crab stocks. Areas would be closed to some or all groundfish fishing, depending on the vessel's gear type or gear configuration. An alternative in the analysis would allow a vessel to be exempt from the closures if the vessel carries 100% observer coverage. This would provide the Council with a high level of confidence in the assessment of any bycatch caught in the closed area, as a basis for future management action as necessary.

1.2 Council's problem statement

The Council formulated the following problem statement in October 2009, to initiate this analysis:

Tanner crab are a prohibited species bycatch in the Gulf of Alaska (GOA) groundfish fisheries. Directed fisheries for Tanner crab in the GOA are fully allocated under the current limited entry system. No specific conservation measures exist in the GOA to address significant, adverse interactions with Tanner crab by trawl and fixed gear sectors targeting groundfish. Tanner crab stocks have been rebuilding since peak fisheries occurred in the late 1970s. Specific protection measures should be advanced to facilitate stock rebuilding.

1.3 History of this action

Since the implementation of the groundfish fishery management plans for Alaska, the North Pacific Fishery Management Council (Council) has adopted measures intended to control the bycatch of species taken incidentally in groundfish fisheries. Certain species are designated as 'prohibited' in the groundfish fishery management plans, as they are the target of other domestic fisheries. Catch of these species and species groups must be avoided while fishing for groundfish, and when incidentally caught, they must be immediately returned to sea with a minimum of injury¹. These species include Pacific halibut, Pacific herring, Pacific salmon, steelhead trout, king crab, and tanner crab.

¹ Except when their retention is authorized by other applicable law, such as the Prohibited Species Donation Program.

To further reduce the bycatch of these prohibited species, various bycatch control measures have been instituted in the Alaska groundfish fisheries (a history is provided in NMFS 2004, Appendix F.5). In the Gulf of Alaska (GOA) groundfish fisheries, halibut bycatch limits (which close the groundfish target fisheries after the limits are reached) and bottom trawl seasonal and permanent closure areas to protect red king crab have been established. To date, no bycatch control measures have been implemented for other crab or salmon species taken incidentally in GOA groundfish fisheries.

The Council has at various times in the past several years requested that staff prepare and update discussion papers examining the scope of crab and salmon bycatch in the GOA groundfish fisheries, and proposing management options that might be considered to regulate such bycatch. During this process, the Council focused the scope on two species and two areas with potentially high bycatch levels: Chinook salmon (*Oncorhynchus tshawytscha*) and *Chionoectes bairdi* Tanner crab, in the central and western GOA. In October 2009, the Council chose to initiate this specific analysis, addressing protection measures for Tanner crab in the central GOA.

2 Description of alternatives

The alternatives evaluated in this analysis were adopted by the Council in October 2009.

Alternative 1: Status Quo – No action

Alternative 2: Close areas (see description of areas in Section 2.1) to all groundfish (trawl, pot, and longline) fisheries.

Option 1: Year round

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Option 2: Seasonally (January 1 – July 31)

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Alternative 3: In order to fish in these areas (see description of areas in Section 2.1), require 100% observer coverage on all groundfish (trawl, pot, and longline) vessels

Note, the suboptions are not intended to be mutually exclusive, and may be applied in combination.

2.1 Areas considered in Alternatives 2 and 3

ADF&G Northeast Section

- Statistical Area 525807
- Chiniak Gully (Four corners at 152°19'34" W x 57°49'24" N by 57°29' N x 151°20' W by 57°20' N x 151°20' W by 57° x 152°9'20' W)

ADF&G Eastside Section

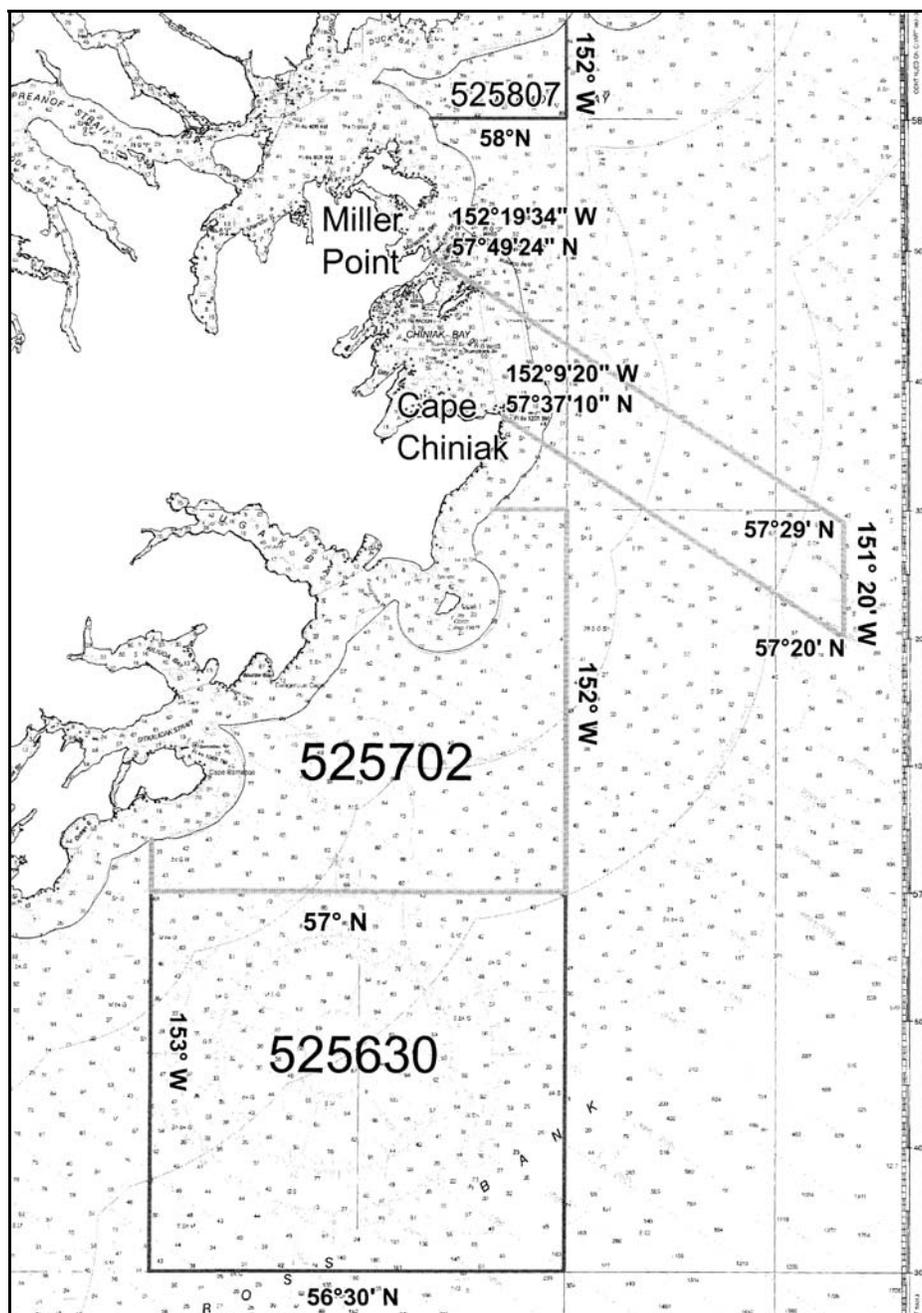
- Statistical Area 525702

ADF&G Southeast Section

- Statistical Area 525630

Note: As defined above, the Chiniak Gully closure encompasses State waters within the defined boundaries. The Council may wish to clarify whether this was the intention of the motion.

Figure 1 Area closures around Kodiak Island considered in Alternatives 2 and 3



2.2 Alternatives considered but not carried forward

The discussion paper reviewed by the Council prior to the development of this analysis suggested several other management measures that could be implemented to address Tanner crab bycatch. All of these other management measures presented concerns for the Council, and they were not included in the current analysis. The management measures can be found in the discussion paper reviewed by the Council in October 2009, which can be accessed at http://www.fakr.noaa.gov/npfmc/current_issues/bycatch/GOAbycatch909.pdf.

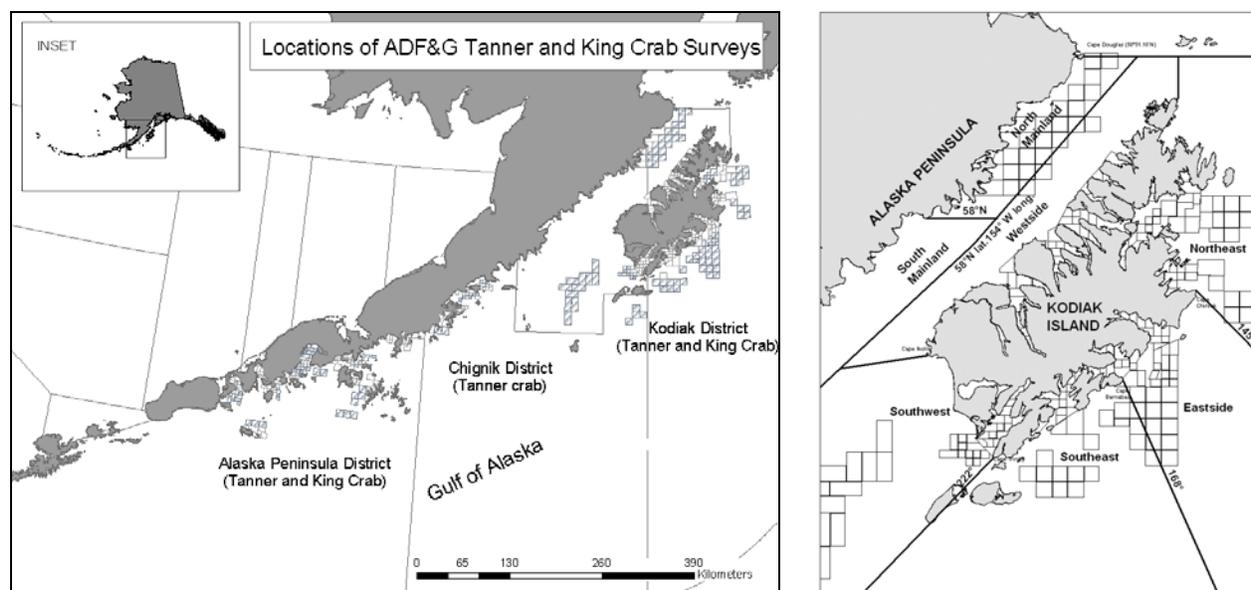
3 Affected Environment

This section provides background information relevant to the analysis of this action.

3.1 *C. bairdi* Tanner crab stocks

Tanner crab fisheries in the GOA are managed by the State of Alaska. Crab populations are evaluated and managed in units called districts. Fisheries south of Cape Douglas (58° 1.10' N lat.), west of Cape Fairfield (148° 50.25' W. long.), and east of Cape Kumlik (157° 27' W. long.) are part of the Kodiak District (5 AAC 35.505). The Kodiak District is further divided into seven sections to distribute harvest and effort (Figure 2).

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

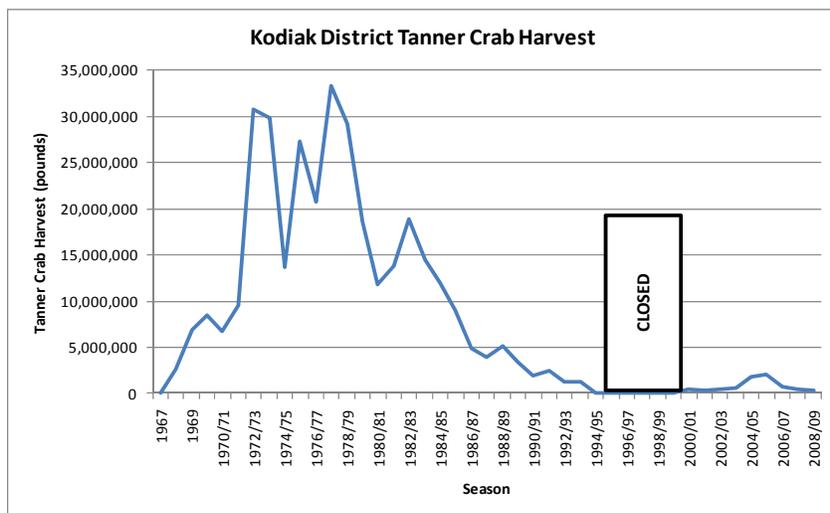


Source: K Spalinger, ADFG

An annual trawl survey is conducted by ADFG covering the Alaska Peninsula, Chignik, and Kodiak districts (Spalinger *in press*). The survey methodology is designed to concentrate sampling in areas of historical king and Tanner crab abundance. While a large proportion of preferred fishing areas are surveyed, not all Tanner crab habitat is covered by the survey.

Commercial Tanner crab harvests date back to the late 1960s (Brown 1971; Figure 3), but the annual trawl survey did not begin until the early 1980s (Colgate and Hicks 1983) after the Tanner crab population had declined. Since 1988, the highest harvest of Tanner crab was just over 5 million pounds (1989), and have averaged less than 2 million pounds. 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*).

Figure 3 Kodiak District Commercial Tanner crab harvest, 1967 to 2008/2009.



3.1.1 Tanner crab abundance inside proposed area closures

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 in 2007 (Table 1). The average Tanner crab population estimate from 2003 – 2009 is approximately 109 million crabs. The management section that consistently has had the highest population of Tanner crab is the Eastside Section (see Figure 2), which has averaged over 48 million crabs from 2003-2009 (Table 1). The section with the second highest abundance is the Northeast Section which has averaged over 17 million crabs from 2003-2009.

Table 1 Population estimates for total numbers of Tanner crab for Kodiak District, by section from the ADFG 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*

The proposed area closures are located in the Northeast and Eastside Sections of the Kodiak District. The proposed 525807 and Chiniak closures are in the Northeast Section, and the proposed 525702 and 525630 closures are in the Eastside Section. Estimates of Tanner crab populations within the proposed area closures range from just over 28 million crabs (2005) to over 38 million crabs (2008) and average 31% of the total Kodiak District population (Table 2). The proportion of crab inside the area closures in the Eastside Section ranged from 20% to 71% of the total Eastside Tanner crab population estimate. The

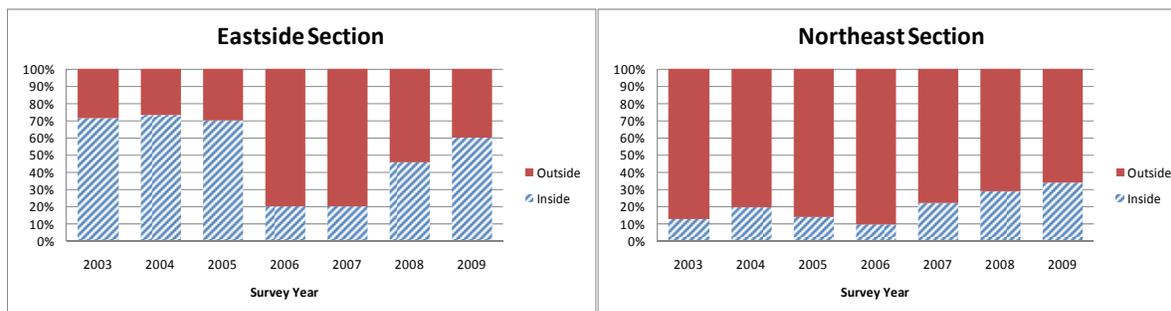
proportion of crab inside the boxes in the Northeast Section was generally lower, ranging from 9% to 34% of the total Northeast Tanner crab population estimate (Table 2 and Figure 4).

Table 2 Population estimates for Tanner crab inside and outside proposed area closures (boxes) in the Eastside (525702 and 525630) and Northeast (525807 and Chiniak) sections in relation to the total Kodiak District population estimate, 2003-2009.

Year	Kodiak District	Inside Proposed Boxes			% of Kodiak Total inside Box
	Total	Eastside	Northeast	Total	
2003	70,417,505	25,686,289	11,708,670	37,394,959	53.1%
2004	70,743,886	19,355,934	13,102,854	32,458,788	45.9%
2005	67,676,188	13,306,984	14,941,006	28,247,990	41.7%
2006	165,042,643	13,853,614	19,863,969	33,717,583	20.4%
2007	186,255,949	19,729,269	14,572,731	34,302,000	18.4%
2008	119,512,680	23,269,812	15,046,428	38,316,240	32.1%
2009	84,391,405	23,359,852	11,237,128	34,596,980	41.0%
03-09 avg.	109,148,608	19,794,536	14,353,255	34,147,791	31.3%

Source: N. Sagalkin, ADFG

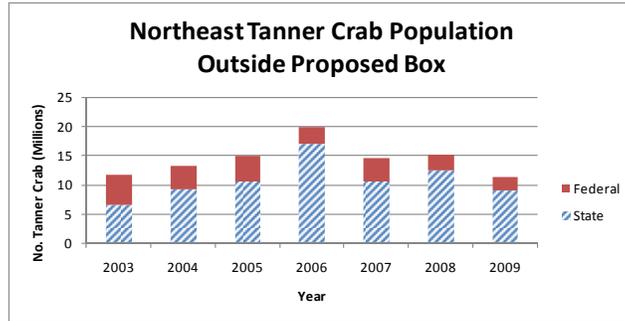
Figure 4 Estimated Tanner crab population outside the proposed area closures (boxes) in the Eastside (525702 and 525630) and Northeast (525807 and Chiniak) Sections relative to state and federal waters, 2003-2009.



Source: N. Sagalkin, ADFG.

Tanner crab populations are distributed inside and outside the 3-mile state water boundary. In the Eastside Section of the Kodiak District, the entire surveyed Tanner crab habitat outside of state waters is contained within the proposed area closures. In the Northeast Section of the Kodiak District, portions of the Tanner crab population are outside state waters and outside of the proposed area closures (Figure 5).

Figure 5 Estimated Tanner crab population outside the proposed area closures (boxes) in the Northeast Section relative to state and federal waters, 2003-2009.

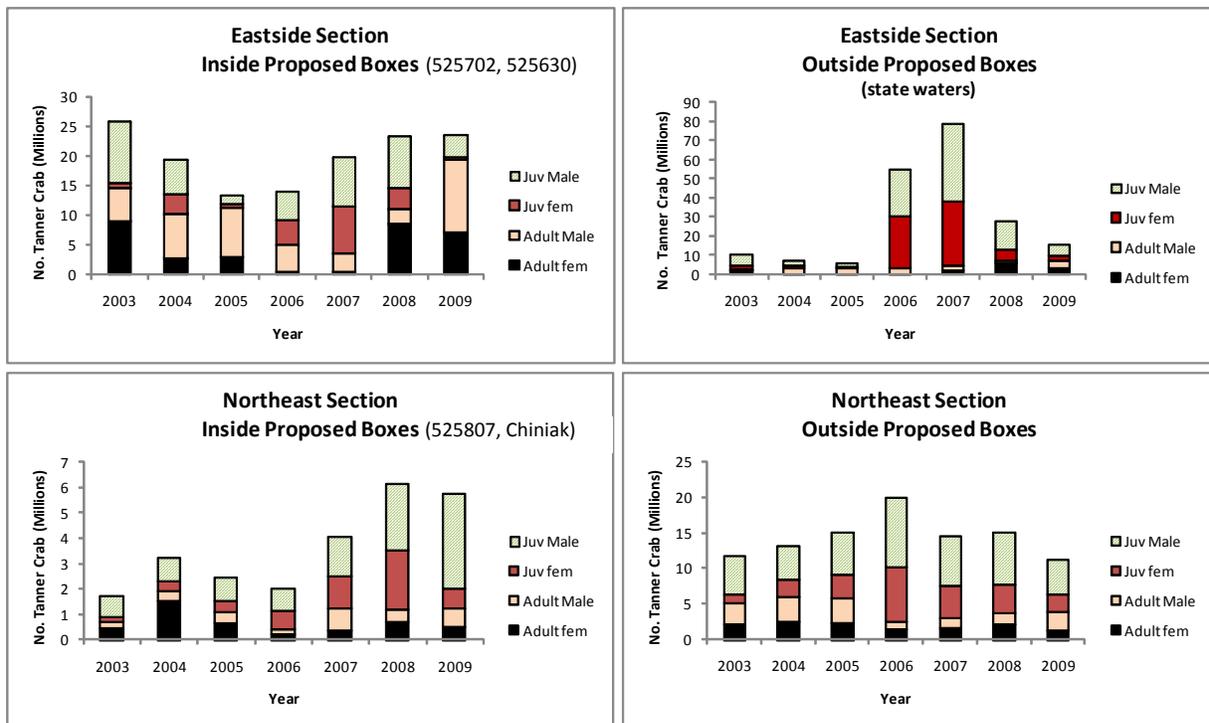


Source: N. Sagalkin, ADFG

In general, the majority of the Tanner crab population in the Northeast Section outside of the proposed area closures is located within state waters (Figure 5).

Tanner crab population estimates are comprised of juvenile and mature, male and female Tanner crab. Figure 6 demonstrates the composition of Tanner crab inside the proposed area closures in the Eastside Section of the Kodiak District. Comparing the population composition (Figure 6) in relation to the proportion of the population inside and outside the proposed area closures (Figure 4), illustrates some spatial patterns that exist in the Eastside Section where mature crab tend to be offshore. This pattern is less evident in the Northeast Section (Figure 6).

Figure 6 Estimated population of juvenile male, juvenile female, adult male, and adult female Tanner crabs inside and outside of the proposed area closures (boxes) in the Eastside and Northeast sections of the Kodiak district, 2003-2009.



Source: N. Sagalkin, ADFG.

3.1.2 C. bairdi Tanner crab life history and seasonal patterns

Tanner crab are widespread in the North Pacific Ocean. They occur mainly on soft bottoms in depths ranging from shallow nearshore waters to over 200 fathoms; although, they are most abundant in depths of 40-50 fathoms (Urban and Hart 1999). Tanner crab may be more sensitive to disturbance during molting, mating, and hatching. While males appear to have synchronous molting in the spring (ADFG unpublished data; Table 3), there is less data on the timing of female molting, except for the female molt to maturity.

The first time female Tanner crab mate is during their molt to maturity. Final molt for females may occur as early as December and as late as June (Donaldson and Adams 1989; Donaldson 1975; Table 3). Females molt to sexual maturity and mate in the softshell condition while grasped by mature male (primiparous females). Peak of egg deposition for primiparous female Tanner crab occurs in April and May (ADFG unpublished data; Table 3). After the maturity molt, females do not continue to grow, but do continue to mate and produce eggs (multiparous females). Primiparous females tend to mate in shallow waters in isolated pairs, while multiparous females mate in large aggregations in deeper waters during April, May, and June (Stevens et al. 1994; Table 3); this differential mating behavior is termed bipartite breeding (Somerton 1982). Mating behavior is intricate and may last several days (Adams 1982; ADFG unpublished data). Some authors have suggested that groundfish trawls could easily capture or disrupt an entire Tanner crab mating aggregation (Steven 1990).

Table 3 Seasonal pattern of life history traits of Tanner crab

Event	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Reference
Female final molt to maturity/mating													Donaldson and Adams 1989; Donaldson 1975
Primparous peak of new egg clutch deposition													ADF&G unpublished data
Multiparous females mate in deepwater aggregations													Stevens, Haaga, and Donaldson 1994
Multiparous females mounding in pods, hatching													Stevens 2003
Male molt - observations of casts on beaches around Kodiak													ADF&G unpublished data
Male molt - Southeast Alaska													Stone 1999

3.2 C. bairdi Tanner crab bycatch in Federal groundfish fisheries

In this section, an overview of Tanner crab bycatch in the Federal groundfish fisheries is provided, both by reporting area and specifically in the proposed area closures. Although some information is given on crab bycatch as a proportion of overall groundfish effort, more detail on groundfish effort is provided in the RIR, in Section 6.6.

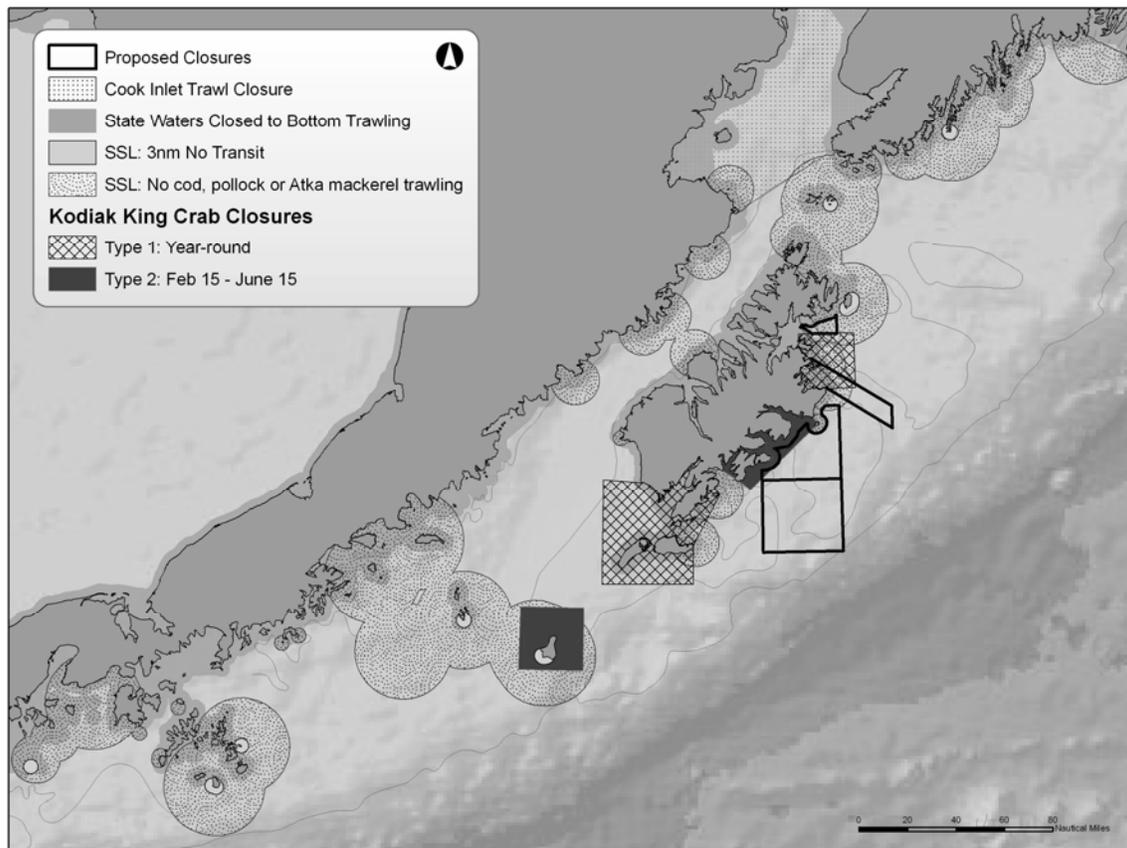
In order to understand the bycatch information presented, the first three subsections below provide some context to the bycatch overview. In Section 3.2.1, the existing area closures that affect some or all gear types in the groundfish fisheries around Kodiak are described. Section 3.2.2 describes the proportion of groundfish fishing effort, by gear type and target fishery, which is observed in the central GOA. The reported numbers of total bycatch are extrapolated based on the rates of bycatch on observed vessels, using a procedure described in Appendix A. Finally, Section 3.2.3 provides information about the various studies of crab bycatch mortality rates that have been conducted for various gear types. The numbers reported here of bycatch in the groundfish fisheries do not account for the differing levels of mortality that may affect bycaught crab caught by different groundfish gear types.

3.2.1 Existing closures in the central GOA management area

There are already seasonal and permanent area closures that have been implemented for the GOA groundfish fisheries, many of which were instituted to reduce bycatch or interactions with Steller sea lions. It is important to consider the development of new spatial controls to reduce bycatch within the context of existing time and area closures. The various State and Federal closures affecting the GOA

groundfish fisheries are described below, along with their intended purpose. The year the closure was implemented is noted in parentheses. Figure 7 maps the existing closures in the central regulatory area, in which the area closures that are focus of this analysis are situated.

Figure 7 Locations of existing trawl fishery and crab protection closures in the Central Gulf of Alaska, and proposed closures of this analysis



Kodiak red king crab closures: Type I and Type II (1993). **Nonpelagic trawl closure areas**, designed to protect Kodiak red king crab because of the poor condition of the king crab resource off Kodiak and because trawl bycatch and mortality rates are highest during the spring months when king crab migrate inshore for reproduction. The molting period off Kodiak begins around February 15 and ends by June 15. Type I areas have very high king crab concentrations and, to promote rebuilding of the crab stocks, are closed all year to all trawling except with pelagic gear. Type II areas have lower crab concentrations and are only closed to non-pelagic gear from February 15 through June 15. In a given year, there may also be Type III areas, which are closed only during specified ‘recruitment events’, and are otherwise opened year-round.

Steller Sea Lion (SSL) 3 nautical mile (nm) no transit zone (2003). **Groundfish fishing closures** related to SSL conservation establish 3-nm no-transit zones surrounding rookeries to protect endangered Steller sea lions.

SSL no-trawl zones for pollock and cod (2003). **Pollock and Pacific cod trawl fishing closures** related to SSL conservation establish 10- to 20-nm fishing closures surrounding rookeries to protect endangered Steller sea lions.

Cook Inlet bottom trawl closure (2001). **Prohibits non-pelagic trawling** in Cook Inlet to control crab bycatch mortality and protect crab habitat in an areas with depressed king and Tanner crab stocks.

State Water no bottom trawling (2000). **Prohibits commercial bottom trawling** in all state waters (0–3 nm), year-round, to protect nearshore habitats and species. However, specific areas in the Shelikof Straits along the west side of Kodiak Island are open to bottom trawling from January 20 to April 30 and October 1 to November 30, and areas around Shumagin and Sanak Islands are open year round.

3.2.2 Observer coverage

Catch and bycatch data were obtained from the NMFS catch accounting database, and analyzed to represent the amount, species composition, timing, and location of salmon and crab caught incidentally in GOA groundfish fisheries. All NMFS data were screened to ensure confidentiality is maintained. The process that is used to estimate bycatch for GOA groundfish fisheries is described in Appendix A. In short, bycatch rates from observed vessels are applied to the fleet as a whole. The resulting estimates are used in this analysis. Further discussion on the proportion of GOA groundfish fisheries that are observed is addressed below.

Spatial analysis of bycatch in this analysis uses only the data directly from observed vessels, as described below represents only a proportion of total catch in the groundfish fisheries.

The North Pacific Groundfish Observer Program collects catch and bycatch data used for management and inseason monitoring of groundfish fisheries. Since 1990, all vessels larger than 60 ft (length overall) participating in the groundfish fisheries have been required to have observers onboard at least part of the time. It is important to note that in a separate initiative, the Council has tasked staff with analyzing alternatives to address known problems with the existing Observer Program. While several issues are being addressed in that analysis, data quality is a key element particularly in fleets with less than 100 percent observer coverage. That analysis is proceeding in tandem with, but not linked to, this discussion paper. Concerns about data quality are intended to be addressed through the Observer Program restructuring initiative.

Under the current Observer Program, the amount of observer coverage is based on vessel length. No vessels less than 60 ft are required to have observers onboard. Trawl and hook and line vessels that are 60 ft to 125 ft must have an observer onboard for 30% of fishing days, by quarter. Similar gear vessels that are larger than 125 ft must have an observer onboard 100% of the time, and shore-based processing facilities must have an observer present for 100% of the time. All pot vessels greater than 60 ft LOA must have observer coverage while 30% of their pots are pulled for the calendar year.

There is a greater prevalence of smaller vessels participating in the GOA groundfish fisheries, and over the past 10 years, participation by smaller vessels in the GOA groundfish fisheries has generally increased, particularly catcher vessels less than 60 ft length overall (NPFMC 2003). Because observer coverage requirements are generally based on vessel length, the proportion of total catch that is observed in GOA groundfish fisheries is much lower than, for example, in the Bering Sea fisheries. The majority of the GOA fleet is subject to 30% observer coverage. Table 4 illustrates the total groundfish catch in the GOA, the total amount of groundfish that is caught while an observer is onboard the vessel, and the resulting percentage. In the central GOA the range is from 32% to 37%. In comparison, the average percentage of observed catch in the Bering Sea is approximately 86%, and in the Aleutian Islands is approximately 95%. Please note that the percentage of observed catch provides only a gross overview as to the quality of information, and may mask data quality concerns. The goal is to have an unbiased estimate that is sufficiently precise to meet the management need for the information. The precision of bycatch estimates depends upon the number of vessels observed and the fraction of hauls sampled (Karp

and McElderry 1999). Because of the relatively lower levels of observer coverage in the GOA, estimates of salmon and crab bycatch are less precise in the GOA than in Bering Sea groundfish fisheries. To what degree they are less precise, however, is not known, as current PSC estimates do not include a measure of uncertainty.

Table 4 Total catch, observed catch, and percent observed catch by area and year

Area	Year	Total (mt)	Observed (mt)	Percent
Western GOA	2004	50,853	14,414	28%
	2005	53,142	13,195	25%
	2006	51,944	17,253	33%
	2007	46,968	16,882	36%
Central GOA	2004	108,707	37,744	35%
	2005	120,030	41,586	35%
	2006	131,271	42,349	32%
	2007	118,871	44,113	37%
Eastern GOA	2004	7,610	2,911	38%
	2005	8,709	3,072	35%
	2006	8,772	3,293	38%
	2007	4,274	3,225	75%
Bering Sea	2004	1,695,228	1,450,413	86%
	2005	1,702,671	1,467,153	86%
	2006	1,696,337	1,470,680	87%
	2007	1,569,110	1,352,914	86%
Aleutian Islands	2004	98,169	93,188	95%
	2005	94,209	89,516	95%
	2006	95,288	91,461	96%
	2007	107,090	101,060	94%

Note: This table does not include jig gear, but otherwise includes all targets.

Source: http://www.fakr.noaa.gov/sustainablefisheries/inseason/percent_observed.pdf

Detailed information on percent of harvest observed in the GOA groundfish fisheries has been presented to the Council meeting as part of their reports from the Observer Advisory Committee, most recently at the April 2008 Council meeting. NMFS compiled a series of tables that provides a breakout of the percentage of harvest observed for each year 2004–2007, inclusive, in order to show the effective rate of coverage in particular target fisheries. The data are broken out by observer coverage category (30%, 100%), gear type, area, and component of the catch by the <60' fleet that is unobserved.² The information for the central GOA is presented in Table 5.

Information in the tables pertinent to the discussion of fisheries in the GOA is summarized below. For the GOA Pacific cod pot fisheries, more than half the catch from 2004–2007 came from the <60 ft fleet, which is unobserved. The remaining catch primarily came from the >60 ft to <125 ft fleet where percent coverage ranged from 17-28% over the four years. For the Pacific cod trawl fisheries delivering shoreside, coverage in the >60 ft to <125 ft category ranged from 24%–30% in this time frame. The State waters Pacific cod fishery is unobserved, however bycatch rates from comparable vessels/areas are applied to the State waters Pacific cod catch. Bycatch attributable to the State waters Pacific cod fishery is included in this discussion paper, but is presented in a separate section.

² Note that the total catch data referenced is from the NMFS catch accounting system, and the observer data is from the NMFS observer database. The observer data includes all sampled and unsampled hauls that occurred while an observer was onboard. High variability in percent observed catch among years has been correlated to several factors, such as the varying season lengths, number of participating vessels, different catch rates per year, weather, and market prices.

For the pollock pelagic trawl fishery, data is mostly confidential for the unobserved <60 ft fleet each year. The remaining catch came from the >60 ft to <125 ft fleet where coverage ranged from 31%–37% over the four years. For non-pelagic trawl arrowtooth flounder and shallow water flatfish targets delivered shoreside, the majority of the catch was in the >60 ft to <125 ft category and percentage covered ranged from 13%–34% over the three-year period. Catch of flatfish in the catcher processor fleet was largely in the >60 ft to <125 ft category, with the exception of arrowtooth flounder in the central GOA, and percentage covered varied widely.

Table 5 Central Gulf of Alaska total catch (mt), observed catch, and percent observed catch by area, harvest sector, gear type, trip target fishery, and vessel length

Gear	Trip target	Sector	Length	2004			2005			2006			2007		
				Total	Observed	Percent									
NPT	Arrowtooth	CP	>=60 and <125	0	0	0%	2,735	2,150	79%	3,878	1,500	39%	518	0	0%
			>=125	--	--	100%	--	--	100%	3,785	3,785	100%	4,498	4,498	100%
		S	<60	0	0	0%	0	0	0%	0	0	0%	--	--	0%
			>=60 and <125	7,517	1,476	20%	8,519	2,212	26%	12,543	2,993	24%	12,818	2,574	20%
	Flathead sole	CP	>=60 and <125	--	--	104%	--	--	77%	--	--	70%	--	--	104%
	Pacific cod	CP	>=60 and <125	--	--	0%	565	411	73%	--	--	0%	0	166	0%
			>=125	--	--	100%	0	0	0%	0	0	0%	0	0	0%
		S	<60	--	--	0%	--	--	0%	--	--	0%	--	--	0%
			>=60 and <125	12,443	3,716	30%	7,376	2,185	30%	4,861	1,152	24%	8,377	2,216	26%
	Rex sole	CP	>=60 and <125	2,674	0	0%	2,776	1,133	41%	6,883	1,691	25%	--	--	36%
			>=125	--	--	100%	--	--	100%	0	0	0%	0	0	0%
	Shallow water flatfish	S	<60	0	0	0%	11	0	0%	0	0	0%	547	0	0%
>=60 and <125			3,339	1,127	34%	6,835	1,300	19%	10,432	1,393	13%	13,382	3,441	26%	
PTR	Pollock, bottom and midwater	S	<60	--	--	0%	1,677	0	0%	--	--	0%	--	--	0%
			>=60 and <125	36,431	13,520	37%	47,273	14,845	31%	44,371	14,187	32%	33,530	11,150	33%
	Rockfish	S	>=60 and <125	66	217	327%	535	636	119%	1,999	1,211	61%	2,990	4,029	135%
POT	Pacific cod	CP	>=60 and <125	0	0	0%	0	0	0%	0	0	0%	--	--	0%
			<60	2,426	0	0%	3,233	0	0%	3,778	0	0%	4,296	0	0%
		S	>=60 and <125	2,475	687	28%	4,920	1,298	26%	4,369	981	22%	4,090	969	24%
			>=125	0	0	0%	0	0	0%	--	--	0%	0	0	0%

Source: http://www.fakr.noaa.gov/sustainablefisheries/inseason/percent_observed.pdf

Notes for Table 5:

These tables do not include data from shoreside processors using paper weekly production reports because the data is at the processor level. The vessel length associated with the catcher vessels delivering to the shoreside processor is not available. This includes 5,717 mt of total groundfish catch in the GOA, consisting of 19 processors in 2004, 11 processors in 2005, and 8 processors in 2006 in the GOA.

1. Values where total and observed columns are blank (-) indicate confidential data. Confidential data have been defined as <3 vessels and processors for that given year, area, sector, gear type, target fishery, and vessel length.
2. Total catch data are from the catch accounting system, and the observer data are from the observer database in March 2008.
3. Harvest sector: S=shoreside; CP/M=catcher processor or mothership
4. Gear type: HAL=hook-and-line; JIG=jig (not included in this table); NPT=non-pelagic trawl, POT=pot; PTR=pelagic trawl
5. Vessel length: <60=vessels less than 60 ft length overall (LOA); >=60 and <125=vessels greater than or equal to 60 ft and less than 125 ft LOA; >=125=vessels greater than or equal to 125 ft LOA
6. Year= target fishery year
7. Weight is rounded to the nearest mt.
8. Percent= (mt of observed catch/mt of total groundfish catch in catch accounting system)*100
9. Not included in the GOA are trip target fisheries per gear type: HAL= pollock, deepwater flatfish, rockfish, other species, arrowtooth (2,406 mt shoreside, 404 mt CP/M); NPT= pollock, deepwater flatfish, shallow water flatfish, rockfish, flathead sole, other species, sablefish (21,367 mt shoreside, 1,633 mt CP/M); POT= pollock, other species (18 mt shoreside); PTR= Pacific cod, shallow water flatfish, flathead sole, other species, arrowtooth, sablefish (2,220 mt shoreside, 566 mt CP/M)
10. For CPs and motherships groundfish catch estimates, the catch accounting system uses weekly production reports for vessels >=60 and <125 and observer data for vessels >=125 except for pot gear uses weekly production reports for vessels >=60.
11. In some cases, the observed data are higher than the total catch for a given area, sector, gear type, target fishery, vessel length. There are several reasons that this occurs:
 - a. In 2004-2006, four CPs >=125 ft. had haul data considered to be invalid by the Observer Program. These data were replaced with weekly production reports in the catch accounting system, but are still used as the observed total.
 - b. For catcher/processors and motherships >=60 and <125, there can be a mismatch between the trip target that is assigned from the observed data and the trip target that is assigned based on weekly production report data. This occurs when a vessel targets more than one target species during a week.
 - c. For the shoreside sector, the total catch is based on fish tickets, which could be different from the observer data.
 - d. The two databases include separate sources of information. The catch accounting system partially uses weekly production reports, landing reports, and observer data. Production reports are focused on different goals from the observer data (production vs. total catch), uses a different method to determine catch and targets, and in the cases of 30% observer coverage include dis-coordinated time frames of estimates, especially at the target level (i.e. observer data may not cover the entire week that a production report is based on).
12. A high level of variability in the percent observed catch for a given target fishery may be explained by the level of coverage that vessels had prior to entering a different FMP area. Observer coverage is by quarter and by fishery category, not by FMP area. A 30% vessel may have enough observer coverage in one FMP area to meet the requirements for their fishing in another FMP area. A high level of variability in percent observed catch also may be attributed to a variable number of vessels that participate in certain GOA fisheries each year.
13. This is NMFS' approach to the OAC data request, as of March 26, 2008.

3.2.3 Mortality Rates

The numbers reported in this analysis for bycatch in the groundfish fisheries represent the number of animals caught, and do not attempt to translate those numbers into the assumed mortality rates of crab caught as bycatch in the various gear types. The assumed handling mortality rate for crab caught as bycatch varies by gear type and target fishery, however there is no agreed-upon mortality rate calculation for each gear type. Based on the various studies that have been done, calculated mortality rates for crab in various gear types and target fisheries may differ widely. The various studies are summarized in Table 6.

In the meantime, the reader should be aware that the data presented in the sections below do not account for handling mortality.

Table 6 Various calculations of mortality rates for harvested crab

Study		Directed crab fisheries			Groundfish fisheries			Scallop fishery
		King crab	<i>C. opilio</i> Tanner crab	<i>C. bairdi</i> Tanner crab				
		Pot	Pot	Pot	Pot	Trawl	Longline	Dredge
Council re-evaluation of overfishing levels	NPFMC et al 2007	20%	50%	20%				
Council's annual BSAI Crab SAFE report	NPFMC 2007	8%	24%	20%	20%	80%	20%	40%
Council's groundfish amendment	NPFMC 1995				8%	80%	37%	40%
NRC study	NRC 1990					12-82%		
1998 snow crab study	Warrenchuk and Shirley 2002			22.2% ^a				

^a Estimate considered to be conservative because the estimated effects of wind and cold exposure as well as handling injuries were considered separately and not synergistically.

3.2.4 Overview of bycatch by area, gear type, and target fishery

In the GOA, *C. bairdi* bycatch primarily occurs in the western and central regulatory areas, and corresponds to the locations of the trawl and pot fisheries. Table 7 illustrates bycatch for 2003-2009, for reporting areas in the western and central GOA. Crab bycatch in the eastern regulatory area is negligible. Given that the proposed area closures in this analysis are all located in reporting area 630, from this point forward, the bycatch overview will focus on this particular reporting area.

Table 7 *C. bairdi* bycatch in the western and central GOA, 2003-2009, in Federal³ groundfish fisheries

Year	610	620	630
2003	7,388	24,033	116,814
2004	12,313	4,576	50,217
2005	45,865	7,037	111,129
2006	9,912	67,266	255,151
2007	34,219	57,336	220,545
2008	31,278	44,074	162,440
2009	8,922	50,717	182,542
Average 2003-2009	21,414	36,434	156,977

Source: AKFIN Comprehensive PSC database, February 2010. Excludes PSC attributed to the State Pacific cod fishery.

Table 8 identifies *C. bairdi* Tanner crab bycatch for 2003-2009, by gear type, in reporting area 630. Non-pelagic trawling contributes the majority of *C. bairdi* bycatch in the Federal groundfish fisheries in 630, ranging from 56% to 99% from 2003-2009, and averaging 83% over the time period. Table 9 provides some historical context for Tanner bycatch in the trawl fisheries, for the GOA as a whole, from 1993-2002. Pot gear catches the remainder of Tanner crab bycatch, with less than 1% of the total attributable to hook and line and pelagic trawl gear. Note, this section only reports on the number of crab caught as

³ Prohibited species catch (PSC), including catch of *C. bairdi*, is extrapolated to all catch in the GOA groundfish fleet using specific catch estimation procedures based on observed bycatch rates (see further explanation in Section 3.2.2). The observed bycatch rate is also applied to Pacific cod catch in the State managed fisheries that base their guideline harvest level on the Federal Pacific cod acceptable biological catch level (ABC). In order to provide the Council with an estimation of only the PSC taken in Federal fisheries, crab bycatch in the State waters pot fisheries was identified based on the date and location of catch. A discussion of the State waters Pacific cod fishery bycatch is presented separately in Section 3.3.1.

bycatch; the relative impact of bycatch on the mortality of crab likely differs by gear type, although studies differ as to the degree (see Section 3.2.3).

Table 8 C. bairdi bycatch in reporting area 630, by gear type, in GOA Federal groundfish fisheries, 2003-2009

Year	Hook and Line		Nonpelagic Trawl		Pelagic Trawl		Pot		Grand total
	Number of crab	% of grand total	Number of crab	% of grand total	Number of crab	% of grand total	Number of crab	% of grand total	
2003	20	0%	112,133	96%	104	0%	4,557	4%	116,814
2004	1	0%	49,763	99%	18	0%	434	1%	50,217
2005	805	1%	87,653	79%	136	0%	22,535	20%	111,129
2006	175	0%	234,238	92%	382	0%	20,356	8%	255,151
2007	117	0%	158,636	72%	1,285	1%	60,507	27%	220,545
2008	531	0%	91,696	56%	31	0%	70,182	43%	162,440
2009	356	0%	172,895	95%	171	0%	9,118	5%	182,542
Average 2003-2009	287	0%	129,573	83%	304	0%	26,813	17%	156,977

Source: AKFIN Comprehensive PSC database, February 2010. Excludes PSC attributed to the State Pacific cod fishery.

Table 9 Bycatch of Tanner crabs in Gulf of Alaska groundfish trawl fisheries, 1993-2002

Year	C. bairdi Tanner crab
1993	55,304
1994	34,056
1995	47,645
1996	120,796
1997	134,782
1998	105,817
1999	29,947
2000	48,716
2001	125,882
2002	89,433

Data has been screened for confidentiality. Source: M. Furuness, J. Keaton, NOAA Fisheries.

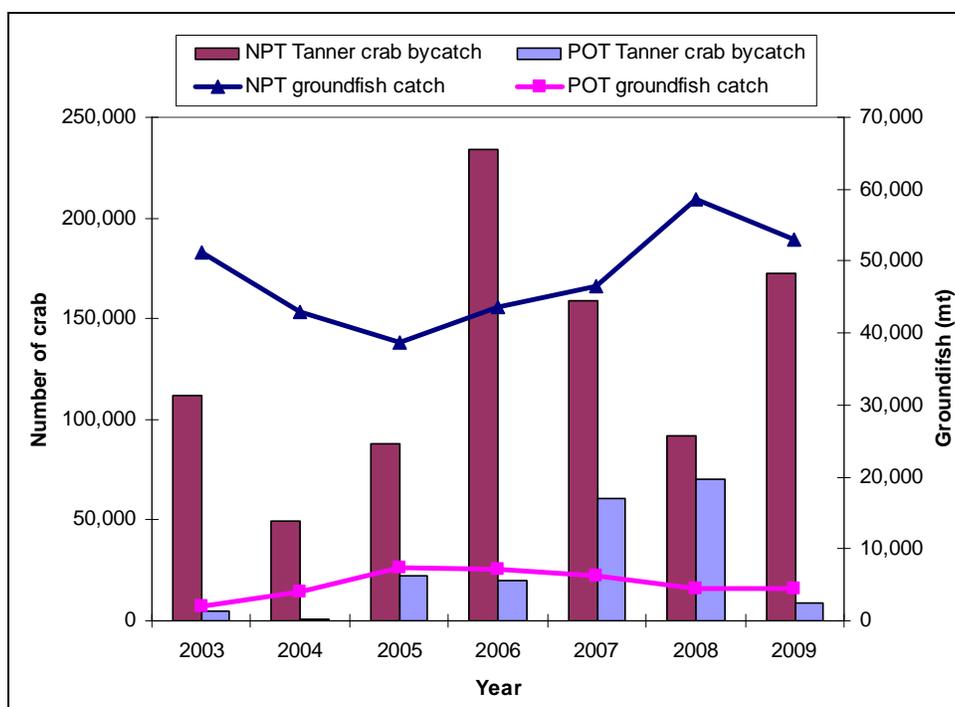
Table 10 and Figure 8 show the bycatch of Tanner crab in proportion with overall groundfish catch for each gear type. In Table 10, the average rate of Tanner crab bycatch per mt of groundfish catch for 2003-2009 was 2.71 crab per mt of groundfish for the nonpelagic trawl fisheries, and 5.2 crab per mt of groundfish for the pot fishery. Catch of groundfish by pot gear has remained relatively consistent throughout the last five years (Figure 8), while bycatch of crab increased in 2007 and 2008. The correlation of non-pelagic trawl bycatch and groundfish catch is less consistent over 2003-2009, with 2004 and 2008 having low bycatch rates, and 2006 having a high bycatch rate. It should be remembered when evaluating these bycatch numbers that they are extrapolated to the fleet as a whole from bycatch recorded on observed vessels, which account, on average, about one third of groundfish catch in the central GOA.

Table 10 Rate of Tanner crab bycatch per mt of groundfish catch in reporting area 630, by gear type, 2003-2009, in Federal groundfish fisheries

Year	Hook and Line	Nonpelagic Trawl	Pelagic Trawl	Pot
2003	0.00	2.19	0.01	2.20
2004	0.00	1.16	0.00	0.11
2005	0.08	2.26	0.01	3.04
2006	0.02	5.38	0.02	2.84
2007	0.01	3.41	0.07	9.59
2008	0.05	1.57	0.00	15.48
2009	0.04	3.26	0.02	2.02
Average 2003-2009	0.03	2.71	0.02	5.20

Source: AKFIN Comprehensive PSC database, February 2010. Excludes PSC attributed to State Pacific cod fishery.

Figure 8 Annual bycatch of *C. bairdi* Tanner crab and groundfish catch in reporting area 630, by Federal trawl and pot fishery sectors, 2003-2009



Source: *C. bairdi* crab bycatch from AKFIN Comprehensive PSC database, February 2010; excludes PSC attributed to the State Pacific cod fishery. Groundfish catch from AKFIN Comprehensive Catch Database, February 2010. Represents total GOA groundfish catch excluding State waters catch.

The highest numbers of Tanner crab taken as bycatch occur primarily in the non-pelagic trawl fisheries targeting flatfish, and in the pot fishery for Pacific cod (Table 11). In the nonpelagic trawl fisheries, the arrowtooth flounder target accounted for 33 to 66% of all *C. bairdi* bycatch in reporting area 630 (by any gear type) in 2004-2006, the shallow water flatfish target accounted for 30% in 2007 and 48% in 2003, and the rex sole target accounted for 58% of bycatch in 2009. Nonpelagic trawl vessels targeting pollock and Pacific cod also contribute to Tanner crab bycatch in some years, but always account for less than 10% of the gear type's total bycatch, and bycatch in the rockfish target fishery was less than 4% of the total in 2004 and 2005, and has been very low since the implementation of the rockfish pilot program in 2007. Bycatch in the Pacific cod pot fishery accounted for 20%, 27%, and 43% of all Tanner crab bycatch in reporting area 630 in 2005, 2007, and 2008, respectively, but only 1-8% in other years.

Table 11 Bycatch of *C. bairdi* Tanner crabs in Federal groundfish fisheries, in reporting area 630, by gear type and target fishery, 2003-2009.

Gear type	Target Fishery	2003	2004	2005	2006	2007	2008	2009	Average 2003-2009
Hook and line	Pacific cod	**	**	644	123	113	531	291	243
	Sablefish	**	**	162	0	4	0	65	36
Non-pelagic trawl	Arrowtooth Flounder	20,934	33,012	66,931	84,106	39,545	33,716	34,461	44,672
	Flathead Sole	16,500	2,249	12,540	23,470	24	6,397	7,647	9,832
	Pacific Cod	1,498	846	270	526	11,693	9,282	1,434	3,650
	Pollock (bottom)		517		7,690	16,484	229	3,055	3,996
	Rex Sole	17,241	4,115	1,187	37,410	24,979	21,373	105,058	30,195
	Rockfish	171	1,517	1,445	830	55	61	195	611
	Shallow Water Flatfish	55,780	7,506	5,091	31,098	65,687	20,456	20,957	29,511
Pelagic trawl	Pollock (bottom)	0	18	4	379	51	13	0	67
	Pollock (midwater)	2	0	1	1	17	15	1	5
	Rockfish			130	0	2	3	0	19
Pot	Pacific Cod	4,557	434	22,535	20,356	60,507	70,182	9,118	26,813

** = data is confidential.

Source: AKFIN Comprehensive PSC database, February 2010. Excludes PSC attributed to State Pacific cod fishery.

Timing of bycatch in Federal groundfish fisheries

The majority of Tanner crab bycatch is taken in the nonpelagic trawl and pot groundfish fisheries between January 1 and July 31 (Table 12). From 2003-2006, between 80% and 100% of all Tanner crab bycatch in the trawl fishery occurred within this season. In 2007 and 2008, approximately two-thirds of trawl Tanner crab bycatch occurred in January-July, although in 2009, only one third of bycatch occurred during this period. For pot vessels, the proportion of bycatch taken in January-July has varied from 59% to 100%, with an average of 89% over 2004-2009.

Table 12 Proportion of annual *C. bairdi* Tanner crab bycatch taken in January-July in reporting area 630, 2003-2009, in GOA Federal groundfish fisheries, by gear type

Year	Hook and Line	Nonpelagic Trawl	Pelagic Trawl	Pot
2003	100%	80%	98%	**
2004	100%	98%	0%	90%
2005	87%	100%	97%	75%
2006	73%	81%	0%	59%
2007	2%	68%	98%	93%
2008	100%	64%	18%	100%
2009	90%	32%	0%	84%
Average 2003-2009	85%	70%	71%	89%

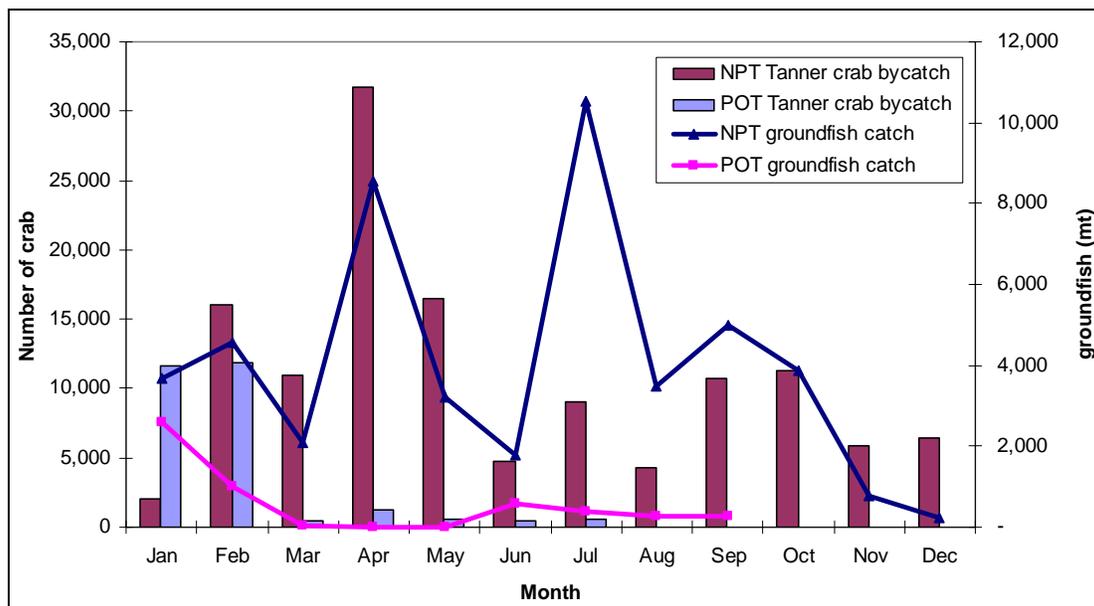
** = data is confidential.

Source: AKFIN Comprehensive PSC database, February 2010. Excludes PSC attributed to State Pacific cod fishery.

Bycatch amounts of *C. bairdi* Tanner crab taken in nonpelagic trawl and pot fisheries generally fluctuate temporally in direct response to groundfish catches (Figure 9). Trawl Pacific cod and flatfish harvests are managed on a quarterly basis, and the trawl fishery begins on January 20th each year. The pot Pacific cod fishery has two seasons (note, the State-managed Pacific cod fishery occurs in the middle of these,

beginning in March, as described further in Section 3.3.1). In the trawl fisheries, average bycatch of Tanner crabs from 2003 - 2009 (in numbers of crabs) increased notably in April due to bycatch in the combined flatfish fisheries. High groundfish catch by trawl vessels in July is associated with the rockfish fishery, which has lower Tanner crab bycatch.

Figure 9 Average bycatch of *C. bairdi* Tanner crab and total groundfish catch by month in reporting area 630, for non-pelagic trawl and pot sectors, in Federal fisheries, 2003-2009



Source: *C. bairdi* crab bycatch from AKFIN Comprehensive PSC database, February 2010; excludes PSC attributed to the State Pacific cod fishery. Groundfish catch from AKFIN Comprehensive Catch database, February 2010; excludes State waters catch.

The implementation of the central GOA rockfish pilot program, in 2007, has allowed some GOA non-pelagic trawl fisheries to occur later into the year than has been the case in years immediately previous. The rockfish pilot program has allowed fishery participants to reduce their catch of halibut PSC, which in previous years has closed down flatfish trawl fisheries in the GOA. Figure 10 illustrates the weeks in the last quarter of the year during which participants have been active in central GOA trawl fisheries, primarily for flatfish, from 2000 to 2009. Table 12 identifies that bycatch of crab in the nonpelagic trawl fisheries in August-December was higher in 2007-9, the years of the program, than in the years immediately previous.

Figure 10 Season duration of the trawl Central Gulf of Alaska groundfish fisheries from October 1 to December 31, 2000 to 2009.

Year	October					November				December			
	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13
2000	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2001	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2002	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2003	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2004	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2005	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2006	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2007	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2008	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active
2009	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active	Active

Source: NOAA Fisheries status reports and groundfish closure summaries

3.2.5 Bycatch in proposed area closures

The proposed area closures are small areas within the 630 reporting area described in Section 3.2.4 above. In order to examine the spatial distribution of bycatch at a finer scale than that of the reporting area, it is only possible to use the bycatch data collected on observed trips, as only observed hauls are associated with geographical coordinates. Consequently it is not possible to use the NMFS catch accounting database, which takes bycatch reports from observed fishing trips and extrapolates them to apply to all vessels fishing within the reporting area, to investigate the catch and bycatch activity of vessels fishing within these specific areas. It is possible to get a sense for how much catch and bycatch is occurring in the closed areas, however, by looking at data from observed groundfish vessels, as long as the limitations of using only data from observed vessels are kept in mind. These limitations are discussed in detail in Section 3.2.2. Only vessels that are 60 ft or longer are observed. Vessels between 60 and 125 ft using hook and line or trawl gear are only required to carry an observer for 30% of their fishing days, by quarter, although if they are larger than 125 ft the must have an observer onboard 100% of the time. Pot vessels carry an observer while 30% of their pots are pulled for the calendar year. Table 13 shows the number of observed vessels fishing in the proposed area closures over the period 2001-2009, compared to the number of vessels fishing in reporting area 630 as a whole. In many of the proposed areas closures, the number of vessels of a particular gear type fishing in an area in a particular year may be very low. Table 4 in Section 3.2.2 examines the actual percentages of observed catch by gear type and target fishery. Overall, the pot Pacific cod target had averaged between 12% and 26% of groundfish catch observed in the Central GOA between 2004 and 2006. Similarly, the nonpelagic trawl shallow water flatfish fishery averaged between 13% and 34% of catch observed between 2004 and 2007 in the same area. **Therefore it should be remembered, throughout this discussion, that the data may only represent a small proportion of fishing effort within the closed areas.**

Table 13 Number of observed vessels fishing in the proposed area closures, by gear type, for the period 2001-2009, and total of all vessels fishing in reporting area 630

Gear type		Observed vessels							Total vessels fishing in 630
		Proposed area closures					Rest of 630	Total – all of 630	
		525807	Chiniak	525702	525630	Total			
Hook and Line	Number of vessels in any given year	0 - 1	1 - 4	0 - 1	1 - 2	1 - 5	31 - 38	31 - 38	
	Total unique vessels	1	6	2	8	10	71	71	606
Nonpelagic trawl	Number of vessels in any given year	2 - 7	9 - 32	14 - 38	10 - 26	20 - 48	37 - 52	38 - 55	
	Total unique vessels	17	52	47	48	60	62	64	74
Pelagic trawl	Number of vessels in any given year	2 - 8	0 - 11	5 - 19	1 - 3	13 - 23	20 - 31	29 - 33	
	Total unique vessels	24	23	39	12	42	46	48	53
Pot	Number of vessels in any given year	0	0 - 7	0 - 3	0 - 3	1 - 7	5 - 16	5 - 16	
	Total unique vessels	0	14	7	7	17	33	33	129

Source: AKFIN Comprehensive Observer database, March 2010; AKFIN Comprehensive Catch database, February 2010.

In this section, we report annual observed bycatch and groundfish catch in the proposed area closures as a proportion of the total observed effort in reporting area 630. In the figures which illustrate where observed vessels fished, bycatch and groundfish catch numbers are summed for all the years from 2001 to 2009.

Observed bycatch in area closures, by gear type and target fishery

Tanner crab bycatch in the proposed closures, on observed vessels, represents an average of 63% of total observed Tanner crab bycatch from reporting area 630, for the years 2001-2009 across all gear types (Table 10). The majority of bycatch comes from ADFG statistical areas 525702 and 525630, representing approximately 54% of the total observed Tanner crab bycatch from reporting area 630. The proportion of bycatch coming from these areas is fairly consistent across the range of years included in this analysis, with the exception of 2002 and 2005, when the rate of bycatch in areas outside of the proposed closure areas represented the majority of Tanner crab bycatch in reporting area 630. Figure 11 compares the proportion of observed bycatch with the proportion of observed groundfish catch that is attributed to the proposed closure areas, as compared with reporting area 630. The proportion of groundfish catch from the proposed closure areas varies between 16 and 30% of the total groundfish catch for 630.

Table 14 Observed Tanner crab bycatch in the proposed area closures, as a proportion of total observed Tanner crab bycatch in reporting area 630, for all gear types

Year	Proposed area closures					Rest of 630
	525807	Chiniak	525702	525630	Total	
2001	0%	44%	26%	8%	78%	22%
2002	4%	1%	20%	7%	32%	68%
2003	3%	8%	18%	34%	64%	36%
2004	2%	12%	37%	20%	71%	29%
2005	0%	2%	19%	6%	28%	72%
2006	0%	1%	36%	36%	73%	27%
2007	0%	2%	40%	32%	75%	25%
2008	0%	1%	38%	36%	75%	25%
2009	6%	2%	51%	19%	77%	23%
Average 2001-2009	1%	6%	31%	24%	63%	37%

Source: AKFIN Comprehensive Observer data, March 2010.

Figure 11 Groundfish catch and Tanner crab bycatch in the proposed closed areas, as a proportion of total catch and bycatch in reporting area 630

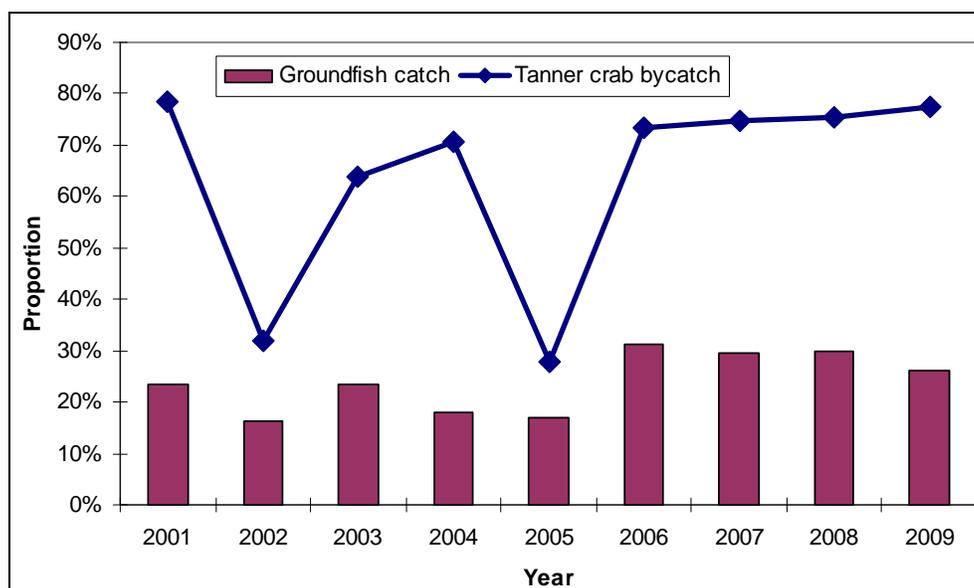


Table 15 combines observer data for the years 2001 to 2009, and identifies the proportion of observed bycatch for reporting area 630, for all years combined, that is attributable to each gear type in each of the proposed closure areas. Very few hook and line vessels were observed within the closed areas during the 2001-2009 period. Pelagic trawl vessels did fish in the closed areas, but contributed very little to the total observed Tanner crab bycatch in all of 630, including in the proposed closure areas. Based on observer data, nonpelagic trawl vessels fishing in the proposed closed areas account for 60% of the total Tanner crab bycatch observed in 630 across all years combined, with the majority of that bycatch caught in statistical areas 525702 and 525630 (Figure 21). For pot vessels, the majority of observed Tanner crab bycatch attributable to the gear type was caught in areas outside of the proposed closures. Table 16 shows observed bycatch rates for each gear type, number of bycaught crab per mt of groundfish, over the same period for inside and outside the proposed area closures and in reporting area 630 as a whole. For all gear types, bycatch rates are higher inside the closed areas than outside, which is consistent with the fact that the closures represent areas with higher crab abundance. For nonpelagic trawl vessels, bycatch rates are highest in 525807, where there is least observed nonpelagic trawl effort. For pot vessels also, observed groundfish catch is low in all of the closed areas, and bycatch rates are high. Only 13% of observed groundfish catch by pot vessels in reporting area 630 occurred in the closed areas, compared to 28% of catch for nonpelagic trawl vessels, 21% of catch for pelagic trawl vessels, and 2% of catch for hook and line vessels.

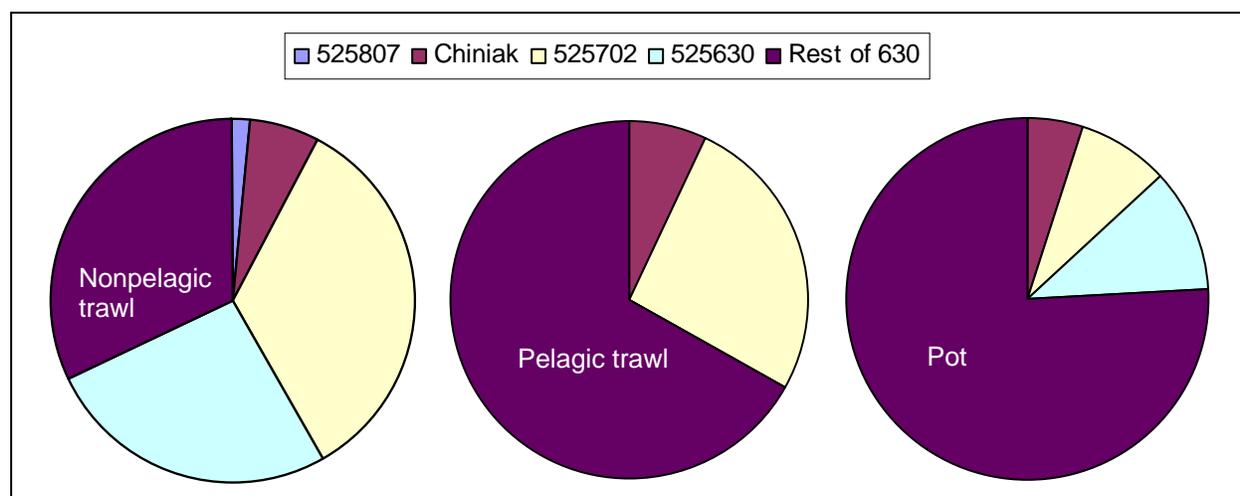
Table 15 Observed tanner crab bycatch in the proposed area closures, as a proportion of total observed Tanner crab bycatch in reporting area 630, by gear type, for the combined years 2001-2009

Gear type	Proposed area closures					Rest of 630	All of 630
	525807	Chiniak	525702	525630	Total		
Hook and line	**	0%	**	0%	0%	0%	0%
Nonpelagic trawl	1%	6%	30%	23%	60%	29%	89%
Pelagic trawl	0%	0%	0%	0%	0%	1%	1%
Pot	0%	1%	1%	1%	2%	7%	10%
Total (all gears)	1%	6%	31%	24%	63%	37%	

** = data is confidential

Source: AKFIN Comprehensive Observer data, March 2010.

Figure 12 Observed Tanner crab bycatch in proposed closed areas and reporting area 630, by gear, for the combined years 2001-2009



Source: AKFIN Comprehensive Observer data, March 2010.

Table 16 Observed bycatch rate in the proposed area closures, observed tanner crab bycatch per mt of groundfish catch, by gear type, for the combined years 2001-2009

Gear type	Proposed area closures					Rest of 630	All of 630
	525807	Chiniak	525702	525630	Total		
Hook and line	**	-	**	0.02	0.04	0.01	0.01
Nonpelagic trawl	13.35	2.97	4.62	3.89	4.17	0.79	1.75
Pelagic trawl	0.00	0.10	0.12	-	0.09	0.05	0.06
Pot		7.09	9.26	12.70	9.84	4.76	5.44
Total (all gears)	1.97	2.14	3.27	3.87	3.25	0.62	1.26

** = data is confidential

Source: AKFIN Comprehensive Observer data, March 2010.

The targets that have been observed in the proposed area closures are similar to those described for reporting area 630 as a whole. Primary nonpelagic trawl targets are flatfish (mainly arrowtooth flounder and shallow water flatfish, and some rex sole and flathead sole), with some Pacific cod and pollock targeting. Pelagic trawlers in the area are targeting pollock, and pot vessels Pacific cod.

Timing of observed bycatch in proposed closed areas

The majority of Tanner crab bycatch in the proposed areas closures, and in reporting area 630 as a whole, is caught during the first part of the year. Table 17 identifies the proportion of annual observed bycatch caught in each of the proposed area closures, by all gear types, between January 1 and July 31, for the years 2001 to 2009. On average, with the exception of the Chiniak area, between 82% and 95% of all Tanner crab bycatch in the proposed closures occurred in this time period. Table 18 shows the proportion of bycatch caught in January through July for each gear type, all years combined. In the Chiniak area, there is a higher occurrence of groundfish fishing in the second half of the year by nonpelagic trawl vessels than occurs in the other proposed closures. Table 21 illustrates how the bycatch is proportioned on a monthly basis.

Table 17 Proportion of annual observed Tanner crab bycatch caught in the proposed area closures between January 1 and July 31, 2001-2009

Year	Proposed area closures					Rest of 630
	525807	Chiniak	525702	525630	Total	
2001	100%	23%	44%	96%	38%	86%
2002	97%	100%	97%	100%	98%	96%
2003	100%	95%	88%	7%	47%	99%
2004	87%	100%	96%	95%	96%	98%
2005	100%	63%	100%	100%	97%	96%
2006	96%	3%	71%	98%	83%	89%
2007	45%	100%	84%	98%	90%	86%
2008	56%	95%	73%	99%	86%	94%
2009	100%	23%	98%	97%	96%	46%
Average 2001-2009	95%	51%	82%	82%	79%	92%

Source: AKFIN Comprehensive Observer data, March 2010.

Table 18 Proportion of annual observed Tanner crab bycatch, by gear type, caught in the proposed area closures between January 1 and July 31, for the combined years 2001-2009

	Proposed area closures					Rest of 630	All of 630
	525807	Chiniak	525702	525630	Total		
Hook and line	**		**	67%	82%	96%	95%
Nonpelagic trawl	95%	49%	83%	81%	79%	92%	83%
Pelagic trawl	100%	100%	91%		93%	98%	96%
Pot		70%	49%	95%	74%	92%	87%
Total	95%	51%	82%	82%	79%	92%	84%

** data is confidential

Source: AKFIN Comprehensive Observer data, March 2010.

Table 19 Proportion of annual observed nonpelagic trawl Tanner crab bycatch caught in the proposed area closures in each month, for the combined years 2001-2009

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
525807		29%	25%	4%	31%	1%	6%	0%	0%		2%	
Chiniak		3%	34%	0%	5%		6%			51%		**
525702	0%	4%	16%	31%	14%	3%	15%	5%	5%	6%	4%	
525630	1%	3%	2%	31%	1%	0%	43%	2%	2%	17%		**
Total – closed areas	1%	4%	12%	27%	9%	1%	25%	1%	3%	14%	2%	0%
Rest of 630	0%	8%	10%	36%	27%	3%	8%	3%	3%	3%	0%	2%
All of 630	0%	5%	11%	30%	15%	2%	19%	1%	3%	11%	1%	1%

** data is confidential

Source: AKFIN Comprehensive Observer data, March 2010.

Location of bycatch in proposed closed areas

In order to map the location of *C. bairdi* Tanner crab bycatch in GOA fisheries, as described above, only data from observed vessels are used because they are associated with geographical coordinates. The observer program database contains detailed sample-level information on species composition and the results of extrapolations from the sample(s) to the haul level. This spatial analysis uses the haul-level extrapolated bycatch numbers of *C. bairdi*, as well as the official ton weight of the haul, to calculate and present bycatch numbers and rates. The distribution of bycatch for 2001-2009 (summed over those nine years) is mapped using data from the AKFIN Comprehensive Observer database, March 2010.

Color Figure 1 through Color Figure 3, found at the end of this document, map observed Tanner crab bycatch and groundfish catch in reporting area 630 for nonpelagic trawl vessels. Color Figure 1 shows the observed number of crab caught as bycatch, summed over 2001 through 2009, within 10km grids. The red squares indicate areas of high bycatch, and the green areas indicate areas of low bycatch. Note that the northwestern portion of the Chiniak proposed area closure is closed to nonpelagic trawling under the GOA red king crab Type 1 closure, and that part of the western portion of 525702 is closed seasonally as a Type 2 closure (see Section 3.2.1 for more information). The southeastern portion of the Chiniak closure has areas of higher bycatch, as does the central sections of the 525702 and 525630 closures. Bycatch in the 525807 closure is comparatively not as high, although directly to the east of the proposed closures are grids with higher bycatch.

By comparing Color Figure 1 with Color Figure 2, it is apparent that many of the areas that are subject to high Tanner crab bycatch are also areas that are heavily fished by nonpelagic trawl vessels. This is particularly true for the central sections of 525702 and 525630, and to some extent also for the Chiniak

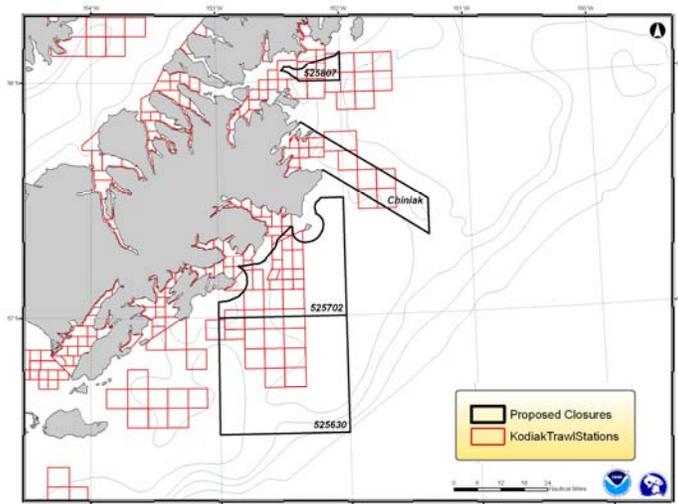
southeastern section. Color Figure 3 demonstrates this comparison by illustrating the amount of groundfish that is caught for each bycaught crab. In this figure, grids with a high rate of catch to bycatch are shown in orange and red. A relationship is apparent between high groundfish effort and higher bycatch levels in 525702, 525630, and Chiniak.

The same three types of figures are provided for pelagic trawl and pot vessels. Maps of hook and line effort in the proposed closure areas are not included, as there has been very little observed hook and line effort in these areas in 2001-2009. Color Figure 4 shows the number of crab caught as bycatch by observed pelagic trawl vessels, and Color Figure 5 the groundfish catch for the same period. Note that the scales are the same for each gear type for crab bycatch and the bycatch rate per mt groundfish, however for groundfish effort, the pot gear map (Color Figure 8) has a different scale. Pelagic trawling for pollock, the primary target in these areas, is prohibited in the northeastern portion of the Chiniak proposed closure, due to Steller sea lion protection measures. Color Figure 6 shows the rate of groundfish catch per crab caught as bycatch, which identifies the northcentral portion of 525702 as having a low bycatch rate for pelagic trawlers.

The maps for pot effort show that the majority of observed pot fishing does not occur within the proposed closed areas. The highest areas for crab bycatch on observed vessels were to the southwest, just outside of 525630 (Color Figure 7), and Color Figure 8 shows that the majority of observed catch in reporting area 630 occurs to the northeast of Kodiak Island. There are pockets of higher bycatch in 525702 and 525630, and in the inshore part of the Chiniak proposed closure. Color Figure 9 illustrates bycatch rates for observed pot vessels, which are often high, however it should be remembered that studies show that the mortality rate of bycaught crab for this gear type are lower than that for trawl gear (Section 3.2.3).

The proposed closure areas were identified based on areas of crab abundance, however in some cases, the specific boundaries of the closed areas were chosen because they represent areas that are defined in existing regulations (in this case, ADFG statistical areas), that also encompass the areas of crab abundance. Chiniak is the exception to this methodology, as its boundaries cross ADFG statistical areas. For areas 525702 and 525630, however, it is notable that the ADFG survey of crab in these areas, which has been identified as important for the GOA Tanner crab stock, is smaller than the statistical areas which are proposed for closure. Figure 13 shows a map overlaying the proposed area closures on the ADFG crab survey grid. However, as demonstrated in the color figures in Appendix B, crab bycatch is also observed in the areas outside of the survey area, but within the statistical areas identified as proposed closures.

Figure 13 Proposed closed areas (shaded) and areas surveyed in the ADFG crab trawl survey (grids)



3.3 *C. Bairdi* Tanner crab bycatch in other fisheries

3.3.1 Bycatch of *C. bairdi* in the State waters Pacific cod pot fishery

The State-managed Pacific cod fishery in western and central GOA began in 1997, and is only open to pot and jig gear. The fishery is managed in five districts: South Alaska Peninsula, Chignik, Kodiak, Cook Inlet, and Prince William Sound. The State bases its guideline harvest level on the Federal acceptable biological catch (ABC) for Pacific cod, and the Council and NMFS reduce the Federal total allowable catch (TAC) for Pacific cod to accommodate the State fishery. In most cases, the fisheries open one week after the close of the Federal Pacific cod A season, and occur in late February to April.

In the discussion of bycatch numbers in Sections 3.2.4 and 3.2.5, catch amounts attributable to the State Pacific cod fishery are not included in the data. However, NMFS inseason management tracks the catch of Pacific cod in the State water fishery, and also makes prohibited species catch extrapolations based on that groundfish catch, because the State Pacific cod fishery guideline harvest level is based on the Federal ABC for Pacific cod. Crab bycatch from the State Pacific cod pot fishery was identified based on the date and location of catch, and these data are presented separately in this section.

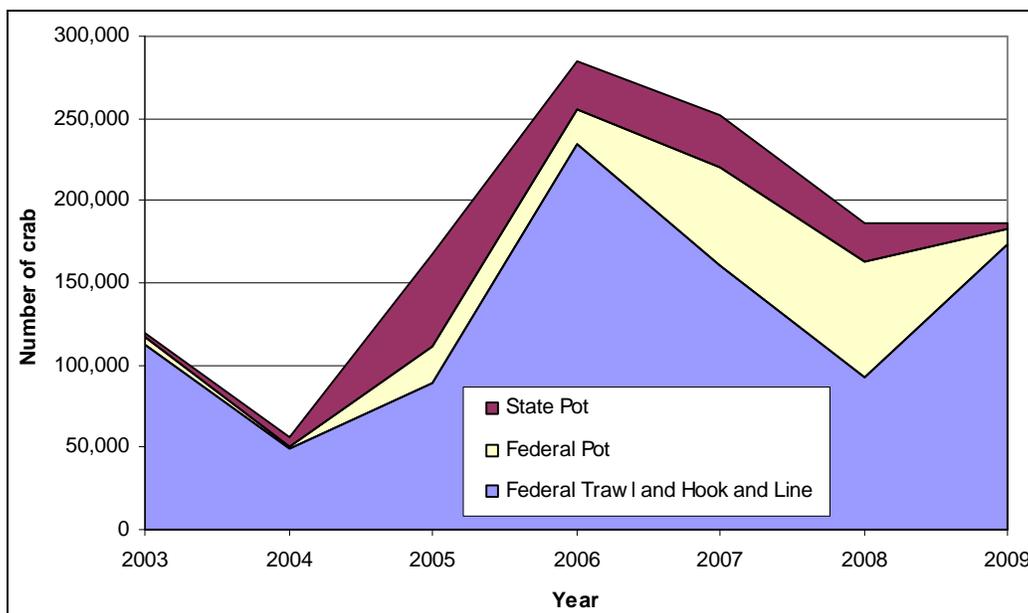
Table 20 identifies the *C. bairdi* bycatch attributable to the State managed Pacific cod pot fishery, which varied from a low of approximately 2,750 crab in 2003, to a high of 56,436 crab in 2005. The contribution of the State managed fishery to overall *C. bairdi* bycatch in the GOA ranged from a low of 2%, in 2003, to a high of 34%, in 2005. On average, the State Pacific cod fishery contributes approximately 12% to the overall *C. bairdi* bycatch in reporting area 630 (Figure 14). It is worth remembering that the bycatch estimates from the State managed fishery are based on extrapolations from similar size vessels fishing in the Federal Pacific cod pot fishery, as there is minimal observer coverage in the State fishery. Consequently, these estimates should be interpreted with caution.

Table 20 *C. bairdi* bycatch in Federal and State groundfish fisheries in reporting area 630, 2003-2009

	Federal fisheries (hook and line, pot, and trawl)	State Pacific cod fishery (pot gear)	Grand Total	State as % of total
2003	116,814	2,751	119,565	2%
2004	50,217	6,355	56,572	11%
2005	111,129	56,436	167,565	34%
2006	255,151	29,894	285,045	10%
2007	220,545	31,057	251,602	12%
2008	162,440	23,319	185,758	13%
2009	182,542	3,751	186,293	2%
Average 2003-2009	156,977	21,938	178,914	12%

Source: AKFIN Comprehensive PSC database, February 2010.

Figure 14 Federal and State *C. bairdi* Tanner crab bycatch in GOA groundfish fisheries



Source: AKFIN Comprehensive PSC database, February 2010.

3.3.2 Scallop fishery

Tanner crab are also caught as bycatch in the scallop dredge fishery. Bycatch is controlled through the use of crab bycatch limits (CBLs), which are based on the condition of individual crab stocks. CBLs were first instituted by the State of Alaska in July 1993. In the scallop fishery’s Kodiak Northeast District, in which the proposed area closures are located, CBLs for Tanner crab are set at 0.5% or 1.0% of the total crab stock abundance estimate, based on most recent survey data. When Tanner crab abundance is sufficient to support a commercial crab fishery, the cap is set at 1.0% of the most recent abundance estimate; when Tanner crab abundance is insufficient to support a commercial crab fishery, the CBL is set at 0.5%. Bycatch caps are expressed in number of crabs and include all sizes of crabs caught in the scallop fishery. Table 21 lists the CBLs in the scallop fishery from 2000/01 to 2008/09, as well as the estimated bycatch. State managers also have inseason authority to close the scallop fishery out of specific areas within the Northeast District to address crab bycatch. This might occur if the overall crab survey abundance in an area is low, or if the proportion of juveniles to legal males observed as bycatch is high (N. Sagalkin, pers. comm., 2/1/10).

Table 21 *C. bairdi* Tanner crab bycatch limits and estimated bycatch in the scallop fishery in Kodiak Northeast District, 2000/01-2008/09, in numbers of animals

Year	Crab bycatch limit	Estimated bycatch
2000/01	81,000	13,311
2001/02	425,000	20,362
2002/03	1,100,000	22,821
2003/04	606,991	18,230
2004/05	527,388	30,717
2005/06	449,403	29,264
2006/07	302,000	16,899
2007/08	220,000	77,348
2008/09	186,000	39,732
Average 2002/3-2008/9		33,573

Source: Rosenkranz and Burt, in prep.

3.4 C. *bairdi* Tanner crab directed fisheries

Tanner crab fisheries in the Kodiak District are managed according to a regulatory harvest strategy. Harvest strategies contain a threshold of mature male abundance as well as additional criteria that must be met prior to the Kodiak District or sections within the district open to commercial fishing. Survey data are also used to determine an annual guideline harvest level (GHL). Commercial fisheries remain open until the GHL is attained or fishery performance (e.g., declining CPUE or average weights) warrants closure to protect the long-term health of the stocks.

The Tanner crab fishery in the Kodiak District began in 1967 when 110,961 pounds were landed (Figure 3). From 1968 through the 1971/72 season, the fishery quickly expanded and over 34 million pounds were harvested. 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. The commercial fishery peaked during the 1977/78 season when over 33 million pounds were harvested.

Tanner crab stocks continued to decline in the Kodiak District, and by the early 1990s, annual harvests averaged less than two million pounds. Beginning with the 1994/95 season, the fishery was closed due to the decline in the harvestable surplus of Tanner crabs in the district. The commercial fishery remained closed until the 2000/01 season when the observed population began to rebound. During the six-year closure period a harvest strategy was developed by ADF&G and subsequently adopted by the Alaska Board of Fisheries (BOF) in 1999. This harvest strategy specified minimum population levels (biological thresholds) and minimum guideline harvest levels (management thresholds) to open a commercial fishery.

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).

Figure 6 depicts sections that have been open to commercial fishing from 2006 to 2009 and ADFG statistical areas within those sections where the majority of the harvest has occurred.

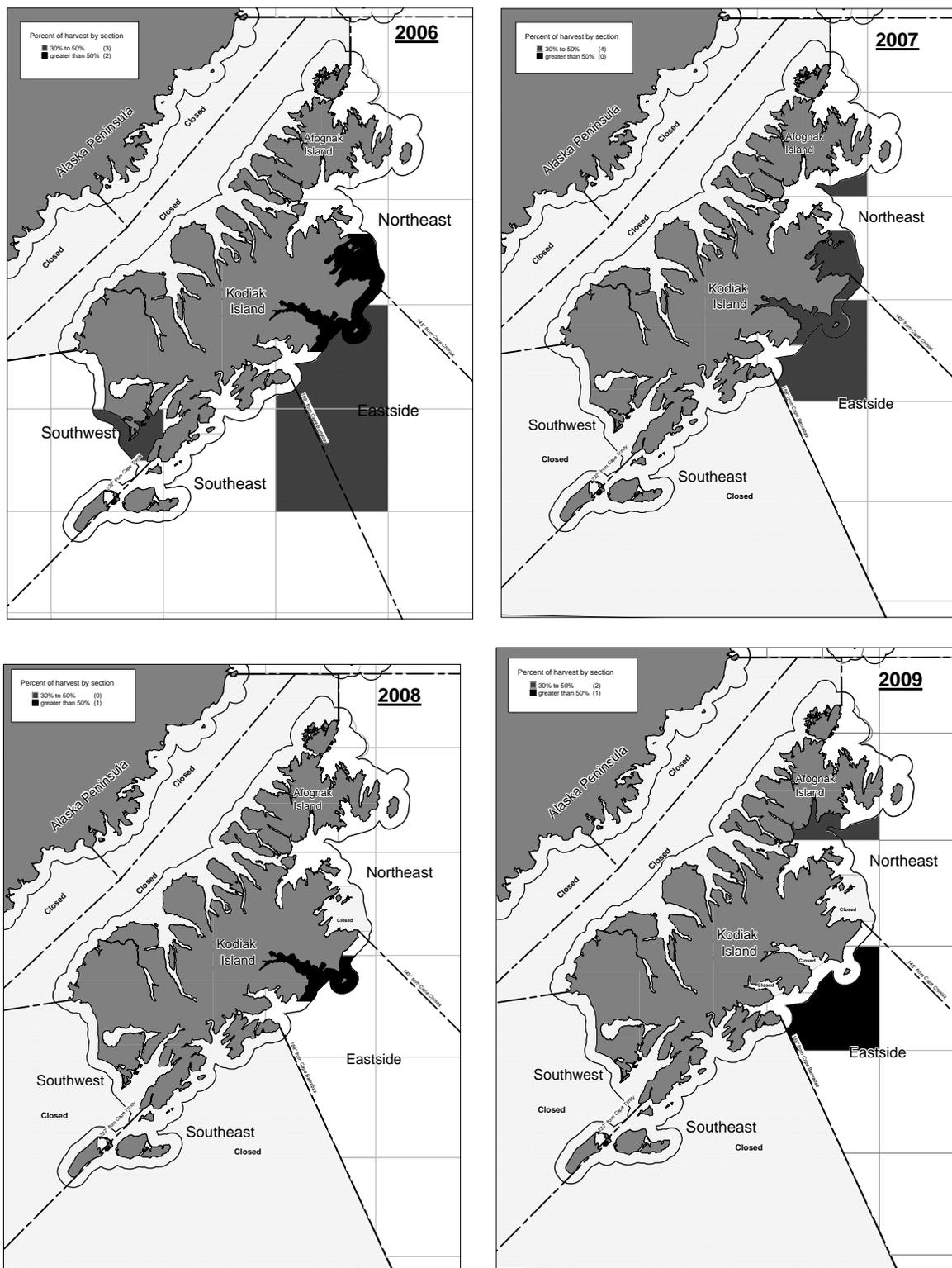
Commercial fishing for Tanner crab in 2009 occurred in the Northeast, Eastside, and Southeast sections of the Kodiak District. Ugak and Kiliuda bays within the Eastside section were kept closed to minimize handling of pre-recruit crab (Sagalkin 2009). Catch information for 2003 to 2009 is provided in Table 22.

Table 22 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	
	millions of 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/shellfish/shellfish_harvest.php for commercial harvest.

Figure 15 Kodiak District section open to commercial Tanner crab fishing and locations of high percentages of the Tanner crab harvest, 2006-2009.



Source: K. Spalinger and N. Sagalkin, ADFG

3.5 Modified gear to reduce impacts on crab

3.5.1 Sweep modification for bottom trawl vessels

The predominant direct effects caused by nonpelagic trawling include smoothing of sediments, moving and turning of rocks and boulders, resuspension and mixing of sediments, removal of seagrasses, damage to corals, and damage or removal of epibenthic organisms. Trawls affect the seafloor through contact of the doors and sweeps, footropes and footrope gear, and the net sweeping along the seafloor. A considerable proportion of the area impacted by trawling is due to contact between the seafloor and the sweeps.

The Council has approved a gear modification requirement that trawl sweeps used for all flatfish fishing in the Bering Sea must be modified. Vessels must install elevating devices (Figure 16) on the sweeps and regular intervals, in order to raise the sweeps off the seafloor and reduce adverse impacts on benthic animals. For most Bering Sea flatfish trawls, sweeps are so long (up to 1500 ft) that they sweep 90 percent of the area covered between the trawl doors. The proposed modifications elevate most of the sweep area 2 to 3 inches above the substrate, allowing space for animals to pass beneath. If the Secretary of Commerce approves the Council's gear modification requirement, the regulations will likely be implemented for the beginning of the 2011 fishing year.

The trawl sweep modification has only been tested on the Bering Sea shelf, for its effectiveness at reducing effects on sessile seafloor animals on unconsolidated (sand and mud) substrates.

Figure 16 Examples of elevating devices.



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



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

Effects on Crab Mortality

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 bottom trawls, but remain on the seafloor. That study estimated mortalities for both species for conventional and modified sweeps. Briefly, crabs were captured by auxiliary nets fished behind different parts of a commercial bottom trawl. They were carefully brought aboard and assessed using a six part reflex test. A subsample of those crabs was held for 5 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

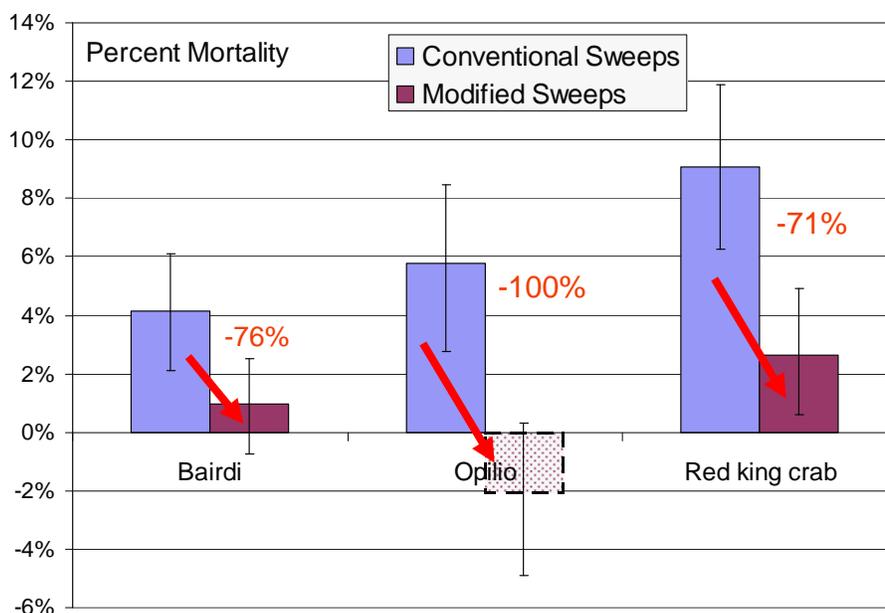
captured with a control net, fished in front of the trawl to serve as a scientific control for the effects of the recapture net itself, were used to assess and adjust for mortalities due to capture and handling. Sample sizes were 21 tows for conventional and modified sweeps and 19 tows of the control net.

Estimates of mortality for crabs encountering conventional sweeps were approximately 5 percent for both species (Figure 17). 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 bottom 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 17 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).

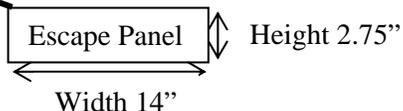


Overall, the trawl sweep modification has been tested to be effective in the Bering Sea flatfish trawl fishery in reducing trawl sweep impact effects on *C. bairdi*, *C. opilio*, and red king crabs by reducing the unobserved mortality of these species. Additionally, the trawl sweep modification has proven 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.

3.5.2 Pot escape mechanisms

The typical Pacific cod pot has tunnels on three sides with cod triggers that allow the passage and retention of Pacific cod. These tunnels with triggers are normally fixed via webbing to a set of web bars that are inset from the outside frame bars by approximately 2 inches. Crab below a threshold size are also able to enter the pot through the triggers, resulting in Tanner crab bycatch when fishing in areas having concentrations of both Pacific cod and Tanner crab. To reduce the bycatch of crab, a pot would need an opening that would permit crab to exit while retaining Pacific cod. The prototype pots are identical to the normal pots (overall dimensions: 6 ½ ft x 7 ft x 3 ft) with tunnels on three sides and an access door on the fourth side. On the rear side of the pot (opposite the door), two web bars are placed horizontally across the bottom instead of the usual one, with the tunnel web laced to only the top bar (Figure 18). Vertical bars are then placed in between the two web bars resulting in four escape openings that are 15 inches wide and 3 inches high. These openings are large enough to permit a Tanner crab to escape, but are not high enough to allow Pacific cod to escape.

Figure 18 Diagram of a modified groundfish pot that has a bottom escape panel..



4 Probable Environmental Impacts

This document analyzes three alternatives that evaluate proposed area closures to protect *C. bairdi* crab around Kodiak Island. Included in the alternatives are options to apply the closures year round or seasonally, and to some or all gear types. Additionally, some vessels may be exempted from the area closures if they meet specific conditions such as using approved gear modifications, or a 100% observer coverage requirement.

The proposed action affects vessels fishing in the Federal groundfish fishery in the Central Gulf of Alaska. Only those environmental components that occur in the proposed area closures around Kodiak Island, or in adjacent areas in which displaced vessels may choose to fish, are likely to be affected by this action. These components include crab species, especially *C. bairdi* crab, target and nontarget fish species, marine mammals and seabirds, bottom habitat, and ecosystem components. This environmental assessment focuses on these potentially affected components, and no effects are expected on the other components of the marine environment in the Gulf of Alaska.

In this section, the impacts of the alternatives and option on the various environmental components are evaluated. Section 4.1 addresses the impacts of the alternatives on *C. bairdi* crab. Section 4.2 looks at impacts on other crab and fish species, and Section 4.3, seabirds and marine mammals. Sections 5.4 and 5.5 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 (Sections 6.7 and 7.9).

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 4.6.

Section 5 addresses the management and enforcement considerations of the proposed alternatives and options.

The criteria listed in Table 23 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 23 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.

4.1 C. bairdi Tanner crab

A discussion of crab stock abundance and bycatch in the groundfish fisheries, both inside and outside of the proposed closed areas, is addressed in Chapter 3. This section draws on this information to evaluate the effects of the alternatives and options.

Alternative 1 – status quo

The impact of 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). As described in Section 3.1, ADFG conducts annual surveys of the crab stocks in the GOA (Spalinger *in press*). The surveys are partial, and concentrate on the historically most important areas of crab abundance; hence, the estimates of abundance are on the low side of total abundance in the area since the total crab habitat is only partially surveyed. In 2009, the estimate of Tanner crab in the Kodiak District was approximately 84 million animals (Table 1). The estimated bycatch in 2009 in the groundfish fisheries for reporting area 630 was approximately 183,000 animals (Table 7 in Section 3.2.4); combined for areas 620 and 630, estimated bycatch was 223,000 animals (although area 620 also includes the Tanner crab Chignik district population). In either case, this represents approximately 0.2 percent of the surveyed abundance of the Kodiak District. The proportion is also comparable for the 2003-2009 averages for groundfish Tanner crab bycatch and Kodiak District Tanner crab surveyed abundance. The Harvest Specifications EIS concludes that bycatch of this magnitude is not considered to have an impact on stocks of Tanner crab in the GOA (NMFS 2007).

State crab fishery managers have identified the Eastside Section of the Kodiak District as the most important area for the Tanner crab population (N. Sagalkin, pers. comm., 2/1/10). This area contains most of the biomass for the District (an average of 44% of abundance for the period 2003-2009; Table 1). Bycatch information for the groundfish fishery as a whole is available for reporting area 630, which is larger than the Eastside Section, including most of the Kodiak District Sections excepting Southwest and South Mainland. However, observer data shows that Tanner crab bycatch in the Eastside Section (represented by bycatch in proposed area closures 525702 and 525630) was approximately 70% of total observed bycatch in 630 in 2009, and 55% on average from 2001-2009. The total Tanner crab bycatch by the groundfish fisheries in reporting area 630 represents 0.5% of the surveyed crab abundance in the Eastside Section for 2009, or 0.3% of the average abundance for 2003-2009. To provide some context for this percentage, the State of Alaska has set crab bycatch limits for the scallop fishery at 0.5-1% of the total crab stock abundance for the Kodiak area.

Additionally, Sections 3.1 and 3.4 describe that the Tanner crab population around Kodiak has been rebounding from lows in the mid 1990s, despite continued bycatch in the groundfish fisheries throughout this period (Table 11). 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). Consequently, based on the criteria identified in Table 23, groundfish bycatch impacts on the sustainability of Tanner crab in the Kodiak District are considered as adverse, but are not likely to be significant.

Alternative 2 – close areas to groundfish fishing

Closing specific areas to groundfish fishing in order to reduce bycatch of Tanner crab is likely to benefit the stock by reducing a source of mortality. The proposed area closures account for an average of 63% of the total observed Tanner crab bycatch in the groundfish fisheries for 2001-2009, while only representing an average of 24% of groundfish catch (Table 14 and Figure 11). Consequently, groundfish effort that is displaced into neighboring areas is not likely to have as high a bycatch of Tanner crab as is currently occurring in the proposed closed areas.

Suboptions 1, 2, 3, 5 – close areas to a particular gear type

Nonpelagic trawl gear catches the vast majority of Tanner crab bycatch in reporting area 630 (Table 8), in part because this gear type also accounts for approximately 60% of total groundfish catch in the area. Bycatch rates in the proposed area closures, based on observer data, are higher in the proposed area closures, 4.17 crab/mt groundfish compared to 0.79 crab/mt groundfish in the rest of 630 (Table 16). Based on observed data, bycatch is highest in 525702 and 525630 (the areas with the highest Tanner crab population), and lower in the Chiniak and 525807 areas (which have lower abundance of Tanner crab) (Color Figure 1). Fishing effort is also highest in the Eastside Section closures (525702 and 525630; Color Figure 2). Displaced vessels may have a lower catch per unit effort from harvesting groundfish in neighboring, less productive areas; this may increase the bycatch rate of Tanner crab in these neighboring areas. However, overall the implementation of the area closures for nonpelagic trawl vessels is likely to reduce Tanner crab bycatch overall, and as such would benefit the stock.

Pot vessels account for an average of 17% of Tanner crab bycatch in reporting area 630 (Table 8), and overall the bycatch rate of crab per mt of groundfish is highest in this sector (Table 10). Note that handling mortality associated with pot gear is reported to be lower than that associated with nonpelagic gear (Section 3.2.3). According to the observer data, the proposed area closures are not used extensively by pot vessels; most of the observed pot effort occurs elsewhere, and bycatch of Tanner crab is highest for pot vessels in areas outside of the proposed area closures (Color Figure 7 and Color Figure 8). The limitations of observer coverage should be remembered for this sector, as observed trips are fewer both due to the size of vessels in the fleet and the overall amount of groundfish catch by this sector. Observer data would indicate that the area closures that are proposed in this analysis are not optimally designed for reducing crab bycatch in the pot sector, however to the extent that pot vessels are currently fishing in the proposed area closures, the crab stocks will benefit from the reduced bycatch.

Very few benefits to the stock are likely to accrue to the Tanner crab stock from closing the proposed areas to hook and line fishing. The gear type catches 0% of the total Tanner crab bycatch in reporting area 630 (Table 8), and based on observer data, also makes little use the proposed areas for target fishing.

Pelagic trawl vessels use the proposed closed areas for pollock fishing, according to data from observed vessels, but also have very low Tanner crab bycatch, both in the proposed closed areas and in reporting area 630 as a whole. As with hook and line vessels, the benefit to Tanner crab stocks of closing the proposed areas to pelagic trawling would be slight.

Suboption 4 – exempt vessels using approved, modified gear from area closures

Section 3.5 discussed two types of modified gear that might be used in the groundfish fisheries to reduce crab bycatch, however neither has been tested for use in the GOA. The trawl sweep modification has

proven to be effective in the Bering Sea flatfish fisheries, and in that instance is successful at reducing unobserved mortality of crab from the trawl sweeps. While requiring this modification for vessels fishing in the area closure would certainly provide benefit to crab stocks, by reducing unobserved mortality, it would not be likely to change reported bycatch totals from trawl fishing, which account only for bycatch that comes up in the trawl net.

The pot modification has not yet been tested at all. Should it prove effective, it would successfully reduce bycatch for the Pacific cod pot fishery. As there are currently no test results available, it is, however, unknown what the impact will be on crab stocks.

Option 1 or 2 – close areas either year round or seasonally

As described in Section 3.1.2, crab are most vulnerable during mating, molting, and hatching. Table 3 shows the annual timing for these activities for Tanner crab. April and May appear to be key months during which crab are sensitive, although the timing of the female molt to maturity spans a longer timeframe. The directed crab fishery is closed from April 30, in order to protect crab at the onset of the mating and molting season.

Option 1, the year round closure, would provide the most protection to Tanner crab. However, Table 12 illustrates that on average, 70-90% of Tanner crab bycatch in the groundfish fisheries (for reporting area 630) is taken with the January-July period, so that under Option 2, crab stocks would still receive considerable benefit from the seasonal closure. The January to July period would encompass the most sensitive months of the crab mating and molting cycle. Using observer data to look specifically at the proposed area closures, the pattern is similar for most of the areas except for Chiniak. In that case, only half of the bycatch on average is caught during the January-July period, as more groundfish fishing occurs in this area in the latter part of the year.

Alternative 3 – close areas to groundfish fishing unless vessels have 100% observer coverage

Alternative 3 would not provide additional protection to crab for those vessels who take advantage of the exemption and fish in the area with 100% coverage. For other vessels, the impact would be similar to Alternative 2. The primary benefit of Alternative 3 would be to reduce the uncertainty associated with the reported bycatch numbers for fishing in the proposed area closures, as all fishing in the areas would be fully monitored. This would allow the Council, at some time in the future, to have a more precise understanding of the exact extent of bycatch in the proposed area closures, and to take appropriate action as necessary.

4.2 Groundfish and incidental catch species

Groundfish fishing occurs in the proposed closure areas primarily with trawl gear. Based on observer data, there is very little hook and line effort occurring in the proposed closure areas, and the majority of observed pot effort occurs to the northeast rather than in the proposed closure areas.

Pelagic trawl vessels in the area target pollock. Color Figure 5, at the end of this document, illustrates observed pelagic trawl effort in reporting area 630. Nonpelagic trawl vessels target primarily flatfish, with some Pacific cod and pollock targeting as well. The distribution of observed catch is shown in Color Figure 2. Further information describing the groundfish fisheries affected by the proposed action can be found in Section 6.6, in the Regulatory Impact Review.

Effects of the Alternatives

All groundfish harvest during the GOA groundfish 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 of prohibited species (crab, halibut, herring, and salmon), is also monitored. 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 GOA groundfish fisheries are currently at sustainable population levels and are unlikely to be overfished under the current management program. Bycatch levels of prohibited species are not at levels that are likely to jeopardize the sustainability of the species. As a result, impacts on these species under the status quo alternative are not likely to be significant.

The proposed action is not expected to result in significant changes in groundfish or incidental catch levels. The proposed area closures may displace some vessels, however the areas are small and the timing, general location, and overall level of effort in the groundfish fisheries is unlikely to change as a result of the closures. Consequently, effects on populations of the species caught directly or incidentally in the GOA groundfish fisheries are not expected to be significant.

4.3 Marine mammals and seabirds

Marine mammals

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 24 (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 assessment 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 or 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 (pot, trawl and hook and line) are classified as Category III fisheries under the Marine Mammal Protection Act (2009 draft List of Fisheries (74 FR 27739, June 11, 2009)). Category III fisheries are unlikely to cause mortality 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 24. 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 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. This draft biological opinion for these species is expected to be released in April 2010. NMFS 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 24 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
Cetacea	Species	Stocks
	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 Steller sea lion protection measures include area-specific closures around rookeries and haulouts and seasonal divisions of TACs to disperse fishing effort throughout the year. The Pacific cod fishing season was divided into two periods: 60% of the TAC was allocated among the A season (Jan. 1 – June 10) and 40% to the B season (June 10 – Dec. 31). The objective was to limit the total amount of cod harvested in the first half of the year. Pacific cod is an important prey item of Steller sea lions (NMFS 2000).

Since 2000, the U.S. portion of the western population of Steller sea lions has been increasing. However, the 2004 count (38,988 animals) was still 7.4% lower than the 1996 count and 32.6% lower than the 1990 count. In the GOA, the 2004 count (9,005 animals) was 12.6% higher than the 2000 count (7,995 animals), but was 45.1% lower than the 1990 count. Although counts at some trend sites are missing for both 2006 and 2007, available data indicate that the size of the adult and juvenile portion of the western Steller sea lion population throughout much of its range (Cape St. Elias to Tanaga Island, 145°-178° W) in Alaska has remained largely unchanged between 2004 (23,107 animals) and 2007 (23,118 animals) (Fritz et al. 2007). However, there are significant regional differences in recent trends: increases between 2004 and 2007 in the eastern Aleutians and western/central Gulf of Alaska have largely been offset by decreases in parts of the central Aleutians and eastern Gulf of Alaska. The relative stability in the Cape St. Elias-Tanaga Island area coupled with the declining trends observed through 2006 west of Amchitka Pass

suggest that the overall trend for the western stock in Alaska (through 2007) is either stable or declining slightly.

Incidental mortality of Steller sea lions during the GOA groundfish fisheries is summarized in Table 25. No incidental mortalities were observed in the fixed gear sectors. In the 2007 stock assessment, the GOA pollock trawl fishery contributes an estimated 0.5% of the total annual mortality to the western population of Steller sea lions attributed to commercial fisheries. The minimum estimate of incidental mortality due to commercial fishing activities in all waters off Alaska is 26.2 sea lions per year, which exceeds 10% of the potential biological removal (PBR), however the total estimated annual level of human-caused mortality and serious injury for all sources is below the PBR level (247) for this stock (Allen and Angliss 2010).

Table 25 Incidental mortality of Steller sea lions in the GOA groundfish fisheries (2002-2006) and estimate of the mean annual mortality rate, based on observer data

Fishery	Years	Observer coverage	Observed mortality	Estimated mortality	Mean annual mortality
GOA Pacific cod trawl	2002	23.2%	0	0	0
	2003	27.3%	0	0	
	2004	27.0%	0	0	
	2005	21.4%	0	0	
	2006	22.8%	0	0	
GOA pollock trawl	2002	26.0%	0	0	1.33 (CV = 0.66)
	2003	31.2%	1	2.1	
	2004	27.4%	0	0	
	2005	24.2%	1	4.2	
	2006	26.5%	0	0	

Source: Allen and Angliss 2010.

Effects of the Alternatives on Marine Mammals

Impacts of the GOA groundfish fisheries on Steller sea lions were analyzed in the Programmatic SEIS (NMFS 2004) and in the 2001 Biological Opinion (NMFS 2001). Current management practices 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. NMFS has reinitiated consultation on the groundfish fisheries and their impact on listed species, including Steller sea lions. NMFS expects to provide a draft biological opinion to the Council in early April 2009 for review. Given the ongoing consultation, NMFS does not intend to initiate rulemaking or other Federal action that would require a separate formal Section 7 consultation outside the process already initiated.

The proposed action would institute proposed area closures to protect *C. bairdi* crab around Kodiak Island, year round or seasonally, for some or all gear types. Some vessels may be exempted from the area closures if they meet specific conditions such as using approved gear modifications, or a 100% observer coverage requirement. The timing, general location, and overall level of fishing effort in the GOA groundfish fisheries is not expected to change, as the proposed area closures are small and fishing will likely continue to occur in neighboring areas. 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 alternatives are not likely to change fisheries 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).

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 below⁴. 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 26). 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 26 ESA-listed and candidate seabird species that occur in the GOA

Common Name	Scientific Name	ESA Status
Short-tailed Albatross	<i>Phoebastria albatrus</i>	Endangered
Steller's Eider	<i>Polysticta stelleri</i>	Threatened
Kittlitz's Murrelet	<i>Brachyramphus brevirostris</i>	Candidate
Black-footed Albatross	<i>Phoebastria nigripes</i>	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.

⁴ Source: (USFWS web site "Seabirds. Species in Alaska. Accessed at <http://alaska.fws.gov/mbsp/mbm/seabirds/species.htm> on August 31, 2007).

The groundfish fisheries may reduce the biomass of prey species available to seabird populations. Fishing gear may disturb benthic habitat used by seabirds that forage on the seafloor and reduce available prey. Bottom trawl gear is the primary source of benthic habitat disturbance in the groundfish fisheries. Fishing activities may also create feeding opportunities for seabirds, for example when catcher processors discard offal.

Hook-and-line gear accounts for up to 94% of seabird bycatch in the BSAI and GOA groundfish fisheries combined (Fitzgerald et al. 2006). In the GOA, this bycatch consists of 46% fulmars, 34% albatrosses, 12% gull species, 5% unidentified seabirds, 2% shearwater species, and less than 1% of 'all other' species (Fitzgerald et al. 2006). Most bycatch of Black-footed Albatross in waters off Alaska occurs in the GOA hook-and-line fisheries. From 2000 to 2004, an estimated 88 Black-footed Albatross were taken annually in the GOA hook-and-line fisheries. Total seabird bycatch in the GOA hook-and-line fisheries peaked in 1996 at 1,649 birds, and decreased to 156 birds in 2004, despite an increase in fishing effort. The incidental catch rate in the GOA decreased from an annual average of 0.021 birds per 1,000 hooks from 1993 to 1999 to 0.01 birds per 1,000 hooks from 2000-2004.

Due to different sampling procedures on trawl vessels, two sets of estimates are calculated for seabird bycatch. Average annual take by trawl vessels in the GOA from 1993 to 2004 was either 63 birds or 97 birds (Fitzgerald et al. 2006). Northern Fulmars comprised the majority of bycatch by trawl vessels during this period. Seabird bycatch by the groundfish pot sector has historically been very low. Average annual bycatch in the GOA pot sector from 1993–2004 was 55 seabirds, less than 1% of the average annual seabird bycatch in the groundfish fisheries.

Effects of the Alternatives on seabirds

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, including the GOA Pacific cod fishery, 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 proposed area closures to protect *C. bairdi* crab around Kodiak Island, year round or seasonally, for some or all gear types. Some vessels may be exempted from the area closures if they meet specific conditions such as using approved gear modifications, or a 100% observer coverage requirement. The timing, general location, and overall level of fishing effort in the GOA groundfish fisheries is not expected to change, as the proposed area closures are small and fishing will likely continue to occur in neighboring areas. The hook and line sector is responsible for the majority of seabird take in the GOA, and as there is very little hook and line fishing in the proposed area closures, these vessels are unlikely to be much affected by the proposed action. Thus, this action would not likely 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).

4.4 Habitat

Benthic habitat is potentially impacted by fishing practices that contact the seafloor. The impacts of fishing gear on benthic habitat are discussed in the Groundfish PSEIS (NMFS 2004). Essential fish habitat (EFH) is defined as those areas necessary to fish for spawning, breeding, feeding, or growth to maturity. Maps and descriptions of EFH for the GOA groundfish species are available in the EFH EIS (NMFS 2005). This document also describes the importance of benthic habitat to different groundfish species and the impacts of different types of fishing gear on benthic habitat. In the hook-and-line fishery,

anchors, groundline, ganglions, and hooks potentially contact the seafloor. The Pacific cod pot fishery has a very small footprint (an estimated 0.17 square mile footprint for the GOA and BSAI combined; NMFS 2005). In the trawl fishery, doors, sweeps, and bobbins on the net may contact the seafloor.

Effects of the Alternatives

The effects of the GOA groundfish fisheries on benthic habitat and EFH were analyzed in the EFH EIS (NMFS 2005). Year-round area closures protect sensitive benthic habitat. Current fishing practices have minimal or temporary effects on benthic habitat and essential fish habitat. These effects are likely to continue under Alternative 1, and are not considered to be significant. Under the proposed area closures, the general location, timing, and overall level of fishing effort by the various gear sectors will remain essentially the same as under Alternative 1, as the proposed closures are small and any dispersed vessels will likely fish in neighboring areas. As a result, impacts on benthic and essential fish habitat under this alternative are expected to be not significant.

4.5 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 ecosystems. Fishing may change predator-prey relationships and community structure, 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 availability for groundfish predators, altering habitat, imposing bycatch mortality, or by “ghost fishing” caused by lost fishing gear. Further information may be found in the Ecosystems Considerations Appendix to the Stock Assessment and Fisheries Evaluation report (NPFMC 2009a) and the Groundfish PSEIS (NMFS 2004).

Effects of the Alternatives

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 2009a) and in the Harvest Specifications SAFE report (NPFMC 2009b). 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, Alternative 1 is not expected to have a significant impact on the ecosystem.

Alternatives 2 and 3 will result in the same overall level of groundfish harvest as Alternative 1. The level of fishing effort by each sector, and the general location and timing of fishing activities is not expected to change, because the proposed area closures are small and fishing will likely continue to occur in neighboring areas. As a result, Alternatives 2 and 3 is not likely to have a significant impact on the ecosystem.

4.6 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 documented in the Groundfish PSEIS, no additional past, present, or reasonably foreseeable 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 GOA groundfish 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 these sectors, including GOA fixed gear LLP recency, GOA and BSAI trawl LLP recency, and GOA Pacific cod sector allocations. Economic impacts of this action are discussed further in Section 6.

5 Management and enforcement considerations

Alternative 2 provides a series of options to close certain areas around Kodiak to directed fishing for groundfish by vessels using specific gear types. Some options would allow directed fishing for groundfish in these areas by vessels using specific gear types or specified types of modified gear. Alternative 3 would allow fishing in these areas by vessels using specified gear type only if they carried an observer 100 percent of the days they conducted directed fishing for groundfish in these areas.

It is assumed that area closures by NMFS for vessels directed fishing for groundfish in these areas would apply only to federal waters. These closures would not apply in State of Alaska waters, so would not affect the adjacent parallel or State waters fisheries.

Directed fishing for groundfish is defined as fishing by a vessel with a Federal Fisheries Permit (FFP) that results in retaining more than the maximum retainable amounts (MRA) of any groundfish managed by NMFS under the GOA groundfish FMP. MRAs for groundfish in the Gulf of Alaska fisheries are in Table 10 to part 679.

All vessel operators who hold an FFP must comply with NMFS recordkeeping and reporting requirements and observer coverage requirements in both federal and parallel fisheries. In addition, vessel operators who hold an FFP must comply with vessel monitoring system (VMS) reporting requirements if they participate in the directed Atka mackerel, Pacific cod, or pollock fisheries in federal or parallel waters.

If the alternatives apply these closures only to “groundfish fisheries”, then the closures would not affect directed fishing for halibut IFQ, even if the vessel operator had an FFP at the time they were fishing in these areas. Operators of vessels directed fishing for halibut IFQ are required to retain all Pacific cod and rockfish caught while halibut fishing. Therefore, nearly all fishers for halibut IFQ also have an FFP. However, if vessel operators retain less than the MRA of groundfish while they are halibut fishing, they would not meet the definition of directed fishing for groundfish and would not be affected by these closures.⁵

Sablefish is a groundfish species. Therefore, any closures that apply to vessels directed fishing for groundfish, would apply to vessels directed fishing for sablefish IFQ in these areas. Halibut and sablefish IFQ are not often targeted during the same fishing trip. However, if a person fishing for halibut IFQ also holds sablefish IFQ on board, sablefish is required to be retained and reported against the sablefish IFQ account. The MRA for sablefish against halibut is 1 percent of the round weight equivalent of halibut. Amounts of sablefish onboard a vessel at any point in time that exceed this MRA would mean that the vessel met the definition of directed fishing for sablefish.

5.1 Alternatives 2 and 3: Area closures

The four closure areas being considered under Alternatives 2 and 3 have high Tanner crab abundance based on crab surveys conducted annually by the Alaska Department of Fish and Game (ADF&G). In these areas, vessels using bottom (or nonpelagic) trawl gear predominantly target Pacific cod, arrowtooth

⁵ Halibut when used as a basis species for calculating MRAs is under the category of “aggregated amounts of non-groundfish species”. The MRA for Pacific cod is 20 percent of the round weight equivalent of the halibut onboard the vessel at any point in time. The MRA of rockfish against halibut is 5 percent of the round weight equivalent of halibut onboard the vessel at any point in time.

flounder, and shallow-water flatfish. Vessels using pot and hook-and-line gear predominantly target Pacific cod. Vessels using pelagic trawl gear target both pollock and rockfish in these areas.

The boundaries of the proposed closed areas are defined by existing ADF&G statistical areas and by polygons defined by latitude and longitude coordinates. Closed areas defined in this manner are easier for both the regulated industry to understand and comply with, as well as enforcement entities to patrol and enforce. The proposed closure areas present no noteworthy enforcement challenges. However, if the goal is to estimate Tanner crab catch in closed areas, boundaries based on entire ADF&G statistical areas are preferable to non-statistical area polygons or partial statistical areas closures because ADF&G statistical areas are the finest spatial resolution available on landing reports.

The proposed closed areas would be principally enforced by using information from VMS units aboard vessels required to carry VMS. Many of the vessels subject to the proposed closed areas are already required to comply with VMS requirement by participation in existing fisheries. Currently, at § 679.28(f)(6), all vessels operating non-pelagic trawl gear in the GOA or operating any gear in the Rockfish Pilot Program fisheries are required to operate VMS. Trawl vessels directed fishing for Pacific cod, pollock, and/or Atka mackerel in the GOA are also required to possess an operable VMS. Additionally, vessels using pot and hook-and-line gear for Pacific cod directed fishing are also required to have active VMS units.

If sablefish IFQ longline or pot vessels are included in the alternatives, additional VMS requirements for these vessels would be necessary to effectively enforce the proposed closed areas. Therefore, NMFS recommends that all vessels with FFPs that are allowed to fish in these closures areas be required to carry VMS at all times while directed fishing for groundfish in these areas.

The proposed areas are located relatively close to the Port of Kodiak, and would be expected to receive a relatively high amount of aerial and surface patrol by USCG platforms, as these patrols depart and arrive into the Kodiak USCG base. These proposed closed areas are also located in areas of high transit activity by the Kodiak and GOA-based fishing fleets and other maritime vessels. For this reason, one could expect a higher likelihood of reporting potential violations by the fishing and maritime community.

Opportunities might exist for vessels claiming to target IFQ halibut while fishing in an area closed to directed fishing for Pacific cod, and claiming the majority of Pacific cod onboard the vessel was harvested outside the closed area. Without a specific prohibition to prevent this, detection of this activity would be difficult, and enforcement of an observer coverage requirement, based upon “directed fishing for groundfish” also would be difficult.

5.2 Alternative 2, Option 1 and 2

Both year round and seasonal closures are being considered. Aside from personnel to perform the monitoring activities, enforcement of year round versus seasonal closures presents no additional monitoring challenges.

5.3 Alternative 2, Suboption 4: Gear modification exemption

Proposed modified gear requirements under Suboption 4, such as trawl sweep modifications or pot escapement mechanisms, would likely be enforced in the same manner as the existing requirements for tunnel eyes on pot gear and trawl sweeps in the flatfish fisheries of the Bering Sea. During boardings at sea, both the USCG and OLE check vessels to ensure proper use and functionality of any gear modifications. All vessels subject to the proposed alternatives, except sablefish IFQ vessels, are currently

required to operate VMS. Thus, if OLE or USCG desired to check gear compliance of vessels fishing in the closed areas, these vessels could be identified.

5.4 Alternative 2, Suboption 5: Pelagic trawl gear exemption

Suboption 5 would exempt vessels using pelagic trawl gear from the proposed area closures. The principle fisheries prosecuted by vessels using pelagic trawl gear in the proposed closed areas are pollock and rockfish. Vessels used to conduct these fisheries are required to operate VMS.

Under this suboption, regulations would specifically prohibit operation of nonpelagic trawl (NPT) gear in the closed areas. Enforcement of this prohibition is difficult. Regulations at § 679.2 contains a list of ten items that define pelagic trawl gear (see definition of “authorized gear”). However, this definition of pelagic trawl gear is problematic for enforcement purposes, since a net meeting the physical description of a pelagic trawl can be fished in contact with the sea floor. Currently, the only method of enforcing unlawful “bottom trawling” (for pollock only) in areas closed to NPT gear is by using a “trawl gear performance standard” (50 CFR 679.7(a)(14)). Under this standard, it is unlawful to possess aboard a vessel, at any point in time, 20 or more crab of any species, with a carapace width of more than 1.5 inches. Enforcement of this standard on any vessel (observed or unobserved) is difficult, and it is virtually impossible to monitor and enforce on unobserved vessels. Anecdotal reports from operators and observers indicate this trawl gear performance standard is quite easy to overcome, by slowly dumping the catch, sorting, and discarding crab from the catch. The existing tools are not considered adequate to provide effective enforcement of a prohibition for directed fishing using NPT gear in the proposed closed areas. However, if the vessels are simply prohibited from having NPT gear aboard while in the proposed closed areas, OLE could board vessels to check for the presence of NPT gear. If the concern is pelagic gear contacting the sea floor, the only tool OLE currently has is the use of the “trawl gear performance standard” described above.

5.5 Alternative 3 - 100 percent observer coverage exemption

Alternative 3 would allow fishing in the proposed closure areas by vessels using specified gear types only if they carried an observer 100 percent of the days they conducted directed fishing for groundfish in these areas. Under current observer coverage requirements at §679.50(c)(1) vessels 125 feet length overall (LOA) or greater are required to carry an observer 100 percent of all fishing days, vessels between 60 feet LOA and 124 feet are required to carry an observer 30 percent of fishing days, and vessels less than 60 feet LOA are not required to carry observers.

Enforcing 100 percent observer coverage on vessels fishing in the closure areas does not present any unreasonable monitoring and enforcement challenges, as long as enforcement entities can identify which vessels are directed fishing for groundfish in the closure areas. Once a vessel is identified as directed fishing for groundfish in the area, the OLE can monitor compliance with the observer coverage requirement by comparing vessel activity with information about where and when observers were deployed on vessels. If some vessels fishing in the proposed closure areas do not have a requirement to carry VMS it would be more difficult to verify the 100 percent observer requirement. The same challenges exist for monitoring compliance with the observer coverage requirements as those described for enforcing directed fishing for groundfish in the proposed closure areas.

No additional management or enforcement concerns exist for catcher vessels greater 125 feet LOA operating in the GOA as they are already required to obtain 100 percent observer coverage for each day of fishing.

Vessels greater than 60 feet LOA but less than 125 feet LOA that fish are required to have an observer for at least 30 percent of their fishing days in a calendar quarter and at least one fishing trip for each species specified under 679.50(c)(2). Vessels in this size category are not currently required to obtain any of their observer coverage in the proposed closure areas. However, they may choose to carry an observer in these areas without the requirement to do so, depending on variables such as weather, season timing or bycatch rates in other areas.

Vessels operating in the proposed closure areas less than 60 feet LOA are not required to carry observers at this time. Many of the vessels less than 60 feet may not be equipped to carry an observer physically or safely.

NMFS has identified three areas of concern about increasing observer coverage for vessels currently not required to carry 100 percent coverage requirement in the proposed closure areas.

Potential Shifts in Areas and Fisheries Observed

At present 30 percent coverage vessels can elect when and where to carry observers. These vessels are subject to a PSC limit for halibut mortality. Vessels may elect to sacrifice some of the targeted species catch in order to carry an observer in an area where incidental catch of halibut is low. In an effort to minimize estimates of halibut mortality, vessels, after carrying an observer on a single trip for each of the fishery targets listed in 679.50(c)(2), often then take observers on trips in areas or fisheries with low incidental catch of halibut in order to meet their 30 percent coverage requirement.

Under Alternative 3, the observer coverage taken to comply with the 100 percent coverage requirement within these areas would accrue towards the vessel's overall 30 percent coverage requirement for the quarter, management area, and fishery category. This could result in decreased coverage from existing levels in areas and fisheries outside the closure areas.

Extrapolation of Observer Samples inside the Closure Areas

At present NMFS uses observer data and extrapolates PSC sampled on observed trips to similar unobserved trips in the larger federal reporting area. NMFS does not create separate PSC estimates for each ADF&G state statistical area. It is unknown if the data from small closure areas would be representative of fishing over a much larger federal reporting area. If disproportionate estimates of incidental catch of Tanner crab from small areas of high crab abundance were extrapolated to unobserved vessels fishing in areas of lower crab abundance, the result could be a higher estimate of incidental catch of Tanner crab for the larger federal reporting area as a whole.

Correlation with the Observer Restructuring Action

Proposed Alternative 3 could impact, or be impacted by, the Observer Restructuring action, currently in review by the Council. In two out of four action alternatives under consideration for restructuring the groundfish Observer Program, the designation of 100 percent observer coverage determines the fee structure and service delivery model to which an operation is subject. The proposed 100 percent observer coverage requirement being considered by this area closure action is inconsistent with the sample design proposed in the Observer Restructuring action. Under the Observer Restructuring sample design, catcher vessels would be subject to 100 percent coverage requirements only if the vessels participated in a catch share program that could be constrained by their allocation of PSC or other secondary groundfish species allocated to the entity. Under the Observer Restructuring sample design for vessels not subject to 100 percent observer coverage, strata are determined such that observer coverage rates are uniform; catcher vessel trips would be observed at a fixed rate. If Alternative 3 is adopted, the Observer Restructuring action will likely obviate the 100 percent observer coverage requirement and place these vessels within a

stratum which may determine the vessel's observer fee structure, i.e., paying a daily fee and carrying an observer for 100% of their days in a year, or paying an ex-vessel value based fee and carrying an observer where and when directed by NMFS. The Observer Restructuring action is currently scheduled to be in place by 2013. If Alternative 3 is selected and the proposed closure area action is in place for the 2012 season, then the 100 percent coverage requirement may only be in effect for a short time.

6 Regulatory Impact Review and Probable Economic and Socioeconomic Impacts

6.1 Introduction

This Regulatory Impact Review (RIR) evaluates the costs and benefits of three alternatives that evaluate proposed area closures to protect *C. bairdi* Tanner crab around Kodiak Island. Included in the alternatives are options to apply the closures year round or seasonally, and to some or all gear types. Additionally, some vessels may be exempted from the area closures if they meet specific conditions such as using approved gear modifications, or a 100% observer coverage requirement.

6.2 What is a Regulatory Impact Review

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

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

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

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

6.3 Problem Statement

The Council formulated the following problem statement in October 2009, to initiate this analysis:

Tanner crab are a prohibited species bycatch in the Gulf of Alaska (GOA) groundfish fisheries. Directed fisheries for Tanner crab in the GOA are fully allocated under the current limited entry system. No specific conservation measures exist in the GOA to address significant, adverse interactions with Tanner crab by trawl and fixed gear

sectors targeting groundfish. Tanner crab stocks have been rebuilding since peak fisheries occurred in the late 1970s. Specific protection measures should be advanced to facilitate stock rebuilding.

6.4 Description of the Alternatives

The alternatives evaluated in this analysis were adopted by the Council in October 2009.

Alternative 1: Status Quo – No action

Alternative 2: Close areas (see description of areas in Section 2.1) to all groundfish (trawl, pot, and longline) fisheries.

Option 1: Year round

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Option 2: Seasonally (January 1 – July 31)

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Alternative 3: In order to fish in these areas (see description of areas in Section 2.1), require 100% observer coverage on all groundfish (trawl, pot, and longline) vessels

Note, the suboptions are not intended to be mutually exclusive, and may be applied in combination.

6.5 Areas considered in Alternatives 2 and 3

ADF&G Northeast Section

- Statistical Area 525807
- Chiniak Gully (Four corners at 152°19'34" W x 57°49'24" N by 57°29' N x 151°20' W by 57°20' N x 151°20' W by 57° x 152°9'20' W)

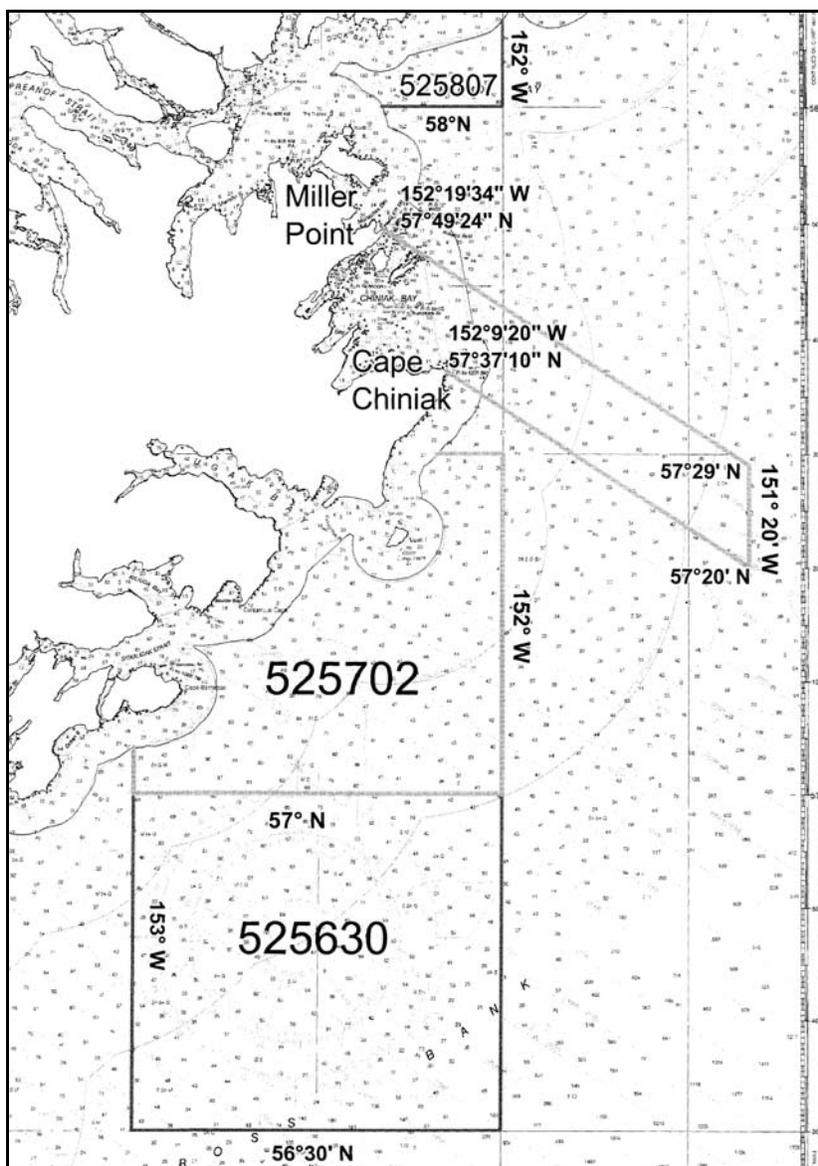
ADF&G Eastside Section

- Statistical Area 525702

ADF&G Southeast Section

- Statistical Area 525630

Figure 19 Area closures around Kodiak Island considered in Alternatives 2 and 3



6.6 Description of the fisheries

6.6.1 Groundfish fisheries in reporting area 630

The proposed action would potentially regulate vessels participating in the trawl, hook and line, and pot groundfish fisheries in reporting area 630 (Kodiak district) of the Central GOA regulatory area. Table 27 provides the official total catch (retained and discarded) in the groundfish fisheries, by gear type, in area 630 from 2003 to 2009. Catch by vessels using nonpelagic trawl gear represents the largest proportion of groundfish catch by gear type, approximately 60% on average during the time period. The primary species targeted by each gear type are as follows: for hook and line gear, Pacific cod and sablefish; for nonpelagic trawl gear, flatfish (shallow water flatfish, flathead sole, rex sole, arrowtooth flounder), Pacific cod, pollock, and rockfish; for pelagic trawl, pollock and rockfish; and for pot gear, Pacific cod.

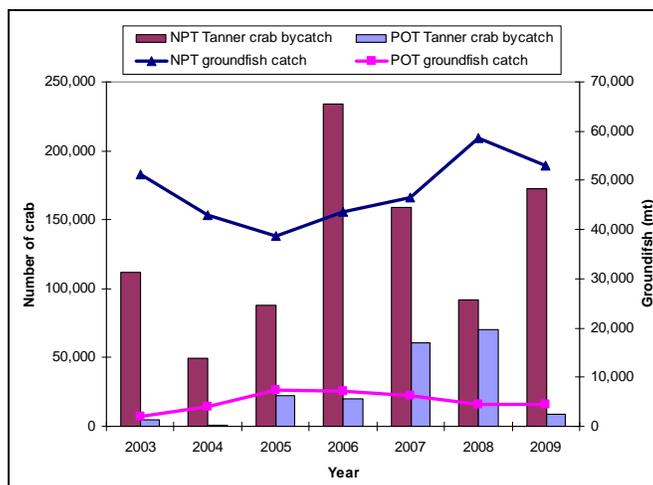
Table 27 Official total catch (mt) in groundfish fisheries in reporting area 630, by gear type, 2003-2009

Year	Hook and line	Nonpelagic trawl	Pelagic trawl	Pot	Total
2003	10,406	51,194	11,556	2,069	75,225
2004	12,419	42,916	13,539	4,114	72,987
2005	10,308	38,719	20,622	7,408	77,056
2006	11,435	43,505	18,205	7,177	80,321
2007	10,774	46,539	17,169	6,311	80,794
2008	11,735	58,538	14,180	4,533	88,986
2009	8,952	53,078	11,327	4,507	77,864
Average 2003-2009	10,861	47,784	15,228	5,160	79,033

Source: AKFIN Comprehensive Catch database, February 2010.

A comprehensive discussion of Tanner crab bycatch in the GOA groundfish fisheries in reporting area 630 is included in Section 3.2.4. Hook and line and pelagic trawl gears contribute very little to overall bycatch levels (Table 8), while nonpelagic trawl is responsible for an average (over 2003-2009) of 83% of crab bycatch, and pot gear for 17%. The relationship of annual crab bycatch and groundfish catch in these two sectors is depicted in Figure 20.

Figure 20 Annual bycatch of *C. bairdi* Tanner crab and groundfish catch in reporting area 630, by Federal trawl and pot fishery sectors, 2003-2009



Source: *C. bairdi* crab bycatch from AKFIN Comprehensive PSC database, February 2010; groundfish catch from AKFIN Comprehensive Catch Database, February 2010. Represents total GOA catch and bycatch, excluding State waters Pacific cod fishery catch.

Table 28 provides average ex-vessel values (2004-2008) for groundfish catch in the Gulf of Alaska, by gear, vessel category, and species, in millions of dollars.

Table 28 Ex-vessel value of groundfish catch in the Gulf of Alaska, by gear, vessel category, and species, average for 2004-2008 (\$ millions)

Gear type	Species	Catcher vessels	Catcher processors	Total
Hook and line	Pacific cod	6.22	3.64	9.86
	Sablefish	63.22	7.76	70.94
Trawl	Flatfish	4.5	1.68	6.2
	Pacific cod	10.74	.86	11.6
	Pollock	17.02	.08	17.1
	Rockfish	3.52	5.0	8.56
Pot	Pacific cod	20.28	.28	20.48

Source: Hiatt et al. 2009

6.6.2 Groundfish fisheries in proposed area closures

The proposed area closures under Alternatives 2 and 3 are small areas within the 630 reporting area. In order to examine the spatial distribution of fishing at a finer scale than that of the reporting area, it is only possible to use the data collected on observed trips, as only observed hauls are associated with geographical coordinates. Consequently it is not possible to use the NMFS catch accounting database, which takes reports from observed fishing trips and extrapolates them to apply to all vessels fishing within the reporting area, to investigate the catch and bycatch activity of vessels fishing within these specific areas. It is possible to get a sense for how much catch and bycatch is occurring in the closed areas, however, by looking at data from observed groundfish vessels, as long as the limitations of using only data from observed vessels are kept in mind. These limitations are discussed in detail in Section 3.2.2. Only vessels that are 60 ft or longer are observed. Vessels between 60 and 125 ft using hook and line or trawl gear are only required to carry an observer for 30% of their fishing days, by quarter, although if they are larger than 125 ft the must have an observer onboard 100% of the time. Pot vessels carry an observer while 30% of their pots are pulled for the calendar year. Table 4 in Section 3.2.2 examines the actual percentages of observed catch by gear type and target fishery. Overall, the pot Pacific cod target had averaged between 12% and 26% of groundfish catch observed in the Central GOA between 2004 and 2006. Many entries for the nonpelagic trawl fisheries are confidential, however a comparison may be made to the nonpelagic trawl shallow water flatfish fishery, which averaged between 13% and 34% of catch observed between 2004 and 2007 in the same area. **Therefore it should be remembered, throughout this discussion, that the data may only represent a small proportion of fishing effort within the closed areas.**

Table 29 identifies the proportion of observed catch in reporting area 630 was observed in each of the proposed area closures. On average, from 2001-2009, approximately 24% of observed catch occurred in the closures as a whole; most of this catch occurred in 525702, followed by 525630. Only 5% of the total observed GOA groundfish catch occurred in 525807 and Chiniak.

Table 29 Observed groundfish catch in the proposed area closures, as a proportion of total observed groundfish catch in reporting area 630, by gear type, for 2001-2009

Year	Proposed area closures					Rest of 630
	525807	Chiniak	525702	525630	Total	
2001	0%	4%	16%	4%	24%	76%
2002	0%	1%	5%	10%	16%	84%
2003	2%	4%	10%	8%	24%	76%
2004	0%	2%	13%	3%	18%	82%
2005	1%	1%	13%	2%	17%	83%
2006	1%	6%	14%	11%	31%	69%
2007	2%	3%	13%	12%	30%	70%
2008	0%	8%	10%	11%	30%	70%
2009	2%	2%	13%	9%	26%	74%
Average 2001-2009	1%	4%	12%	8%	24%	76%

Source: AKFIN Comprehensive Observer data, March 2010.

Groundfish catch in the proposed closure areas is examined by gear type in Table 30. For the most part, hook and line vessels are not observed to fish in the proposed area closures. The table provides the groundfish catch in each area, and by each gear type, as a percentage of total observed catch in 630 by all gear types over the combined years 2001-2009. Figure 21 illustrates the total observed catch for each gear type in reporting area 630, and how that catch is distributed inside and outside fo the closed areas. For nonpelagic trawl, catch in the closed areas is approximately 28% of the total observed groundfish catch in

630; for pelagic trawl, it is approximately 21%, and for pot vessels approximately 13%. In comparison, bycatch in the closed areas (described in detail in Section 3.2.5, and specifically in Figure 12) was approximately 68% of the 630 total for nonpelagic trawl vessels, 33% for pelagic trawl, and 24% for pot vessels.

Table 30 Observed groundfish catch in the proposed area closures, as a proportion of total observed groundfish catch in reporting area 630, for the combined years 2001-2009

Year	Proposed area closures					Rest of 630	All of 630
	525807	Chiniak	525702	525630	Total		
Hook and line	**	0%	**	0%	0%	6%	7%
Nonpelagic trawl	0%	2%	8%	8%	18%	46%	64%
Pelagic trawl	1%	1%	4%	0%	6%	21%	27%
Pot	0%	0%	0%	0%	0%	2%	2%
Total	1%	4%	12%	8%	24%	76%	

** data is confidential

Source: AKFIN Comprehensive Observer data, March 2010.

Figure 21 Observed groundfish catch in proposed closed areas and reporting area 630, by gear, for the combined years 2001-2009

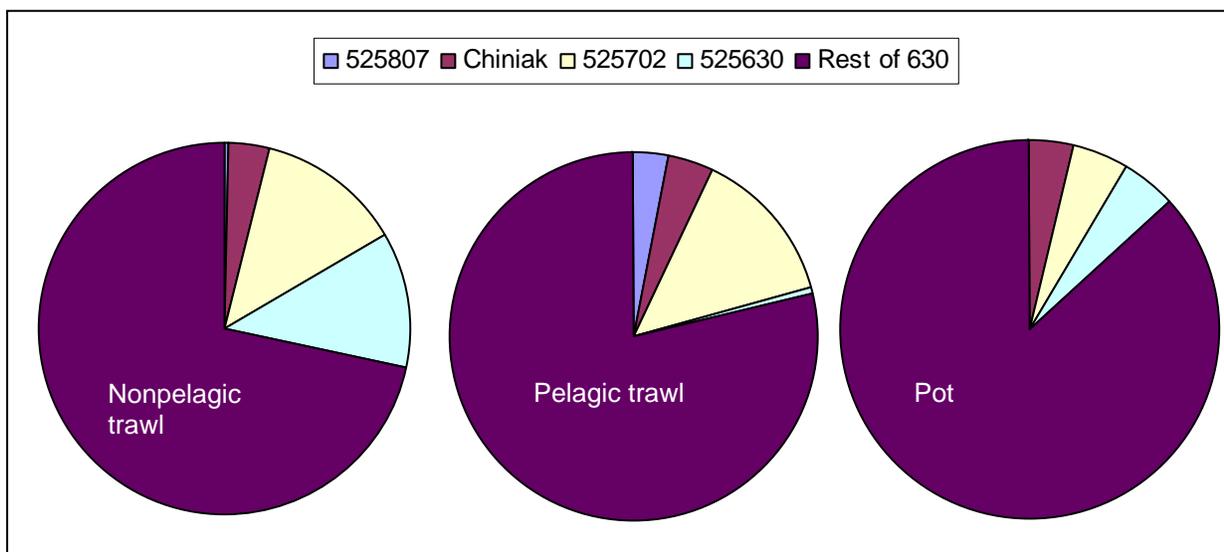


Table 31 identifies the observed target fisheries for trawl and pot gear, listing catch in the proposed area closures as a proportion of total observed catch in reporting area 630. For nonpelagic trawl vessels, flatfish is the primary target, with most catch attributed to the arrowtooth flounder target, although in recent years the shallow water flatfish target has also been important in these areas. Pelagic trawl vessels in the areas are targeting pollock.

Table 31 Observed groundfish catch by gear type and target in the proposed closed areas, as a proportion of the total observed catch by gear type in reporting area 630

Gear type	Target Fishery	2001	2002	2003	2004	2005	2006	2007	2008	2009
Nonpelagic trawl	Arrowtooth Flounder	4%	5%	14%	10%	8%	26%	25%	14%	10%
	Flathead Sole	1%	0%	0%	0%	0%	0%	0%	2%	3%
	Pacific Cod	7%	8%	2%	4%	0%	2%	5%	4%	3%
	Pollock (bottom)	7%	8%	2%	4%	0%	2%	5%	4%	3%
	Rex Sole						0%		2%	2%
	Rockfish	0%	4%	2%	1%	0%	0%	2%	1%	1%
	Shallow Water Flatfish	5%	2%	2%	2%	5%	10%	10%	10%	10%
Pelagic trawl	Pollock (bottom)	27%	3%	4%	13%	22%	15%	4%	7%	1%
	Pollock (midwater)	5%	3%	39%	13%	5%	5%	10%	7%	16%
Pot	Pacific Cod	0%	0%	0%	1%	7%	2%	1%	1%	1%

Timing of observed groundfish catch in proposed closed areas

The majority of groundfish catch in the proposed area closures, and in reporting area 630 as a whole, occurs in the period January 1 to July 31, representing between 66% and 77% of total observed catch between 2001 and 2009 (Table 32). In 525807, catch in the first half of the year encompasses almost all of the annual catch in 2001 to 2007, although in the last two years there has been a slight increase in observed catch in August to December. For Chiniak, the interannual variability of observed catch between the two periods is high, but on average, the area had a much lower proportion of catch in the first half of the year. From Table 33, one can see that this is true across all gear sectors, although the vast majority of the observed catch in the area is from nonpelagic and pelagic trawl vessels. 525702 also has a balanced proportion of catch from the January to July and August to December periods, where nonpelagic trawl catch is high in the beginning of the year, and pelagic trawl catch is high in the latter portion. Overall, area 525630, which is primarily fished by nonpelagic trawl vessels, has low usage by observed vessels in the latter half of the year.

Table 32 Proportion of annual observed groundfish catch caught in the proposed area closures between January 1 and July 31, 2001-2009

Year	Proposed area closures					Rest of 630	All of 630
	525807	Chiniak	525702	525630	Total		
2001	100%	38%	42%	62%	45%	87%	77%
2002	100%	81%	54%	82%	74%	77%	77%
2003	100%	30%	34%	36%	38%	74%	66%
2004	100%	78%	34%	75%	46%	75%	70%
2005	100%	58%	43%	85%	51%	79%	74%
2006	100%	8%	65%	96%	66%	71%	69%
2007	99%	16%	81%	89%	79%	75%	76%
2008	62%	18%	69%	95%	65%	69%	68%
2009	84%	46%	61%	99%	74%	64%	66%
Average 2001-2009	93%	29%	55%	84%	62%	74%	71%

Source: AKFIN Comprehensive Observer data, March 2010.

Table 33 Proportion of annual observed groundfish catch, by gear type, caught in the proposed area closures between January 1 and July 31, for the combined years 2001-2009

Year	Proposed area closures					Rest of 630	All of 630
	525807	Chiniak	525702	525630	Total		
Hook and line	**	52%	**	95%	92%	90%	90%
Nonpelagic trawl	51%	42%	75%	85%	75%	80%	79%
Pelagic trawl	100%	2%	10%	21%	21%	58%	50%
Pot		38%	52%	81%	58%	65%	64%
Total	93%	29%	55%	84%	62%	74%	71%

** data is confidential

Source: AKFIN Comprehensive Observer data, March 2010.

To provide additional perspective on the timing of fisheries within the two periods described above, Table 34 breaks out the observed groundfish catch for nonpelagic trawl vessels by month. The majority of nonpelagic trawl catch in the closed areas occurs in April and July, followed by October, February, and March as important time periods. For pelagic trawl vessels, the most important month for fishing in the closed areas is October, followed by September and August, and then March and February.

Table 34 Proportion of annual observed nonpelagic trawl groundfish catch caught in the proposed area closures in each month, for the combined years 2001-2009

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
525807	0%	20%	15%	8%	6%	0%	2%	0%	1%	39%	6%	4%
Chiniak	2%	9%	12%	2%	2%	2%	13%	2%	7%	47%	1%	0%
525702	3%	8%	12%	20%	6%	5%	20%	7%	6%	9%	3%	0%
525630	1%	9%	10%	37%	5%	1%	23%	0%	5%	9%	1%	0%
Total – closed areas	2%	9%	11%	24%	5%	3%	20%	3%	6%	14%	2%	0%
Rest of 630	5%	5%	3%	9%	7%	6%	45%	3%	10%	5%	1%	0%
All of 630	4%	6%	5%	14%	6%	5%	38%	3%	9%	8%	1%	0%

** data is confidential

Source: AKFIN Comprehensive Observer data, March 2010.

Location of observed groundfish catch in proposed closed areas

Observed groundfish catch and Tanner crab bycatch is mapped by gear type (for trawl and pot gears) in the color figures included at the end of this document, in Appendix B. As depicted in Color Figure 2, the primary density of groundfish catch for nonpelagic trawl vessels occurs in the central portions of the proposed closed areas 525702 and 525630. In comparison with Color Figure 1, it is apparent that this same area is also one where a high amount of crab bycatch is observed. Color Figure 3 maps the bycatch rate for nonpelagic trawl vessels (number of crab per mt groundfish catch), and while this area still has a higher bycatch rate than some other parts of reporting area 630, it is nonetheless apparent that the high bycatch in this area is due at least in part to the intensity of groundfish fishing that occurs in this area.

For pelagic trawl vessels, Color Figure 5 illustrates observed groundfish catch. Of fishing occurring in the proposed area closures, fishing is heaviest in area 525702, also in the central portion of that area. As is apparent in Color Figure 4, overall the bycatch of Tanner crab in the pelagic trawl fishery is substantially lower than for the nonpelagic trawl fleet. Color Figure 6 shows the bycatch rate for pelagic trawl vessels, and bycatch rates in the proposed closed area that is predominantly fished (525702) are very low.

The observed groundfish catch for pot vessels is mapped in Color Figure 7, and shows that the majority of observed pot effort occurs outside of the proposed closures. Within 525702 and 525630, the areas that are important to the pot fishery differ from those that are used by trawl vessels, based on observer data, without the concentration on the central portions of those statistical areas that is evident in trawl fishing patterns. Color Figure 8 shows that bycatch in the pot fishery is highest just outside the southeastern boundary of area 525630. Bycatch rates for the pot fishery are mapped in Color Figure 9, and bycatch rates for pot gear are generally higher than those for trawl.

6.6.3 Participants

Table 35 identifies the number of vessels fishing for groundfish in reporting area 630, by gear type, between 2003 and 2009, as well as the number of those vessels which are attributed with having caught Tanner crab as bycatch. Table 36 shows the number of observed vessels fishing in the proposed area closures over the period 2001-2009. In many of the proposed areas closures, the number of vessels of a particular gear type fishing in an area in a particular year may be very low. The most observed vessels fishing in the closed areas occur in the nonpelagic trawl sector.

Table 35 Number of vessels fishing for groundfish in reporting area 630, by gear type, over the period 2003-2009

Gear type	Total number of vessels	Total number of vessels to which Tanner crab bycatch was attributed	Vessels with bycatch as percentage of total
Hook and line	606	317	52%
Nonpelagic trawl	74	68	94%
Pelagic trawl	53	47	89%
Pot	129	100	76%

Source: AKFIN Comprehensive Catch and PSC databases, February 2010.

Table 36 Number of observed vessels fishing in the proposed area closures, by gear type, for the period 2001-2009, and total of all vessels fishing in reporting area 630

Gear type		Observed vessels						
		Proposed area closures					Rest of 630	Total – all of 630
		525807	Chiniak	525702	525630	Total		
Hook and Line	Number of vessels in any given year	0 - 1	1 - 4	0 - 1	1 - 2	1 - 5	31 - 38	31 - 38
	Total unique vessels	1	6	2	8	10	71	71
Nonpelagic trawl	Number of vessels in any given year	2 - 7	9 - 32	14 - 38	10 - 26	20 - 48	37 - 52	38 - 55
	Total unique vessels	17	52	47	48	60	62	64
Pelagic trawl	Number of vessels in any given year	2 - 8	0 - 11	5 - 19	1 - 3	13 - 23	20 - 31	29 - 33
	Total unique vessels	24	23	39	12	42	46	48
Pot	Number of vessels in any given year	0	0 - 7	0 - 3	0 - 3	1 - 7	5 - 16	5 - 16
	Total unique vessels	0	14	7	7	17	33	33

Source: AKFIN Comprehensive Observer database, March 2010; AKFIN Comprehensive Catch database, February 2010.

Of observed vessels fishing in the proposed closure areas, in all years except 2002 and 2003, most vessels are between 60 and 124 ft LOA. Table 37 shows the proportion of groundfish catch attributable to vessels greater than 125 ft in the proposed closed areas, compared to vessels fishing in reporting area 630 as a

whole. Note, observer coverage is not required on vessels less than 60 ft overall, so information about how the proposed area closures are used by these vessels is not available.

Table 37 Proportion of total observed nonpelagic trawl groundfish catch from vessels greater than 125 ft LOA, with 100% observer coverage, 2001-2009

Gear type	Total – closed areas	630
2001	2%	35%
2002	37%	51%
2003	55%	33%
2004	8%	17%
2005	1%	13%
2006	0%	16%
2007	6%	16%
2008	9%	16%
2009	5%	14%
Average 2001-2009	12%	24%

Source: AKFIN Comprehensive Observer databases, March 2010.

6.7 Analysis of Alternatives

Alternative 1 – status quo

Under Alternative 1, no area closures for protecting GOA Tanner crab would be implemented.

Alternative 2 – close areas to groundfish fishing; Suboptions 1, 2, 3, 5 – close areas to a particular gear type

Alternative 2 proposes four specific area closures to all groundfish fishing by trawl, pot, and hook and line gear. Suboptions 1, 2, 3, and 5 could limit the closures to only apply to a specific gear type: trawl, pot, hook and line, or nonpelagic trawl (Suboption 5 exempts pelagic trawlers from the area closures).

Groundfish vessels that are subject to the closures will be required to forego fishing in the proposed areas. The impact on these vessels will be proportional to the extent that they rely on the area for target fishing. Based on observer data, the nonpelagic trawl flatfish fishery will be most impacted by the area closures, followed by the pelagic trawl pollock fishery. From Color Figure 2 and Color Figure 5 it is apparent that these fisheries are both prosecuted in other areas within reporting area 630, which would remain open to fishing. Consequently, it is assumed for this analysis that vessels would be able to fully harvest groundfish TACs despite the proposed area closures. Depending where the vessels choose to fish, there are likely to be lower bycatch rates in these alternate areas (Color Figure 3 and Color Figure 6; Table 16). In some areas, however, there may be lower catch per unit effort, which would increase costs for fishers and could result in increased bycatch of crab or other incidental species.

The biggest impact for nonpelagic trawl gear would result from the closure of 525702 and 525630, where the central portions of those statistical areas are heavily used fishing grounds (according to observer data; Figure 21). This is also the gear type that catches the most bycatch, however; closing the areas would provide the largest reduction in crab bycatch. For pelagic trawl, the biggest impact would result from closing 525702, where the western and central portions of the statistical area are important for pollock trawling. Crab bycatch in the pelagic trawl fisheries in all years is one percent or less of the overall bycatch total for reporting area 630.

For pot vessels, the proposed area closures have a smaller impact on groundfish fishing because, according to observer data, the area is not as much fished as other parts of reporting area 630 (Color

Figure 8). Crab bycatch within the closed areas represents a quarter of all observed crab bycatch in reporting area 630 (Figure 12). For hook and line vessels, the areas are very little fished, and the impact on vessels would likely be very low. At the same time, the bycatch of Tanner crab by hook and line vessels is also very low, so there is also little benefit to closing the areas to this gear type.

To the extent that the reduction in bycatch from the area closures increases crab recruitment to the fishery, crab fishers may also benefit from Alternative 2. However, current levels of crab bycatch in the groundfish fisheries represent 0.3% or less of surveyed crab abundance (see Section 4.1). Bycatch numbers of crab in the groundfish fisheries, and catch numbers in the directed crab fisheries are not comparable, as the groundfish bycatch numbers include all crab (including juvenile, female, and sublegal males), which crab fishery catch numbers include only legal males. It is not possible to assess the value to the directed crab fishery of crab caught as bycatch in the groundfish fisheries. Catch composition of bycatch is unknown, and studies differ with respect to the appropriate handling mortality rate to apply to bycatch in the groundfish fisheries by gear type.

The management and enforcement considerations section (Section 5.1) recommends that VMS be used to monitor the proposed area closures. Most of the vessels that would be subject to the closures are already required to have VMS, either because they operate nonpelagic trawl gear, they participate in the Rockfish Pilot Program, or they engage in directed fishing for Pacific cod or pollock. If the proposed closures are required for sablefish hook and line vessels, however, these vessels would need to install and operate VMS units. Purchase and installation costs for a VMS unit are approximately \$2,058, and monthly transmission fees are approximately \$63 (NMFS 2008). There is also an annual maintenance cost that is estimated at \$77.

Suboption 4 – exempt vessels using approved, modified gear

As described in Section 3.5, modified gear to reduce crab mortality and bycatch in the GOA has not been tested for any gear type. A sweep modification has been approved by the Council for implementation in the Bering Sea flatfish fisheries; this modification has been shown to reduce unobserved mortality of crab from trawl sweeps (although use of the modification would not result in lower bycatch in trawl nets). The average cost of the modification to fishermen, for the gear configuration used in the Bering Sea, is \$3,000-5,000 annually (NMFS 2009). This cost may be offset if, as suggested, the modification extends the useful life of the sweeps, and reduce the frequency with which new gear must be purchased. There may also be one-time costs for modifying the vessel to accommodate the sweep modification, depending on current vessel configuration.

A different modification has been proposed for pot gear, to build an escape mechanism into the bottom of the pot to allow crab to exit. No cost specifications are available for this proposed modification, nor has it yet been tested by agency personnel.

Assuming the logistics of approving modified gear for regulatory implementation can be addressed, vessels that habitually use the proposed area closures would have the option of paying for the installation and annual costs of using modified gear as an alternative to being displaced from their fishing grounds.

Option 1 or 2 – year round or seasonal closure

The majority of catch for all gear types occurs in January to July, which is the seasonal period identified in Option 2 (Table 33). For gears that account for almost all of the Tanner crab bycatch (nonpelagic trawl and pot gears), 75% and 58% of groundfish catch is caught in the January to July period, respectively, compared to 79% and 74% of Tanner crab bycatch. Under Option 2, the seasonal closure, adverse impacts from the area closures on groundfish fishers would be reduced, as vessels could fish in the areas for the

remainder of the year. This would especially be beneficial for the nonpelagic trawl fleet fishing in the Chiniak area, where 58% of observed catch is caught in August to December.

Alternative 3 – close areas to groundfish fishing unless vessels have 100% observer coverage

The impacts of Alternative 3 are the same as Alternative 2 for all vessels that do not choose to take advantage of the exemption. Under Alternative 3, vessels may continue to fish in the closed areas if they carry an observer onboard at all times while fishing in the area.

Analysis of Alternative 3 is difficult because it is not known how many vessels are fishing in the proposed area closures. Section 6.6.2 describes fishing patterns in the areas by observed vessels, however this does not provide any indication as to whether and how frequently the areas are used by vessels under 60 ft LOA, which are unobserved. Additionally, vessels which are subject to the 30% observer coverage requirement have discretion about where they choose to fish while observers are onboard, so the effort observed on vessels 60-125 ft LOA should not be interpreted to represent 30% of the fishing effort in the area. Observed catch from larger vessels (exceeding 125 ft LOA), which are subject to 100% observer coverage, represented only 12% (average, for 2001-2009) of the total observed catch for the closed areas (Table 37). Table 35 provides the total number of vessels fishing in the groundfish fisheries in reporting area 630, who could take advantage of the observer program exemption.

The last estimate of industry costs for observers (in 2004) was \$355/day including travel (NPFMC 2008). In this case, vessels would need to contract to have an observer onboard for all fishing occurring in the closed areas, and would incur the daily fee for the extent of those fishing trips. This would have no impact on vessels exceeding 125 ft LOA, as they already meet the 100% observer coverage requirement; in effect, this alternative would be equivalent to status quo for this category of vessels. Vessels 60-125 ft LOA would be able to count any observed fishing within the closed areas towards their 30% observer coverage requirement. For some vessels that fish extensively within the closed areas, their fishing time may exceed their observer requirement needs, in which case those vessels would either have to incur the daily observer fee, or change their fishing practices to fish elsewhere.

Vessels less than 60 ft that routinely fish in the proposed closed areas are likely to incur the greatest cost. These vessels have no observer coverage requirement, so taking an observer onboard in order to continue fishing in these areas would incur a daily observer fee expense that is not present in the status quo. Additionally, some vessels of this size class may not be equipped to carry an observer physically or safely. Alternatively, these vessels could choose to fish in neighboring areas, and impacts would be similar to Alternative 2.

Section 5.5 discusses some of the management and enforcement considerations for implementing Alternative 3. NMFS has identified three areas of concern about increasing observer coverage for vessels currently not required to carry 100 percent coverage requirement in the proposed closure areas. The first relates to potential shifts in areas and fisheries observed: observer coverage taken to comply with the 100 percent coverage requirement within these areas would accrue towards the vessel's overall 30 percent coverage requirement for the quarter, management area, and fishery category. This could result in decreased coverage from existing levels in areas and fisheries outside the closure areas. The second concern relates to extrapolation of observer samples inside the closure areas. If disproportionate estimates of incidental catch of Tanner crab from small areas of high crab abundance were extrapolated to unobserved vessels fishing in areas of lower crab abundance, the result could be a higher estimate of incidental catch of Tanner crab for the larger federal reporting area as a whole. Finally, the proposed 100 percent observer coverage requirement being considered by this area closure action is inconsistent with the sample design proposed in the Observer Restructuring action. If Alternative 3 is adopted, the Observer Restructuring action will likely obviate the 100 percent observer coverage requirement and place these

vessels within a stratum which may determine the vessel's observer fee structure, i.e., paying a daily fee and carrying an observer for 100% of their days in a year, or paying an ex-vessel value based fee and carrying an observer where and when directed by NMFS. The Observer Restructuring action is currently scheduled to be in place by 2013. If Alternative 3 is selected and the proposed closure area action is in place for the 2012 season, then the 100 percent coverage requirement may only be in effect for a short time.

Net benefit to the Nation

The net benefit to the Nation of the proposed alternatives is not quantifiable. The alternatives are not likely to result in forsaken groundfish harvest, as the groundfish TACs will likely be harvested in neighboring areas. There may be an increased cost associated with the displaced groundfish harvest, particularly for flatfish and potentially pollock, due to lower catch per unit effort rates elsewhere. Some benefits may accrue to the Nation through the continued rebuilding of Tanner crab stocks, as a source of mortality from the groundfish fisheries is reduced.

7 Initial Regulatory Flexibility Analysis

7.1 Introduction

This IRFA evaluates the impacts on directly regulated small entities of the proposed action, proposed area closures to protect *C. bairdi* crab around Kodiak Island. Included in the alternatives under consideration are options to apply the closures year round or seasonally, and to some or all gear types. Additionally, some vessels may be exempted from the area closures if they meet specific conditions such as using approved gear modifications, or a 100% observer coverage requirement.

7.2 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.

7.3 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.

7.4 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.

7.5 What is this Action?

The alternatives evaluated in this analysis were adopted by the Council in October 2009.

Alternative 1: Status Quo – No action

Alternative 2: Close areas (see description of areas in Section 2.1) to all groundfish (trawl, pot, and longline) fisheries.

Option 1: Year round

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Option 2: Seasonally (January 1 – July 31)

Suboption 1: trawl gear

Suboption 2: pot gear

Suboption 3: longline gear

Suboption 4: Vessels using approved, modified gear would be exempt from closures (e.g., trawl sweep modifications or pot escape mechanisms).

Suboption 5: Vessels using pelagic trawl gear would be exempt from closures

Alternative 3: In order to fish in these areas (see description of areas in Section 2.1), require 100% observer coverage on all groundfish (trawl, pot, and longline) vessels

Note, the suboptions are not intended to be mutually exclusive, and may be applied in combination.

7.6 Areas considered in Alternatives 2 and 3

ADF&G Northeast Section

- Statistical Area 525807
- Chiniak Gully (Four corners at 152°19'34" W x 57°49'24" N by 57°29' N x 151°20' W by 57°20' N x 151°20' W by 57° x 152°9'20' W)

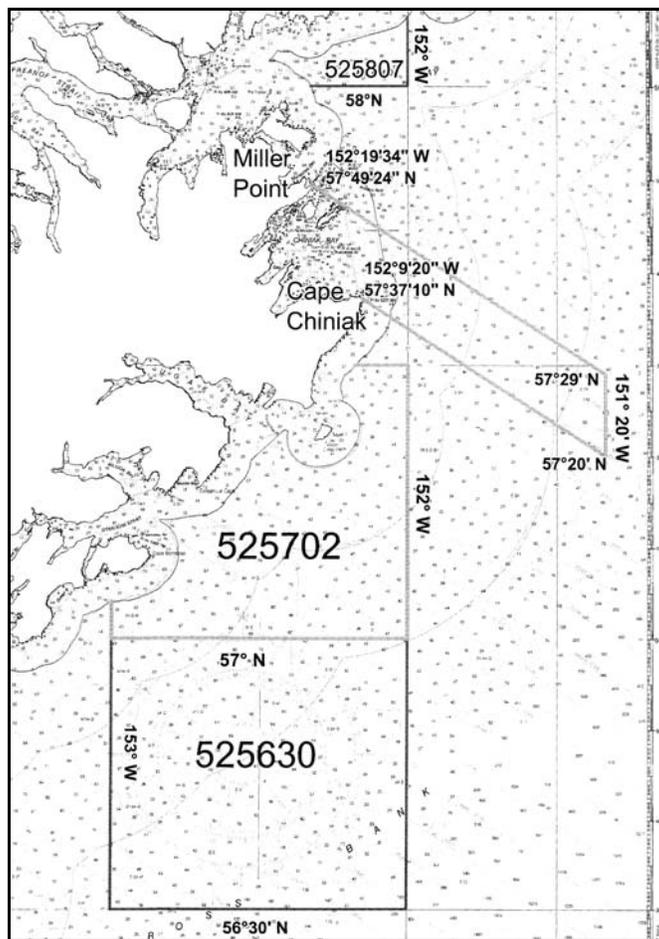
ADF&G Eastside Section

- Statistical Area 525702

ADF&G Southeast Section

- Statistical Area 525630

Figure 22 Area closures around Kodiak Island considered in Alternatives 2 and 3



7.7 Objectives and Reasons for Considering the Proposed Action

The Council formulated the following problem statement in October 2009, to initiate this analysis:

Tanner crab are a prohibited species bycatch in the Gulf of Alaska (GOA) groundfish fisheries. Directed fisheries for Tanner crab in the GOA are fully allocated under the current limited entry system. No specific conservation measures exist in the GOA to address significant, adverse interactions with Tanner crab by trawl and fixed gear sectors targeting groundfish. Tanner crab stocks have been rebuilding since peak fisheries occurred in the late 1970s. Specific protection measures should be advanced to facilitate stock rebuilding.

7.8 Legal Basis for the Proposed Action

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

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

This action could directly regulate all vessels, except those using jig gear, participating in Federal groundfish fisheries around Kodiak Island in the Central Gulf of Alaska. From 2003 to 2009, there were 317 hook and line vessels, 68 nonpelagic trawl vessels, 47 pelagic trawl vessels, and 100 pot vessels with reported Tanner crab bycatch, participating in one or multiple years in the groundfish fisheries in reporting area 630.

Fishing vessels, both catcher vessels and catcher/processors, are considered small, for RFA purposes, if their gross receipts, from all their economic activities combined, as well as those of any and all their affiliates anywhere in the world, (including fishing in federally managed non-groundfish fisheries, and in Alaska-managed fisheries), are less than or equal to \$4.0 million annually. Further, fishing vessels were considered to be large if they were affiliated with an AFA or Amendment 80 fishing cooperative, as the members of these cooperatives had combined revenues that exceeded the \$4.0 million threshold. Of the vessels with reported Tanner crab bycatch, fishing in reporting area 630 from 2003-2009, 294 hook and line vessels, 26 nonpelagic trawl vessels, 12 pelagic trawl vessels, and 97 pot vessels are considered small for RFA purposes.

7.10 Recordkeeping and Reporting Requirements

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

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

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

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

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

7.12 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 alternatives accepted by the Council for consideration in this EA/RIR/IRFA are described in detail in Section 2 of the EA and are briefly described in Section 6.4 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.

8 FMP and Magnuson-Stevens Act considerations

8.1 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 area closures on some or all gear types participating in the Federal groundfish fisheries off Kodiak Island in the Central Gulf of Alaska. Target groundfish species that are currently caught in these areas include flatfish, Pacific cod, pollock, rockfish, and sablefish. It is not anticipated that the imposition of area closures will prevent the fishery from achieving annual total allowable catch for these species. These species are not currently in danger of overfishing and are considered stable. Additionally, the proposed action may reduce the mortality of *C. bairdi* crab species. While these are not subject to a Federal fishery managed under the Magnuson-Stevens Act, a reduction in bycatch mortality of crab species may result in an increase in yield from the directed fishery. In terms of achieving “optimum yield” from a 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 reduced by any relevant economic, social, or ecological factor; and
- (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the 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 GOA groundfish 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 TACs are set for GOA groundfish 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. These GOA stocks will continue to be managed as a single stock under the alternatives in this analysis.

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

Nothing in the alternatives considers residency as a criterion for the Council's decision. Residents of various states, including Alaska and states of the Pacific Northwest, participate in the major sectors affected by these allocations. No discriminations 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 area closures.

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 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. A summary of the level of fishery engagement and dependence in the communities of vessels affected by the proposed action 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.

The proposed action is specifically intended to reduce bycatch and bycatch mortality of *C. bairdi* crab in the groundfish fisheries. The practicability of bycatch reduction is discussed in the analysis of the impacts of the various alternatives and options, in Section 6.7 of the RIR.

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.

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

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

The alternative actions considered in this analysis are described in Section 2. The impacts of these actions on participants in the fisheries and fishing communities are the topic of Sections 6 and 7, in the RIR and IRFA.

Fishery Participants

The proposed actions directly impact participants in the GOA groundfish fisheries occurring around Kodiak Island in the Central GOA. The primary target fisheries that are prosecuted around Kodiak Island in the areas proposed for closure are flatfish (arrowtooth flounder, flathead sole, shallow water flatfish, and rex sole), Pacific cod, pollock, rockfish, and sablefish. From 2001 to 2009, there have been a total of 536 different vessels participating in these directed fisheries.

Fishing Communities

The fishing communities that are expected to be potentially directly impacted by the proposed action are those communities which serve as homeports to the vessels potentially affected by the area closures, where they offload product, take on supplies, provide vessel maintenance and repair services, and provide homes to vessel owners and crew. 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 groundfish sector tend to recruit crew from many locations.

Detailed information on the range of fishing communities relevant to the proposed action may be found in a number of other 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.

8.3 GOA FMP — Groundfish Management Policy Priorities

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

- Control the bycatch of prohibited species through prohibited species catch limits or other appropriate measures.
- Continue and improve current incidental catch and bycatch management program.
- Continue to manage incidental catch and bycatch through seasonal distribution of total allowable catch and geographical gear restrictions.
- Continue program to reduce discards by developing management measures that encourage the use of gear and fishing techniques that reduce bycatch which includes economic discards.

By proposing area closures or gear modifications to reduce bycatch of *C. bairdi* crab, the Council is consistent with its management policy.

9 NEPA Summary

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

Context: For this action, the setting is the Central GOA groundfish fisheries that participate in specific areas around Kodiak Island that are proposed for closure. Any effects of this action are limited to this area, or adjacent areas in the Central GOA where vessels may choose to catch their target fish once they have been closed out of specific fishing grounds. The effects of this action on society within this area are on individuals directly and indirectly participating in these fisheries and on those who use the ocean resources. Because this action concerns the use of a present and future resource, this action may have impacts on society as a whole or regionally.

Intensity: Considerations to determine intensity of the impacts are set forth in 40 CFR 1508.27(b) and in the NAO 216-6, Section 6. Each consideration is addressed below in order as it appears in the NMFS Instruction 30-124-1 dated July 22, 2005, Guidelines for Preparation of a FONSI. The sections of the EA that address the considerations are identified.

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

(EA Section 4.2). No. No significant adverse impacts on target species were identified for Alternatives 2 or 3. No changes in overall amount or timing of harvest of target species are expected with any of the alternatives or option in the proposed action, and the general location of harvest is also likely to be similar to the status quo, although there may be localized shifts. Therefore, no impacts on the sustainability of any target species are expected.

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

(EA Section 4.2 and 4.1). No. Potential effects of Alternatives 2 and 3 on non-target and prohibited species are expected to be insignificant and similar to status quo because no overall harvest changes to target species were expected. Some benefit to *C. bairdi* crab, a prohibited species caught as bycatch in the groundfish fisheries, may accrue due to the area closures. Because no overall changes in target species harvests under the alternatives is expected, the alternatives and option are not likely to jeopardize the sustainability of any nontarget/prohibited species.

3) *Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in the fishery management plans (FMPs)?*

(EA Section 4.4). No. No significant adverse impacts were identified for Alternatives 2 or 3 on ocean or coastal habitats or EFH. The alternatives provide additional protection to areas around Kodiak Island where area closures are proposed. Alternative 3 is less protective of habitat than Alternative 2 because it allows an exemption to the area closures for vessels that meet a 100% observer coverage requirement. Substantial damage to ocean or coastal habitat or EFH by Alternatives 2 or 3 is not expected.

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

(EA Section 0). No. Public health and safety will not be affected in any way not evaluated under previous actions or disproportionately as a result of the proposed action. The proposed action for Alternatives 2 and 3 will not change fishing methods (including gear types), timing of fishing, or quota assignments to gear groups, which are based on previously established seasons and allocation formulas in regulations.

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

(EA Section 4.3). No. Alternatives 2 and 3 would create area closures around Kodiak Island in the Central GOA. The proposed action would not change the Steller sea lion protection measures, ensuring the action is not likely to result in adverse effects not already considered under previous ESA consultations for Steller sea lions and their critical habitat. The area adjacent to these closures, into which the groundfish vessels may be displaced, is not identified as critical habitat for any ESA-listed species and population level effects are not expected. Because there will be no change in overall harvest, the alternatives are not likely to adversely affect ESA-listed species or their designated critical habitat.

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

(EA Section 4.5). No significant adverse impacts on biodiversity or ecosystem function were identified for Alternatives 2 or 3. The alternatives would provide protection to biodiversity and ecosystem function by creating area closures around Kodiak Island, and likely benefit marine features that provide an ecosystem function. No significant effects are expected on biodiversity, the ecosystem, marine mammals, or seabirds.

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

(EA/RIR/IRFA Chapters 4, 6, and 7). Socioeconomic impacts of this action result from displacement of vessels that fish in the proposed area closures, or additional costs associated with the options that would allow them to be exempted from the closures. The social or economic impacts of the alternatives are not expected to be significant as target fish are harvested in areas adjacent to the proposed closure areas, and meeting the requirements for the exemptions do not appear to be excessively expensive to the groundfish fleet. Beneficial social impacts are likely for those who depend on directed fisheries for *C. bairdi* crab, a resource that may be protected by this action. No significant adverse impacts were identified for Alternatives 2 or 3 for social or economic impacts interrelated with natural or physical environmental effects.

8) *Are the effects on the quality of the human environment likely to be highly controversial?*

No. This action is limited to specific areas around Kodiak Island in the Central GOA, areas that are historically of value to the groundfish fleet. Development of the proposed action has involved participants

from the scientific and fishing communities and the potential impacts on the human environment are well understood. No issues of controversy were identified in the process (EA Sections 4 and 6).

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

(EA Section 4). No. This action would not affect any categories of areas on shore. This action takes place in the geographic area of the Central GOA. The land adjacent to this marine area may contain archeological sites of native villages. This action would occur in adjacent marine waters so no impacts on these cultural sites are expected. The marine waters where the fisheries occur contain ecologically critical areas. Effects on the unique characteristics of these areas are not anticipated to occur with this action because of the amount of fish removed by vessels are within the total allowable catch (TAC) specified harvest levels and the alternatives provide protection to EFH and ecologically critical nearshore areas.

- 10) *Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?*

No. The potential effects of the action are well understood because of the fish species, harvest methods involved, and area of the activity. For marine mammals and seabirds, enough research has been conducted to know about the animals' abundance, distribution, and feeding behavior to determine that this action is not likely to result in population effects (EA Sections 4.3). The potential impacts of different gear types on habitat also are well understood, as described in the EFH EIS (NMFS 2005) (EA Section 4.4).

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

(EA Chapter 4.6). No. Beyond the cumulative impact analyses in the 2006 and 2007 harvest specifications EA and the Groundfish Harvest Specifications EIS, no other additional past or present cumulative impact issues were identified. Reasonably foreseeable future impacts in this analysis include potential effects of global warming. The combination of effects from the cumulative effects and this proposed action are not likely to result in significant effects for any of the environmental component analyzed and are therefore not significant.

- 12) *Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?*

(EA Section 4). No. This action will have no effect on districts, sites, highways, structures, or objects listed or eligible for listing in the National Register of Historic Places, nor cause loss or destruction of significant scientific, cultural, or historical resources. Because this action occurs in marine waters, this consideration is not applicable to this action

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

(EA Section 4). No. This action poses no effect on the introduction or spread of nonindigenous species into the Gulf of Alaska beyond those previously identified because it does not change fishing, processing, or shipping practices that may lead to the introduction of nonindigenous species.

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

No. This action would provide for additional protection to GOA *C. bairdi* crab by imposing area closures. This action does not establish a precedent for future action because area closures have been frequently used as a management tool for the protection of marine resources in the Alaska groundfish fisheries. Pursuant to NEPA, for all future actions, appropriate environmental analysis documents (EA or EIS) will be prepared to inform the decision makers of potential impacts to the human environment and to implement mitigation measures to avoid significant adverse impacts.

15) *Can the proposed action reasonably be expected to threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment?*

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

16) *Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?*

(EA Section 4.2 and 4.6). No. The effects on target and non-target species from the alternatives are not significantly adverse as the overall harvest of these species will not be affected. No cumulative effects were identified that added to the direct and indirect effects on target and nontarget species would result in significant effects.

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Appendices

Appendix A Estimation procedures for prohibited species bycatch in the Alaska groundfish fisheries

The Alaska Region manages groundfish and prohibited species catch (PSC) under Fishery Management Plans for Groundfish of the Bering Sea/Aleutian Islands and for the Gulf of Alaska. NMFS estimates bycatch (here defined as PSC) based on data from the North Pacific Groundfish Observer Program, Weekly Production Reports (WPR), and Alaska Department of Fish and Game fish tickets. The observer data is used to create bycatch rates, and landings data (observer data, fish tickets or WPRs) is multiplied against the rates to provide bycatch estimates. In the Alaska Region, the source for landings data is observer data for 100% observed vessels, WPR data for catcher/processors with 30% observer coverage, and fish tickets for all shoreside deliveries. The estimation procedures for bycatch are designed to meet two key requirements. First, the estimation procedures are designed to provide a quick turn-around of the data so that inseason managers have useful information as quickly as possible. The system makes maximum use of small amounts of observer data quickly (at coarser aggregation levels) which are updated and refined as more data becomes available. Second, the system is flexible, so that changes to the management structure can be mirrored in the catch accounting structure to allow inseason management to stay current with fisheries regulations and specifications.

PSC and discard estimates are based on observer data, and estimates are made using automated procedures within NMFS catch accounting system. The estimation procedures are run daily to incorporate new data or any edits to existing data. It is assumed that unobserved vessels have incidental catch rates, and the bycatch rates are applied to unobserved catch as well⁶.

Prohibited species bycatch estimation

Management of PSC species is based solely on estimates derived from the following procedure, rather than from reported catch. Note that PSC estimates are based on observer rates derived from sampling.

All available observer data are used in the calculation of PSC bycatch rates. Rates at five levels of aggregation are calculated daily. As landings data is updated or received, bycatch estimates are created by finding the best possible matching rate and multiplying the landed catch by that rate. PSC are calculated and managed in numbers of animals for crab and salmon, and in weights for halibut and herring.

Rates for each PSC species are calculated at the following levels of aggregation:

- Precedence 50 CV. Vessel specific catcher vessel (CV) rate aggregated by:
 - Vessel ID, year, trip target date, and fisheries management plan (FMP) area (BSAI or GOA);
- Precedence 50 CP. Vessel specific catcher processor (CP) rate aggregated by:
 - Vessel ID, year, trip target date, gear, federal reporting area, special subarea;
- Precedence 40. Sector specific 3-week average aggregated by:
 - Year, trip target code⁷, week end date, processing sector (CV, CP, or Mothership), gear, federal reporting area, special subarea;

⁶ PSC and discard estimates are also calculated for catch in the State Pacific cod fishery that sets its guideline harvest level based on the Federal Pacific cod acceptable biological catch.

⁷ Targets include: A - Atka Mackerel, B - Bottom trawl Pollock, C - Pacific cod, D - Deepwater flatfish (GOA only), E - Alaska plaice, F - Other flatfish, H - Shallow water flatfish (GOA only), I - halibut (directed), K - rockfish, L - flathead

- Precedence 30. Across-sector 3-week average aggregated by:
 - Year, trip target code, week end date, gear, federal reporting area, special subarea;
- Precedence 20. FMP area rate aggregated by:
 - Year, trip target code, gear, FMP area.

Rates are calculated by summing the total number or weight of observed PSC and dividing by the total groundfish weight (retained and discarded catch of groundfish) of sampled observer hauls at the above levels of aggregation. Note that hauls or sets with no PSC are included in the denominator. At the end of 2005, 26,413 individual PSC rates were calculated for the 7 PSC species, and 134,604 estimates were calculated from these rates. The three-week averages in Precedence levels 30 and 40 above are 3-week moving averages that include catch from the previous and following weeks. At least 3 observed hauls or sets must be included in the average before it is used in the matching process.

As an example of the process, consider the case where the best rate available was Precedence 30. Each night the suite of all possible rates are calculated to include the most current data. When the reported catch from an unobserved catcher vessel from the GOA fishing in the Pacific cod target with hook and line gear in reporting area 630 is received, for example as a fish ticket from a shoreside plant, the program searches for a matching PSC rate. Since the vessel was unobserved, no vessel specific rates will be found (Precedence 50). If no observed trips were made by a similarly situated catcher vessel during the three-week period including the prior and the following weeks, no rate at Precedence 40 would be created for the match. The program would then look for a matching rate at the next precedence level (30) which would include observed bycatch by any observed vessel using hook and line gear in the Pacific cod target in reporting area 630, including catcher/processors or catcher vessels delivering to motherships. Upon finding a match, the catch would be multiplied by the Precedence 30 rate, providing an estimate of PSC.

The procedure described above details the technical mechanics of how NMFS uses observer sampling ratios to estimate PSC. Detailed instructions on the procedures observers use to collect their data can be found in the series of observer manuals available at: <http://www.afsc.noaa.gov/Quarterly/jfm2008/jfm08feat.pdf>. The observer procedures provide the data which are inputs into the estimation process.

In order to continue to improve the system for managing groundfish and prohibited species catch, the Alaska Fisheries Science Center and Alaska Region have collectively contracted with the Pacific States Marine Fisheries Commission to review the current data and data systems used for inseason management and catch accounting in Alaska. The purpose of the contract is to identify the types of data that are available, their limitations, and to look at the statistical assumptions associated with all estimation procedures. It is intended that the evaluation will result in recommendations for practical system design changes to improve estimation and to recognize statistical uncertainty in NMFS estimates of catch and bycatch.

sole, O - Other groundfish, P - Pelagic pollock, rocksole (BSAI only), S - sablefish, T - Greenland turbot, W - arrowtooth flounder, X - Rex sole (GOA only), and Y - Yellowfin sole (BSAI only).

Appendix B Color Figures

Nonpelagic trawl

Observed <i>C. bairdi</i> Tanner crab bycatch in the nonpelagic trawl groundfish fishery, summed over 2001-2009.....	B
Observed groundfish catch in the nonpelagic trawl groundfish fishery, summed over 2001-2009.....	B
Observed rate of groundfish catch per bycaught crab in the nonpelagic trawl groundfish fishery, for the period 2001 to 2009	C

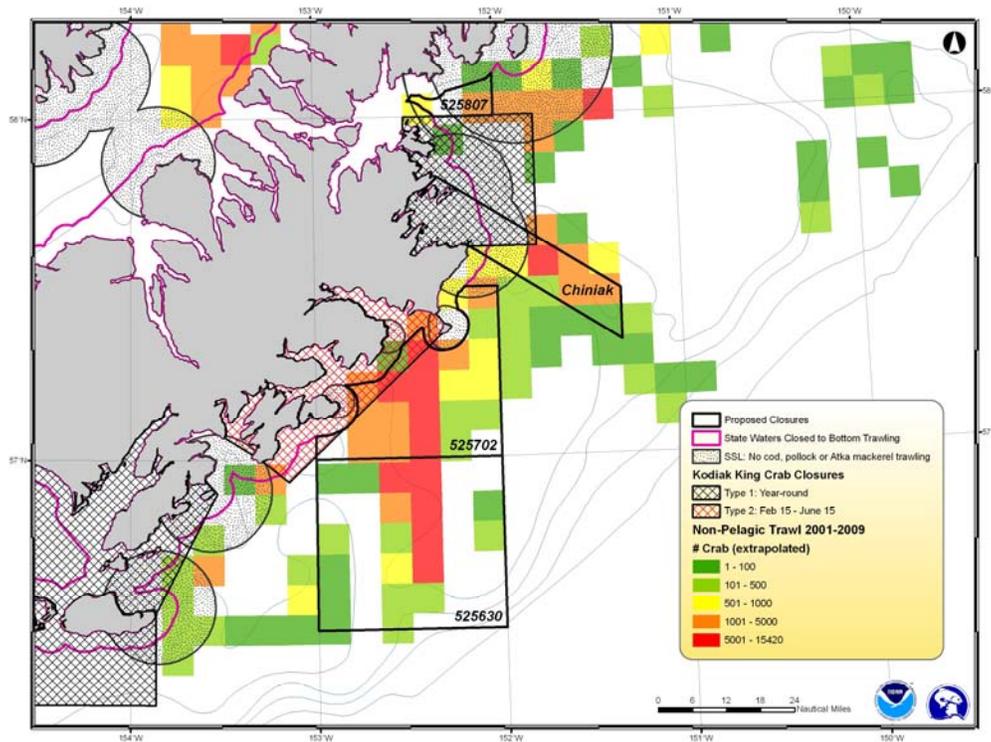
Pelagic trawl

Observed <i>C. bairdi</i> Tanner crab bycatch in the pelagic trawl groundfish fishery, summed over 2001-2009.....	D
Observed groundfish catch in the pelagic trawl groundfish fishery, summed over 2001-2009.....	E
Observed rate of groundfish catch per bycaught crab in the pelagic trawl groundfish fishery, for the period 2001 to 2009.....	E

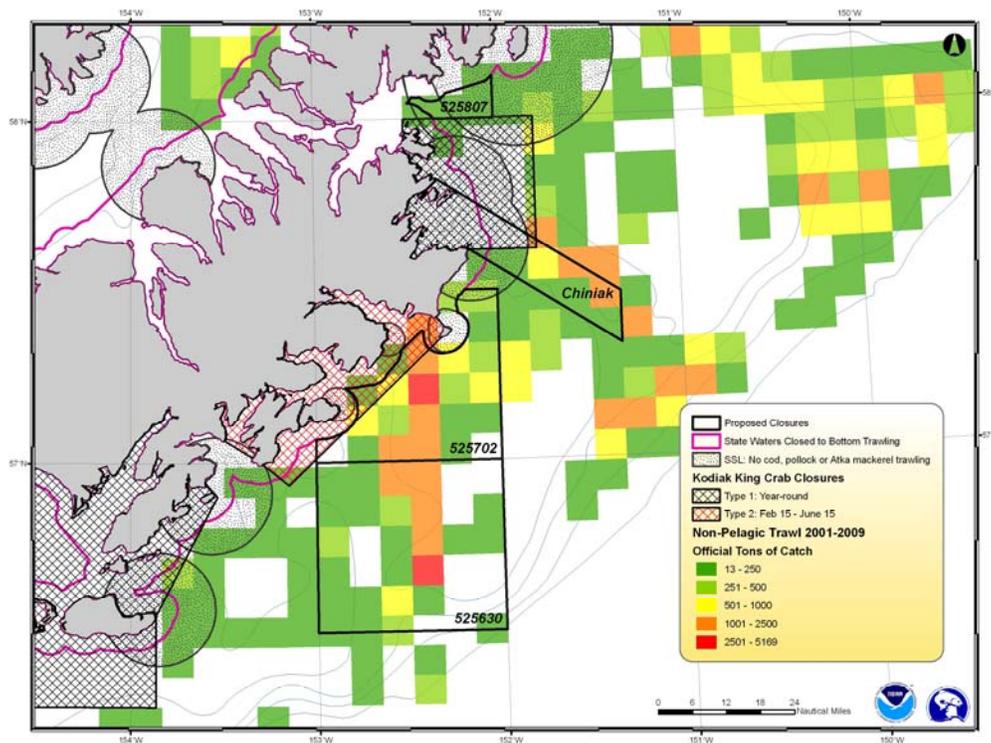
Pot

Observed <i>C. bairdi</i> Tanner crab bycatch in the pot groundfish fishery, summed over 2001-2009	F
Observed groundfish catch in the pot groundfish fishery, summed over 2001-2009	F
Observed rate of groundfish catch per bycaught crab in the pot groundfish fishery, for the period 2001 to 2009.....	G

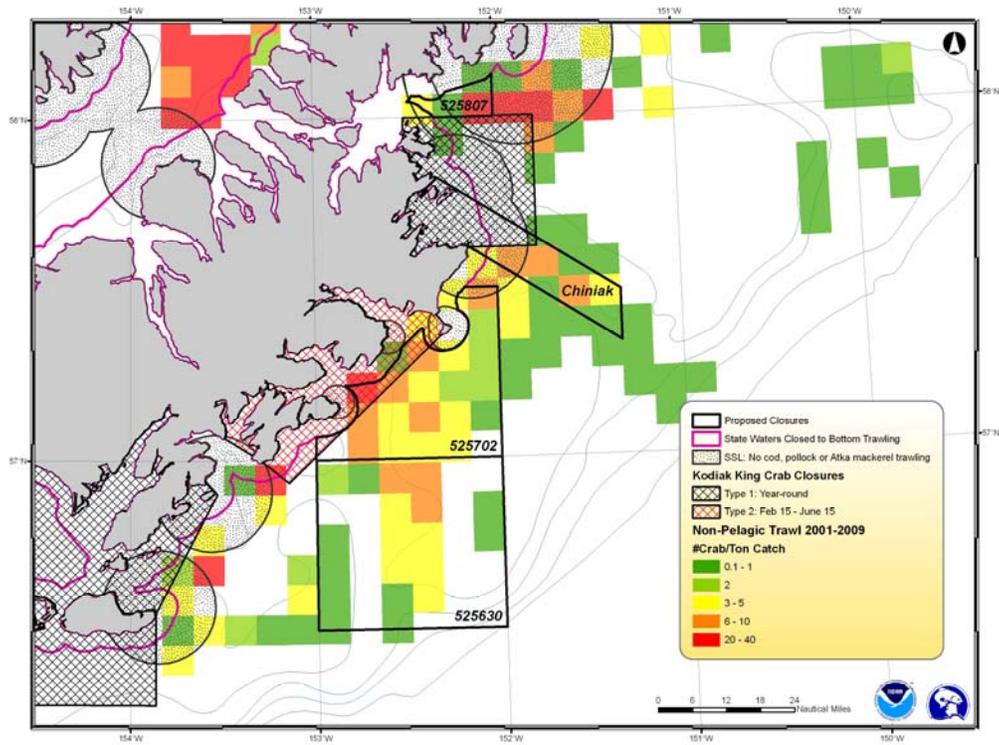
Color Figure 1 Observed *C. bairdi* Tanner crab bycatch in the nonpelagic trawl groundfish fishery, summed over 2001-2009



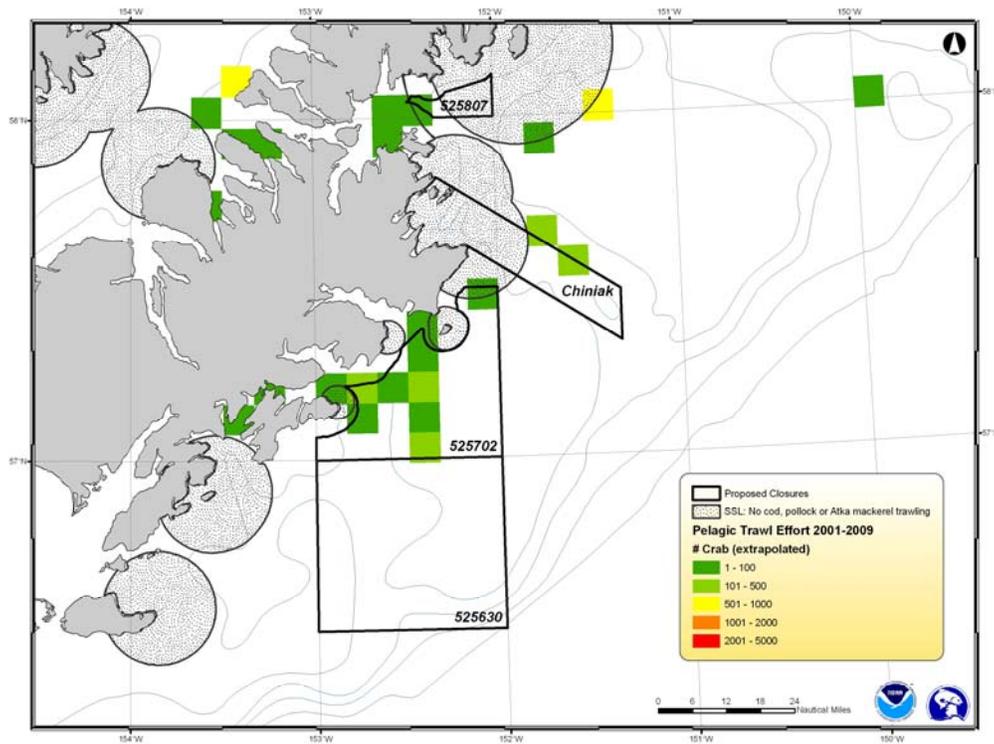
Color Figure 2 Observed groundfish catch in the nonpelagic trawl groundfish fishery, summed over 2001-2009



Color Figure 3 Observed rate of groundfish catch per bycaught crab in the nonpelagic trawl groundfish fishery, for the period 2001 to 2009

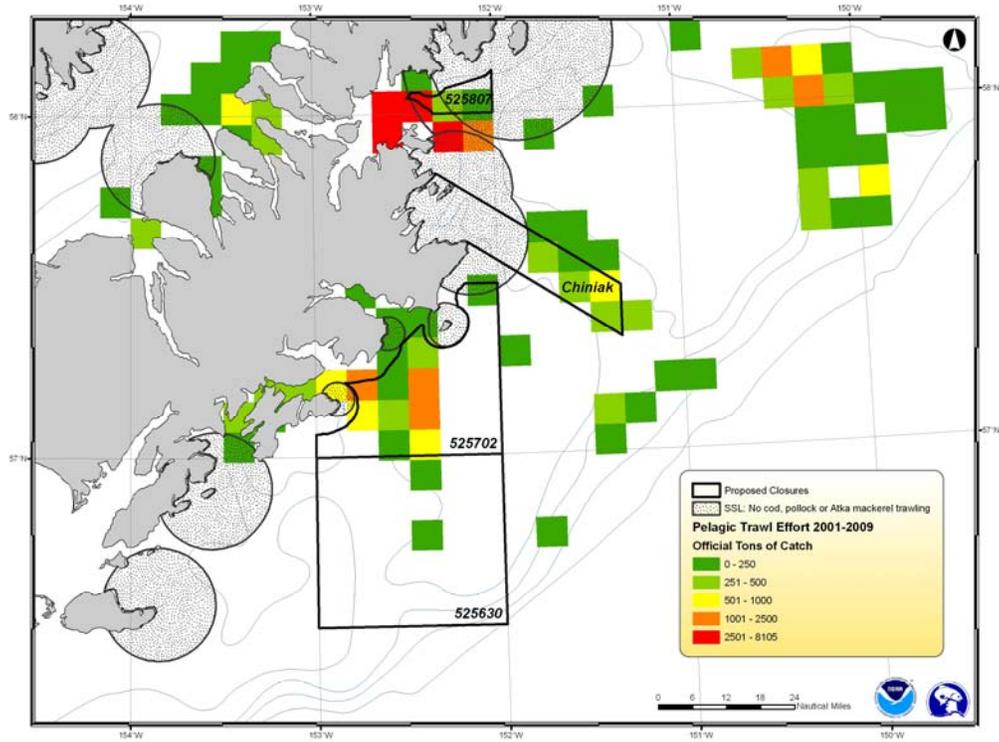


Color Figure 4 Observed *C. bairdi* Tanner crab bycatch in the pelagic trawl groundfish fishery, summed over 2001-2009⁸

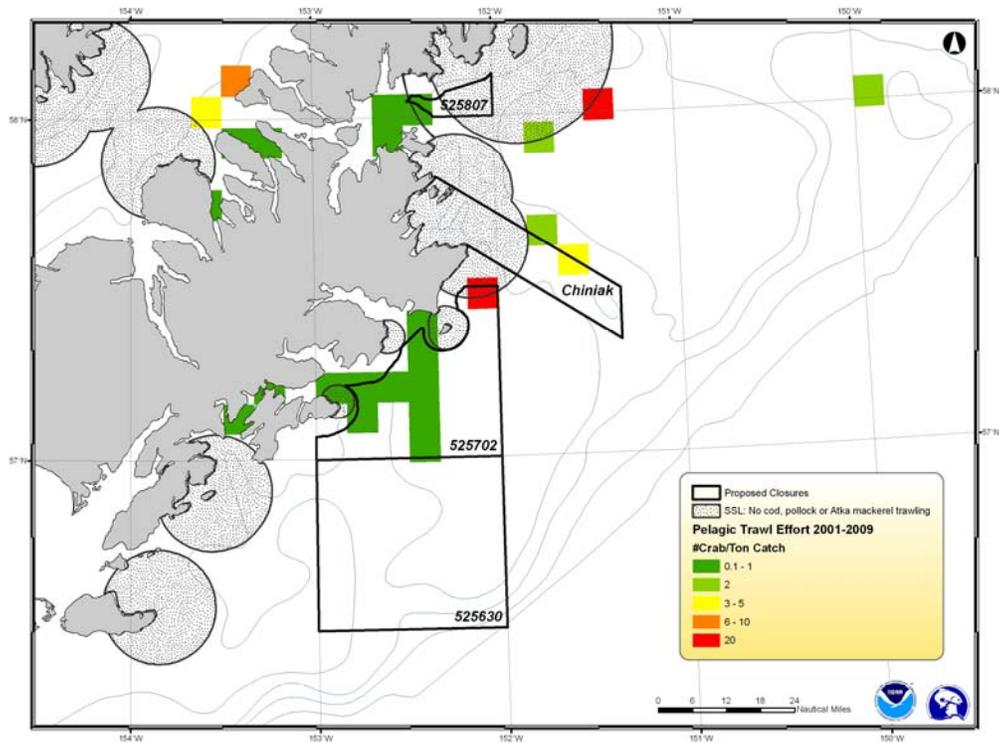


⁸ There is an important limitation in the observer program data for PSC from the shoreside pollock fishery when it is used for spatial analysis. The limitation is due to a technical database problem, which was corrected by NMFS re-design of the observer database implemented in 2008. The issue is that PSC in the shoreside pollock fishery are sampled at the plant, rather than onboard the vessel. This is because of the particular handling of large volumes of catch in the pollock fishery. Typically, catch is rapidly placed in below deck refrigerated seawater tanks and there is limited opportunity to take large samples. As all hauls are mixed together in the vessel's hold, the entire delivery is monitored for PSC at the shoreside plant upon delivery. Prior to 2008 the Observer Program database did not provide for capturing the delivery level information. Instead, the delivery level were proportioned back to individual tows made during the trip. This was done to fit the data into the existing system. We caution that care must be exercised when attempting to interpret PSC rates at the haul level. The spatial distribution currently displayed in the document maps the bycatch data by individual tows. In effect, this averages the bycatch among several hauls at several locations, when in fact it could possibly be the case that all the bycatch was caught during one haul in one location, and other locations had little or no associated bycatch.

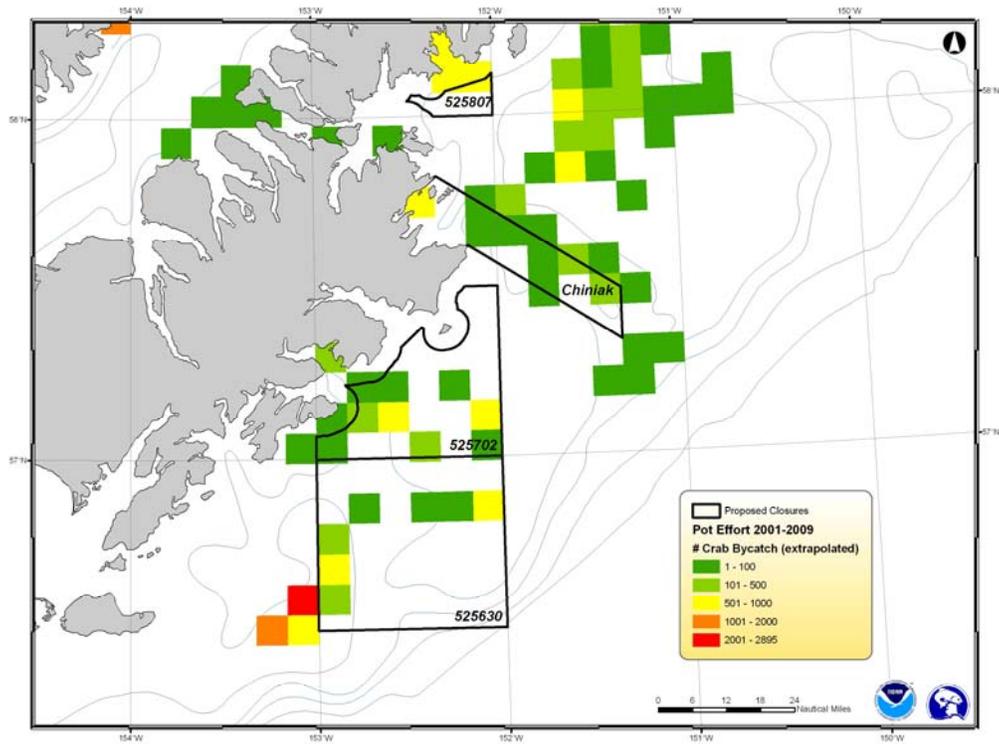
Color Figure 5 Observed groundfish catch in the pelagic trawl groundfish fishery, summed over 2001-2009



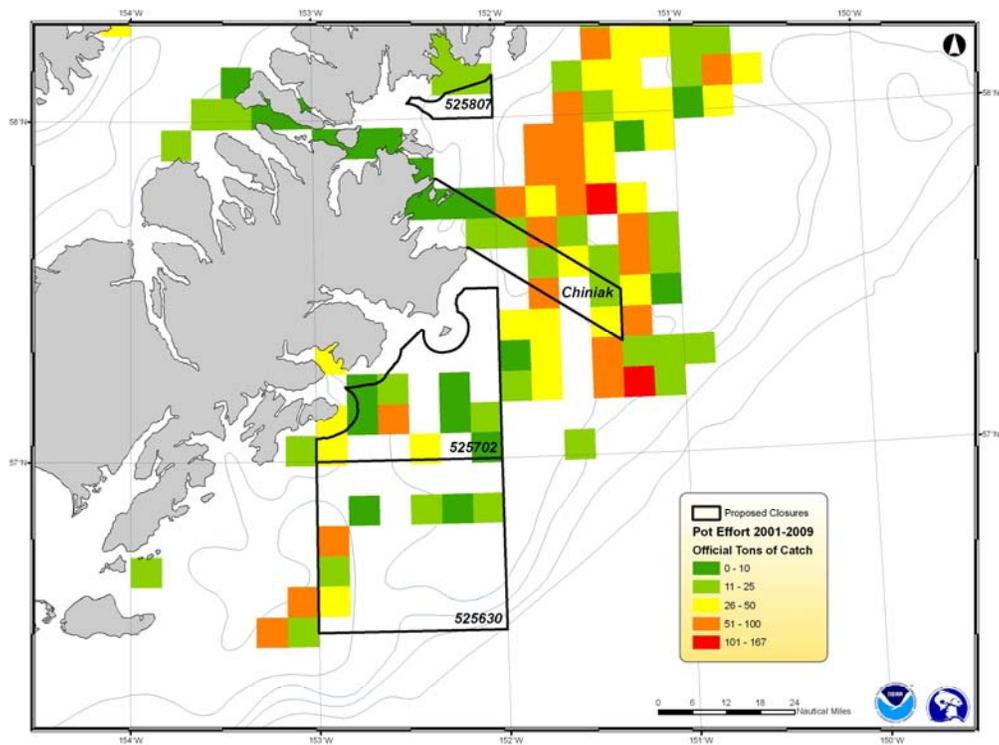
Color Figure 6 Observed rate of groundfish catch per bycaught crab in the pelagic trawl groundfish fishery, for the period 2001 to 2009



Color Figure 7 Observed *C. bairdi* Tanner crab bycatch in the pot groundfish fishery, summed over 2001-2009



Color Figure 8 Observed groundfish catch in the pot groundfish fishery, summed over 2001-2009



Color Figure 9 Observed rate of groundfish catch per bycaught crab in the pot groundfish fishery, for the period 2001 to 2009

