

Crab Bycatch in the Bering Sea/Aleutian Islands Fisheries

Staff Discussion paper

January 2013

Introduction

The Bering Sea/Aleutian Islands (BSAI) Crab Fishery Management Plan (FMP) applies to ten crab stocks in the BSAI: four red king crab, *Paralithodes camtschaticus*, in Bristol Bay, the Pribilof Islands, Norton Sound, and Adak; two blue king crab, *Paralithodes platypus*, in the Pribilof District and around Saint Matthew Island, two golden (or brown) king crab stocks, *Lithodes aequispinus*, in the Aleutian and Pribilof Islands; the Eastern Bering Sea (EBS) Tanner crab, *Chionoecetes bairdi*; and the EBS snow crab, *C. opilio*. All other BSAI crab stocks are exclusively managed by the State of Alaska (State).

Following approval of Amendments 24 and 38 to the BSAI Crab FMP, these ten stocks now have annually-specified overfishing limits (OFLs) and Acceptable Biological Catch (ABC) levels¹. Total allowable catch (TAC) levels (and GHLS for the Norton Sound red king crab stock and Pribilof Islands golden king crab stock) are established exclusively by the State. All catch accrues towards the ABC (or ACL¹). Additional bycatch outside of the directed crab fisheries occurs in the BSAI groundfish fisheries and Bering Sea scallop fishery. Total catch from all sources may not exceed the ACL thus currently the State must assume anticipated levels of bycatch for each stock in order to set TAC or GHLS at a level where the total catch from directed and non-directed sources will not exceed the ACL. As noted in the accountability measures for the ACL requirements under Amendment 38, if an ACL is exceeded, the TAC or GHLS in the following year will be reduced in order to prevent against exceeding the ACL concurrently. Thus all accountability measures come out of the directed crab fishery. In deference to this, in 2010 the Council initiated an analysis of PSC limits in the BSAI groundfish fisheries for BSAI crab stocks in order to potentially limit the overall bycatch by stock and provide the State with a hard limit for each stock in order to facilitate TAC-setting.

In order to avoid exceeding stock ABC/ACLs, ADF&G must account for all possible sources of fishery mortality when establishing TACs for the state-managed BSAI crab fisheries. BSAI crab stocks are susceptible to three principal sources of fishery mortality: retained catch and bycatch during the directed fishery, bycatch mortality during other state-managed crab fisheries, and bycatch mortality during federally-managed groundfish fisheries. All those sources of fishery mortality are forecast with uncertainty. However, ADF&G can forecast the mortality during crab fisheries with greater confidence than it can forecast the mortality during federal groundfish fisheries because ADF&G establishes the TACs for the crab fisheries, has access to extensive observer data on crab bycatch during crab fisheries that can be used to estimate bycatch as a function of retained catch, and has the ability to close areas to crab fishing that have potential for high crab bycatch. On the other hand, ADF&G has no control over the bycatch mortality that occurs during the federal groundfish fisheries and no means for forecasting bycatch mortality in groundfish fisheries except for the estimates of bycatch mortality in past years. To accommodate the uncertainty on bycatch mortality in groundfish fisheries when establishing TACs, ADF&G has assumed that the maximum of the annual bycatch mortality due to groundfish fisheries in the previous 20 years could occur. The actual amount assumed by stock for the 2013-14 season where available is described in the individual stock sections.

¹ Under the Crab FMP, the annual catch level (ACL) is = to the annually recommended ABC level. The ABC is recommended to the Council by the SSC.

The Council adopted a problem statement and a suite of alternatives. These alternatives were further revised in October 2011. The current suite of alternatives and the Council's problem statement are included as Appendix 1. This paper describes the historical bycatch by groundfish fisheries by gear type for each stock, and what (if any) measures are currently employed under the BSAI groundfish FMP to limit the bycatch by crab stock as well as provides suggestions for moving forward with analysis of components and options.

1. Summary of existing management measures

The BSAI groundfish FMP specifies crab bycatch management measures for protection of Bristol Bay red king crab, EBS Tanner crab, EBS snow crab, Pribilof blue king crab and St. Matthew blue king crab stocks (Table 1). These measures consist of triggered or fixed time and area closures for trawl fisheries. Additional details on the individual measures and trends in PSC catch by stock are included in the stock specific overview sections. No measures are currently in place for any fixed gear fisheries (pending the Pribilof Islands pot closure, nor are overall limits placed on bycatch of any crab species. Bycatch management measures are not linked to new BSAI crab FMP requirements to account for total removals from all fisheries under new ACL requirements.

Bycatch in groundfish fisheries is currently accounted for in numbers (See previous discussion paper for an overview of the methodology by which these calculations are made. The link for that paper is: <http://www.alaskafisheries.noaa.gov/npfmc/PDFdocuments/bycatch/CrabBycatchPSC510.pdf>). The Council has already indicated an interest in moving to weight-based crab PSC management and may wish to combine that initiative with this analysis of PSC limits by crab stock. For purposes of this paper catch data are reported in both weight in pounds as well as in numbers of crab. No mortality rates have been applied to these data. For purposes of calculating the mortality which accrues towards crab ACLs annually, handling mortality rates of 80% for trawl gear and 50% for fixed gear are applied. The basis for those estimates are described in the previous paper and not repeated here. Stock assessment authors apply those rates in their assessments annually for calculating relative mortality by gear type.

Table 1. Summary of groundfish management measures to address crab bycatch in the trawl fisheries.

Stock	Area	Gear type	Timing	For trigger closures		
				Allocation by sector or target fishery in 2013	How catch accrues	2013 PSC limit
Bristol Bay red king crab	Red King Crab Savings Area	nonpelagic trawl	closed year-round, except subarea			
	Nearshore Bristol Bay Trawl Closure	nonpelagic trawl	closed year-round, except Togiak subarea open 4/15-6/15			
	Zone 1	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole Pacific cod pollock/mackerel/ other species	RKC bycatch in Zone 1, by fishery	97,000 allocated among target fisheries
EBS Tanner crab	Zone 1	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Tanner crab bycatch in Zone 1, by fishery	980,000 allocated among target fisheries
	Zone 2	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Tanner crab bycatch in Zone 2, by fishery	2,970,000 allocated among target fisheries
Pribilof Islands blue king crab	Pribilof Islands Habitat Conservation Area	all trawl	year-round			
EBS snow crab	C. opilio Bycatch Limitation Zone (COBLZ)	all trawl	when limit is reached, area closes to target fishery	Amd. 80 sector yellowfin sole rockfish Pacific cod pollock/mackerel/ other species	Snow crab bycatch in the COBLZ, by fishery	10,501,333 allocated among target fisheries
	Northern Bering Sea Research Area	nonpelagic trawl	currently year-round; fishing may resume in future under a research plan			
St Matthew blue king crab	St Matthew Island Habitat Conservation Area	nonpelagic trawl	year-round			

2. Staff suggestions for moving forward with analyses

The Council has already initiated an analysis of crab PSC management measures broadly (See Appendix 1) but additional specificity will be required to further develop appropriate alternatives by crab stock. As currently constructed with the options for various area closures and the application broadly across all crab stocks and all groundfish fisheries at one time, this would be a massively complex analysis. As such, it would be very difficult to estimate relative impacts and costs with so many additional variables considered in the same analysis. Some direction and prioritization is likely needed from the Council

regarding dividing the analysis by stocks to facilitate iterative analyses rather than one comprehensive analysis as well as prioritization of stocks and specificity of management measures.

Problem statement: This analysis was initiated to address an allocative concern between the directed crab fisheries and the bycatch by groundfish fisheries in order to appropriately establish TAC level so as to avoid exceeding a crab stock ACL and thus penalize the directed crab fishery the following year. If that is indeed still the case, the Council could further clarify that the intent is to address this variability in bycatch projections for this purpose, not to address concerns regarding the actual level of bycatch of crab in groundfish fisheries.

Prioritization: In terms of prioritization, the stocks for which the State faces the most challenges in TAC setting should likely be addressed first as these are the ones with the highest variability in bycatch and difficulties in projecting bycatch estimates. Stock status however, plays a very important role in the ability to adequately account for relative removals in the groundfish fisheries. In recent years, the two stocks which have been the most problematic for estimating bycatch needs are the EBS Tanner crab stock and the St. Matthew blue king crab stock. For Tanner crab the existing trawl measures, as shown in Table 5 appear to comprise the majority of the trawl bycatch but a significant contribution to the overall bycatch occurs in the fixed gear fisheries for which there are no measures. While there are no limits for the St. Matthew blue king crab stock, trawl bycatch is generally minimal and fixed gear (especially pot gear) bycatch can be significant in some years. Measures to limit fixed gear bycatch for both stocks (Tanner crab, St. Matthew blue king crab) could be considered.

With stock status declines, the relative bycatch assumption becomes increasingly important. Currently the Bristol Bay red king crab stock has been declining while snow crab has been increasing. The limit for Bristol Bay red king crab is specified on threshold levels of stock abundance and trawl bycatch consistently makes up the largest proportion of overall groundfish bycatch, however in some years fixed gear bycatch can be significant. For snow crab the COBLZ closure and trawl catch comprises 88-98% of the total trawl bycatch but fixed gear bycatch can also comprise a significant portion (up to 49%) of the bycatch in some years. Additional measures to limit fixed gear bycatch for both stocks (Bristol Bay red king crab and snow crab) could be considered.

There are also no measures in place to address bycatch of Aleutian Islands golden king crab. This includes the AI areas 541, 542 and 543. Bycatch occurs primarily in the sablefish pot fishery and trawl fisheries for rockfish, atka mackerel, and Kamchatka flounder. The necessity of prioritizing bycatch measures for Aleutian Islands golden king crab may increase as the stock assessment moves to a biomass-based assessment with an ABC determined based upon stock status. Currently this stock is managed based on average catch with a TAC set in state regulation and bycatch in groundfish fisheries has not been a concern in setting the TAC as it is well below the ABC. The stock assessment model will ideally be employed in the 2013 assessment cycle and a better evaluation of the impact this will have on management will be available at that time (May/June 2013).

There are no PSC management measures for Northern District (Area 514) red king crab. Flatfish trawl fisheries comprises nearly all of the bycatch of this stock thus any measure to address Northern District bycatch in the Nunivak Island area would be focused on those fisheries (yellowfin sole and rock sole). Currently however these crab do not count towards the ACL under either BBRKC or NSRKC. There has been discussion at the Crab Plan Team meetings based upon the stock assessment author's concerns that the boundary for the BBRKC stock should be reconsidered(it remains south of the Area 514 line) and should be extended northward as trawl surveys and flatfish fisheries consistently catch crab in the southern portion of this area. However no action has occurred with ADF&G at this time to modify the BBRKC registration area to extend the stock boundary to the north.

Stocks for which bycatch controls for allocative purposes appear to be of a lower priority currently would be those stocks for which no directed fishery has been occurring and/or are closed to directed fishing and TAC = 0. These include Pribilof Islands golden king crab, Pribilof Islands blue king crab, Pribilof Islands red king crab and Adak RKC.

Stock concerns remain regarding the bycatch of Pribilof Islands blue king crab in the groundfish fisheries as evidenced by the complications regarding estimation of bycatch of this stocks. These issues are outlined in the EA for revising the rebuilding plan for this stock at: http://www.alaskafisheries.noaa.gov/npfmc/PDFdocuments/catch_shares/Crab/PIBKCrebuildingEA512.pdf. Until these issues are better resolved, moving forward with PSC limits for Pribilof Islands blue king crab may be a lower priority.

Methodology to set PSC limits: The Council is considering PSC limits based upon crab abundance. Based upon the current components, these limits would either apply to existing closures (for Bristol Bay red king crab, EBS Tanner crab and Snow Crab) as a triggered closure or to the full distribution of the individual stock. The Council would need to specify the means by which the limits under Alternative 3 would be established based on crab abundance. Some options could include consideration of historical bycatch levels as a percentage of abundance in each year, with or without ‘stair-steps’ or minimum/maximum levels as with the formulation of the current PSC limits. Stocks in Tier 5 cannot have limits established based on abundance thus if limits are to be established for those stocks an alternative means of setting PSC limits would need to be considered. Stocks that do not have abundance estimates include Pribilof Island golden king crab, Adak red king crab and at present Aleutian Islands golden king crab.

Should the Council prioritize stocks and fisheries to be considered in the analysis, a possible next step would be to begin to flesh out the components under Alternative 2. A discussion paper outlining proposed methodology for setting PSC limits could be prepared for a future meeting. A summary of information availability by crab stock is shown in Table 2.

Table 2 Summary of information availability by crab stock, current management measures and bycatch by gear type between 2003/04 – 2011/12 as a proportion of the 2012/13 ABC.

Stock	Abundance estimate	Current fishery	Existing Bycatch controls	Trawl bycatch mortality as % of ABC	Fixed gear mortality as % of ABC	Assumption in TAC-setting
Bristol Bay red king crab	√	√	Trawl PSC limits and closure area	0.72%-2.10%	0.19%-0.35%	Maximum mortality in last 20 years (0.84 million pounds)
EBS Tanner crab	√		Trawl PSC limits	1.25%-2.15%	0.55%-2.93%	Varies based upon estimates of needs in the snow crab fishery
EBS snow crab	√	√	Trawl PSC limits	0.20%-1.14%	0.04%	Depends on stock status and buffer below ABC
St. Matthew blue king crab	√	√	Bottom Trawl closure area	0.02%-0.05%	0.08%-7.09%	Maximum mortality in last 20 years (0.077 million pounds)
Pribilof Island red king crab	√		Pot/Trawl closure area*	1.42%-4.73%	0.13%-1.54%	No directed fishery due to PIBKC stock status
Pribilof Island blue king crab	√		Pot/Trawl closure area*	1.9%-11.00%	12.55%-204%	No directed fishery, stock overfished
Norton Sound red king crab	√	√		NA	NA	NA
Aleutian Island golden king crab		√		0.02%-0.10%	0.16%-0.9%	TAC set in regulation and is well below current average catch ABC
Adak red king crab				1.93%-11.76%	2.67%-12.47%	Directed fishery closed due to poor stock status

*Pribilof area closure to pot gear pending approval

2.1. Bristol Bay red king crab (BBRKC)

Bycatch of BBRKC by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type in numbers of crab (Figure 1) and by weight in pounds (Figure 2). The majority of the bycatch occurs consistently in the non-pelagic trawl fisheries, specifically in the rock sole, and yellowfin sole fisheries. Of the fixed gear fisheries, the highest amounts of bycatch on average are in the Pacific cod pot and hook and line fisheries.

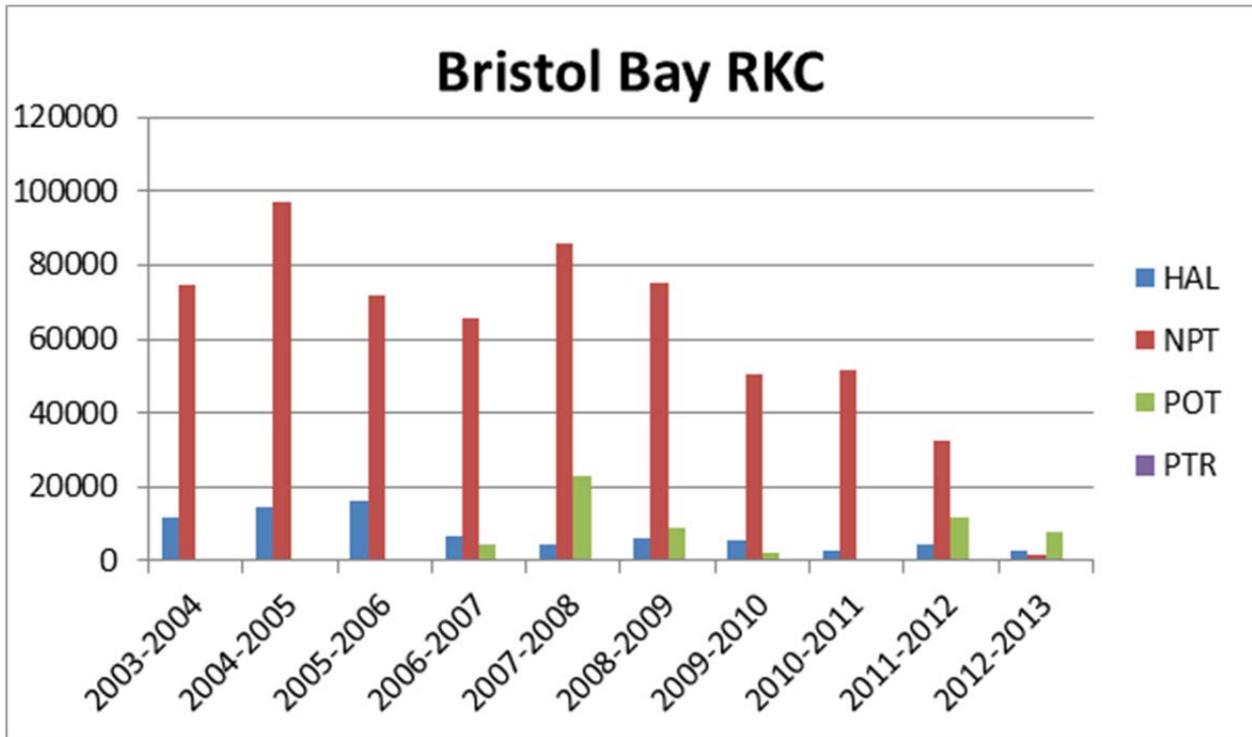


Figure 1 Bycatch of BBRKC by gear type in numbers of crab

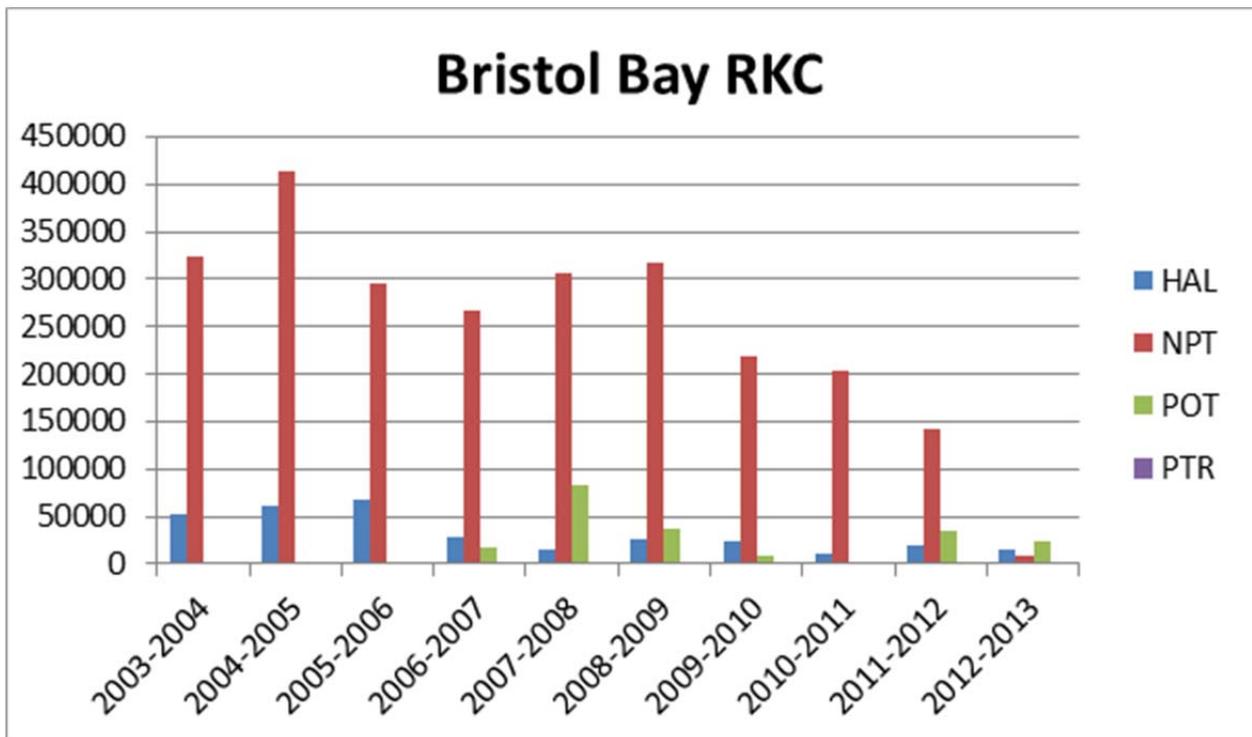


Figure 2 Bycatch of BBRKC by gear type in weight in pounds

The State has assumed the maximum amount of bycatch mortality by groundfish fisheries for this stock (maximum since 1990) at 0.84 million pounds. For 2013 this represents 5.3% of the ABC of 15.80 million pounds. There are several management measures under the FMP to protect Bristol Bay red king crab stocks and habitat. These are fixed closures and a triggered time/area closure to trawl gear. No additional bycatch management measures are currently in place for fixed gear or bycatch outside of the designated areas. A description of the current measures are included below.

2.1.1. Red King Crab Savings Area

Non-pelagic trawling is prohibited year round within the area indicated in with the exception that a subarea of the Red King Crab Savings Area between 56°00' N. and 56°10' N. latitude and 162°00' W. and 164°00' W. longitude may be opened to non-pelagic by the NMFS Alaska Regional Administrator in consultation with the Council. This is done during the annual specifications process by the Council in December 2009.

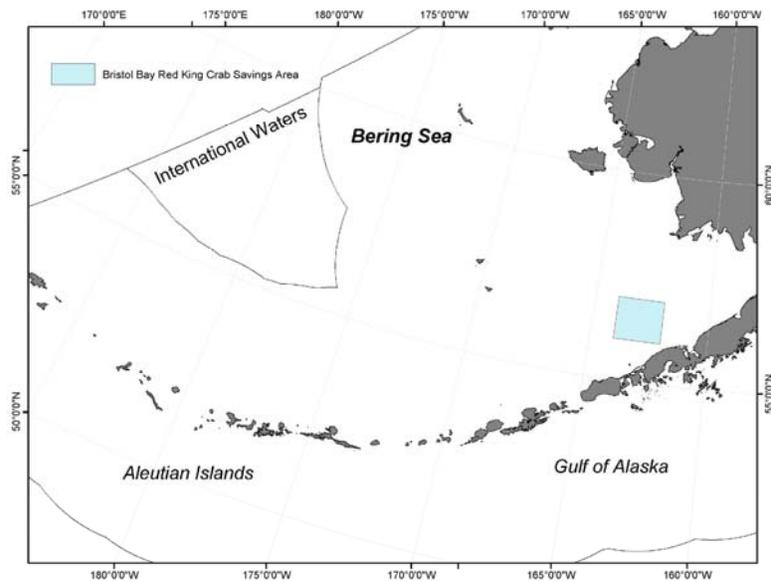


Figure 3. Bristol Bay red king crab savings area.

2.1.2. Nearshore Bristol Bay Trawl Closure

All trawling is prohibited year round in Bristol Bay east of 162°00' W. longitude, except the subarea that is open to trawling during the period April 1 to June 15 each year (Figure 4).

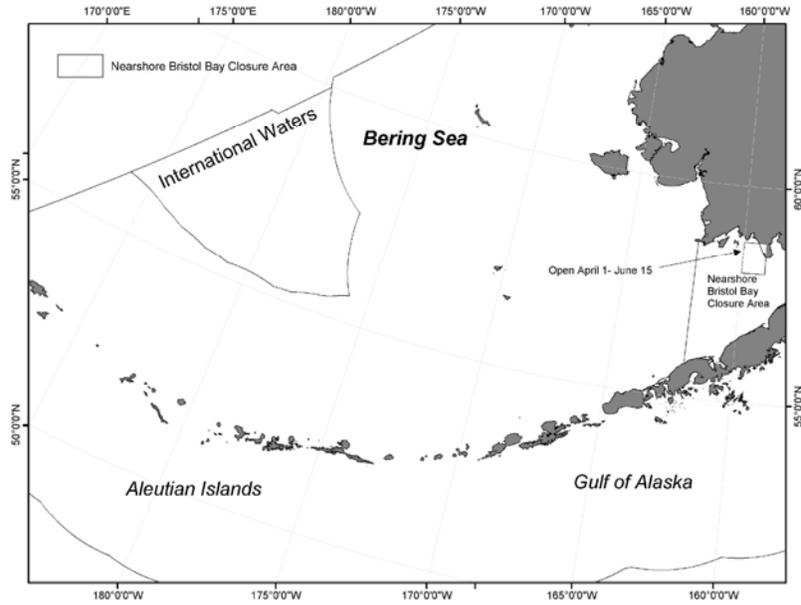


Figure 4. Nearshore Bristol Bay trawl closure.

2.1.3. Zones 1 and 2

Zones 1 and 2 are closed to directed fishing when the crab bycatch caps (red king crab and EBS Tanner crab) are attained in specified fisheries (Figure 5). Species-specific caps are described below.

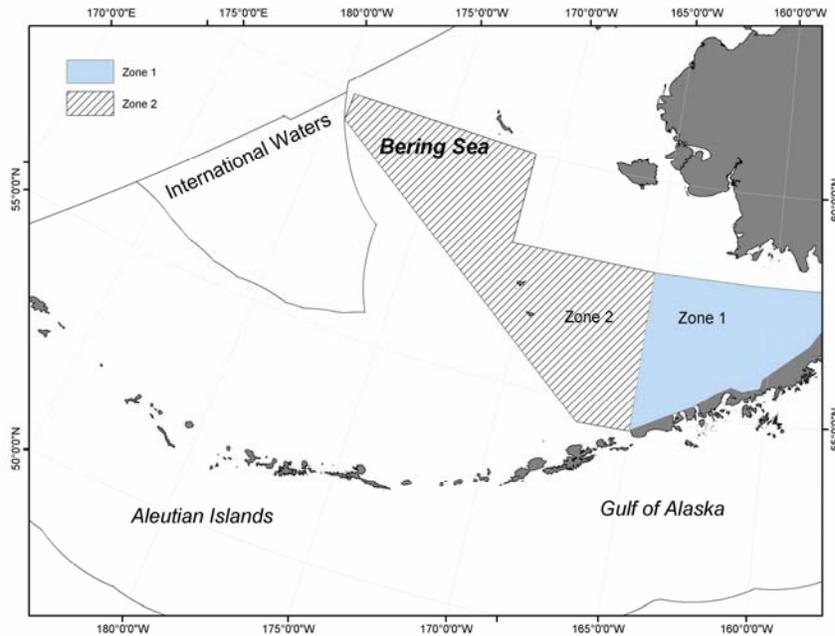


Figure 5. Zones 1 and 2 area for closures (Bristol Bay red king crab and EBS Tanner crab).

Table 3. PSC limits for red king crab.

PSC limits for Zone 1 red king crab (No Zone 2 RKC)	
Abundance	PSC Limit
Below threshold or 14.5 million lbs of effective spawning biomass (ESB)	33,000 crabs
Above threshold, but below 55 million lbs of ESB	97,000 crabs
Above 55 million lbs of ESB	197,000 crabs

The stair step procedure for determining PSC limits for red king crab taken in Zone 1 trawl fisheries is based on abundance of Bristol Bay red king crab (Table 3). Based on the 2012 estimate of effective spawning biomass of 44.156 million pounds, the PSC limit for 2013 is 97,000 red king crabs. Up to 25% of the red king crab PSC limit can be used in the 56°00' - 56°10' N. strip of the Red King Crab Savings Area. The red king crab cap has generally been allocated among the pollock/mackerel/other species, Pacific cod, rock sole, and yellowfin sole fisheries. Since 2003-04, 66-94% of the total bycatch of BBRKC has been taken within the Zone 1 closure area (Table 4)

Table 4 Proportion of BBRKC PSC taken by trawl gear within the Zone 1 closure compared to the total PSC by all gear types of BBRKC by year (numbers of crab).

Year	Zone 1 PSC total	Overall BBRKC PSC	Zone 1 proportion of total PSC
2003-04	74,540	86,705	86%
2004-05	97,191	111,693	87%
2005-06	71,362	88,731	80%
2006-07	65,756	77,139	85%
2007-08	85,588	113,131	76%
2008-09	75,116	90,395	83%
2009-10	50,517	58,167	87%
2010-11	51,621	54,719	94%
2011-12	32,272	49,021	66%
2012-13*	1,725	12,205	14%

*note that 2012-13 is only through January 17

2.2. EBS Tanner crab stock

Bycatch of EBS Tanner crab by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 6) and by number of crab (Figure 7). The majority of the bycatch on average occurs consistently in the Pacific cod pot fishery, followed by the non-pelagic trawl fisheries, specifically in the yellowfin sole, rock sole and flathead sole fisheries.

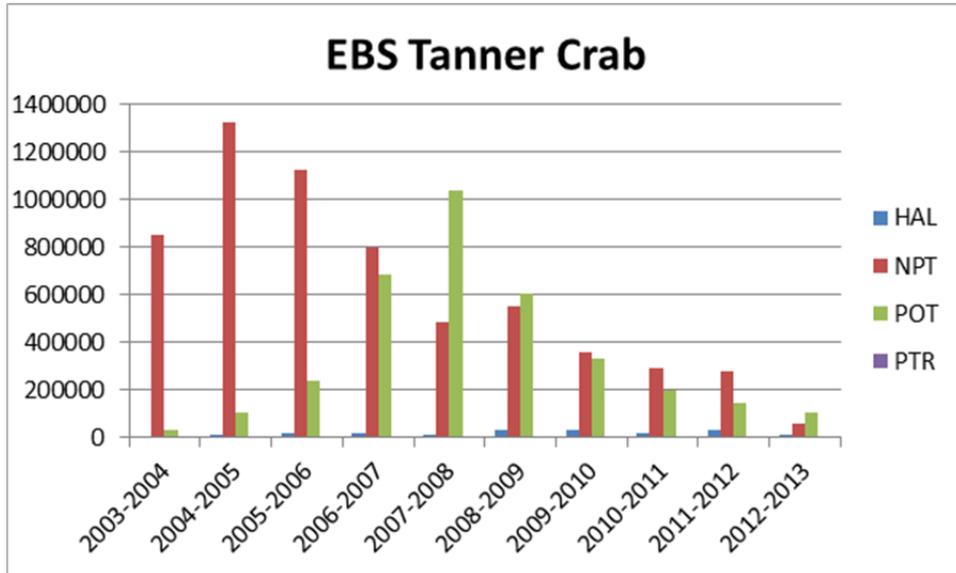


Figure 6 Bycatch of EBS Tanner crab (in pounds) by gear type

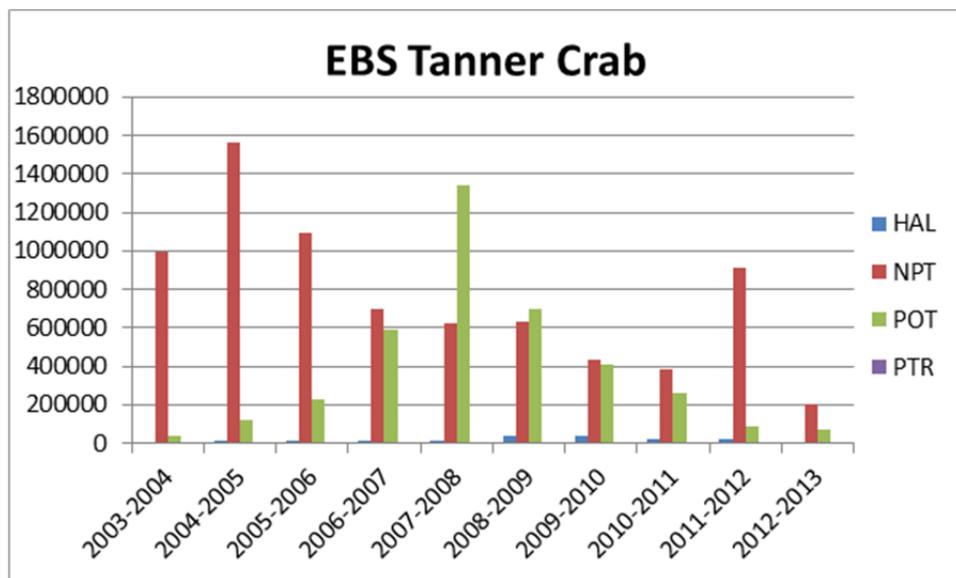


Figure 7 Bycatch of EBS Tanner crab (in numbers of crab) by gear type

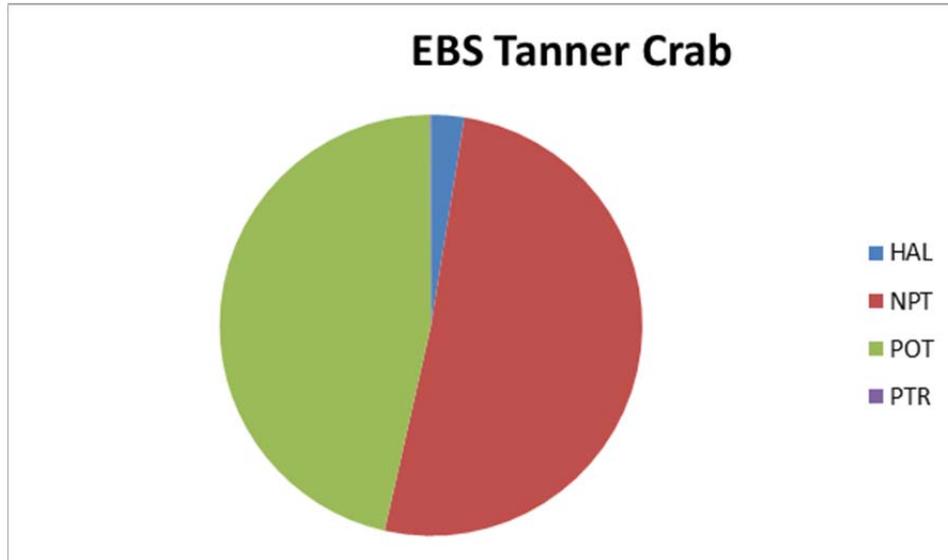


Figure 8 Average proportion of bycatch by gear type by weight from 2003-04 through 2012-13

In past years the State has struggled with accounting for bycatch mortality of Tanner crab in groundfish fisheries. Because the groundfish fisheries can account for a significant portion of the bycatch mortality in some years, the State must consider the relative risk of exceeding the ACL by balancing assumptions of bycatch in the groundfish fisheries with relative bycatch in the directed snow crab fishery. The ACL has not been exceeded but there remains a risk in future years of further constraining the snow crab fishery in order to buffer the mortality that could occur in the groundfish fishery absent some additional constraint.

There are two triggered closures in the trawl fishery to address trawl bycatch of Tanner crab. These are triggered time/area closures to trawl gear as shown in Figure 5. Trawl PSC trigger limits for EBS Tanner crab in Zones 1 and 2 are based on a percentage of the total abundance minus an additional reduction implemented in 1999 of Tanner crab as indicated by the NMFS trawl survey (Table 5). Based on the 2012 abundance (711 million crabs), the PSC limit in 2013 for EBS Tanner crab is unchanged from last year: 980,000 crabs in Zone 1 and 2,970,000 crabs in Zone 2.

Table 5. PSC limits for EBS Tanner crab.

PSC limits for bairdi Tanner crab: Zone 1 and 2		
Zone	Abundance	PSC Limit
Zone 1	0-150 million crabs	0.5% of abundance
	150-270 million crabs	750,000
	270-400 million crabs	850,000
	over 400 million crabs	1,000,000
Zone 2	0-175 million crabs	1.2% of abundance
	175-290 million crabs	2,100,000
	290-400 million crabs	2,550,000
	over 400 million crabs	3,000,000

There are no additional limits for trawl fisheries outside of the Zone 1 and Zone 2 trigger areas nor limits on any of the fixed gear fisheries. Table 6 below shows the total number of crab taken inside of Zones 1 and 2 by trawl fisheries as compared to the overall annual total number of Tanner crab taken as trawl bycatch and bycatch by all gears. Since 2003-04, 29-89% of the total PSC of EBS Tanner crab has been

taken within the Zone 1 and Zone 2 trawl closure areas with the remaining bycatch primarily from fixed gear fisheries (Table 6).

Table 6 Proportion of Tanner crab PSC taken by trawl gear within the Zone 1 and Zone 2 closures compared to the total PSC by all gear types of EBS Tanner crab by year (numbers of crab).

Year	Zone 1 PSC	Zone 2 PSC	Proportion of overall trawl PSC	Total PSC	Proportion of total PSC (Zones 1 and 2)
2003-04	178,405	565,324	75%	1,044,171	71%
2004-05	254,002	441,365	44%	1,700,902	41%
2005-06	232,542	800,554	94%	1,341,742	77%
2006-07	197,399	495,179	99%	1,306,269	53%
2007-08	137,777	435,728	92%	1,983,373	29%
2008-09	181,319	441,057	98%	1,375,541	45%
2009-10	166,980	268,233	99%	880,340	49%
2010-11	157,994	230,228	100%	676,790	57%
2011-12	329,899	584,643	100%	1,028,938	89%
2012-13*	46,869	151,025	97%	283,783	70%

*note that 2012-13 is only through January 17

2.1. EBS Snow crab stock

Bycatch of snow crab by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 9) in numbers of crab (Figure 10) and average proportion by gear type (Figure 11). The majority of the bycatch occurs consistently in the non-pelagic trawl fisheries, specifically in the yellowfin sole, flathead sole and rock sole fisheries as well as the Pacific cod trawl fishery. Of the fixed gear fisheries, the highest amounts of bycatch on average are in the Pacific cod pot and hook and line fisheries.

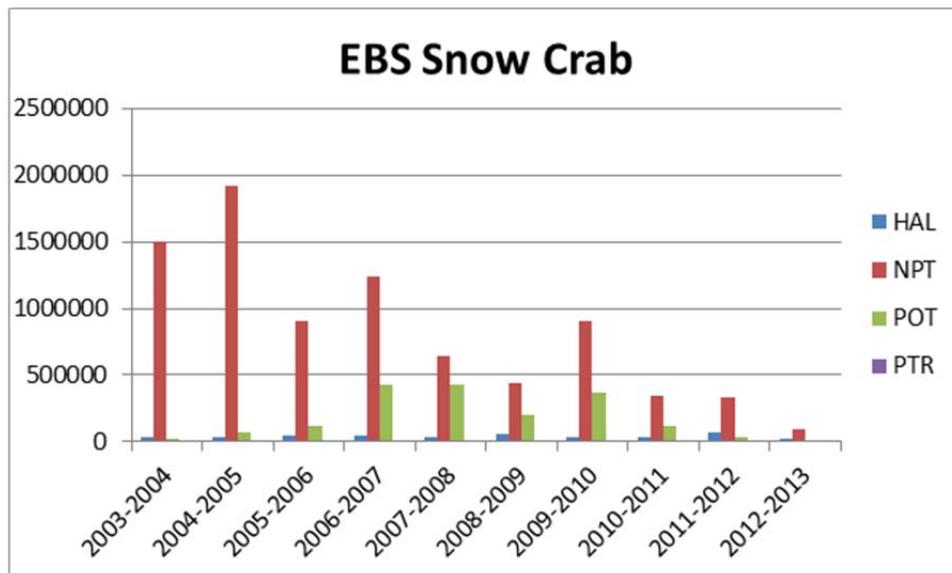


Figure 9 Bycatch of snow crab by gear type in weight (pounds)

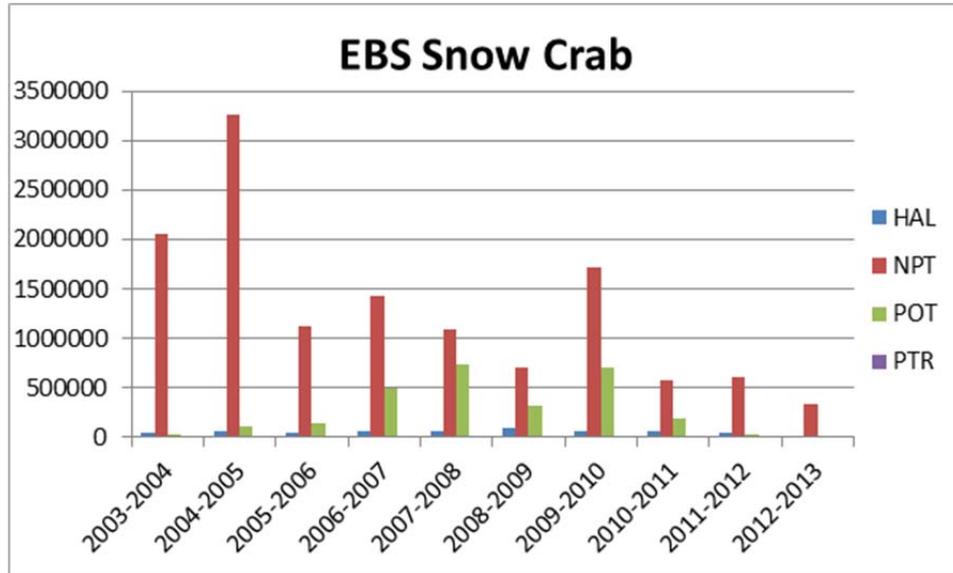


Figure 10 Bycatch of snow crab by gear type in numbers of crab

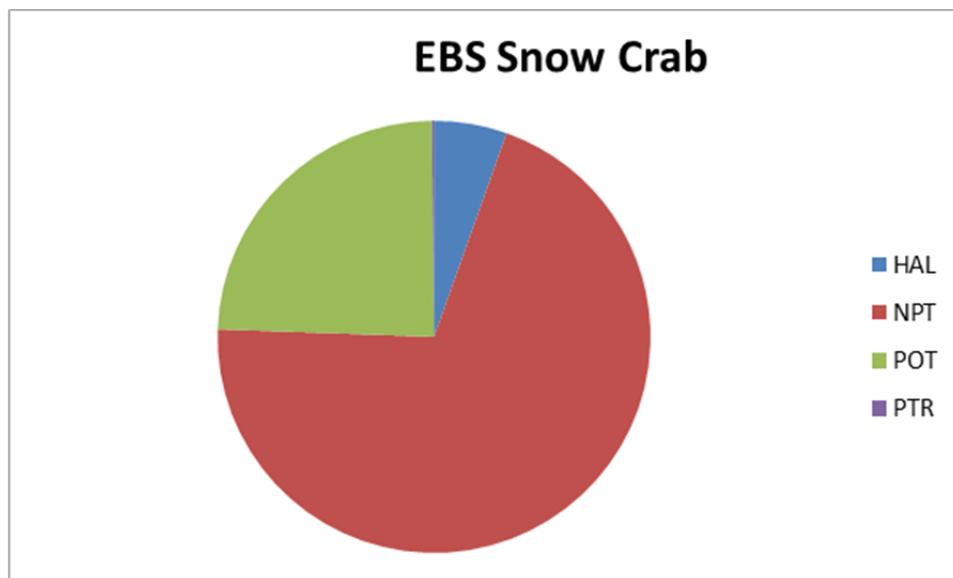


Figure 11 Average contribution to snow crab bycatch by gear type 2003-04 through 2012-13

In recent years bycatch in the groundfish fishery has not been a significant concern for the State in setting the snow crab TAC due to the buffer between the TAC calculated by the State harvest strategy and the ABC recommended by the SSC. However changes in stock status have a significant effect on the relative importance of estimating bycatch mortality by the groundfish fishery in comparison to directed fishery removals.

The FMP contains a triggered time/area closure (described below) for trawl fisheries to protect snow crab stocks and their habitat. There are no additional management measures for fixed gear fisheries or trawl bycatch outside of the time/area closure.

2.1.1. *C. Opilio* Bycatch Limitation Zone (COBLZ)

A closure for EBS snow crab (*C. opilio*) is triggered if the limit is reached in specified fisheries. The limit accrues for bycatch taken within the *C. opilio* Bycatch Limitation Zone (COBLZ). That area then closes for the fishery that reaches its specified limit. (Figure 12).

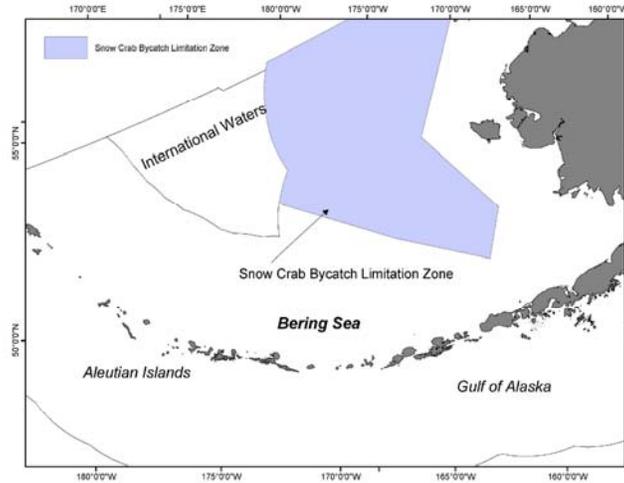


Figure 12. *C. opilio* Bycatch Limitation Zone (COBLZ)

EBS snow crab trawl PSC limits are based on total abundance of snow crab as indicated by the NMFS standard trawl survey. The cap is set at 0.1133% of snow crab abundance index, with a minimum of 4.5 million snow crabs and a maximum of 13 million snow crabs; the cap is further reduced by 150,000 crabs. The 2012 survey estimate of 9,401,000,000 crabs results in a 2013 PSC limit of 10,501,333 crabs. The 2012 PSC limit was 7,029,520 crabs, based on a 2011 survey estimate of 6,336,734,734 crabs. Only snow crab taken within the COBLZ accrue toward the PSC limits established for individual trawl fisheries.

Table 7 below shows the total number of snow crab taken inside of COBLZ by trawl fisheries as compared to the overall annual total number of snow crab taken as bycatch. Since 2003-04, 51-94% of the total bycatch of snow crab has been taken within the COBLZ (Table 7).

Table 7 Proportion of Snow crab PSC taken by trawl gear within the COBLZ closure compared to the total PSC by all gear types of snow crab by year (numbers of crab).

Year	COBLZ PSC	Proportion of total trawl PSC	Overall total PSC	Proportion of total PSC
2003-04	2,003,407	98%	2,124,035	94%
2004-05	3,175,466	97%	3,426,667	93%
2005-06	1,048,193	93%	1,328,250	79%
2006-07	1,370,211	96%	1,989,036	69%
2007-08	960,360	88%	1,881,678	51%
2008-09	623,429	88%	1,113,903	56%
2009-10	1,656,081	97%	2,487,774	67%
2010-11	533,958	92%	824,652	65%
2011-12	570,532	94%	683,165	84%
2012-13*	335,761	98%	368,461	91%

*note that 2012-13 is only through January 17

2.2. Pribilof Islands blue king crab management measures

Bycatch of PIBKC by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type in weight in pounds (Figure 13) and in numbers of crab (Figure 14) as well as the average proportion by gear type (Figure 15). The majority of the bycatch occurs the Pacific cod pot and hook and line fisheries as well as non-pelagic trawl fisheries, specifically in the yellowfin sole and rock sole fisheries.

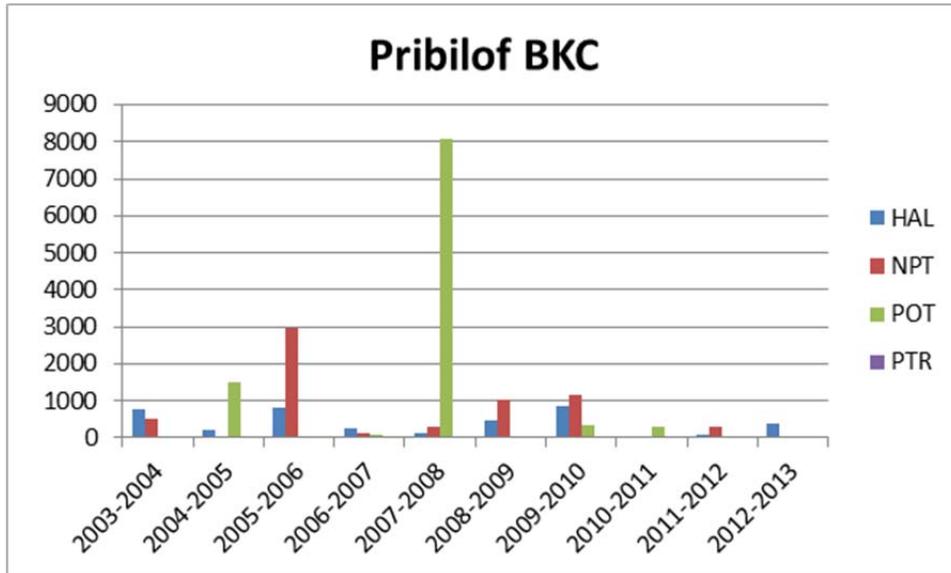


Figure 13 Bycatch of PIBKC by gear type by weight (pounds)

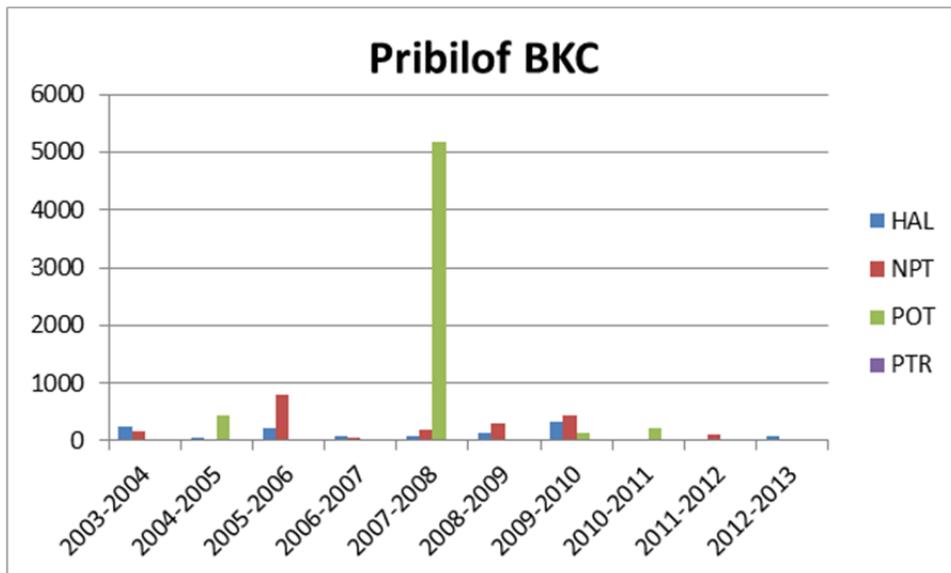


Figure 14 Bycatch PIBKC by gear type in numbers

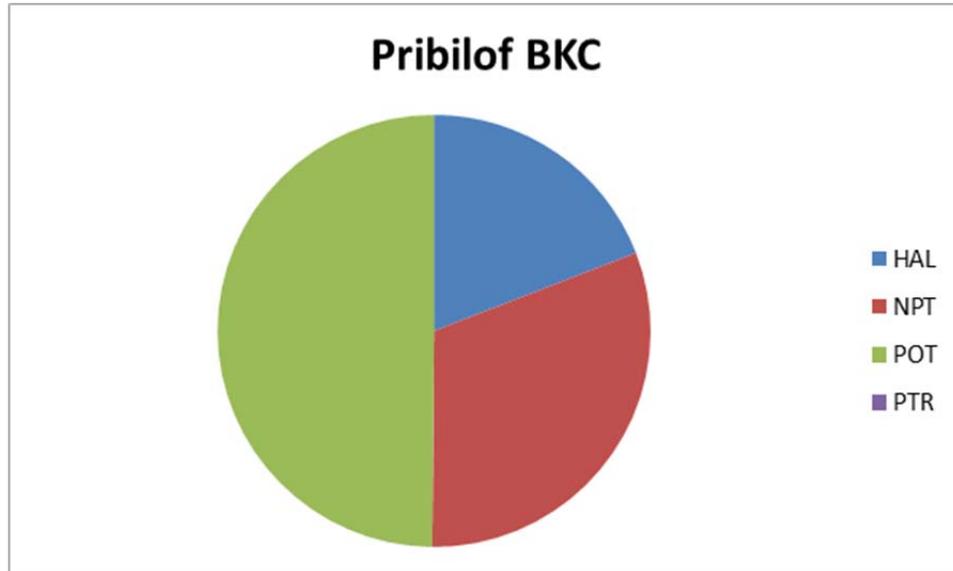


Figure 15 Proportion of average bycatch of PIBKC by gear type from 2003-04 through 2012-13

There are no PSC limits for any gear type for PIBKC. However the Pribilof Islands Habitat Conservation Area (Figure 16) has been closed to trawling since 1995. The intent of this closure was to protect the unique habitat and ecosystem surrounding the Pribilof Islands which provides habitat for commercially important groundfish species, blue king crab, red king crab, Tanner crab, snow crab, juvenile groundfish, Korean hair crab, marine mammals, seabirds, and their prey species. This area was established based upon the distribution and habitat of the blue king crab in the NMFS annual trawl surveys and on observer data. Amendment 103 to the FMP in conjunction with a revised rebuilding plan for PIBKC will extend this closure to the Pacific cod pot fleet as well. The Council took final action on Amendment 103 in June 2012. Implementation is anticipated in 2014.

The directed crab fishery for PIBKC has been closed since 1998 due to concerns with stock status (this stock was declared overfished in 2002). Groundfish bycatch is the only catch which accrues towards the ACL for this stock thus the State has not needed to make assumptions about appropriate buffer values as TAC = 0.

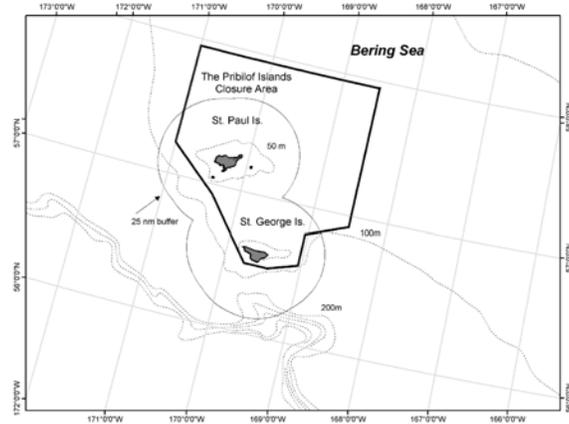


Figure 16. Pribilof Islands Habitat Conservation Zone.

2.3. St. Matthew blue king crab stock

Bycatch of SMBKC by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 17), numbers of crab (Figure 18) and average proportion by gear type (Figure 19). The majority of the bycatch occurs the Pacific cod pot and hook and line fisheries.

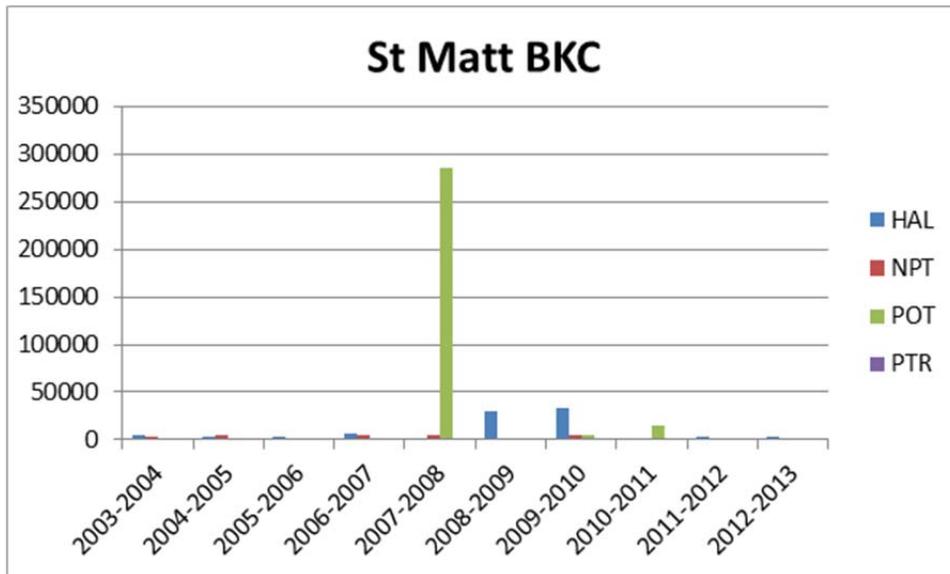


Figure 17 Bycatch of SMBKC by gear type by weight (pounds)

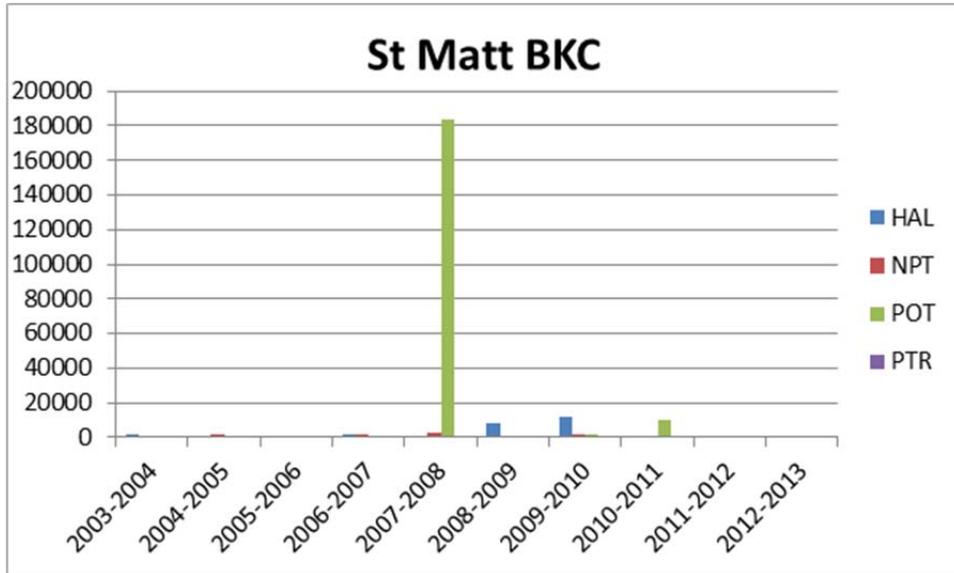


Figure 18 Bycatch SMBKC by gear type in numbers

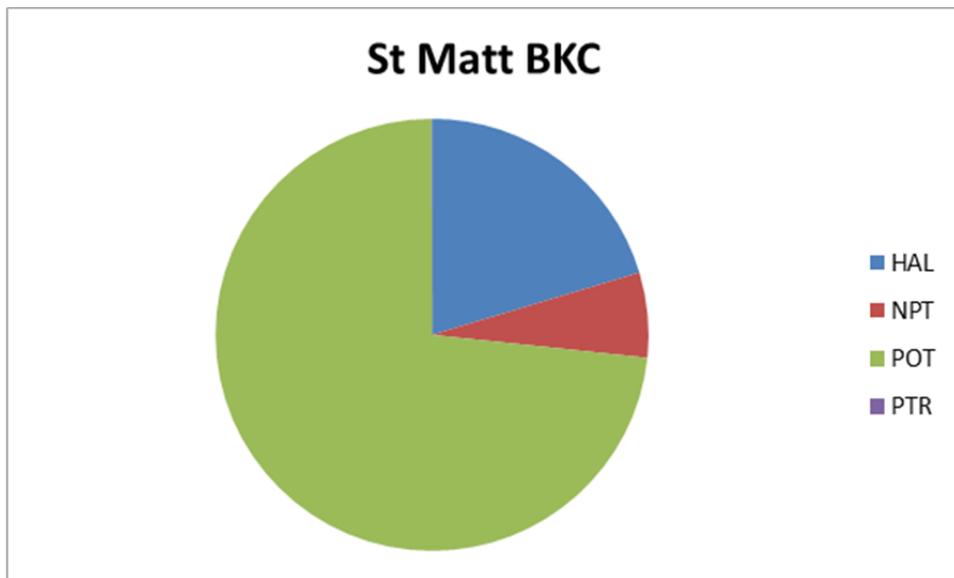


Figure 19 Proportion of average bycatch of SMBKC by gear type from 203-04 through 2012-13

There are no PSC limits for any gear type for SMBKC. Non-pelagic trawl gear fishing is prohibited in St. Matthew Island Habitat Conservation Area in the vicinity of St. Matthew Island to protect blue king crab stocks and habitat (Figure 20).

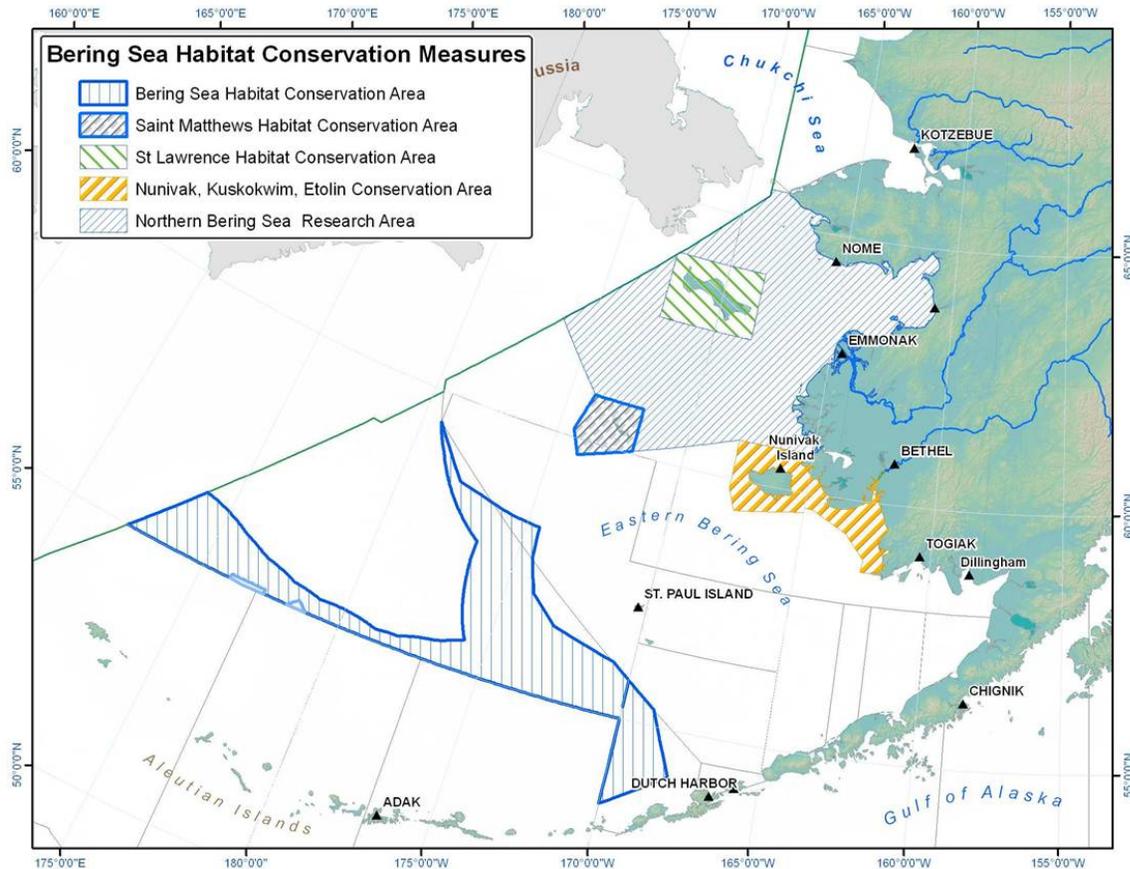


Figure 20. Bering Sea Habitat Conservation measures closure areas.

Setting an appropriate TAC for SMBKC to accommodate bycatch in groundfish fisheries beneath the ACL has been problematic in recent years when the fishery was opened. In 2012/12 the TAC computed according to the State harvest strategy would have led to a TAC > ABC, thus the State needed to first make assumptions about the maximum amount of bycatch potential in the groundfish fisheries (taken as the maximum from 1991/92 – 2011/12 at 0.77 mill lb) and subtracted that from the approved ABC in order to evaluate what was remaining for other crab fisheries and the directed crab fishery. This bycatch allowance represented 38% of the ABC.

2.4. Pribilof Islands red king crab stock

Bycatch of PIRKC by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 21), in numbers of crab (Figure 22) and average proportion by gear type (Figure 23). The majority of the bycatch occurs the non-pelagic trawl fisheries, specifically the yellowfin sole, rock sole and flathead sole fisheries. For fixed gear fisheries, the bycatch occurs primarily in the Pacific cod pot and hook and line fisheries.

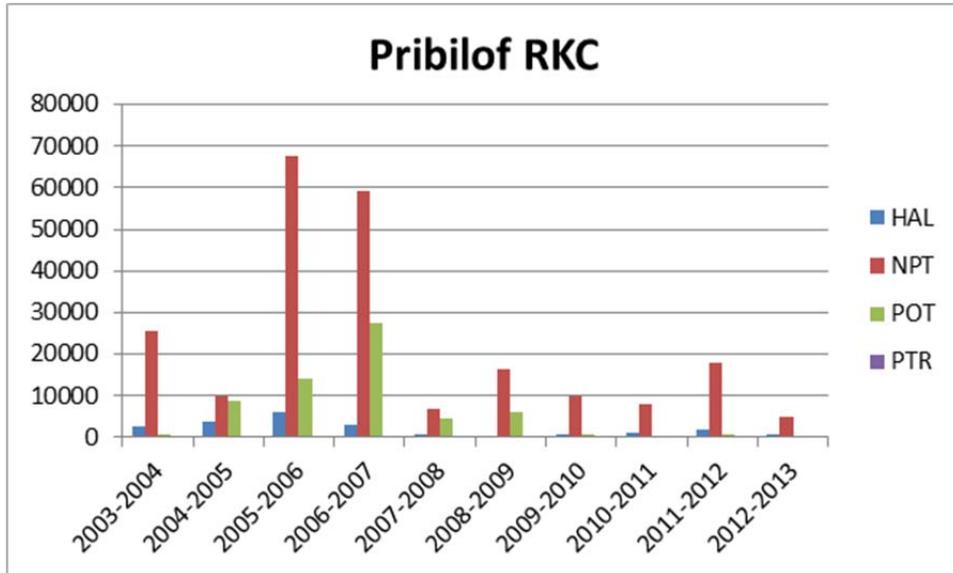


Figure 21 Bycatch of PIRKC by gear type by weight (pounds)

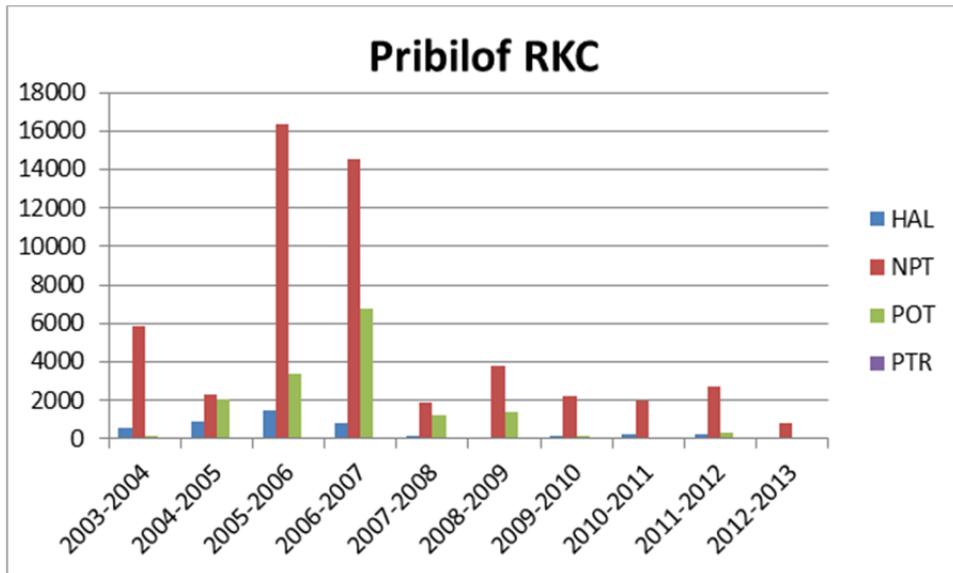


Figure 22 Bycatch PIRKC by gear type in numbers

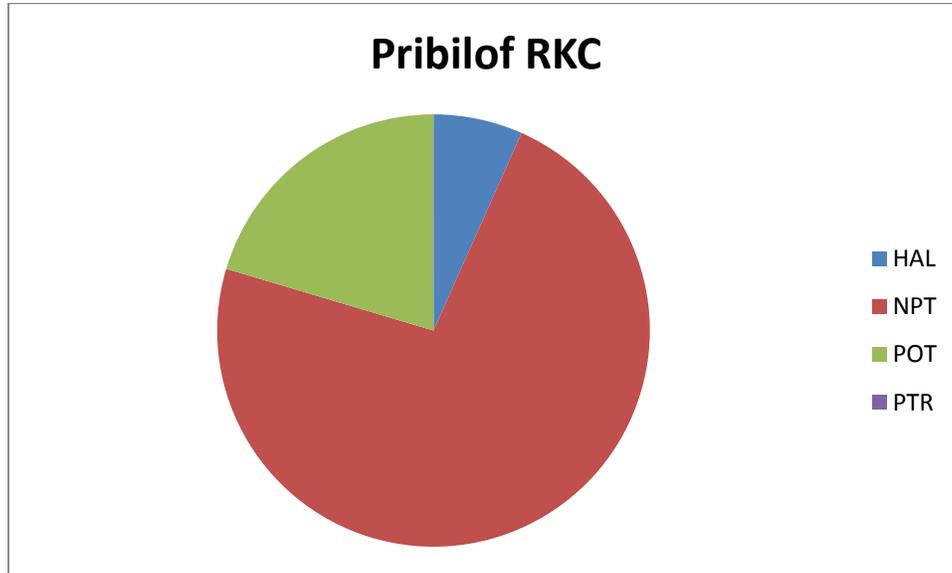


Figure 23 Proportion of average bycatch of PIRKC by gear type from 2003-04 through 2012-13

There are neither PSC limits nor area closures designed exclusively for PIRKC. However the PIHCZ is closed to trawling in the area of the Pribilof Islands (and to Pacific cod pot fishing following implementation of Amendment 103). The directed crab fishery for PIRKC has been closed since 1998 due to concerns with bycatch of PIBKC. Groundfish bycatch is the only catch which accrues towards the ACL for this stock thus the State has not needed to make assumptions about appropriate buffer values as TAC = 0.

2.5. Pribilof Islands golden king crab stock

Bycatch of PIGKC by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 24), in numbers of crab (Figure 25) and average proportion by gear type (Figure 26). The majority of the bycatch occurs in the Sablefish pot fishery, the Pacific cod hook and line fishery and the non-pelagic trawl flatfish fisheries. There are no bycatch management measures in place for AIGKC. There has been limited effort in this directed fishery in years thus bycatch is currently the only catch which accrues towards the ACL for this stock thus the State has not needed to make assumptions about appropriate buffer values.

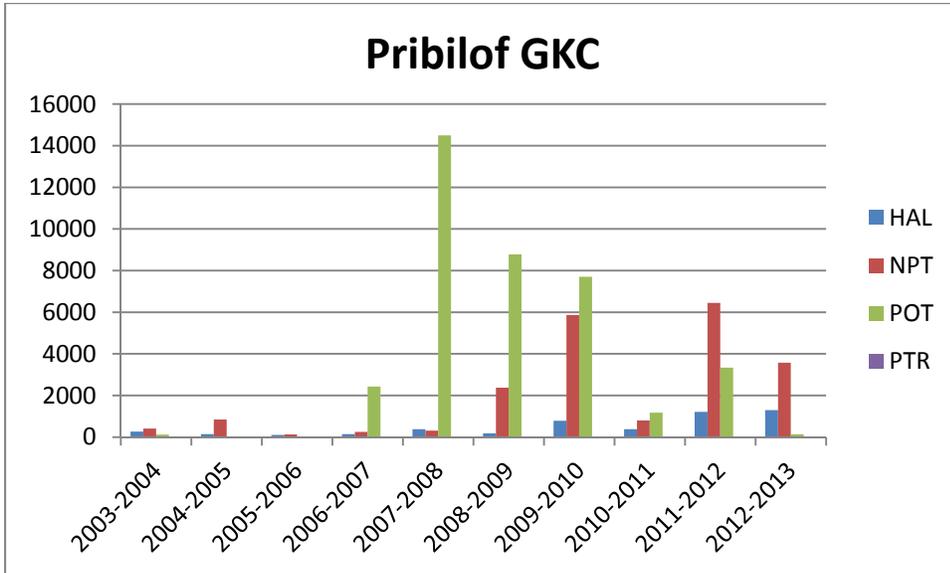


Figure 24 Bycatch of PIGKC by gear type and weight (pounds)

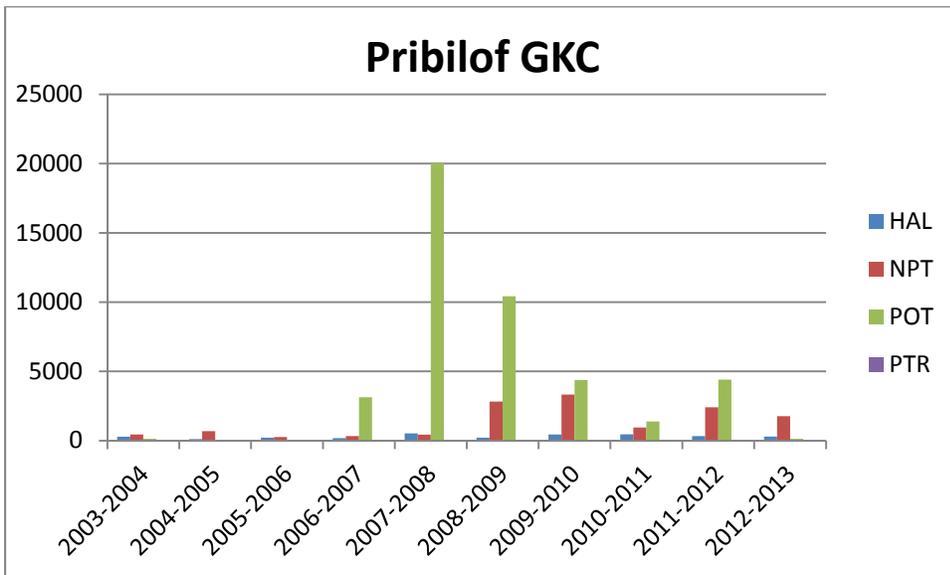


Figure 25 Bycatch of PIGKC by gear type and number of crab

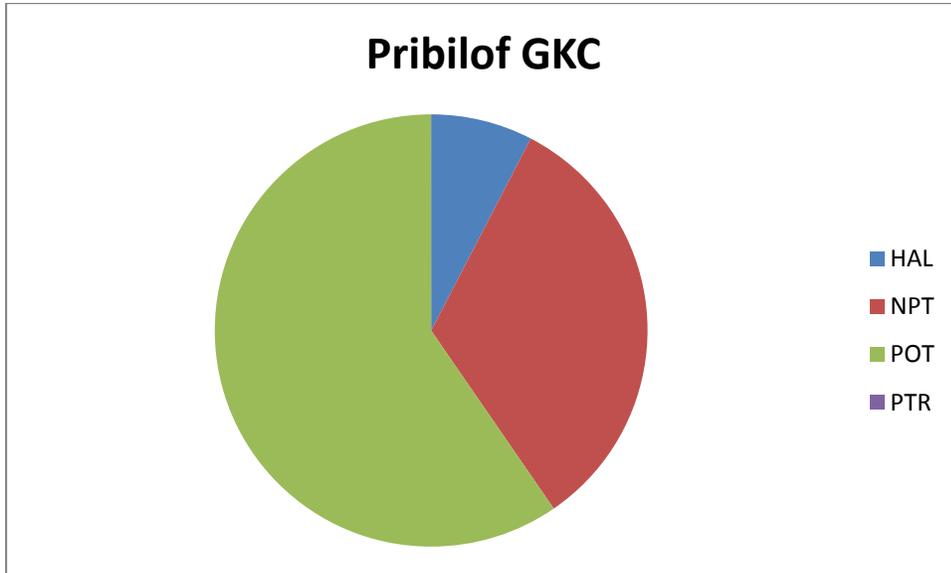


Figure 26 Proportion of average bycatch of PIGKC by gear type from 2003-04 through 2012-13

2.6. Northern District red king crab

Bycatch of red king crab in the Northern District (Area 514 which comprises stock areas for both SMBKC and NSRKC) by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 27), numbers of crab (Figure 28). The majority of the bycatch occurs the non-pelagic trawl fisheries, specifically in the yellowfin sole and rock sole fisheries.

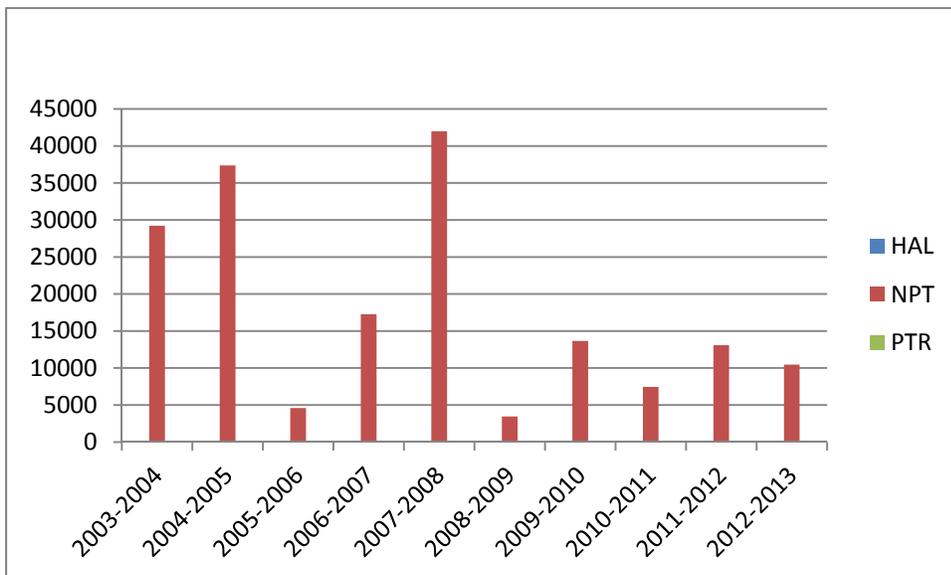


Figure 27 Bycatch of Northern District by gear type and weight (pounds)

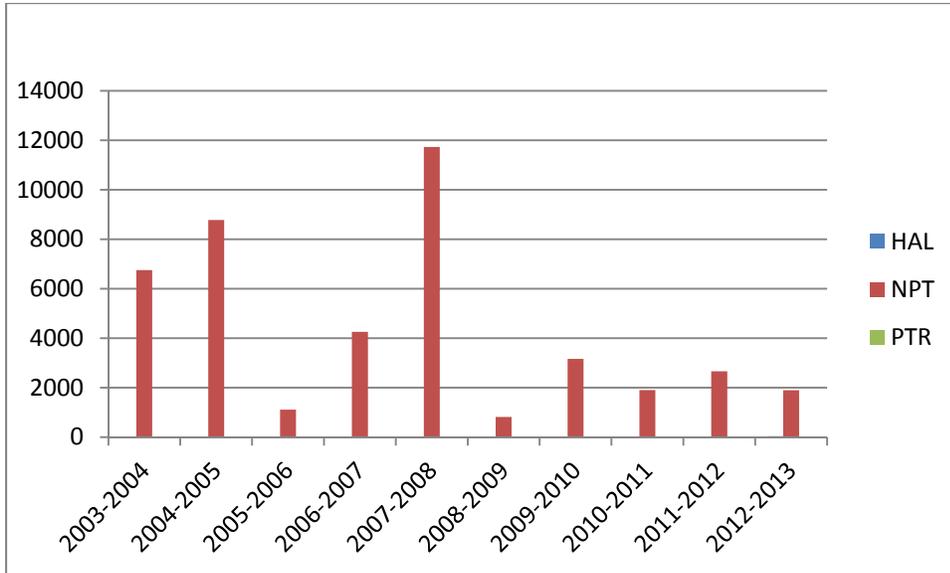


Figure 28 Bycatch of Northern District by gear type and number of crab

There are no management measures in place for bycatch of Northern District red king crab. Bycatch in this area does not accrue towards either the NSRKC (to the north) or the BBRKC stock (to the south).

2.7. Aleutian Islands golden king crab stock

Bycatch of AIKC by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 29), in numbers of crab (Figure 30) and average proportion by gear type (Figure 31). The majority of the bycatch occurs in the sablefish pot fishery, and trawl fisheries for rockfish, atka mackerel and in recent years, flatfish (Kamshatka flounder). There are no bycatch management measures in place for AIGKC. Due to current Tier 5 management of the stock (where OFL and ABC are based on average catch) and the TAC in State regulation, there has been no concern in accommodating the bycatch beneath the ABC. However the stock assessment is moving towards an assessment model which may have ABC and eventually TAC implications in the future.

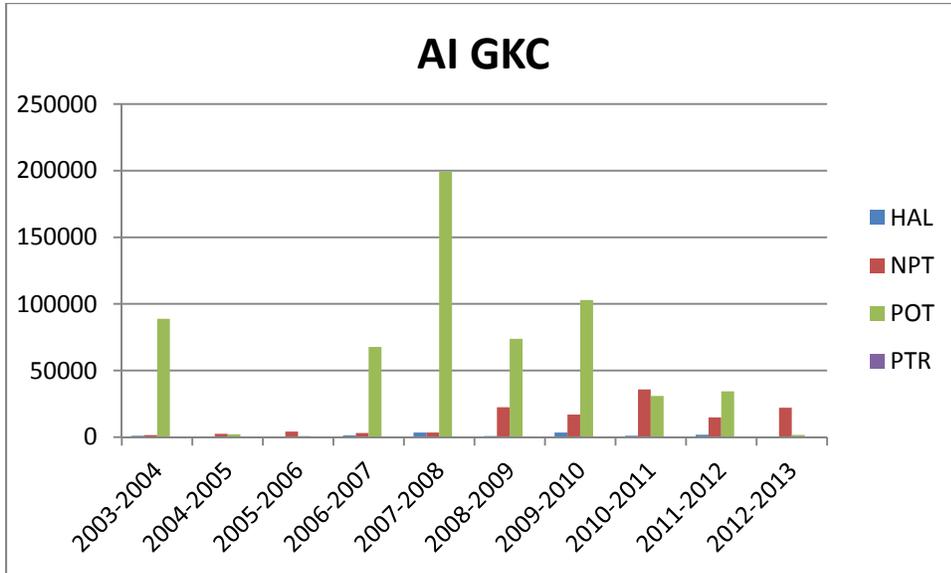


Figure 29 Bycatch of AIGKC by gear type and weight (pounds)

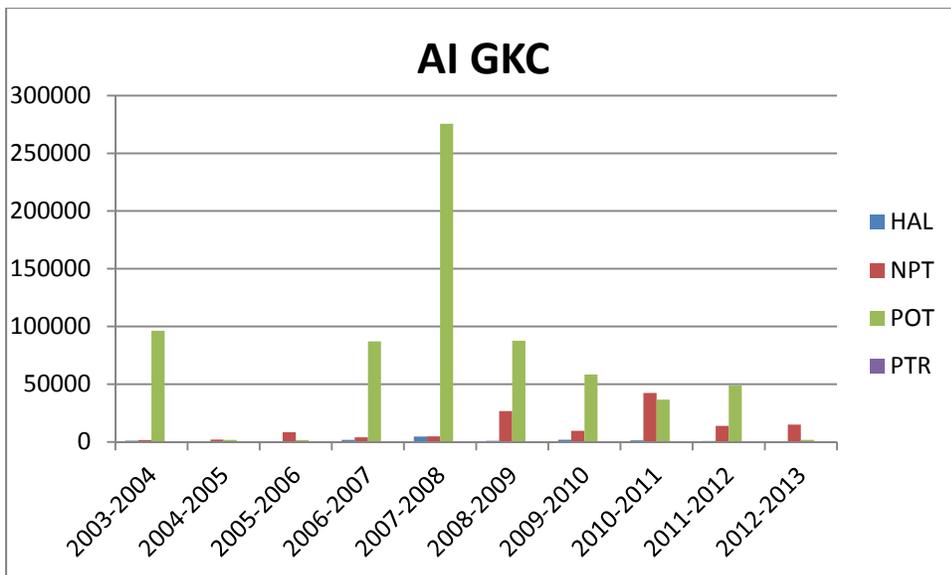


Figure 30 Bycatch of AIGKC by gear type and number of crab

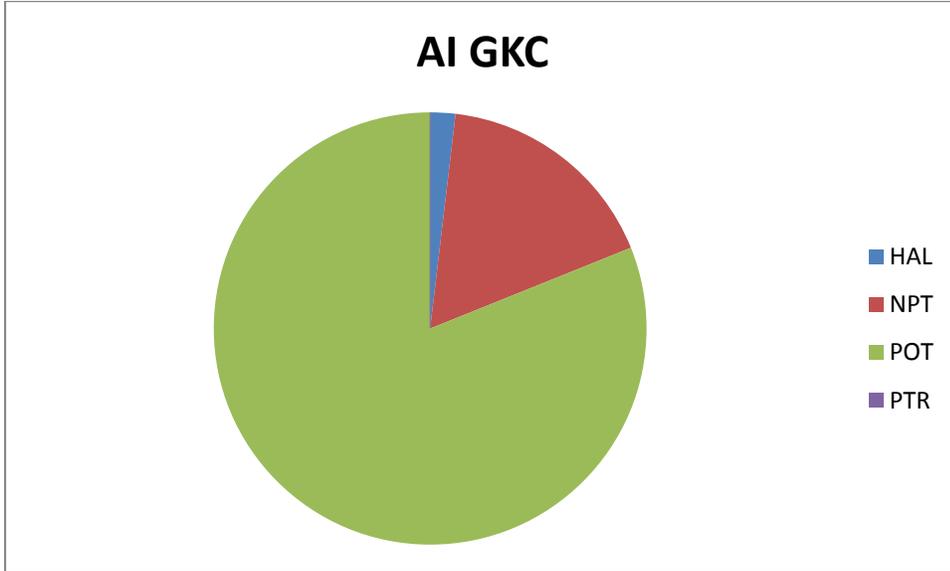


Figure 31 Proportion of average bycatch of AIGKC by gear type from 2003-04 through 2012-13

2.8. Adak king crab stock

Bycatch of Adak RKC by all groundfish fisheries for the Crab Fishing Year (July-June) from 2003-04 through 2012-13 is shown by gear type by weight in pounds (Figure 32) in numbers of crab (Figure 33) and average proportion by gear type (Figure 34). The majority of the bycatch occurs in the trawl fisheries for Atka mackerel, Pacific cod and rockfish, as well as pot fisheries for Pacific cod. There are no bycatch management measures in place for Adak red king crab. Due to unreliable biomass estimates, Adak red king crab is managed as a Tier 5 stock with an OFL and ABC based upon average catch. There remain concerns about the stock being severely depleted and the directed fishery has been closed since 2003/04.

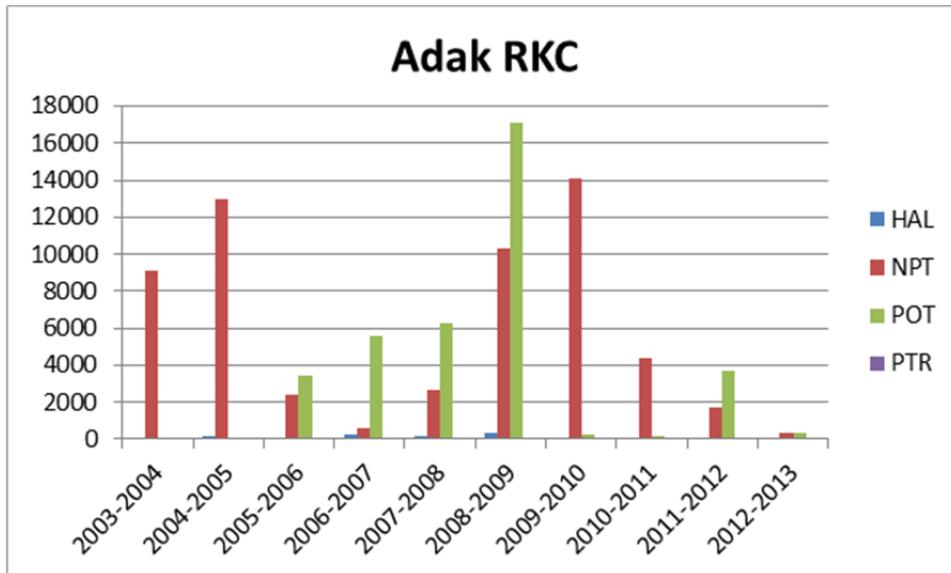


Figure 32 Bycatch of Adak RKC by gear type and weight (pounds)

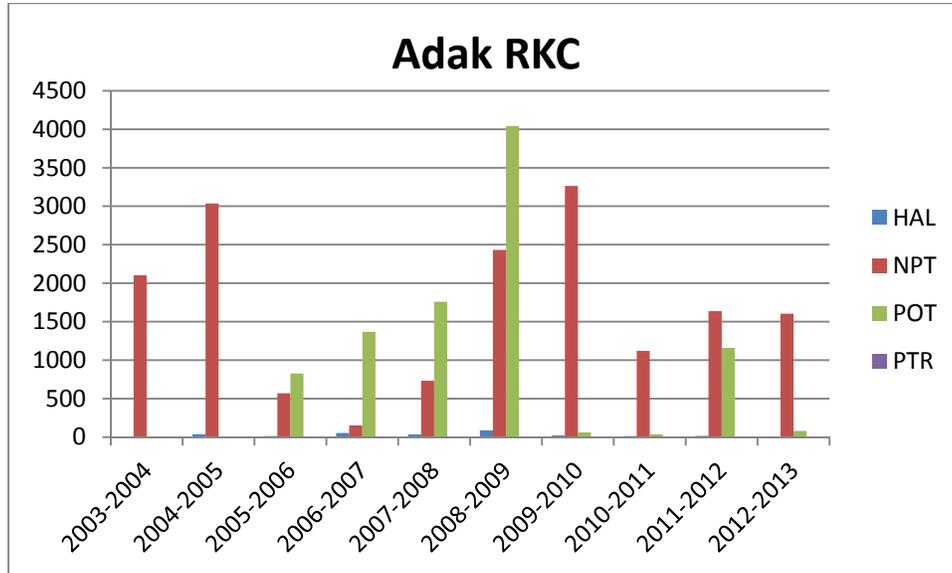


Figure 33 Bycatch of Adak RKC by gear type and number of crab

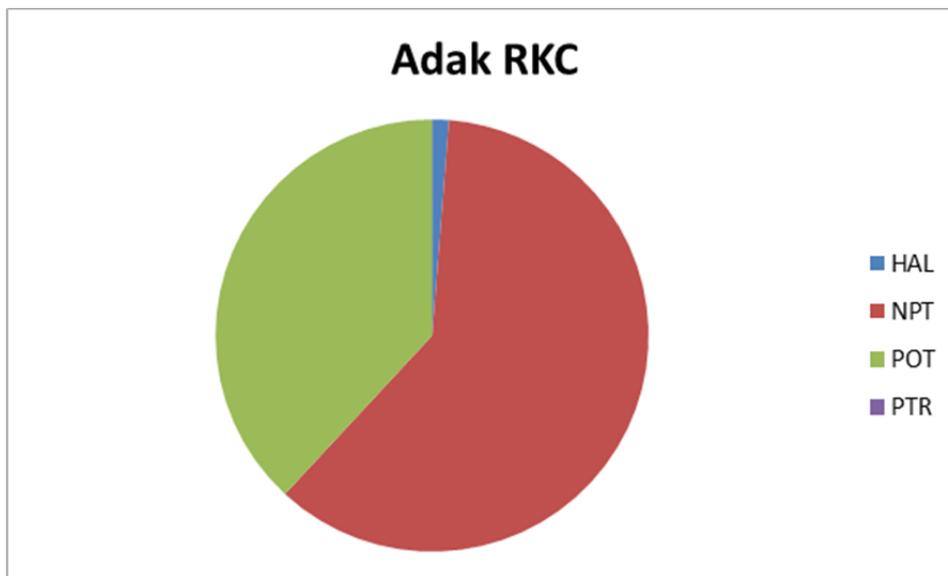


Figure 34 Proportion of average bycatch of Adak RKC by gear type from 2003-04 through 2012-13

Appendix 1: Council Problem Statement and Alternatives (revised October 2011)

Problem Statement

Total catch overfishing levels (OFLs) are specified annually for the ten crab stocks included in the Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs (FMP); these OFLs account for all sources of fishing mortality including directed crab fishery discards and bycatch mortality caused by groundfish, scallop, and Pacific halibut fisheries. Requirements to comply with Annual Catch Limits (ACLs), addressing uncertainty in OFL estimates, include Accountability Measures (AMs) that trigger a management action if an ACL is exceeded.

Crab bycatch in the directed crab and scallop fisheries is controlled by the State of Alaska, however current management structure does not link the crab and groundfish FMPs; if a crab ACL is exceeded due to bycatch mortality in a groundfish fishery the resulting AM would reduce directed crab fishery harvest the following year. Crab bycatch management measures were first adopted for BSAI groundfish trawl fisheries in 1986. These measures, established in the BSAI groundfish FMP, consist of triggered or fixed time and area closures and prohibited species catch (PSC) limits; PSC limits apply only to Bristol Bay red king, Bering Sea Tanner, and Bering Sea snow crab. There are no PSC limits for the remaining seven FMP crab stocks and the existing closure areas do not circumscribe the full distributional range of stocks they are intended to protect, thereby allowing bycatch mortality to occur without accrual towards PSC limits. Furthermore no bycatch management measures are imposed on the fixed gear groundfish or Pacific halibut sectors. In order to address crab bycatch in the BSAI groundfish fisheries the BSAI groundfish FMP must be amended.

Alternative 1 - No action

Maintain existing crab PSC limits and closure areas.

Alternative 2 - Variable PSC limits

Crab PSC limits would be set annually based on crab abundance.

Components with options for Alternative 2 (Note: different components may be chosen for each FMP crab stock):

Component 1: Closure areas

- a) Existing closure areas
- b) Expand triggered closure areas to include full distribution of each crab stock
Option: Triggered closure areas encompassing distribution of vulnerable size/sex components of crab stock

Component 2: Timing of closure areas

- a) Fixed
 - i. Year-round
 - ii. Seasonal
Option: based on vulnerable life history or gear susceptibility
- b) Triggered
 - i. Full
 - ii. Stair-stepped (area closed expands as bycatch triggers are reached)

Component 3: Groundfish sectors/target fisheries included

- a) All trawl sectors
- b) All fixed gear sectors
- c) Halibut IFQ

Component 4: Accountability measures

- a) Crab bycatch would accrue inseason towards groundfish sector PSC limit and an overage would trigger accountability measures during the subsequent season or year for that groundfish sector

Component 5: Catch accounting issues

- a) Account for PSC limit accrual against time/area closure thresholds on a crab fishing year (June-May)
- b) Account PSC limit accrual against time/area closure thresholds on a groundfish fishing year (January - December)