

Description of Alternatives: Pribilof Islands Blue King Crab Rebuilding Plan (includes Council modifications in December 2011)

*Note see figure at end for comparisons of Alternatives 1-6 closures*

**Alternative 1: Status Quo**

Alternative 1 retains the current protections for PIBKC stock. Pribilof Islands blue king crab is currently managed under the rebuilding plan that was implemented in 2004.

Provisions of the rebuilding plan in the Crab FMP (and ADF&G management): Directed fishery closure until the stock is completely rebuilt. ADF&G has also closed the following to further protect the PIBKC stock by minimizing bycatch: Directed fishery closure of the PI red king crab; area closure to snow crab fishing.

Provisions of the rebuilding plan in the BSAI Groundfish FMP: 1) blue king crab is a prohibited species and must be avoided while fishing for groundfish, and must be returned to the sea with minimum of injury; 2) Pribilof Islands Habitat Conservation Zone (PIHCZ) is closed to all trawl gear.

**Alternative 2: Expand the current Pribilof Islands Habitat Conservation Zone closure to apply to additional select groundfish fisheries or expand to apply to Pacific cod pot fishing.**

Option 2a: Closure applies to all groundfish fisheries which have contributed greater than a designated threshold to bycatch of PIBKC since 2003. The only additional fisheries that would fall under the 5 percent threshold for being subject to the closure, in addition to the existing trawl closure are **pot and hook-and-line Pacific cod fisheries.**

Option 2b: In addition to the existing trawl closure, all **Pacific cod pot fishing** would also be prohibited in this zone year-round.

Option 2c: Vessels fishing for **Pacific cod with pot gear** in the existing Pribilof Island Habitat Conservation Zone (PIHCZ) must carry 100% observer coverage. Pacific cod pot fishing in the PIHCZ will be closed for the year if total PIBKC bycatch across all fisheries reaches:

- i) 20%
  - ii) 30%
  - iii) 50%
- of the overall trigger closure cap (75% ABC)

**Alternative 3: ADF&G crab closure areas applied select groundfish fishing and just Pacific cod pot fishery.**

Option 3a: Closure applies to all groundfish fisheries which have contributed greater than a designated threshold to bycatch of PIBKC since 2003. Under the five percent criteria threshold the closure would apply to the following fisheries: **yellowfin sole trawl, other flatfish trawl, Pacific cod pot and Pacific cod hook and line fisheries.**

Option 3b: Under this option no federal **Pacific cod fishing with pot gear** would be allowed within the confines of the closure.

**Alternative 4: Closure that covers the entire distribution of the Pribilof Islands blue king crab stock.**

There are two year-round closure options under Alternative 4:

Option 4a: Closure applies to all groundfish fisheries which have contributed greater than a designated threshold to bycatch of PIBKC since 2003. Under the five percent criteria threshold the closure would apply to the following fisheries: ~~rock sole trawl~~, **yellowfin sole trawl, other flatfish trawl, Pacific cod pot and Pacific cod hook and line fisheries.**

Option 4b: Closure area applied only to pot fishing for Pacific cod. Under this option no federal **Pacific cod fishing with pot gear** would be allowed within the confines of the closure shown in Figure 10-3 (a or b).

**Alternative 5: Trigger closures with cap levels established for PIBKC in all groundfish fisheries.**

Cap sub-option	Cap description	Cap (lb)	Cap (numbers of crab)
1	OFL	2,557	957
2	ABC	2,301	862
3	90% ABC	2,071	775
4	75% ABC	1,726	646

There are 4 closure options under Alternative 5:

Option 5a: The existing PIHCZ, as described in Alternative 1 (Figure 10-1), would be modified to apply to **Pacific cod pot and hook and line** as the non-exempt trawl fisheries are already closed from this area year-round. The closure would be triggered by attainment of a fishery-wide cap set at the options below. Cap options are the following:

- Sub-option 1: Cap level = OFL
- OFL Sub-option 2: Cap level = ABC
- Sub-option 3: Cap level = 90%
- ABC Sub-option 4: Cap level = 75%
- ABC

Option 5b: The existing ADF&G crab closure areas between 168° and 170° West longitude, and between 57° and 58° North latitude would be closed to additional fishing effort as indicated in Figure 10-2. The fisheries to which this closure would apply are **Pacific cod pot and hook-and-line, yellowfin sole trawl, and other flatfish trawl**. The closure would be triggered by attainment of a fishery-wide cap set at the options below. Cap options are the following:

- Sub-option 1: Cap level = OFL
- Sub-option 2: Cap level = ABC
- Sub-option 3: Cap level = 90%
- ABC Sub-option 4: Cap level = 75%
- ABC

Option 5c: The closure area consists of the full distribution of the Pribilof Islands stock aggregated from 1975 to 2009 based on the NMFS EBS bottom trawl survey Figure 10-3A). The fisheries to which this closure are **Pacific cod pot and hook-and-line, yellowfin sole trawl, and other flatfish trawl**. The closure would be triggered by attainment of a fishery-wide cap set at the options below. Cap options are the following:

Sub-option 1:	Cap level =
OFL Sub-option 2:	Cap level =
ABC	
Sub-option 3:	Cap level = 90%
ABC Sub-option 4:	Cap level = 75%
ABC	

Option 5d: The smaller closure area (Option 2) consists of the full distribution of the Pribilof Islands stock aggregated from 1984 to 2009. In 1984, there was a constriction of the PIBKC distribution towards the Pribilof Islands that has persisted until 2009 (Figure 10-3B). The fisheries to which this closure would apply are **Pacific cod pot and hook-and-line, yellowfin sole trawl, and other flatfish trawl**. The closure would be triggered by attainment of a fishery-wide cap set at the options below. Cap options are the following:

Sub-option 1:	Cap level =
OFL Sub-option 2:	Cap level =
ABC	
Sub-option 3:	Cap level = 90%
ABC	
Sub-option 4:	Cap level = 75%
ABC	

Under Option 5d, suboptions 3 and 4, there is an additional option for allocation of the cap by gear types. This allocation is as follows:

Trawl gear:	40%
Pot gear:	40%
Hook and Line gear:	20%

**Alternative 6: PIHCZ closure to Pacific cod pot fishery and triggered area closure to qualified fisheries (PPA)**

Component 1: Year-round closure of the PIHCZ to fishing for Pacific cod with pot gear. This closure would be in addition to the existing closure to all trawl gear of the PIHCZ. Thus only fishing with hook and line gear would be allowable inside the PIHCZ.

Component 2: Triggered closure of the area representing the distribution of the PIBKC stock between 1984-2009 (see Figure 10-3). The PSC cap associated with this closure is established as a fishery-wide level at 75% of the ABC (currently this equates to a cap of 1,726 lb or 646 crab). This PSC cap is then further allocated to sectors by gear type as follows:

Trawl Gear – 45% of trigger cap  
Pot Gear – 45% of trigger cap  
H&L Gear – 30% of trigger cap

Under the current 2011/12 ABC this would equate to cap levels by sectors as indicated in the table below (in lb and numbers of crab):

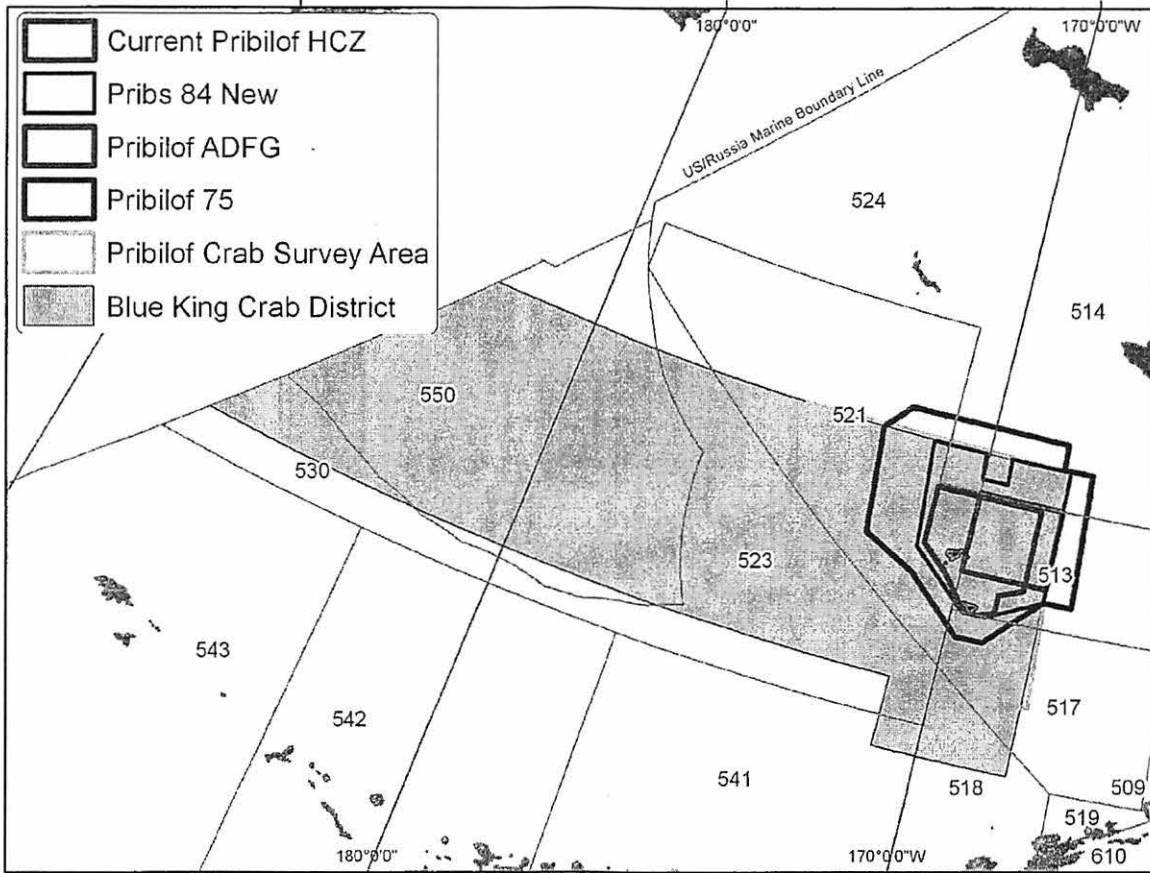
Gear type	% allocation	Cap (lb)	Cap (numbers of crab)
Trawl	45%	777	291
Pot	45%	777	291
Hook and Line	30%	518	194

**Option for Increased Observer Coverage**

Option1: Apply increased observer coverage to fisheries which contributed to PIBKC bycatch above a threshold criteria since 2003 for which a cap (PSC or trigger) or closure applies;

Option 2: Apply increased observer coverage to specific fisheries.

Sub-option (applies to both options 1 and 2): This would sunset under implementation of the restructured observer program.



Comparison of alternative closure configurations under alternatives 1-6 with NMFS reporting areas (numbered) and the PI District (shaded area). Note that Alternative 6 is the area labeled "Pribilof 84 New".

## Overfishing limit for PIBKC

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There are multiple issues related to this analysis involved in the overfishing limit (OFL) for the PIBKC stock. These involve how the current OFL is determined based upon stock status, the area over which the OFL is currently applied, the area over which it may be applied in the future, the mechanisms by which this stock area may be modified, and the catch accounting issues associated with bycatch accrual over different spatial areas. These issues are described separately below in an attempt to clarify the various related issues in relation to setting this value and the implications of changes to that in the rebuilding analysis.

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## **1 How the OFL is currently established**

Status determination criteria for crab stocks are annually calculated using a five-tier system that accommodates varying levels of uncertainty of information. The five-tier system incorporates new scientific information and provides a mechanism to continually improve the status determination criteria as new information becomes available. Under the five-tier system, overfishing and overfished criteria and acceptable biological catch (ABC) levels are annually formulated. The annual catch limit (ACL) for each stock equals the ABC for that stock. Each crab stock is annually assessed to determine its status and whether (1) overfishing is occurring or the rate or level of fishing mortality for the stock is approaching overfishing, (2) the stock is overfished or the stock is approaching an overfished condition, and (3) the catch has exceeded the ACL.

For crab stocks, the overfishing level (OFL) equals maximum sustainable yield (MSY) and is derived through the annual assessment process, under the framework of the tier system. Overfishing is determined by comparing the OFL with the catch estimates for that crab fishing year. For the previous crab fishing year, NMFS will determine whether overfishing occurred by comparing the previous year's OFL with the catch from the previous crab fishing year. For the previous crab fishing year, NMFS will also determine whether the ACL was exceeded by comparing the ACL with the catch estimates for that crab fishing year. Catch includes all fishery removals, including retained catch and discard losses, for those stocks where non-target fishery removal data are available. Discard losses are determined by multiplying the appropriate handling mortality rate by observer estimates of bycatch discards. For stocks where only retained catch information is available, the OFL and ACL will be set for and compared to the retained catch.

Annually in the stock assessment process, the Council, Scientific and Statistical Committee, and Crab Plan Team review (1) the stock assessment documents, (2) the OFLs and ABCs, and total allowable catches or guideline harvest levels, (3) NMFS's determination of whether overfishing occurred in the previous crab fishing year, (4) NMFS's determination of whether any stocks are overfished and (5) NMFS's determination of whether catch exceeded the ACL in the previous crab fishing year.

The stock status, OFL and maxABC levels are determined using a five-tier system (Figure 1, Table 1). First, a stock is assigned to one of the five tiers based on the availability of information for that stock and model parameter choices are made. Tier assignments and model parameter choices are recommended through the Crab Plan Team process to the Council's Scientific and Statistical Committee. The Council's Scientific and Statistical Committee recommends tier assignments, stock assessment and model structure, and parameter choices, including whether information is "reliable," for the assessment authors to use for calculating the proposed OFLs and ABCs based on the five-tier system.

Based on the availability of annual information on survey data, the PIBKC stock is assigned to Tier 4. For Tiers 1 through 4, once a stock is assigned to a tier, the determination of stock status level is based on recent survey data and assessment models, as available. The stock status level determines the equation used in calculating the  $F_{OFL}$ . Three levels of stock status are specified and denoted by "a," "b," and "c" (see Table 1). The  $F_{MSY}$  control rule reduces the  $F_{OFL}$  as biomass declines by stock status level. At stock status level "a," current stock biomass exceeds the  $B_{MSY}$ . For stocks in status level "b," current biomass is

less than  $B_{MSY}$  but greater than a level specified as the “critical biomass threshold” ( $\beta$ ). In stock status level “c,” the ratio of current biomass to  $B_{MSY}$  (or a proxy for  $B_{MSY}$ ) is below  $\beta$ . At stock status level “c,” directed fishing is prohibited and an  $F_{OFL}$  at or below  $F_{MSY}$  would be determined for all other sources of fishing mortality in the development of the rebuilding plan. The Council will develop a rebuilding plan once a stock level falls below the MSST.

Based upon the ratio of the current biomass to the estimated  $B_{MSY}$  proxy, the PIBKC stock falls into stock status ‘c’. Under the control rule (see Figure 1), directed fishing is prohibited and the appropriate  $F_{OFL}$  must be determined in conjunction with the development of a rebuilding plan. The stock has been under a rebuilding plan since 2003, and has been closed to directed fishing since 1998. Since 2008, due to this stock status, the OFL has been set based upon an average of catch mortality in the groundfish fisheries in NMFS reporting area 513 between 1999 – 2005 (Table 3). This represents a period after the directed crab fishery was closed and prior to the increased bycatch in the groundfish fisheries in 2006 and 2007. This average catch value has been used as the OFL since 2008. The catch accounting database was revised in 2009 for accounting for unmeasured crab in the data and for PIBKC this resulted in a lower catch estimate over those years (Table 3). For that reason the OFL was previously set at 1.81 t (4,000 lb) and is now set at 1.16 t (2,557lb).

Area 513 has been used since 2008 for calculating the catch mortality in the groundfish fisheries which accrues towards the OFL (as well as the catch quantities used to estimate an overage over that time frame) due to difficulties in refining the spatial scale of crab stock boundaries with the NMFS reporting area boundaries for purposes of the CAS system. This issue is discussed further in the next section.

The ABC is set at 90% of the OFL, based upon the maxABC control rule for a Tier 5 stocks rather than the maxABC control rule for a Tier 4 stock due to the establishment of an OFL based upon a Tier 5-like calculation. The current ABC is 1.04 t (2,301 lb). The OFL and ABC are annually established under the current process for crab specifications. This process begins with the assessment author’s recommended OFL and ABC, the Crab Plan Team review of the assessment and resulting recommendations, and finally the final OFL and ABC recommendations from the SSC to the Council in October.

## **2 Area over which the OFL is specified and potential modification**

The NMFS summer survey provides biomass estimates by standard stations for calculating PIBKC stock status. Data from 2003-2011 survey estimates are shown in Figure 2 in conjunction with the standard survey grid. The same stations are sampled annually. The alternative closures considered in the rebuilding plan analysis were recommended by the CPT and later the SSC to cover the best range of alternative closure configurations around the Pribilofs. Specifically the CPT was requested to consider a closure which covered the “full distribution of the PIBKC stock”. As noted previously in the analysis, this was evaluated by using historical survey data and defined in two different periods: 1975-2009 (broader distribution) and 1984-2009 (smaller distribution) based upon an observed constriction of the stock based on survey data beginning in 1984 to the more eastern distribution (Figure 3). Note that the observed survey stations extend beyond the boundary of the Pribilof District and the closure configuration was based upon survey distribution not the boundaries of the registration district.



## 2.1 Registration Areas

Registration Areas in the Bering Sea-Aleutian Islands King and Tanner Crab Fishery Management Plan (FMP) are defined by the state of Alaska and adopted by the FMP. The FMP provides for registration areas, as well as district, subdistrict and section management units. Several king crab management units are depicted in Figure 4. Modification of registration areas is a Category 2 measure under the FMP and deferred to the state of Alaska under guidelines in the FMP. The Pribilof District is part of king crab Registration Area Q (Bering Sea); the Pribilof District is defined as that portion of Registration Area Q south of the latitude of Cape Newenham ( $58^{\circ}39'$  N. lat), and west of  $168^{\circ}$  W long (Figure 4). Similarly, the western boundary for Registration Area T (Bristol Bay, 5 AAC 34.800) is  $168^{\circ}$  W. long. Any change to the Pribilof District eastern boundary would require modification of these two registration areas.

The western boundary of the Bristol Bay Area ( $168^{\circ}$  W long.) was initially drawn to cover the distribution of the Bristol Bay red king crab stock which began domestically in the late 1960s. The Pribilof District fishery started as a blue king crab target in 1973, while Pribilof District red king crab fishery began in the early 1990s. Currently the Pribilof District red king crab fishery is closed due primarily to concerns of blue king crab bycatch in that red king crab fishery. Any modification of the Pribilof District line to the east for blue king crab would need to consider the impact on harvest and management of Bristol Bay red king crab. Currently directed fishing for red king crab is allowed east of  $168^{\circ}$  W long. as Bristol Bay red king crab.

As a FMP Category 2 measure, these two boundaries can be changed by the Alaska Board of Fisheries, and must comply with FMP and National Standards. The next in-cycle Board of Fisheries meeting for BSAI king and Tanner crabs will be in 2013/14, although the Board has discretion to take a proposal out-of-cycle for coordination with federal actions. Specifically, regulation 5 AAC 39.999(b) says: The board will, in its discretion, change its schedule for consideration of proposed regulatory changes as reasonably necessary for coordination of state regulatory actions with federal fishery agencies, programs, or laws.

Changing the Pribilof District registration boundary would need to consider effects to red, blue and golden king crab fisheries in the Pribilof District, although the eastern boundary probably has no association with golden king crab habitat. The Pribilof District designation is also used for hair crab, a non-FMP species, by the State of Alaska. Bristol Bay is an exclusive registration area, whereas Pribilof District is a non-exclusive registration area. Some consideration would have to be given as to how to treat historical data and any other effects of bycatch management not related to the issue at hand. The fish ticket database, eLandings, and stock assessments would have to be modified if the  $168^{\circ}$  W long. line were moved.

## 2.2 Modifying the OFL area (only)

An option to modifying the actual registration area would be to modify the area over which the OFL accrual is considered. This is what is done currently by use of only Area 513 rather than the entire district or known distribution of the stock. As an interim measure area 513 has been used to define the area of groundfish catch mortalities due to the configuration of areas 524 and 521 in their proximity to St. Matthew Island and the blue king crab stock in that region. As catch mortalities from groundfish fisheries have always been reported on NMFS reporting area scale, these areas were excluded because more of the catch reported in them was assumed to come primarily from catch in the the St Matthew stock area, although some observed catch is near the Pribilofs but within those NMFS reporting areas. Another issue

relative to the use of those reporting areas has been in accounting for unobserved catch as given the PSC extrapolation methods, any catch extrapolation from the reporting area despite being near the Pribilofs is likely to employ rates from the St. Matthew stock here as rates of BKC bycatch are higher due to a larger stock biomass in that region. This extrapolation method is described in further detail in the Monitoring and Enforcement chapter appended separately.

The Crab Plan Team had recommended previously that as spatial data in the CAS allowed for it, that crab mortality from all fisheries towards that stock be defined by the appropriate stock boundary area for each stock. While still being planned, this has not yet occurred thus interim measures on NMFS reporting scales are still being employed to account for bycatch by crab stock. Note that for Bering Sea wide stocks such as Tanner crab and snow crab this is not a problem. This is an issue when dealing with the smaller stock area boundaries between similar crab stocks such as the red king crab stocks (Bristol Bay, Pribilof Island, Adak and Norton Sound), blue king crab stocks (St Matthew and Pribilof Islands) and golden king crab stocks (Aleutian Islands, Pribilof Islands). The CAS is still moving towards these better spatial resolutions for bycatch of these stocks.

This analysis however has highlighted the immediacy of this change for PIBKC however given the complexity of issues in identifying appropriate stock boundaries for this stock and the extrapolation issues inherent in accounting for the catch of these crab in unobserved fisheries. These issues are explained in the Monitoring and Enforcement chapter appended separately and are not repeated here.

If the SSC recommended it, the boundary for the OFL could be modified without the need to modify the registration area. The question then becomes what is the appropriate boundary for the distribution of the stock and in particular on what information should it be based: is it to be based on survey data only, bycatch data or some combination of the two. Bycatch over the Pribilof District and Bristol Bay district by groundfish gear type over two time frames 2001-2005 and 2006-2010 is shown in Figure 5. Data must be aggregated for confidentiality. Figure 6 shows the recent survey distribution 2003-2011 and the observed locations (only no associated magnitude) of bycatch of blue king crab over the same PI District and Bristol Bay, while Figure 7 shows this same information overlaid on the NMFS summer bottom trawl grid. Note these displays of both survey catch and bycatch do not include any area that would be attributed to the St. Matthew stock further to the north-west and thus would be considered to potentially represent bycatch of PI blue king crab.

Three options could be considered for modifying the area of the OFL depending upon considerations of available data.

- 1- Status quo. Defined two ways, area 513 only (which is known to underestimate the bycatch and survey data) or the Pribilof District (which does not include survey stations or observed bycatch to the east of the 168 line). Note the default assumption is the status quo will become the Pribilof District as soon as the CAS system is able to define a special spatial area more explicitly than on NMFS regulatory areas.
- 2- Pribilof District and the Bristol Bay District. Noting that the survey does not observe crab in the areas of observed bycatch in area 509
- 3- Pribilof District plus the additional 20nm to the east of the 168 line which comprises the survey stations where blue king crabs are consistently observed as well as the observed bycatch in the same area.

This modification could occur in conjunction with the upcoming assessment cycle for the 2012/13 specification process. This would be discussed by the CPT in May, the SSC in June and the final assessment and specifications occurring at the October SSC meeting following CPT review in September.

### 3 Implications for the analysis of the OFL

Modifying the OFL area would not change the actual closure configurations in the analysis. These closure configurations were drawn irrespective to registration or NMFS reporting areas and are based on either existing closures (PIHCZ, ADF&G crab closures) or consideration of survey distribution of PIBKC. However, a modification of the area over which the groundfish bycatch under the OFL is to accrue may affect the qualified fisheries under the closures. This could occur outside of the analytical process to refine the rebuilding plan, however for consistency and for the implications to applicable fisheries it would be best to indicate the proposed modification at this time for inclusion in the analysis. Modifying the stock boundary area (and thus the area of catch accrual) for either option 2 or 3 would change the non-exempt fisheries for closure purposes under the current suite of alternatives. Retaining only Area 513 would also modify the qualified fisheries. While more analysis would be necessary to evaluate the inclusion of bycatch in areas 509 under option 2, modifying the area for options 2 or 3 for consistency with observed bycatch and known survey locations would likely indicate that fisheries previously considered under this analysis and currently exempt may now be subject to closures absent a change in the Council's 'qualification requirement'<sup>1</sup>.

Specifically, several flatfish fisheries have been iteratively removed from consideration in this analysis when their observed bycatch was found to be outside of the PI District boundary (and most notably in the 20 nm strip to the east under consideration). These include the flathead sole fishery, rocksole fishery and 'other flatfish' fisheries. These fisheries under either option 2 or 3 for the OFL area would most likely be included back for consideration in the closures. Note this would also occur if Area 513 (only) were selected for the stock area.

Under any of the options for a stock boundary area (including moving to the PI District) the OFL average catch amount would also need to be reconsidered (in the analysis or in the next assessment cycle) to account for catch in the areas of 521 and 524 that are currently not captured in the average catch estimate from area 513. In the future, moving forward, the area over which the OFL is to accrue (be it the PI District or other region) will be defined as a special area in the CAS system and catch estimates produced accordingly as described in the Monitoring and Enforcement chapter appended separately. An historical reconstruction of the catch in any of these OFL boundary areas would be necessary in order to estimate an average catch over an appropriate time period for calculating an OFL in this manner. Should the stock ever rebound such that its biomass in relation to  $B_{MSYPROXY}$  is above the critical  $\beta$  threshold, (i.e.  $B/B_{MSY}^{prox} > \beta$ ) the OFL would no longer be determined based upon average catch (or some other means as recommended by the SSC) but would rather be determined by application of the sloping control rule as described in Table 1 and Figure 1. However until such a time an alternative means to establish the OFL is needed.

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<sup>1</sup> The current suite of alternatives indicates that any fishery with greater than 5% or 10% of the ABC of bycatch between 2003-2010 is subject to the closures considered under the rebuilding plan.

Table 1 Five-Tier System for setting overfishing limits (OFLs) and Acceptable Biological Catches (ABCs) for crab stocks. The tiers are listed in descending order of information availability. Table 2 contains a guide for understanding the five-tier system.

Information available	Tier	Stock status level	$F_{OFL}$	ABC control rule
$B, B_{MSY}, F_{MSY}$ , and pdf of $F_{MSY}$	1	a. $\frac{B}{B_{msy}} > 1$	$F_{OFL} = \mu_A$ = arithmetic mean of the pdf	ABC $\leq$ (1-b <sub>y</sub> ) * OFL
		b. $\beta < \frac{B}{B_{msy}} \leq 1$	$F_{OFL} = \mu_A \frac{B/B_{msy} - \alpha}{1 - \alpha}$	
		c. $\frac{B}{B_{msy}} \leq \beta$	Directed fishery $F = 0$ $F_{OFL} \leq F_{MSY}^\dagger$	
$B, B_{MSY}, F_{MSY}$	2	a. $\frac{B}{B_{msy}} > 1$	$F_{OFL} = F_{msy}$	ABC $\leq$ (1-b <sub>y</sub> ) * OFL
		b. $\beta < \frac{B}{B_{msy}} \leq 1$	$F_{OFL} = F_{msy} \frac{B/B_{msy} - \alpha}{1 - \alpha}$	
		c. $\frac{B}{B_{msy}} \leq \beta$	Directed fishery $F = 0$ $F_{OFL} \leq F_{MSY}^\dagger$	
$B, F_{35\%}, B_{35\%}$	3	a. $\frac{B}{B_{35\%}} > 1$	$F_{OFL} = F_{35\%}$ *	ABC $\leq$ (1-b <sub>y</sub> ) * OFL
		b. $\beta < \frac{B}{B_{35\%}} \leq 1$	$F_{OFL} = F_{35\%} \frac{B/B_{35\%} - \alpha}{1 - \alpha}$	
		c. $\frac{B}{B_{35\%}} \leq \beta$	Directed fishery $F = 0$ $F_{OFL} \leq F_{MSY}^\dagger$	
$B, M, B_{msy^{prox}}$	4	a. $\frac{B}{B_{msy^{prox}}} > 1$	$F_{OFL} = \gamma M$	ABC $\leq$ (1-b <sub>y</sub> ) * OFL
		b. $\beta < \frac{B}{B_{msy^{prox}}} \leq 1$	$F_{OFL} = \gamma M \frac{B/B_{msy^{prox}} - \alpha}{1 - \alpha}$	
		c. $\frac{B}{B_{msy^{prox}}} \leq \beta$	Directed fishery $F = 0$ $F_{OFL} \leq F_{MSY}^\dagger$	
Stocks with no reliable estimates of biomass or M.	5		OFL = average catch from a time period to be determined, unless the SSC recommends an alternative value based on the best available scientific information.	ABC $\leq$ 0.90 * OFL

\*35% is the default value unless the SSC recommends a different value based on the best available scientific information.

† An  $F_{OFL} \leq F_{MSY}$  will be determined in the development of the rebuilding plan for an overfished stock.

Table 2 A guide for understanding the five-tier system.

- $F_{OFL}$  — the instantaneous fishing mortality (F) from the directed fishery that is used in the calculation of the overfishing limit (OFL).  $F_{OFL}$  is determined as a function of:
  - $F_{MSY}$  — the instantaneous F that will produce MSY at the MSY-producing biomass
    - A proxy of  $F_{MSY}$  may be used; e.g.,  $F_{x\%}$ , the instantaneous F that results in x% of the equilibrium spawning per recruit relative to the unfished value
  - B — a measure of the productive capacity of the stock, such as spawning biomass or fertilized egg production.
    - A proxy of B may be used; e.g., mature male biomass
  - $B_{MSY}$  — the value of B at the MSY-producing level
    - A proxy of  $B_{MSY}$  may be used; e.g., mature male biomass at the MSY-producing level
  - $\beta$  — a parameter with restriction that  $0 \leq \beta < 1$ .
  - $\alpha$  — a parameter with restriction that  $0 \leq \alpha \leq \beta$ .
- The maximum value of  $F_{OFL}$  is  $F_{MSY}$ .  $F_{OFL} = F_{MSY}$  when  $B > B_{MSY}$ .
- $F_{OFL}$  decreases linearly from  $F_{MSY}$  to  $F_{MSY} \cdot (\beta - \alpha) / (1 - \alpha)$  as B decreases from  $B_{MSY}$  to  $\beta \cdot B_{MSY}$ .
- When  $B \leq \beta \cdot B_{MSY}$ ,  $F = 0$  for the directed fishery and  $F_{OFL} \leq F_{MSY}$  for the non-directed fisheries, which will be determined in the development of the rebuilding plan.
- The parameter,  $\beta$ , determines the threshold level of B at or below which directed fishing is prohibited.
- The parameter,  $\alpha$ , determines the value of  $F_{OFL}$  when B decreases to  $\beta \cdot B_{MSY}$  and the rate at which  $F_{OFL}$  decreases with decreasing values of B when  $\beta \cdot B_{MSY} < B \leq B_{MSY}$ .
  - Larger values of  $\alpha$  result in a smaller value of  $F_{OFL}$  when B decreases to  $\beta \cdot B_{MSY}$ .
  - Larger values of  $\alpha$  result in  $F_{OFL}$  decreasing at a higher rate with decreasing values of B when  $\beta \cdot B_{MSY} < B \leq B_{MSY}$ .
- The parameter,  $b_y$ , is the value for the annual buffer calculated from a  $P^*$  of 0.49 and a probability distribution for the OFL that accounts for scientific uncertainty in the estimate of OFL.
- $P^*$  is the probability that the estimate of ABC, which is calculated from the estimate of OFL, exceeds the "true" OFL (noted as OFL') ( $P(ABC > OFL')$ ).

Table 3 Non-retained total catch mortalities from directed and non-directed fisheries for Pribilof Islands District blue king crab. Handling mortalities (pot and hook/line= 0.5, trawl = 0.8) were applied to the catches. Groundfish fishery data is not available prior to 1991/1992 and ADF&G catch data is not available prior to 1996/1997 (Bowers et al. 2011; D. Pengilly, ADF&G; J. Mondragon, NMFS).

Year	Crab pot fisheries			Groundfish fisheries	
	Legal male non-retained (t)	Sublegal male (t)	Female (t)	All fixed (t)	All Trawl (t)
1991/1992				0.03	4.96
1992/1993				0.44	48.63
1993/1994				0.00	27.39
1994/1995				0.02	5.48
1995/1996				0.05	1.03
1996/1997	0.00	0.40	0.00	0.02	0.05
1997/1998	0.00	0.00	0.00	0.73	0.10
1998/1999	1.15	0.23	1.86	9.90	0.06
1999/2000	1.75	2.15	0.99	0.40	0.02
2000/2001	0.00	0.00	0.00	0.06	0.02
2001/2002	0.00	0.00	0.00	0.42	0.02
2002/2003	0.00	0.00	0.00	0.04	0.24
2003/2004	0.00	0.00	0.00	0.17	0.18
2004/2005	0.00	0.00	0.00	0.41	0.00
2005/2006	0.00	0.00	0.05	0.18	1.07
2006/2007	0.00	0.00	0.05	0.07	0.06
2007/2008	0.00	0.00	0.05	2.00	0.11
2008/2009	0.00	0.00	0.00	0.07	0.38
2009/2010	0.00	0.00	0.00	0.17	0.43
2010/2011	0.00	0.09	0.00	0.07	0.02

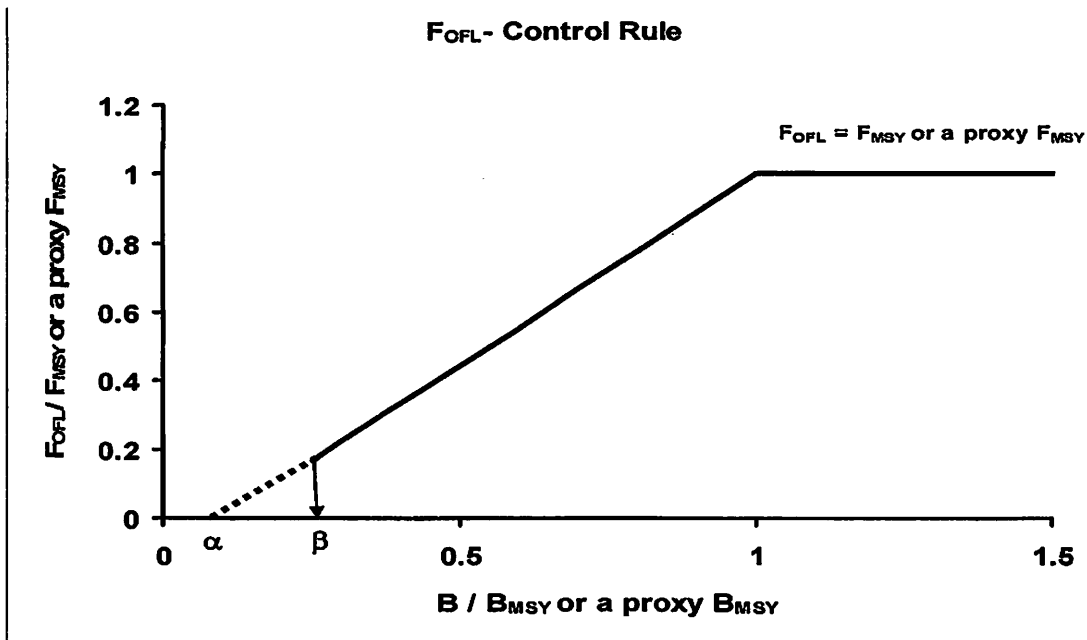




Figure 1 Overfishing control rule for Tiers 1 through 4. Directed fishing mortality is 0 below  $\beta$ .

**PIBKC survey CPUE  
2003-2011 combined**

 1,300 crab / square nm

 IMMATURE\_M

 MATURE\_MAL

 TOTAL\_FEMA

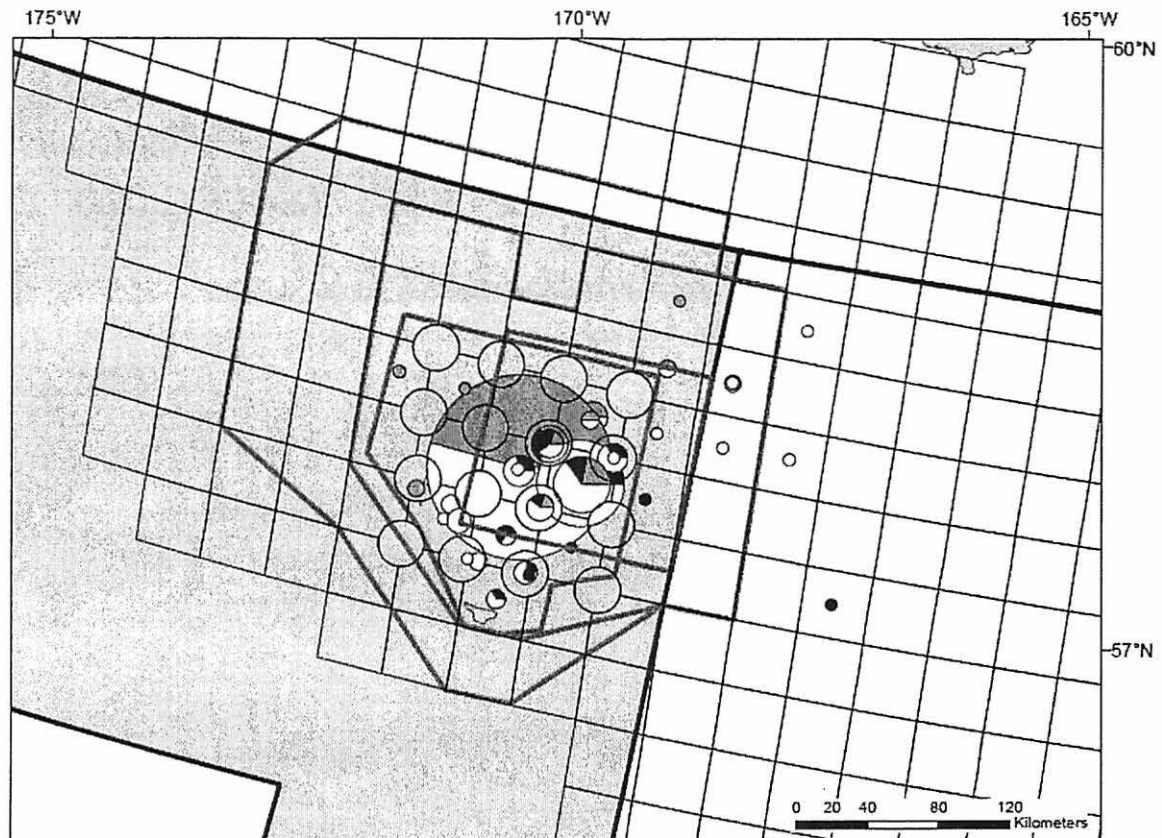


Figure 2 Survey CPUE 2003-2011, survey grids (20nm blocks) and the proposed closures under consideration. Note that the size of the circles is relative to the number of crab caught. The shaded area is the Pribilof District.



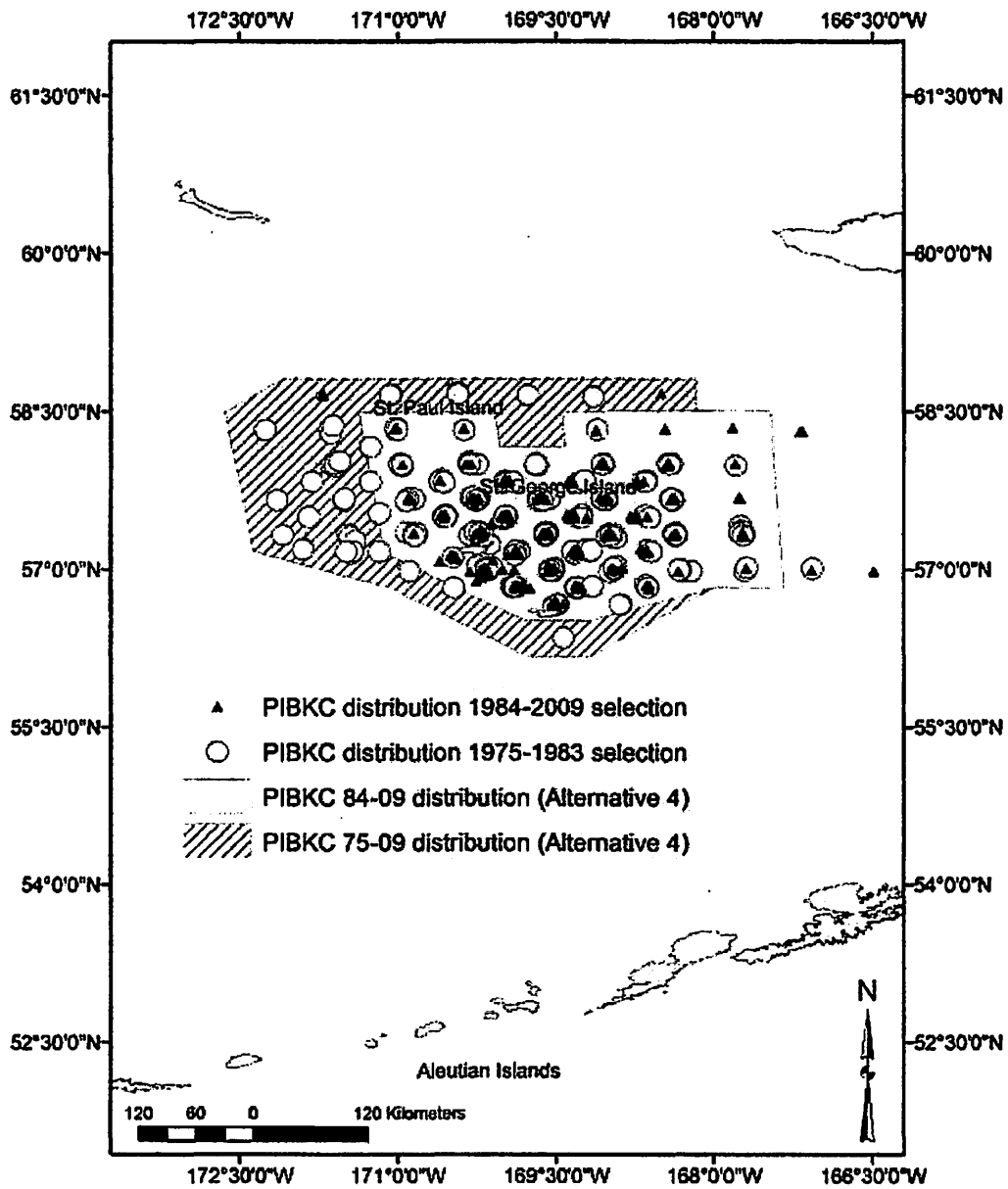
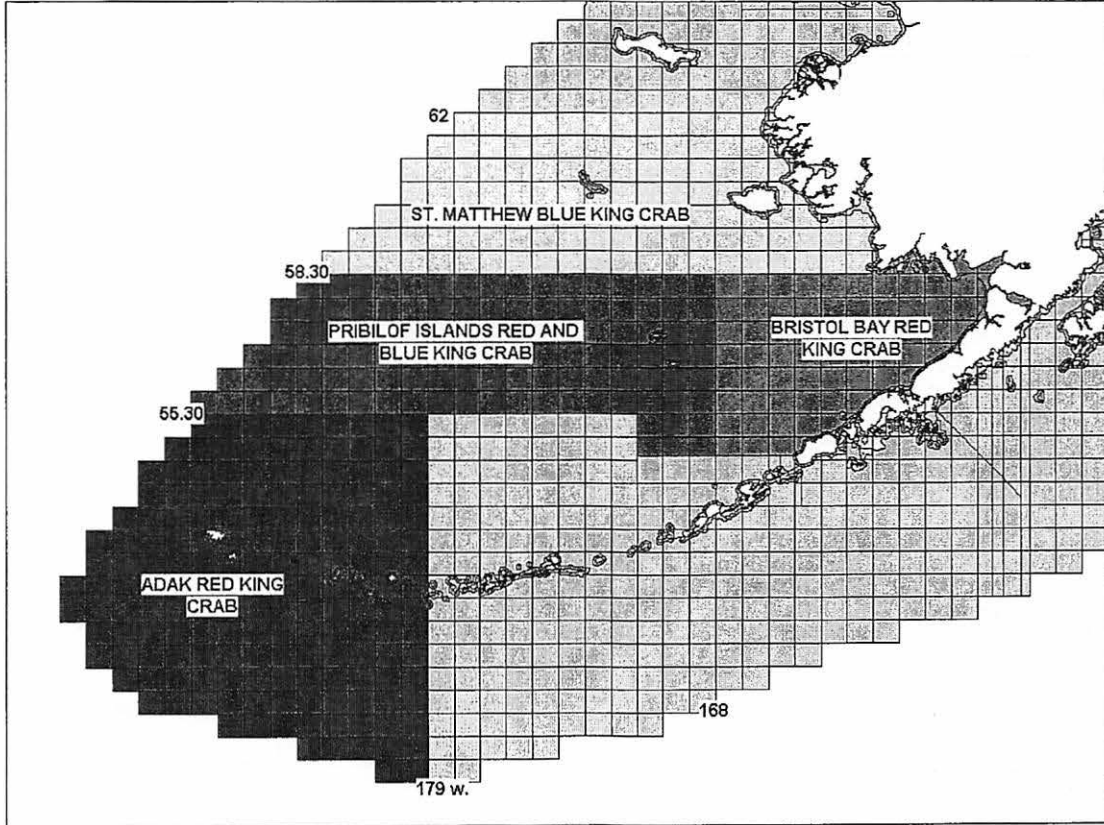


Figure 3 Distribution of Pribilof Islands blue king crab (PIBKC) from survey stations over two time frames 1975-1983 and 1984-2009 showing the change in relative distribution to the east after 1984. Closure options proposed under Alternatives 4 and 5 are shown in white block and hatched box.



CRAB RATIONALIZATION ALLOCATION AREAS - RED AND BLUE KING CRAB

Figure 4 Crab Rationalization Allocation areas showing geographic extent of Pribilof Islands stocks in regulation.

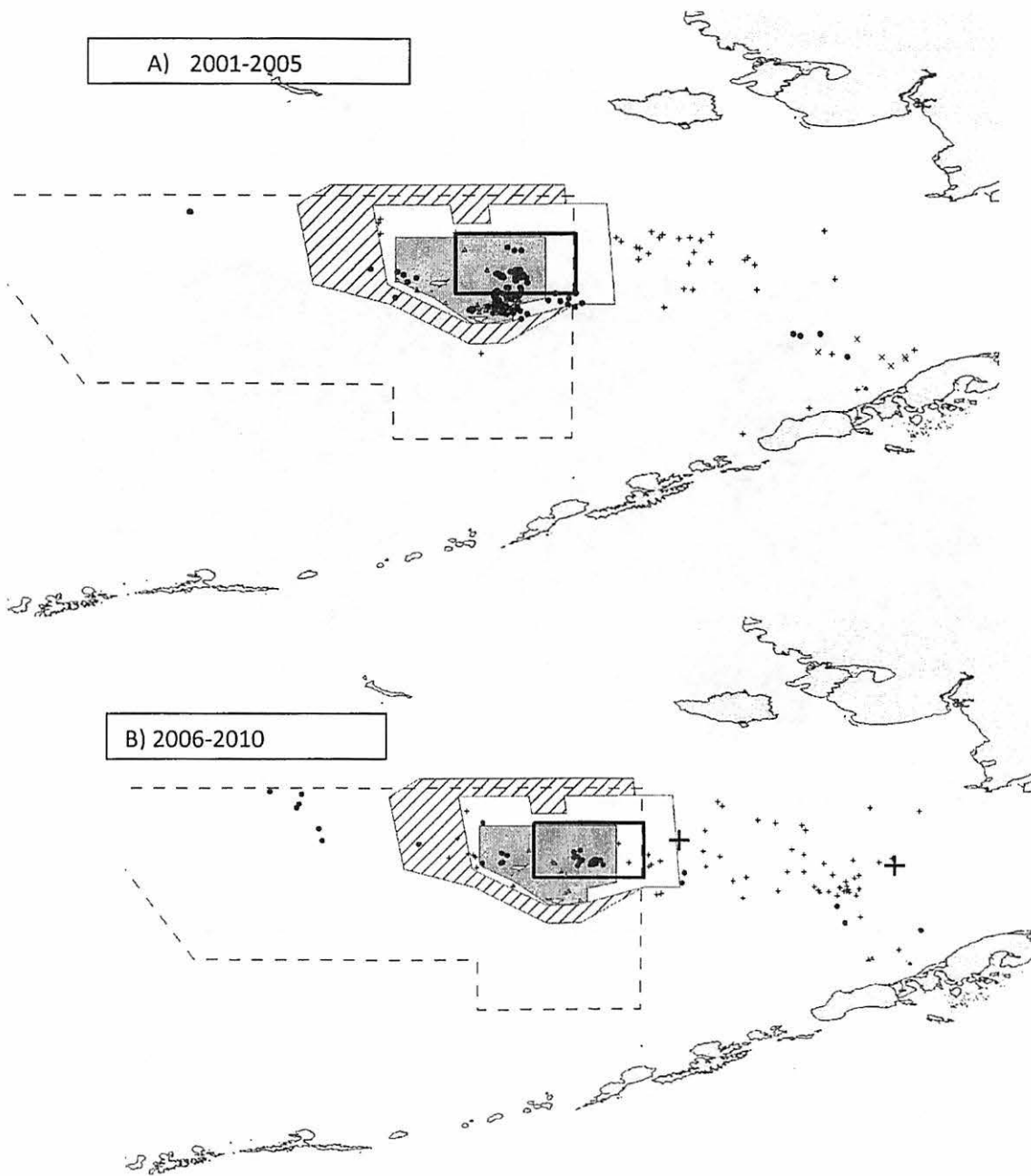


Figure 5 The distribution of observed bycatch of blue king crab in the Pribilof Islands management district (dashed region) and the Bristol Bay District to the east in 5 year intervals between 2001-2005 (A: upper panel) and 2006- 2010 (B: lower panel) by gear type (longline=circles, non-pelagic trawl=cross, pelagic trawl=x, pot=triangle) where the smallest relative symbol equals 1-200 observed crabs and the largest symbol equals 800-1000 observed crabs.

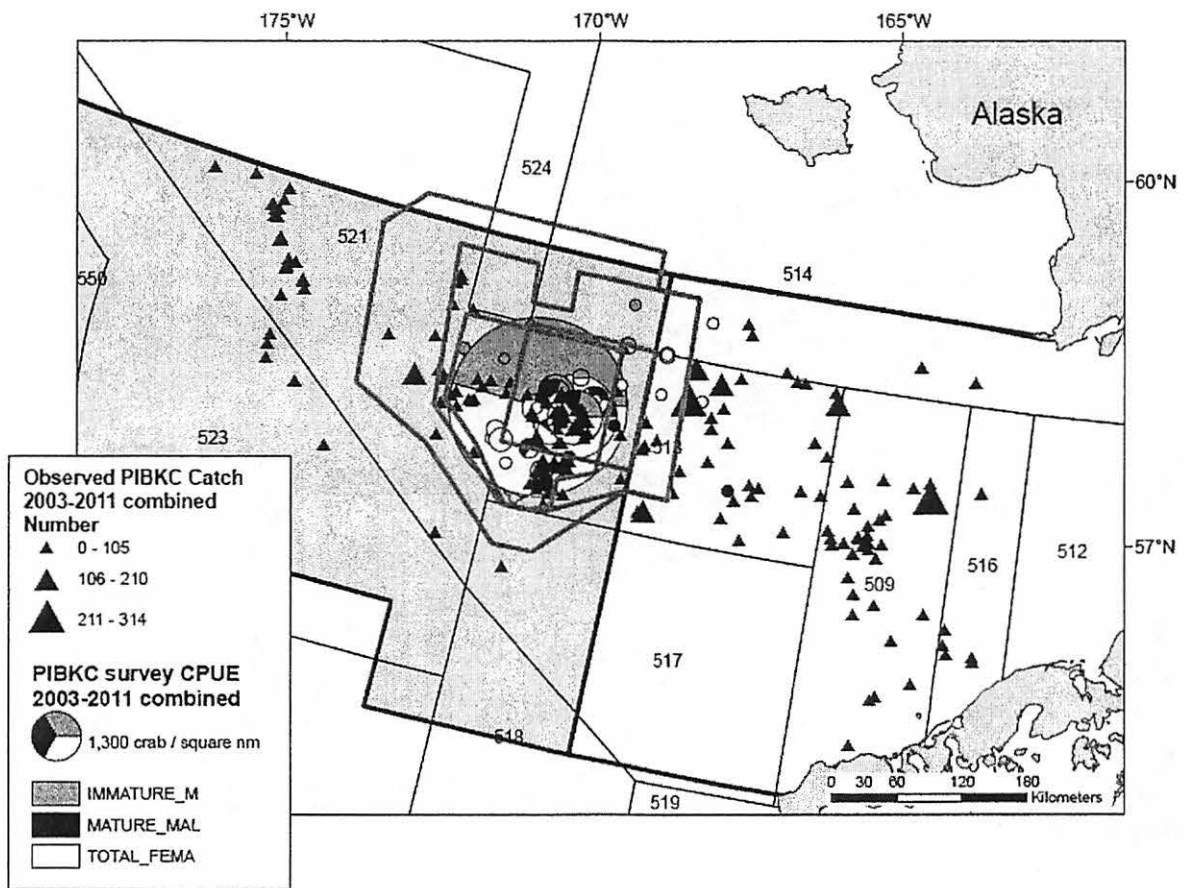


Figure 6 Observed bycatch of blue king crab (all gear types) in triangles in the Pribilof District and Bristol Bay in conjunction with observed survey catch in circles 2003-2011. The shaded area represents the Pribilof District.

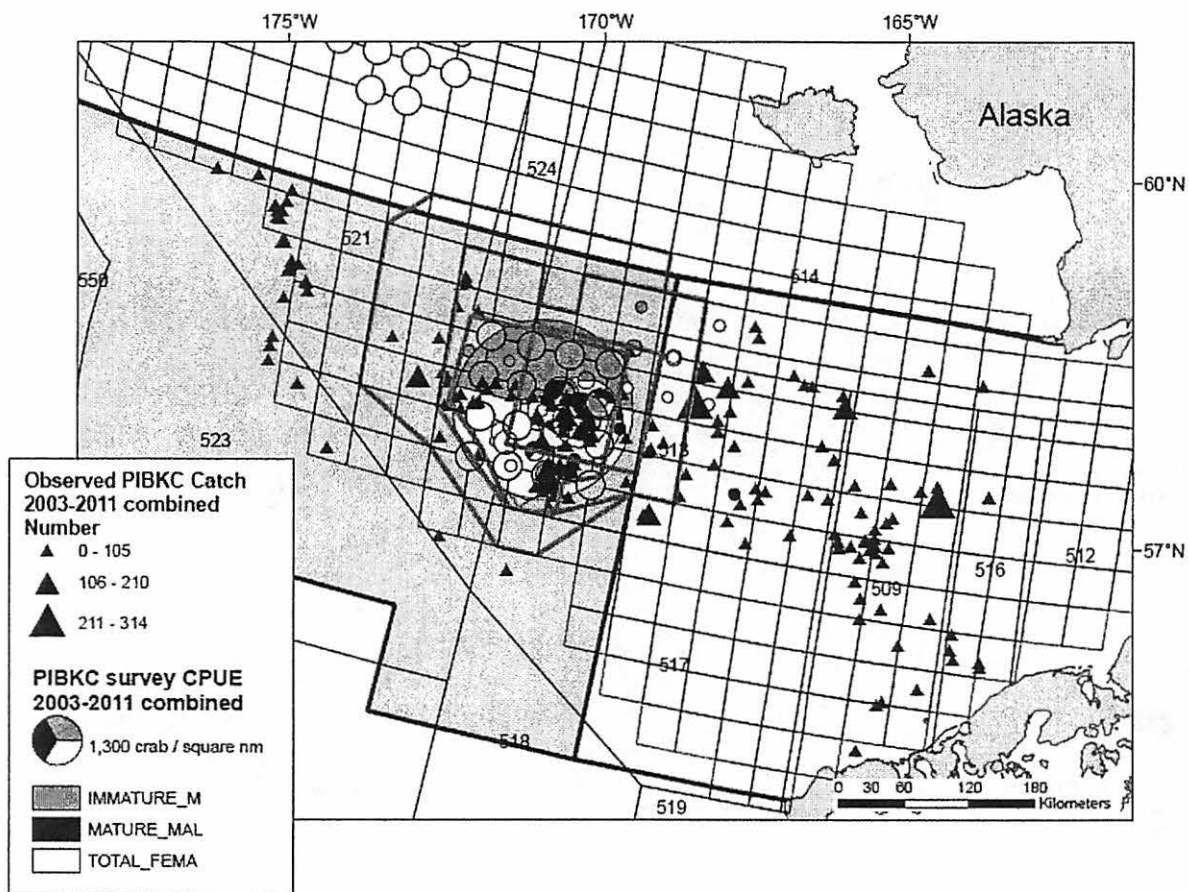


Figure 7 Observed bycatch of blue king crab (all gear types) in triangles in the Pribilof District and Bristol Bay in conjunction with observed survey catch in circles 2003-2011. Note grid represents the NMFS bottom trawl survey grid (20nm blocks). The shaded area represents the Pribilof District.

## PSC crab cap in numbers versus weight

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In December 2011, the Council requested clarification on the issues related to managing a PSC cap for PIBKC in the groundfish fisheries that is based on numbers of crab rather than the overall weight of crab accruing towards a set cap level. These issues relate to both the calculation itself, from observer data, as well as the fluctuation in cap levels as a result of using an annually-varying average weight calculation.

The draft Monitoring and Enforcement chapter (appended separately), under the section on status quo, describes the process by which observers collect data on crab weight in their samples and explains how NMFS uses the weight to estimate crab PSC in numbers of individuals. As noted in the chapter, this process results in multiple conversions, from weight to number and then back to weight. These conversions rely on averages that do not necessarily correspond with the sampling frame. Nonetheless this is the current process and absent a modification, in conjunction with this amendment analysis, any PSC cap recommended by the Council will be in numbers of crab rather than weight.

The Council's trigger caps are formulated as a proportion of the OFL, which is a quantity managed in weight. The analysts have used the average weight of crab, by year, applied historically to the cap proportions to estimate the number of crab PSC for purposes of the analysis. This is intended to reflect the reality of managing a weight-based cap in numbers, on an inter-annual basis, and demonstrate the time-varying nature of the caps based solely upon the average-weight estimate employed to convert to numbers of crab. Note that the annual variation of the PSC cap is due solely to the average weight of king crab caught over all gear types the previous season and is not related to the abundance of Pribilof Islands blue king crab.

The table below shows the cap levels in numbers of crab following conversion of weight to numbers employing the average weight as listed. Also shown is the annual average weight employed by NMFS in that year for conversion of crab PSC back to weights for accrual in the annual stock assessment. Note that actual average weights have only been used since 2008. Crab PSC catch by groundfish fisheries did not accrue towards an OFL for crab stocks until 2008 because that was the first year that annually estimated OFLs for crab stocks were implemented. Note that this fluctuation in cap numbers, by year, has an impact on the relative constraints estimated in the analysis in each year.

Crab fishing year	Average weight in lb	Cap options in numbers under consideration:			
		Option 1: OFL	Option 2: ABC	Option 3: 90%ABC	Option 4: 75%ABC
2003/04	1.255	3,187	2,869	2,582	2,151
2004/05	3.177	1,259	1,133	1,020	850
2005/06	3.480	1,149	1,034	931	776
2006/07	3.700	1,081	973	876	730
2007/08	3.123	1,281	1,153	1,037	865
2008/09	1.559	2,565	2,309	2,078	1,732
2009/10	3.388	1,181	1,063	956	797
2010/11	2.671	1,498	1,348	1,213	1,011

## Seasonal allocation of PSC cap for PIBKC

In December 2011, the Council received public comment on the alternatives under consideration for the PIBKC rebuilding plan. Specifically public comments suggested the inclusion of a 'seasonal release' of any proposed PIBKC PSC cap for comparison against the sector allocations included in the analysis. A specific seasonal allocation was not proposed, but rather the request that staff "*Analyze a seasonal release strategy of PIBKC bycatch where seasonal releases may be based on the seasonality of fishing activity that occurs in the Pribilof district, or similar data.*" (MCA comment letter to NPFMC, December 2011). The Council requested that staff explore this concept further and report back to the Council at this meeting regarding any proposed seasonal allocations that could be folded into the existing suite of alternatives at this time.

Staff analysts began exploring appropriate approaches for a fishery-level (combined all sectors as well as CDQ and non-CDQ) seasonal allocation that would allow for maximizing fishing opportunities under the existing cap options in the analysis. The PPA cap (75% of the ABC) was used for example purposes in this examination. Quartiles of the PSC cap compared with bycatch in each year were examined. Two options are proposed for consideration: seasonal allocation of 50% of the bycatch (for all gear types combined) beginning January 1-June 10, with 50% remaining June 11-December 31; and 75% January 1-June 10, with 25% remaining June 11-December 31. These cap allocations by year are shown in Table 1 below. The inherent assumption is that the bycatch that accrues towards this cap apportionment is for all fisheries combined. When the cap itself is reached however, only the fisheries which are subject to this action (currently, yellowfin sole, Pacific cod pot and Pacific cod hook and line fisheries) would be subject to whichever closure constraint is proposed by the Council.

Table 1 Cap levels by year based upon the PPA cap of 75% of the ABC (in numbers of crab) and associated seasonal allocation options of 50/50 and 75/25 % by season. Note the first allocation is from January 1-June 10 while the second is from June 11-December 31. Bycatch accrues fishery-wide for these caps although the constraint (associated area closure) is only for qualified fisheries as specified in the analysis.

Year	PPA cap (#s of crab)	Seasonal allocation		
		50%	75%	25%
2003	2,151	1,076	1,613	538
2004	850	425	637	212
2005	776	388	582	194
2006	730	365	547	182
2007	865	432	648	216
2008	1,732	866	1,299	433
2009	797	398	598	199
2010	1,011	505	758	253

A preliminary examination of all fisheries bycatch under these two seasonal allocation schemes was conducted using the CIA DB to estimate total bycatch of PIBKC by all gear types in the Pribilof District (note these results are preliminary and contingent upon CIA DB estimation of bycatch within the PI District). Bycatch was tabulated in the PI District by year and compared against the proportion of the cap estimated in that year. Results were compiled for consideration with and without a rollover of unused bycatch from the first allocation (January 1-June 10) to the second (June 11-December 31). These date ranges are meant to bracket the full range of applicable seasons for all gear types understanding that not all gear types are able to fish under the full seasonal allocation time frame.

The week-ending dates that an estimated constraint would be reached by seasonal allocation are shown in Table 2 and Table 3 below. The tables indicate the constraint in the second seasonal allocation period with and without a rollover from the first seasonal allocation.

For the 50/50 seasonal allocation, the only year the cap would have been estimated to be reached would have been in 2005. For the second season however, without a rollover the cap would have been reached in 2006, 2007 and 2009. With the seasonal allocation the cap would be reached later in 2006 but the same weekending date in 2007. In 2007 the cap levels for all caps under consideration were reached in the week of September 22<sup>nd</sup>. Under the rollover for this option the cap would not have been reached in 2009.

For the 75/25 allocation, the cap is not reached in any year in the first seasonal allocation. In the second season, absent a rollover the smaller proportion of the cap is reached in multiple years (2004, 2006, 2007, 2009 and 2010). However, with the rollover the cap is only reached in 2006 on September 2<sup>nd</sup> and in 2007 on September 22<sup>nd</sup> (when all cap levels are reached due to bycatch in that period as noted previously).

Table 2. 50/50 seasonal allocation of a fishery-wide PIBKC PSC cap and the associated week-ending date it would have been reached with and without a rollover form the first to the second season.

Year	Cap by season for 50/50 allocation (#s crab)	Week-ending date cap reached by season		
		January 1- June 10	June 11- December 31	Date cap reached if rollover allowed
2003	1,076	----	----	----
2004	425	----	----	----
2005	388	Feb 12	----	----
2006	365	----	Aug 19	Sep 2
2007	432	----	Sep 22	Sep 22
2008	866	----	----	----
2009	398	----	Sep 26	----
2010	505	----	----	----

Table 3 75/25 seasonal allocation of a fishery-wide PIBKC PSC cap and the associated week-ending date it would have been reached with and without a rollover form the first to the second

Year	Cap by season	Cap by season	Week-ending date cap reached by season		
	(#s crab) 75%	(#s crab) 25%	January 1- June 10	June 11- December 31	Date cap reached if rollover allowed
2003	1,613	538	----	----	----
2004	637	212	----	Aug 7	----
2005	582	194	----	----	----
2006	547	182	----	Aug 19	Sep 2
2007	648	216	----	Sep 8	Sep 22
2008	1,299	433	----	----	----
2009	598	199	----	Sep 19	----
2010	758	253	----	Sep 26	----



**DRAFT**  
**Monitoring, management, and enforcement considerations**  
**For the Environmental Assessment to revise the Pribilof Islands**  
**Blue King Crab Rebuilding Plan**

## **1. Introduction**

This chapter was prepared by NMFS to evaluate monitoring, management, and enforcement under the alternatives and will be included in the Environmental Assessment (EA) for the proposed amendment to revise the rebuilding plan for Pribilof Islands blue king crab. The sections in this chapter describe: the harvest specification process; inseason management; prohibited species catch estimation; observer data collection; accountability measures and preventing overfishing; and monitoring and enforcement.

As described in Chapter 2 of the EA, the alternatives contain two management approaches:

1. Year-round area closures for specific directed fisheries.
2. PSC limits that, when reached, trigger closure of a specific area.

The PSC limit and trigger closure alternatives pose the most challenges for management, therefore, the majority of this chapter addresses the implementation of this type of alternative.

Alternative 6 (the Preliminary Preferred Alternative, PPA) would implement both of these approaches. Specifically, Alternative 6 would:

1. Close the PIHCZ (Figure 10-1) year-round to directed fishing for Pacific cod with pot gear, which is in addition to the existing closure of this area to all trawling; and;
2. Establish a PSC limit that, when reached, triggers closure of a larger area (the Pribilof Islands blue king crab distribution closure area under Alternative 5(d), 1984-2009 distribution Figure 10-3(B)) hereafter referred to in this chapter as the Pribilof Island Blue King Crab Savings Area (PIBKC Savings Area) to specified directed fisheries.
3. Accrue all blue king crab caught by vessels using any gear type in all directed groundfish and halibut fisheries (CDQ and non-CDQ combined) in the Pribilof blue king crab district (Figure 10-13) against this PSC limit. Note that the area in which blue king crab will accrue against the PSC limit is larger than the area that would close once the PSC limit is reached.
4. Close the PIBKC Savings Area when this PSC limit is reached, as follows:
  - a. When 30% of the PSC limit (currently 194 crab, although this will change in any given year) is caught in the Pribilof blue king crab district by all vessels using hook-and-line gear, then directed fishing for Pacific cod using hook-and-line gear in the PIBKC Savings Area would close for the remainder of the year.
  - b. When 45% of the PSC limit (291 crab) is caught in Pribilof blue king crab district by all vessels using pot gear, then directed fishing for Pacific cod using pot gear in the PIBKC Savings Area would close for the remainder of the year.

- c. When 45% of the PSC limit (291 crab) is caught in the Pribilof blue king crab district by all vessels using trawl gear, then directed fishing with trawl gear for yellowfin sole in PIBKC Savings Area would close for the remainder of the year<sup>1</sup>.
- d. When the overall PSC limit is reached (646 crab), the PIBKC Savings Area closes to directed fishing for Pacific cod by vessels using hook-and-line and pot gear and directed fishing for yellowfin sole by vessels using trawl gear for the remainder of the year.

## 2. Allocation of the PSC Limit in the Groundfish Harvest Specification Process

A PSC limit may either be set as an explicit amount or as an explicit percentage of the ABC (such as that included as an option under Alternative 5d, suboptions 3 and 4). If the PSC limit is based on a percentage of the annual ABC, which fluctuates each year, then the limit and apportionments must be specified under the annual groundfish harvest specifications process. The following describes the process by which this could occur.

The regulations at 50 CFR 679.21 would establish the PIBKC PSC limits; describe any apportionments of the PSC limit to fishery categories, sectors, or gear types; and establish closure areas, as determined by the Council's final action. Each year, the PIBKC PSC limit and the fishery apportionment thereof would be determined as part of the groundfish harvest specification process set out at 50 CFR 679.20(c). At the October Council meeting, the SSC would determine the ABC for PIBKC based on the best available scientific information in the most recent stock assessment prepared by the Crab Plan Team. The apportionment of the PIBKC PSC limit among groundfish fisheries and fishery categories, if further apportioned, would be recommended to the Council by their Advisory Panel<sup>2</sup>. The Council would recommend to NMFS proposed PIBKC PSC limits and the BSAI fishery apportionments thereof for up to two years. NMFS would review the recommendations and publish in the *Federal Register* proposed harvest specifications in November or early December. At the December Council meeting, the Council would consider public comments on the proposed harvest specifications, public testimony, and any changes from the Advisory Panel, and then recommend to NMFS final PIBKC PSC limits. NMFS would review the recommendations and publish in the *Federal Register* final harvest specifications in approximately February or March the following year.

### 2.1 CDQ Allocations

The Council has the authority to recommend allocations of PSC limits to the CDQ Program and among the CDQ groups. Section 305(i)(1)(B)(i) of the Magnuson-Stevens Act establishes the CDQ Program allocations, stating that "the annual percentage of the total allowable catch, guideline harvest level, or other annual catch limit allocated to the program in each directed fishery of the Bering Sea and Aleutian Islands shall be the percentage approved by the Secretary, or established by Federal law, as of March 1, 2006. PSC limits established in the BSAI groundfish fisheries, and the corresponding allocations from those limits to the CDQ Program, are not directed fisheries and regulations at 50 CFR § 679.21(b)(2) require operators of vessels engaged in directed fishing for BSAI groundfish to minimize its catch of PSC. Therefore, the requirements of section 305(i)(1)(B)(i) do not apply to allocations or prohibited species quota and these allocations remain under the authority of the Council to recommend.

The CDQ Program receives allocations of the PSC limits for halibut, red king crab in Zone 1, *C. bairdi* Tanner crab in Zone 1, *C. bairdi* Tanner crab in Zone 2, *C. opilio* crab, Bering Sea Chinook salmon, Aleutian Islands Chinook salmon, and non-Chinook salmon. Once allocated to the CDQ Program, the PSC limit is known as a "prohibited species quota" or PSQ. The PSQs are further subdivided among the six CDQ groups based on

<sup>1</sup> The affected fisheries are subject to change depending upon final definition of the Pribilof blue crab stock boundary.

<sup>2</sup> Note this recommendation is necessary if the Council does not set a fixed percentage for each fishery in conjunction with final action. If the Council does recommend fixed percentages, these percentages would be in regulation and annual recommendations during the harvest specifications process would not be necessary.

percentage allocations established in 2005 (71 FR 51804; August 31, 2006). The PSC limits for crab are trigger caps that once reached close specific areas (Zone 1 or Zone 2) to fishing with trawl gear. Once a CDQ group's PSQ for a particular crab species is reached, operators of vessels fishing on behalf of that CDQ group are prohibited from using trawl gear to harvest groundfish CDQ in the specified area.

The CDQ Program does not receive allocations of the herring PSC limit or the red king crab savings subarea portion of the red king crab zone 1 PSC limit. An allocation of the herring PSC limit was not made to the CDQ Program in the 1998 expansion of the program to include the remainder of the groundfish species and prohibited species, because of the conflict between NMFS's proposal to require full retention of herring for proper accounting and State of Alaska regulations prohibited the retention of herring by vessels using trawl gear (63 FR 30381, June 4, 1998). Any closures of the herring savings areas apply equally to vessels CDQ and non-CDQ fishing.

Regulations at 50 CFR 679.21(e)(3)(ii)(B) establish the red king crab savings subarea (RKCSS) with a trigger cap set by the Council during the annual groundfish specifications at a maximum of 25 percent of the red king crab PSC limit. Once this trigger cap is reached, the RKCSS is closed to vessels fishing with non-pelagic (bottom) trawl gear. The RKCSS trigger cap is not allocated among the CDQ and non-CDQ fisheries. Once the cap is reached, the closure to non-pelagic trawl gear applies to vessels participating in both the CDQ and non-CDQ fisheries equally.

### **3. Inseason Management**

Under Alternatives 1-4 and Alternative 6 (the PPA), a designated area would be closed year-round to specific fisheries. This is currently how status quo is regulated, with the PIHCZ, defined by Figure 10 to 50 CFR Part 679, closed to all trawl gear. NMFS and NOAA Office of Law Enforcement monitor compliance with this closure area using location information from observer and vessel monitoring system (VMS) data. There is no PSC limit currently associated with this closure area.

Under Alternative 2 this same area would be closed year round to Pacific cod fixed gear fisheries (as the other fisheries listed in Table 11-1 are already excluded as trawl fisheries). Under Alternatives 3 and 4, new year-round closures would be for specific fisheries as listed in Table 11-1 (or for Pacific cod pot gear under options 3b and 4b). Under Alternative 6, the PPA, the PIHCZ would be closed year-round to directed fishing for Pacific cod by vessels using pot gear, in addition to the existing closure of this area to all vessels using trawl gear.

Alternatives 2, 5, and 6 also include "triggered closure areas," which are areas that would close upon attainment of a newly specified PSC limit. Closures would apply to various combinations of gear type and directed fishery. NMFS would monitor the PSC of PIBKC in the groundfish and halibut fisheries based on best available data (discussed below) and would issue fishery closures once the overall PSC limit was reached. Operators of vessels identified in the closure notices would be prohibited from directed fishing in the area once NMFS closed the area to a fishery. The methods for estimating the catch of PIBKC in the groundfish fisheries is described below in Section 4. Hook-and-line fisheries for halibut under the IFQ and CDQ programs also occur in the action area. However, NMFS is not, at this time, able to use observer data to estimate the PSC of PIBKC in the halibut fisheries. As described in Section 5 below, under observer restructuring, the halibut fleet will be subject to observer coverage starting in 2013. Therefore, data may be available in the future to estimate the PSC of PIBKC in the halibut fisheries.

Under Alternative 6, the PPA, the apportionment of the PSC limit among gear types is 45% trawl, 45% pot, and 30% hook-and-line. As the sum of these apportionments is greater than the amount of the PSC limit, this apportionment means that each gear type is not guaranteed to have the full amount of the PIBKC apportioned to

it available as a PSC limit for their fisheries. This structure for the PSC limit means that vessels subject to the triggered closure are operating under two levels of the PSC limit at all times. Their directed fishery would be closed when the portion of the PSC limit that applies to their gear type is reached, or (2) the overall PSC limit is reached, whichever occurs first. If the full amount of the PIBKC PSC limit is reached during the year, one of the gear types will not be allowed the full amount of their PSC limit apportionment. For example, if both trawl gear and pot gear fully harvest their 45% apportionment of the PSC limit, then 90% of the PSC limit would have been taken and only 10% of the PSC limit remained available for vessels using hook-and-line gear, even though these vessels have an apportionment of 30% of the PSC limit. Because of the small number of PIBKC that would be the PSC limit and with the PSC accruing against each of the three gear apportionments throughout the year, and it is possible that the PSC limit may be reached before any of the three gear types completes groundfish fishing in the Pribilof blue king crab district, triggering an area closure under Alternatives 2, 5, and 6.

### **3.1 Rollovers & Transfers**

#### ***Inter-sector rollovers***

In its October 2011 motion, the Council requested that NMFS discuss its ability “to manage sector-level triggers through inter-sector rollovers.” A “rollover” is a management action taken by NMFS that would re-allocate PIBKC PSC from one sector to one or more other sectors through a notice in the *Federal Register*. Rollovers generally apply when one sector has finished fishing for a season or for the year without reaching its PSC limit. Under these circumstances, the remaining amount of the PSC limit may be made available to other sectors to maximize the amount of groundfish that may be harvested for a given PSC limit. The opportunity to apply rollovers under the PPA is limited because the gear type apportionments of the PSC limit are annual limits that add up to more than 100%. Therefore, if one sector (gear) has completed fishing in the Pribilof king crab stock area without exceeding its apportionment of the PSC limit, the remaining amount of its apportionment of the PSC limit isn’t necessarily fully available to the other sectors. For an inter-sector rollover to occur, NMFS would have to know that all vessels of a specific gear type have completed fishing in the Pribilof blue king crab district for the year. If this occurred, NMFS could re-apportion the remaining percent of the PIBKC PSC limit originally apportioned to the gear type that had completed fishing among the two other gear types that still could fish in the area. If both other gear types had remaining fishing opportunities in the Pribilof blue king crab district, then NMFS would need guidance about how to apportion the remaining percentage PSC limit among the two gear types. If the Council recommends that NMFS undertake rollovers, but does not provide guidance about how they should occur, NMFS would evaluate the specific circumstances and develop a rationale for a particular rollover approach based on which sectors were still fishing and the remaining fishing expected to occur. However, this could be a complicated and controversial decision that representatives of the remaining gear types may not agree with, therefore, the decision about how to affect the rollover may take more time than is available in the remaining season. In addition, the fact that the PSC limit will be relatively low and PSC amounts difficult to predict likely would limit NMFS’s willingness to undertake sector re-allocations.

#### ***Seasonal rollovers***

An alternative approach that has been discussed, but has not yet been fully analyzed, would be to allocate the PIBKC PSC limit by season instead of by gear type. Under this scenario, all PIBKC caught by any vessels fishing for groundfish, regardless of gear type, would accrue toward the seasonal limit of PSC. If PIBKC was allocated by seasons and the seasonal limit was not reached at the end of a season it would be possible for the PSC limit to be added to the respective seasonal apportionment for the next season during a current fishing year. Seasonal rollovers are simpler for NMFS to implement because the season is based on a clear-cut definition (time) and do not require the agency to determine if everyone is finished fishing or not, like is necessary under inter-sector rollovers, nor are there issues with multiple sectors being potentially able to receive the rollover.

NMFS could not implement both inter-sector rollovers and seasonal rollover combined. This limitation is due to the small number crab that could be specified to both sectors (gear) and season for the PIBKC PSC limit under the PPA.

### **Transfers**

None of the proposed alternatives under this action will create a transferable PSC allocation program and thus PSC limits of PIBKC will not be allocated to entities or cooperatives under this action. As such, none of the proposed alternatives support quota transfers like has been implemented in PSC allocation programs like Amendment 91 or Amendment 80.

## **3.2 Applying the Trigger Cap to the CDQ fisheries**

The PIHCZ currently is closed to all trawling, including vessels using trawl gear to fish under the CDQ Program. Under the PPA, closure of this area to vessels directed fishing for Pacific cod using pot gear would apply to vessels in the CDQ and non-CDQ fisheries.

Two options exist to apply trigger cap for the PIBKC Savings Area to the CDQ Program and CDQ fisheries: (1) allocate a portion of the PSC limit to the CDQ Program and among the CDQ groups and manage these limits separately from the portion of the PSC limit allocated to the non-CDQ fisheries, or (2) do not allocate a portion of the PSC limit to the CDQ Program and manage the trigger cap for the CDQ and non-CDQ fisheries combined. **Due to the relatively small number of blue king crab that could be specified for the PIBKC PSC limit under the PPA, NMFS recommends that this trigger cap be managed as a single cap that applies to the CDQ and non-CDQ fisheries together.** This management approach is similar to how the red king crab savings subarea (RKCSS) trigger cap currently is managed. Catch of blue king crab by both CDQ and non-CDQ vessels would accrue against the same PSC limit and if the trigger cap is reached, closure of the PIBKC Savings Area would apply to the CDQ and non-CDQ fisheries.

## **4. Prohibited Species Catch (PSC) Estimation**

### **4.1 PSC Estimation under Status Quo**

NMFS determines the number of crab caught in the groundfish fisheries using the catch accounting system (CAS) and details of the groundfish and PSC catch estimation methods are described in a NOAA Technical Memorandum (Cahalan et al. 2010). The CAS was developed to receive catch reports from multiple sources, evaluate data for duplication and errors, and estimate total catch by species (or species group). The catch estimates are specific to species and fisheries to allow effective monitoring of the catch allocations in the annual harvest specifications. In general, the degree to which a seasonal or annual allocation requires NMFS management is often inversely related to the size of the allocation. Typically, the smaller the catch allocation, the more intensive the management required to ensure that it is not exceeded.

Data from the Observer Program and mandatory fishing industry reports are the two sources of information used to estimate catch and bycatch in the groundfish fisheries. Industry reports of landings and production are generated for all fishing activity in Federal groundfish fisheries through a web-based interface known as eLandings. eLandings was implemented in 2005 by NMFS, Alaska Department of Fish and Game, and the International Pacific Halibut Commission as a joint program to reduce reporting redundancy and consolidate industry-reported fishery landing information. Each industry report submitted via eLandings undergoes error checking. Data are then stored in a database and made available to the three collaborating agencies. There are two basic eLandings report types used for catch estimation:

- **Production Reports:** At-sea production reports are mandatory for Cather/Processors (CPs) and motherships that are issued a Federal Fisheries Permit. At-sea production reports include information about the gear type used, area fished, and product weights (post-processed) by species, and the amount of groundfish and prohibited species discard. Since 2009, the at-sea fishing fleet has submitted these reports

electronically each day. Prior to 2009, these reports were submitted weekly. Shore-based plants also complete production reports, but these are not used for catch estimation.

- **Landing Reports:** when a Catcher Vessel (CV) makes a delivery to a shoreside processor or a mothership a landing report is required. Upon making a landing, a representative of the shoreside processor or mothership submits the landing report into eLandings and a paper "fish ticket" is printed for both the processor and the CV representative to sign. The collection period for a landing report is a trip for CVs that deliver to shoreside processors and a delivery for each CV that delivers to a mothership. A trip for CVs delivering to a shoreside processor is defined as the time period between when fishing gear is first deployed and the day the vessel offloads groundfish (50 CFR 679.2). Landing reports are mandatory for all processors required to have a Federal Processor Permit, including motherships who receive groundfish from Federally permitted CVs.

NMFS estimates of PSC are derived from observer data, which is an independent source of information, rather than from industry reported catch. In the CAS, the observer data are used to create PSC rates (a ratio of the estimated PSC in the sampled hauls to the estimated total catch in sampled hauls). On observed trips with unsampled hauls, an estimate of total PSC (by species) for the trip is derived by expanding a PSC rate from sampled hauls during the trip to the total catch of groundfish (retained+discarded) during the trip. For trips that are unobserved, the PSC rates are applied to industry reported landings of retained catch. Depending on the observer data that are available, the extrapolation from observed vessels to unobserved vessels is based on varying levels of post-stratification. Data are matched based on processing sector (e.g. CV or CP), week, fishery (e.g., Pacific cod), gear (e.g., pot), and Federal reporting area. If data are not available from an observed vessel within the same sector then rates are applied based on observer data from all sectors in the same target fishery, using the same gear, and fishing in the same Federal reporting area. If observer data are not available from any vessels within the same week then a three-week average is used from all vessels in the same target fishery using the same gear and fishing in the same Federal reporting area. If data are not available within a three-week period then a three-month average is used. Finally, if data from the same Federal reporting area are not available then observer data from the fishery and the FMP area (e.g. BSAI) as a whole will be applied.

The PSC for crab are currently estimated in numbers of crab. When the observer program obtains samples of crab, both the weight and the number of crab in the sample are collected. NMFS then converts the sample weights into numbers of crabs in the haul. The number of crabs in each sampled haul is then used in PSC estimation (as described above) so that NMFS can monitor PSC limits on the number of crabs.

The catch estimation methods are designed to provide an estimate of catch and bycatch as quickly as possible so that inseason managers have information to make decisions. The CAS makes use of observer data as soon as they are available, but the estimates are updated as more observer data becomes available. It can take anywhere from a day to over a week for NMFS to receive preliminary observer data. After deployment in the field, which may be as long as three months, observers review their data with FMA Division staff to ensure that data were collected following NMFS protocols. It is normal for there to be some data modifications during this "debriefing" and quality control process. For these reasons, PSC estimates change on a regular basis, and there can be variations in the estimates until the observer data are finalized in late February to early March of the year following the fishery.

Although catch of blue king crab may occur in the halibut fisheries in the Pribilof king crab stock area, these fisheries are not observed and no reliable data exists on which to base estimates of this catch. As described in a later section, observer data collected by halibut vessels in the future under observer restructuring may provide additional information about whether blue king crab are caught in the halibut fisheries and, if so, the extent of this catch.

## 4.2 PIBKC PSC estimation under a trigger closure

Under a trigger closure, NMFS would need to monitor the amount of PIBKC PSC in the Pribilof blue king crab district to make inseason management decisions about when to issue closure notices to prevent exceeding the PSC limit. As described in the previous section, the current method for estimating PSC in the groundfish fisheries is done at the level of Federal reporting areas. Under the alternatives that involve a PSC limit that triggers an area closure, catch of PIBKC in the Pribilof blue king crab district would accrue against the PSC limit. Federal reporting area 513 is entirely inside the Pribilof blue king crab district; however the known stock distribution does not cover the entire 513 Federal reporting area. Federal reporting area 521 contains both Pribilof and St. Matthew blue king crab stocks. Therefore, to provide data for inseason management, NMFS would modify the CAS to generate estimates of PIBKC PSC at the spatial resolution of the Pribilof Island blue king crab district instead of the Federal reporting area. The estimation method would be similar to how the catch accounting system accounts for catch of red king crab in the Red King Crab Savings Area. Essentially, a new area would be defined in the CAS that matches the Pribilof blue king crab district and PSC estimates would be generated for the district.

The current PSC estimation methodology uses observer data to create PSC rates that are applied to unobserved trips. The current method uses the observer data that are available and if observer data are not available, the system aggregates (post-stratifies) until an appropriate PSC rate can be generated. When direct observations from nearby vessels in the same week and fishery (same target and gear) are not available, it is necessary to move to broader time periods and eventually to the entire FMP area. For estimation of PIBKC this is especially relevant because there has been low observer coverage in some fisheries in the area around the Pribilof Islands. Under the current method, when there is a lack of observer data, PSC estimations can require extrapolations from the region closest to the St. Matthew Island where concentrations of blue king crab are higher than in the Pribilof Islands area. This issue is highlighted in 2007 (Figure 10-6) when the high rate used to extrapolate the unobserved landings near the Pribilofs originated from the St. Matthew region, leading to a pot PSC estimate of ~2,800 crabs. Because of the misalignment of these two Federal reporting areas with the PIBKC stocks, as a temporary measure, only PSC occurring in Area 513 has been attributed towards the PIBKC OFL.

Under this action, there are two ways that NMFS could derive estimates of PIBKC PSC in the groundfish fisheries on the spatial scale consistent with Pribilof blue king crab district as (Figure 10-13). One possibility would be for NMFS to use the VMS-Observer Enabled Catch-In-Areas (VOE-CIA) database to provide estimates of crab PSC. The VOE-CIA database integrates catch data from the Catch Accounting System (at the spatial resolution of a Federal Reporting Area) into a database that resolves the GIS data into polygons with areas of approximately seven kilometers. In an unrestricted area, sixty-four grid IDs fit inside one State statistical area. The VOE-CIA could provide annual PSC estimates at a fine spatial resolution, however the VOE-CIA is a tool for post-season analysis; it not designed to provide real-time estimates of catch for inseason management. In addition, the VOE-CIA uses the data from the catch accounting system, so it does not modify the underlying catch estimation process.

Alternatively, NMFS could modify the catch accounting system to generate PSC estimates of blue king crab at the spatial resolution of the Pribilof blue king crab district. As such, the PSC estimates would only include observer data from outside this area if a three-month average were used to generate the PSC rate. Under the current observer deployment model, where vessels decide when to take observers, it is possible for data gaps to occur and PIBKC PSC estimates to be generated from observer data outside the Pribilof area. However, as described in the section 5 on observer issues, NMFS anticipates that extrapolation of observer data to the small number of unobserved trips within the Pribilof blue king crab district will not require using observer data from outside of the district. To completely avoid using observer data from outside the district, NMFS could further modify the catch accounting system to never use observer data from outside the Pribilof blue king crab district to generate the PSC estimate. However, if there was a trigger closure that required NMFS to monitor the PSC and

issue inseason management actions, this approach could mean that NMFS would have no data available to generate a PSC estimate, and the agency would not have the data to make a timely inseason management decision. *NMFS recommends using the catch accounting system to generate PSC estimates of blue king crab and modifying the current method to generate estimates at the spatial resolution of the Pribilof blue king crab district.*

#### ***PSC limits in weight versus number***

As described in the section on the status quo, observers collect data on the weight of crab in their samples and then NMFS converts the weight to estimate crab PSC in numbers of individuals. The crab stock assessment authors, however, need estimates of crab bycatch in total weight. Thus, to obtain an estimate for the stock assessment authors, NMFS converts total PSC estimates of number of crabs back to weight of crab using a global average weight per crab by gear (fixed or trawl), species, and crab fishery year. This process results in multiple conversions, from weight to number and then back to weight, that rely on averages that do not necessarily correspond with the sampling frame.

In the future, NMFS would recommend setting PSC limits as weight of crab rather than numbers to avoid the problem of converting numbers into weight and vice versa. The change to estimate crab PSC by weight would require programming changes for both the observer program database and the catch accounting system. In addition, if PSC limits were set as weight it would require changes in regulations and the FMP. Because of the complexity of changing crab reporting from numbers to weights and the need to implement the rebuilding plan in a timely manner, *NMFS does not recommend making this change as part of this proposed action.*

#### ***PSC discard mortality rates***

Discard mortality rates are currently applied to the crab bycatch estimates from the groundfish fishery during the stock assessment process. Specifically, the OFL and ABC/ACL calculation accounts for all losses to the stock not attributable to natural mortality. The OFL and ABC/ACL are total catch limits comprised of three catch components: (1) non-directed fishery discard losses; (2) directed fishery discard losses; and (3) directed fishery retained catch. To determine the discard losses, a handling mortality rate is multiplied by discards in each fishery. Currently the rates applied to the groundfish discards are 80% for trawl fisheries and 50% for combined fixed (pot and Hook and Line) fisheries.

It would be possible to modify the current method and instead of applying discard mortality rates during the stock assessment, apply discard mortality rates in "real-time" as the PSC limit is monitored. This could be similar to halibut PSC estimates, which incorporate discard mortality rates inseason. However, unlike halibut, there is currently no process for evaluating crab mortality rates in the groundfish fishery and the required data and implementation process have not been evaluated. This is a complicated issue and is not limited to blue king crab (for example, NMFS has been approached about applying discard mortality rates to sablefish and octopus). *NMFS recommends that discard mortality rates on species other than halibut be evaluated through a separate analysis.* If processes were established to develop discard mortality rates, then NMFS could work with the Council in the future to determine if such an approach could be implemented for the PIBKC PSC limits.

## **5. Observer Sampling**

### **5.1 Observer Coverage**

#### ***Status Quo***

Under the status quo, observer coverage is required on vessels and at shoreside processors according to vessel length or processing volume. Catcher/processors (CPs) and catcher vessels (CVs) between 60 and 125 ft. in length and all CPs and CVs using pot gear carry observers 30% of their fishing days; the vessel operator decides which days to carry an observer. CPs and CVs greater than 125 ft. in length (with the exception of vessels using pot



gear) are required to carry an observer 100% of their fishing days. All motherships are required to carry an observer 100% of their fishing days. Some operations participating in catch share programs are required to carry two observers to meet the data requirements to manage catch shares.

### ***Restructured Observer Program***

In October 2010, the Council took final action to restructure the observer program (NPFMC 2010) and implementation of the new program is anticipated in January 2013. The actions being considered for PIBKC would be implemented under the new program which is expected to improve observer data quality under all of the alternatives. The goals of the restructured observer program are to improve observer data quality, increase equity in the cost and burden of carrying an observer among the industry, and increase NMFS' ability to be flexible in responding to current and future management needs of individual fisheries (NPFMC 2010). Under the Council's motion, observer coverage requirements based on vessel length and processing volume at 50 CFR 679.50 would be removed and all exemptions from observer coverage (e.g., for vessels less than 60' LOA) would be eliminated. Operations would be classified into two coverage categories: greater than or equal to 100% coverage (full coverage category) or less than 100% coverage (partial coverage category).

Operations in partial coverage category would be included in a restructured observer funding and deployment system where NMFS contracts with service providers to deploy observers in a randomized fashion. Vessels and processors in the partial coverage category would pay an ex-vessel value-based fee on their groundfish and halibut landings to pay for observer coverage in this category. Per the Council's motion, the partial coverage category would include all CVs with the exception of operations participating in catch share programs with transferable PSC allocations (see below). All shoreside processors and stationary floating processors would be in the partial coverage category except while receiving AFA or CDQ pollock. NMFS would determine the level of observer coverage required to monitor regulatory compliance and yield estimates of catch and bycatch in the partial coverage sectors within the budget afforded by the ex-vessel fee proceeds.

Under the restructured program, all CPs would be required to have at least 100% observer coverage, regardless of vessel length. CVs while participating in the AFA pollock fishery or the groundfish CDQ fisheries in the BS would also be required to be in the full coverage category. In the Council's motion, the criteria for including a CV sector in the full coverage category was participation in a fishery with a management system that uses a transferable PSC allocation in conjunction with a catch share program.

CVs fishing in the Pribilof blue king crab district (Figure 10-13) with hook-and-line, pot, and non-pelagic trawl gear would be in the partial coverage category under the restructured observer program and NMFS would deploy observers in a randomized fashion. These CVs harvest a very small proportion of the total retained groundfish from the Pribilof blue king crab district. Between 2007 and 2010, vessels that would be in the partial coverage category generally account for less than 0.5% of the total groundfish retained in the Pribilof blue king crab district. One exception was 2008, when CV effort increased and accounted for approximately 2.8% of the total retained groundfish. The majority of the CV harvest in the Pribilof blue king crab district was taken by CVs using pot gear. From 2008 through 2010, pot gear accounted for an average of 85% of the groundfish harvest by the CV sector (which, again, is a nominal portion of the overall harvest) in the Pribilof blue king crab district.

The overall amount of groundfish fishing effort in the Pribilof blue king crab district has been fairly consistent between years. For example, between 2007 and 2010 there were approximately 33 trips made by 12 to 16 distinct vessels. An exception to this stability occurred in 2008 when the number of trips was substantially higher (121) than other years because of increased pot and non-pelagic trawl effort.<sup>3</sup>

Observer coverage and resulting data would increase in the Pribilof blue king crab district under the restructured observer program as all CPs would have at least 100% observer coverage. This level of coverage would account

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<sup>3</sup> The increased effort was likely due to low pollock TACs and high Pacific cod prices that encouraged fishing.

for all trips being observed for 97-99% of the groundfish harvest in the Pribilof king crab district (based on data from 2008 through 2010). NMFS also anticipates an increase of observer data available from the CV sector in the Pribilof blue king crab district via the randomized deployment process anticipated under the restructured program.

Additional observer coverage in the CV sector in the Pribilof blue king crab district could be accomplished in a couple of different ways under the restructured observer program if the Council deemed it necessary. Through a new rule, the Council could place any class of vessels in the full coverage category. These vessels would obtain their own observer coverage at their own cost; the funds would not come out of the financial pool used for the partial coverage category. On one hand this approach would be consistent with that taken for CVs included in the full coverage category while participating in certain fisheries (e.g., BS pollock fisheries) and included in the partial coverage category while participating in others (e.g., the Gulf of Alaska Pacific cod fishery). However, this approach would diverge from the criteria established by the Council for including CVs in the full coverage category in its motion on observer program restructuring unless the subject fisheries are managed by catch shares with transferable PSC allocations.

The restructured observer program would eliminate 100% observer coverage requirements in place at 50 CFR 679.50 for CVs fishing for groundfish in the Red King Crab Savings Area. The restructured observer program is designed to increase NMFS' flexibility in deploying observers according to a randomized design structured to address data needs for management. As such, NMFS anticipates collecting sufficient data for management with lower observer effort for some CV sectors with 100% coverage requirements under the status quo, such as CVs fishing for groundfish in the Red King Crab Savings Area. The Pribilof blue king crab district would not be an exception.

As an alternate to full observer coverage, NMFS could assign high observer coverage rates to CVs intending to fish in areas such as the Pribilof blue king crab district with funds available for coverage in the partial coverage sector. To stratify coverage specifically for this area, vessel operators would need to indicate their intent to fish in this area upon notifying NMFS of an upcoming trip. This would complicate the notification process since any operator can enter the district, and as such, every operator would need to be asked if they plan to enter the area. Those that plan to fish in this area would be selected for coverage. As NMFS is not controlling the effort in these areas, designating high coverage in an area could cause unpredictable cost overruns on the finite partial coverage funds and impact NMFS' ability to cover other fisheries.

*Consistent with the Council's motion on observer program restructuring, NMFS does not recommend 100% observer coverage for the CV sector while fishing in the Pribilof blue king crab district.* The CP sector would have 100% observer coverage under a restructured observer program and precision in estimates of blue king crab PSC are expected to increase. NMFS expects that estimates of blue king crab PSC in the CV sector would be improved through randomized observer deployment under a restructured observer program and a revised spatial algorithm for PSC estimates. Observers could be deployed at a range of rates under the restructured program and NMFS expects sufficient data to be collected to estimate area-specific PSC rates to monitor PSC limits in the Pribilof blue king crab district. NMFS would also modify the spatial algorithm for estimating PSC in the Pribilof blue king crab district so that PSC rates more accurately reflect the areas PSC and not that of neighboring reporting areas.

## **5.2 Sampling Protocol**

NMFS uses observer sample data to estimate the weight and/or number of each species caught by fishing vessels. NMFS utilizes a robust sampling design to minimize the effects of sampling error, and observer sampling methods are based on randomized sampling designs. None of the alternatives would change NMFS's sampling protocol.

### ***Observer Sampling aboard Trawl CPs***

All CP trawl vessels fishing in the Bering Sea, are required to use flow scales to weigh all catch prior to any sorting as well as any sampling by an observer. Observers monitor the processing of these hauls and select samples following a random sampling methodology. The size of the samples is limited by the observers' workload. The greater the diversity of species found in the haul, the greater the observer's workload in processing samples. However, observers attempt to obtain several discrete samples totaling between 300 and 500 kg for each haul. Observers count and weigh all species, including PSC, found in their samples and take any necessary biological samples from these same fish/crab. The samples are expanded by NMFS to the total haul weight for an estimate of total catch of each species. Other expansion algorithms are applied when there are unsampled hauls.

### ***Observer Sampling aboard Trawl CVs***

In contrast to trawl CPs, catch on trawl catcher vessels is not weighed at sea and observers rely on volumetric methods to estimate catch weight. When volumetric methods are not possible due to safety or operational characteristics of the vessel, the captain's estimate of catch weight can be used. Within those catches, observers generally take samples on deck before the fish are sorted and moved into below deck bins. Observers attempt to take multiple samples from throughout individual hauls, however this is often constrained by the deck layout, limited workspace, and the vessel's catch handling procedures. Therefore, it is common for NMFS to only obtain one sample from a haul, which limits NMFS' ability to calculate within-haul variances for this component of the fleet, and it has potential for bias since the sample only comes from one portion of the haul.

### ***Observer Sampling aboard Longline Vessels***

Observer information collected aboard vessels fishing with longline gear consists of the following components. First, observers obtain an average hook count at least two times per week. An average hook count is a count of the number of hooks on an individual gear segment, and of at least one fifth of the number of segments in a regular set. For example, if a vessel regularly sets 20 segments (rails, magazines, tubs) in a set, the observer will count all the hooks on five individual segments and this will be done at least twice per week. The number of segments of gear in an individual set is verified on a regular basis, specifically, observers compare their own observations to the vessel logbook to verify that the logbook information regarding total segments in a set is reliable. Then, observers monitor portions of the gear retrieval following a random sampling methodology. During these sample or "tally" periods, observers count everything caught by the gear. Most observers find that they can sample at least 1/3 of a set and still have time to complete their other sampling duties (2011 Observer Program Sampling Manual). The crewmember at the roller sets aside bycatch, and PSC, as requested by the observer. This bycatch collection is used to determine an average weight per bycatch species. Finally, observers obtain a weight sample from each species caught for an average weight. These weight samples are collected either during the tally period or as close to it as possible. The average weight, coupled with the count, allows NMFS to estimate the total catch of each species (NMFS 2010a).

### ***Observer Sampling aboard Pot Vessels***

Observer-collected data aboard pot vessels consist of the following components. First, observers independently verify the number of pots in each set. The number of segments of gear in an individual set is verified on a regular basis, specifically, observers compare their own observations to the vessel logbook to verify that the logbook information regarding total segments in a set is reliable. Then, observers select specific pots to sample following a random sampling methodology. When these selected pots are retrieved, observers count and weigh everything caught in the selected pot, including PSC. Most observers find that they can sample at least 1/3 of a set and still have time to complete their other sampling duties (2011 Observer Program Sampling Manual). This sample collection is used to determine an average weight per species. The average weight, coupled with the count, allows NMFS to estimate the total catch of each species (NMFS 2010a).

### 5.3 PIBKC sampling protocol under a trigger closure

Any of the trigger closures under consideration would challenge NMFS' ability to monitor a small amount of bycatch of a relatively rare species. NMFS' current process to account for PSC relies on observer sampling and rare events create special difficulties in a sampling environment. Given current sample sizes in diverse fisheries, the probability of detection of a rare species in any single sample is low. Thus, NMFS would likely see many zeros in the samples for blue king crab, followed by an occasional sample with a number of animals which could then expand to a large number when multiplied by the total catch. Thus the overall estimate will be unbiased, but it may be imprecise<sup>4</sup>. This presents a challenge for NMFS since the infrequent occurrence of blue king crab in the samples limits the ability to predict when a limit will be reached. For example, one 2 KG crab in a 300 KG sample from a 30 MT haul would expand to an estimated 100 crab at 200 kg. Given the tight limitations on the numbers of crab being proposed for the PSC limit, a handful of crab in very few samples could account for the entire PSC limit. This may make it difficult to monitor a PSC limit and anticipate when the limit will be reached in time to take an inseason action.

Despite these limitations, the current sampled-based estimation provides an unbiased estimate and is the best approach. As such, under this action, *NMFS will continue to use the current observer sampling protocol*. Ideas about improving the estimation and issues associated with alternative approaches are provided below.

The quality of the data used for management could be improved by increasing the precision of the current estimates. Precision can generally be increased by taking more samples and by sampling more vessels. The current catch estimation processes provide point estimates without a measure of the error in those estimates. Analytical staff has been working to develop measures of uncertainty around existing catch estimates so that the quality of existing estimates can be informed. When complete, this will allow sound choices about investments in improving precision which can be predicted and measured. From past work, we know that the majority of variability is between vessels so increasing the number of vessels sampled would improve estimation.

The observer restructuring analysis articulated the long term goal of documenting the precision of catch estimates in order to improve and inform choices about the allocation of limited observer resources. As discussed in the observer coverage section, almost all (97-99%) of the groundfish catch in the Pribilof blue king crab district will be observed under the restructured observer program due to the full observer coverage requirements on all CPs. Thus, improved precision in the point estimates for CPs will be accomplished through that action.

In lieu of sampling, a census could be conducted to monitor blue king crab PSC in groundfish fisheries. The Council could recommend a census under any trigger closure alternative. A census, by definition, means sorting and counting every blue king crab from every haul, set, or pot. The advantage of a census is that counting every crab eliminates the need to estimate catch and thus eliminates concerns about imprecision. However, a critical disadvantage to a census is that if any crabs are missed, the census will be biased low. As the catch composition in the fishery is diverse, NMFS expects that observer labor would need to be devoted to composition sampling. Thus, vessel crew would need to sort all crab, and camera monitoring of that activity would be required to ensure sorting occurred. Observers would then need to separate the blue king crab from other species, and count and weigh them. The time dedicated to this activity would likely increase the mortality of the crab as returning them to the sea would be delayed. Moreover, full observer coverage would be needed at processing plants to ensure that all crabs are counted.

Starting January 20, 2011, NMFS implemented a census approach for salmon PSC in the Bering Sea pollock

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<sup>4</sup> No specific analysis of the precision of the blue king crab estimate was conducted for this analysis due to time constraints for production of the analysis and thus the comments about precision are general based on previous work. NMFS and the Council would be helped in the future by an analysis of the precision of the current blue king crab estimates. This is particularly the case where the Council would like to see improvements in the estimates.

fishery. So far, the approach appears to be successful, but it is labor and cost intensive for NMFS and the industry. Because a census involves sorting and counting every animal from every haul, set, or pot, intensive and ongoing monitoring measures are needed to ensure the census is correct. Using the Chinook salmon census in the BS pollock fishery as a model, a census approach for blue king crab with observer verification would likely require:

- at least 100 percent coverage of all vessels which participated in this fishery with the potential for 200 percent for vessels with 24 hours per day operations;
- crew responsibilities to sort and set all crab aside for observer identification, counting and weighing;
- dedicated space on the vessels for crab to be stored prior to observer conducting crab identification, counting, and weighing;
- video systems to verify that the crab catch was being sorted and retained for the observer identification and counts.
- mechanisms to ensure that no blue king crab were being sorted and discard by crew;
- full observer coverage at processing plants to ensure that no blue king crab were missed in the vessel sorting;
- electronic reporting to NMFS via the NMFS ATLAS computer software and logbooks in order to monitor the small limit in real time.

An observer verified census approach in a single fishery such as pollock where the catch is relatively consistent may not provide the best model for this action. It is not clear what would be required to enable a practical census approach for blue king crab on vessels where catch can be diverse. If it is even logistically feasible, there would likely be a high NMFS overhead cost in a census approach for managing and monitoring camera systems, observers, the resulting data, and in working with industry members to ensure their responsibilities are completed correctly. However, these costs have not been fully identified or analyzed.

The systems and accounting mechanisms for a census could be required at all times, or they could be required only when fishing in the area of concern. If required only when fishing in the area of concern, NMFS would also need to engineer the internal catch accounting system to utilize the census within the defined areas, and combine it with the existing estimation processes outside of them. The ability to switch back and forth between sampling protocols would make it logistically challenging for observers, and mechanisms would need to be developed to facilitate observer data collection to ensure the quality of the data. In addition, the use of a census would require design changes to the NMFS observer data reporting applications, logbooks, and data storage and processing systems.

All of the implementation issues and costs associated with an observer verified census approach, along with the higher levels of observer coverage necessary for such an approach, would need to be considered relative to implementation of the restructured observer program. **In summary, NMFS will continue to use the current observer sampling protocol, and the agency does not recommend increasing observer coverage beyond that which will occur under the restructured program.**

## **6. Annual Catch Limits and Preventing Overfishing**

### **6.1 Accountability Measures**

The National Standard One guidelines require accountability measures in fisheries management to prevent exceeding ACLs (74 FR 3178, January 16, 2009). For PIBKC, the ABC is the ACL. Accountability measures may be applied within the fishery season or applied at the end of the fishery year, depending on the availability of information for making management decisions and the nature of the management for a particular fishery. One accountability measure currently implemented for the PIBKC is the closure of this fishery to directed fishing on this stock. This limits the catch of PIBKC to PSC in other fisheries.

Under the PPA, the accountability measures for the PIBKC ACL include a year-round closure to Pacific cod pot fishing in the Pribilof Islands Habitat Conservation Zone. In addition, a larger area closure, representing the 1984 to 2009 distribution of PIBKC, would be subject to a trigger closure when the PSC limit is reached. The PSC limit is 75% of the ABC allocated by gear type to the following: 45% trawl fisheries, 45% pot fisheries, and 30% hook-and-line fisheries. These accountability measures would be implemented in the yellowfin sole, Pacific cod pot, and Pacific cod hook-and-line fisheries. Total catch of PIBKC (including research and discards in groundfish and other fisheries) is applied to the PIBKC ACL when determining compliance with the National Standard One guidelines. If the ACL is exceeded more than once in four years, under National Standard One guidelines, the accountability measures should be re-evaluated by the Council.

If the PSC limit allocated to a specific fishery is reached, the appropriate accountability measures would be implemented for the specific fishery (trawl, pot, or hook-and-line) in the 1984 to 2009 distribution area during the fishing season. As this proposed action is likely to occur in the same timeframe as implementation of the restructured observer program, additional observer data would provide a better foundation of information to ascertain more specifically where and how much PIBKC PSC is occurring in groundfish and halibut fisheries, allowing for more precise identification of fisheries that should be managed to prevent potential exceedences of the PIBKC ACL and to identify appropriate management measures for these fisheries. If the ACL for PIBKC is exceeded more than once in 4 years, NMFS would work with the Council to evaluate the accountability measures and any new information from the restructured observer program to determine any changes that may be necessary to prevent future exceedences of the PIBKC ACL.

## **6.2 Preventing Overfishing**

Under status quo, there is no mechanism to prevent overfishing. The OFL corresponds to the five year average of bycatch in groundfish and crab fisheries from 1999/2000-2005/2006. There were years when catch was higher than or near the OFL, so presumably catch could exceed the OFL again in the future without a mechanism to control bycatch. The historical average bycatch estimates contained a certain amount of variation that was a result of both at-sea sampling and catch accounting rate extrapolation.

The area closure alternatives reduce the risk of overfishing by closing the areas where blue king crab PSC occurs, but overfishing could still occur due to PSC outside of the closure area. The risk of overfishing would decrease as the size of the closed area increases, assuming the PIBKC concentrations do not shift out of the closure area.

A PSC limit with a trigger closure is a way to allow fishing in a given area while monitoring catch and closing the fishery to prevent exceeding the PSC limit. The trigger closures are intended to control catch to below the PSC limit. However, the PSC limits under the trigger closure alternatives are very small, which poses problems in managing to the PSC limit and in preventing overfishing. The trigger closure alternatives do reduce the risk of overfishing relative to status quo, but, given the small cap numbers, the risk still exists. The risk still exists because the OFL is very low and even an apparently large buffer of 75% of the ABC would equate to an actual buffer of approximately 486 crabs (1,300 lb). In addition, given the small sector caps for the trigger closures and natural delay between when catch is actually observed and inseason is able to manage with the estimate, there is about a 1 week time lag that inseason must contend with when forecasting area closures. Therefore, the PSC limit could be reached quickly and without much warning, so there may not be enough time for inseason to respond by closing the fishery. And, during this time lag, there is the potential that catch could not only exceed the PSC limit but exceed the ACL and even the OFL. Additionally, the ACL or OFL could be exceeded after NMFS closes the trigger area by PIBKC PSC outside of the closure area.

None of the trigger closure alternatives address these risks of exceeding the OFL. National Standard 1 Guidelines recommend that a rebuilding plan have accountability measures that prevent overfishing (74 FR 3178, January 16, 2009). If the stock is overfished and experiencing overfishing, then the plan must include provisions to immediately end overfishing. At this time, the PIBKC stock is not experiencing overfishing (NPFMC 2011 Crab SAFE), and therefore, the rebuilding plan is not required to have mechanisms to immediately end overfishing.

Absent a specific provision in the proposed action, if overfishing occurred, NMFS would immediately inform the Council and NMFS would need to take action to immediately end overfishing. NMFS does have authority to make an inseason adjustment under 679.25 to close areas to directed fishing for specified groundfish species if the closures are necessary to prevent excessive prohibited species bycatch. Another option would be to include a provision that if overfishing occurred in a given year, the trigger closure area would remain closed in the following year.

## **7. Enforcing Directed Fishing Closures in Special Management Areas**

The closures proposed in the PPA allow some fishing for groundfish in both the existing PIHCZ and the proposed PIBKC Savings Area, while prohibiting other directed fisheries. The PIHCZ currently is closed to vessels using trawl gear. The PPA would add closure of this area to vessels directed fishing for Pacific cod using pot gear, but not to other directed fisheries using pot gear. In addition, the trigger caps proposed for the PIBKC Savings Area could lead to closure of the area to directed fishing for Pacific cod by vessels using hook-and-line or pot gear, and directed fishing for yellowfin sole by vessels using trawl gear, while the area remained open to other directed fisheries. These types of closures require NMFS or the USCG to determine what species or species group a vessel operator is directed fishing for in areas that are different from the larger Federal reporting area (e.g., "special management areas"). Similar types of triggered closures of special management areas exist for all of the other PSC species, except halibut (i.e. the chum salmon savings area, the red king crab savings area, the red king crab savings subarea, the herring savings areas, etc.)

Monitoring, management, and enforcement of the area closures in the PPA would be similar to the process currently used to monitor, close, and enforce existing triggered area closures. Determining what a vessel operator is directed fishing is based on several different data sources, including the vessel operator's reports of retained catch on board, landed catch weight, observer reports, and VMS data. A VMS is required on Pacific cod trawl, hook-and-line, and pot vessels operating in the Bering Sea. Observer coverage is 100 percent for AFA and Amendment 80 vessels, and at the same or lower levels for other nonpelagic trawl vessels in the flatfish fisheries depending on vessel size. VMS data is helpful to determine vessel location in relation to closure areas, but it may not conclusively indicate whether a vessel is fishing, transiting through a closed area, or targeting a particular species. Location information for a vessel without VMS or an observer would be available from eLanding reports. Increased observer coverage under the restructured observer program may provide additional vessel location data for determining compliance with closure areas.

When an area is closed to directed fishing for some species or species groups, but open for others, maximum retainable amounts (MRAs) are the primary tool to make a determination about what directed fishery or fisheries a vessel has been participating in. Regulations at § 679.20(e) and (f) and Table 11 to 50 CFR part 679 establish MRA percentages for groundfish species and species groups in the BSAI. MRAs are used to allow some retention of a species or species group closed to directed fishing (incidental species) while catching groundfish species or species groups open to directed fishing (basis species). An MRA is the maximum round weight of an incidental species or species group, closed to directed fishing, that may be retained onboard a vessel. Compliance with an MRA is determined by comparing the round weight of incidental species retained to the round weight of basis species retained. The percent of incidental species or species group retained in relation to the basis species must not exceed the MRAs listed in Table 11. For example, the MRA for Pacific cod as an incidental species, caught in a directed fishery for rock sole as a basis species, is 20 percent. When rock sole is open to directed fishing and Pacific cod is closed to directed fishing, a vessel operator may retain at any point in time during a fishing trip an amount of Pacific cod up to 20 percent of the amount of round weight equivalent of rock sole that is onboard the vessel. All incidental catch of Pacific cod in excess of the 20 percent MRA must be discarded.

*For catcher vessels*, the maximum retainable amount for vessels fishing during a fishing trip in areas closed to directed fishing is the lowest maximum retainable amount applicable in any area, and this maximum retainable

amount must be applied at any time and to all areas for the duration of the fishing trip. *For catcher/processors*, MRAs apply at any point in time for the duration of the fishing trip. The only exception is that for non-AFA trawl catcher/processors, the MRA for pollock is calculated at the end of each offload.

To properly account for compliance with directed fishing closures in the PIHCZ and the PIBKC Savings Area, NMFS may need to revise catcher vessel logbooks to add information about whether the vessel fished within one of these areas during a time when a directed fishing closure applied to vessels using the particular gear type. This information would assist vessel operators and enforcement officers in determining which MRA should apply to the entire trip.

Compliance with MRAs for catcher/processors is based on retained catch onboard the vessel either at any point in time or, in some cases, at the time of offload. This information is submitted to NMFS electronically in a daily production report in eLandings. The daily production report, which includes an MRA worksheet, would be modified by NMFS to add the new special areas of the PIHCZ and the PIBKC Savings Area that may have different directed fishing closures. The addition of the new special areas to eLandings would allow vessel operators to calculate and record retained catch onboard from areas with different directed fishing closures and maximum retainable amounts. No regulatory revisions are needed to add special areas to the daily production report and the MRA worksheet.



10 Figures

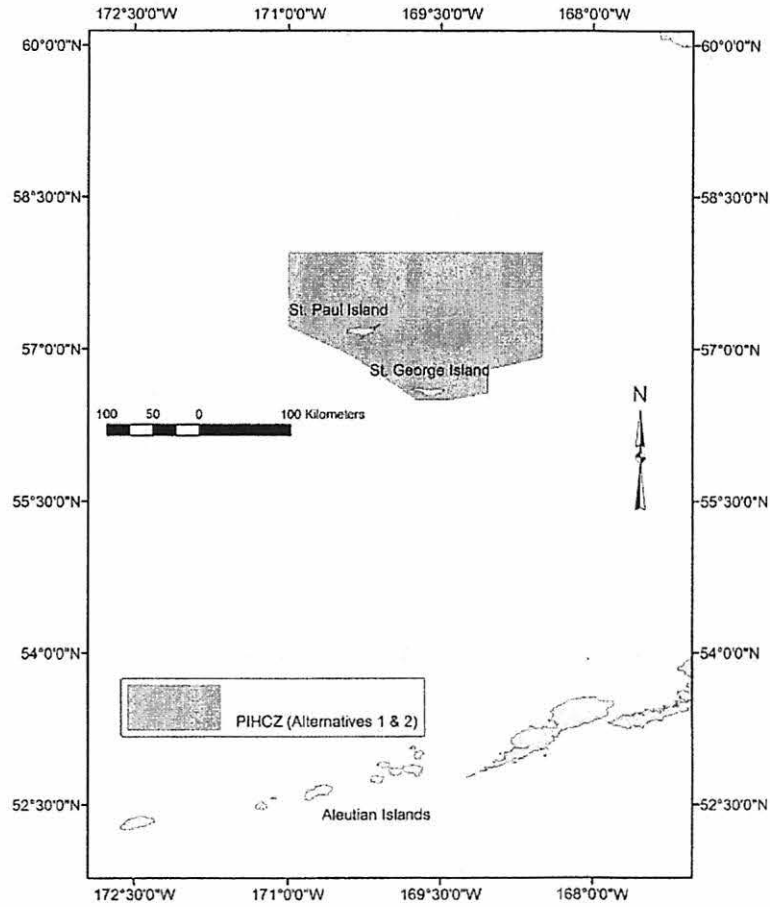
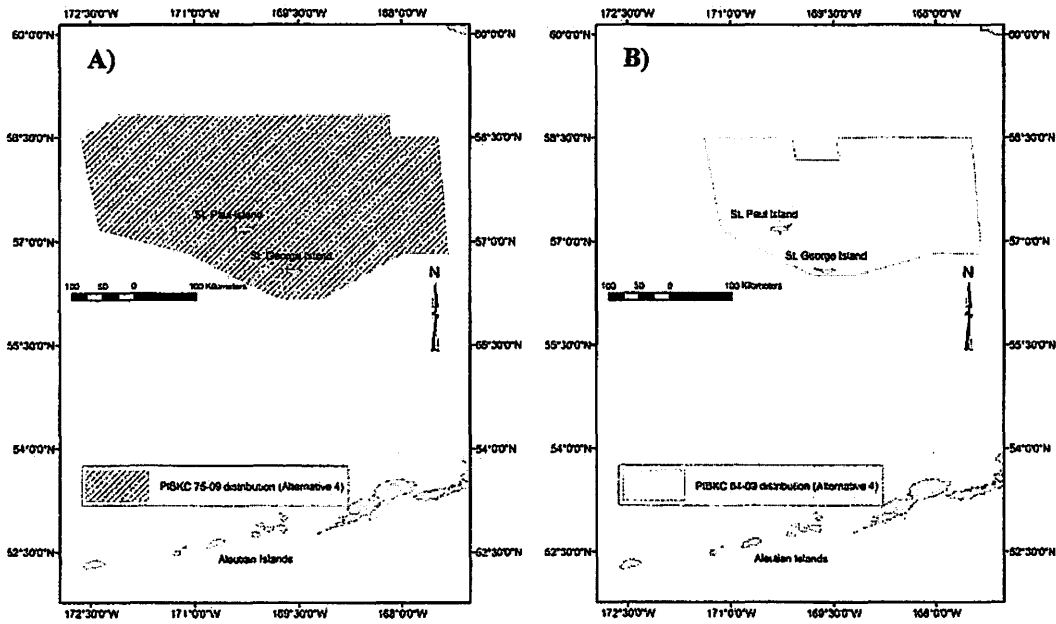
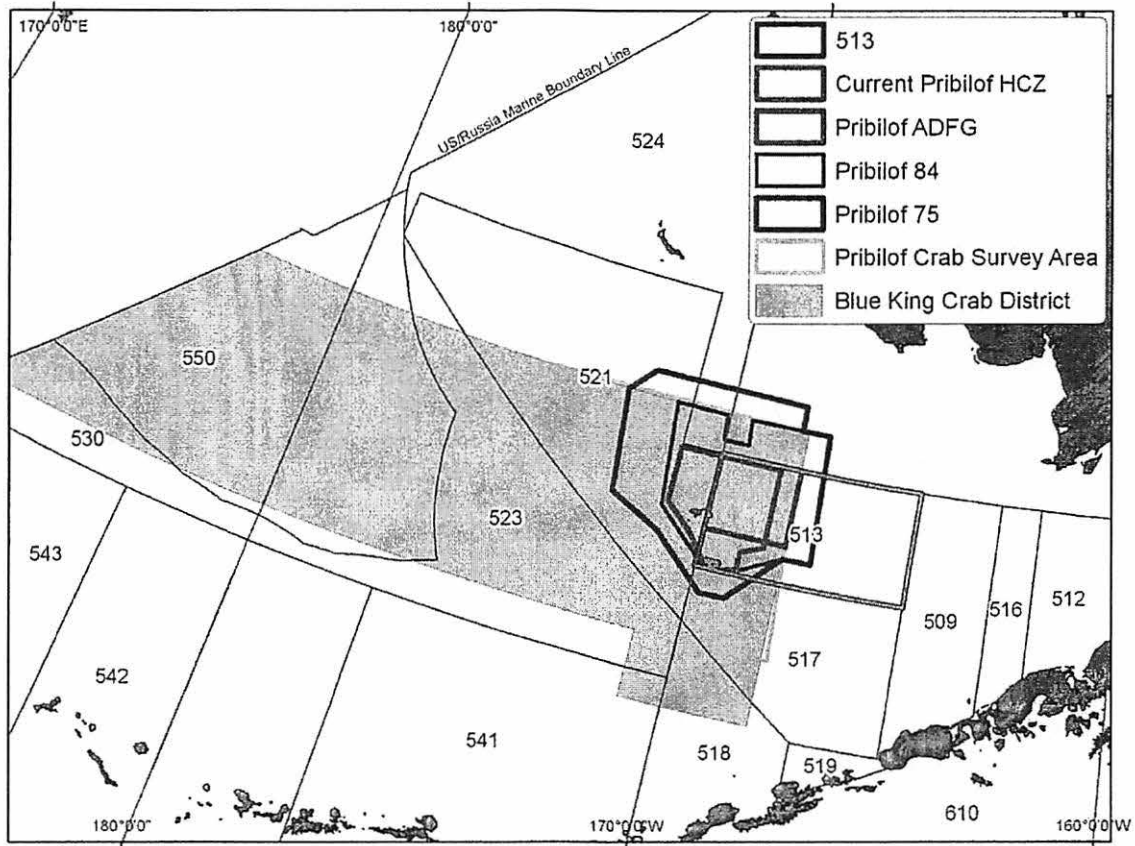


Figure 10-1 Pribilof Islands Habitat Conservation Zone (PIHCZ): Alternatives 1 and 2.



**Figure 10-3 Pribilof Islands blue king crab distribution closure area (Alternative 4): A) 1975 to 1983 distribution; B) 1984 to 2009 distribution.**



**Figure 10-13** Proposed closures overlaid on National Marine Fisheries Service federal reporting areas. Note as an interim measure for the assessment determination of overfishing annually for bycatch accrual currently only Area 513 is counted. The Pribilof District is shown in the shaded area. In the future, bycatch of PIBKC will accrue only from the shaded Pribilof District.