

## 8 Aleutian Islands Golden King Crab

### *Fishery information relative to OFL setting*

The directed fishery has been prosecuted annually since the 1981/82 season. Retained catch peaked in 1986/87 at 6,696 t and averaged 5,398 t over the 1985/86-1989/90 seasons. Average harvests dropped sharply to 3,130 t for the period 1990/91–1995/96. Management based on a formally established GHLL began with the 1996/97 season. A GHLL of 2,676 t was established for the 1996/97 season based on the previous five-year average catch. The GHLL has been relatively stable and was 2,853 t for the 2012/13–2015/16 seasons. The retained catch for 2014/15 was 2,771 t.

This fishery is rationalized under the Crab Rationalization Program. The management area currently includes waters west of 164° 44' W, separated into eastern and western areas at 174° W. The maximum total allowable catch (TAC) is 1,501 t east of 174° W and 1,352 t west of 174° W. In the 2014/15 season, the harvest of 1,554 t slightly exceeded the TAC in the eastern area as cost recovery catches were not considered as part of the TAC, but are included in estimates of retained catch and total catch. The 2014/15 harvest of 1,217 t in the western area was slightly less than the TAC. The 2015/16 season ended by regulation on 30 April 2016 and data are not available at this time.

Non-retained bycatch occurs mainly in the directed fishery, and to a minor extent in other crab fisheries. Bycatch also occurs in fixed-gear and trawl groundfish fisheries although that bycatch is low relative to the weight of bycatch in the directed fishery. The annual non-retained catch of golden king crab during crab fisheries has decreased relative to the retained catch since the 1990s. Bycatch was just over 1,514 t (55% of the retained catch) for 2014/15. The bycatch mortality rates for king crab were assumed to be 0.20 for all crab fisheries, 0.50 for fixed gear during groundfish fisheries, and 0.80 for groundfish trawl fisheries. Bycatch mortality in the crab fisheries and groundfish fisheries was 307.9 t for the 2014/15 season. Estimated total mortality (retained catch plus bycatch in crab and groundfish fisheries) in 2014/15 was 3,079 t.

### *Data and assessment methodology*

Available data for assessment are from ADF&G fish tickets (retained catch numbers, retained catch weight, and pot lifts by ADF&G statistical area and landing date), size-frequencies from samples of landed crab, at-sea observations from pot lifts sampled during the fishery (date, location, soak time, catch composition, size, sex, and reproductive condition of crabs, etc.), and bycatch estimates from the groundfish fisheries. These data are available through the 2014/15 season; complete data from the 2015/16 fishery season, which ended on 30 April 2016, are not currently available. Most of the available data were obtained from the directed fishery which targets legal-size ( $\geq 6$ -inch CW) males, and trends in the data can be affected by changes in both fishery practices and the stock. Data from historical triennial pot surveys (last performed in 2006) in the Yunaska-Amukta Island area of the Aleutian Islands, approximately 171° W longitude, and tag recoveries from crabs released during the triennial pot surveys are also available. The triennial survey was too limited in geographic scope and too infrequent to provide a reliable index of abundance for the Aleutian Islands area. A new survey, as well as a model-based assessment, are currently being developed for this stock.

### *Stock biomass and recruitment trends*

Although a model-based stock assessment is in development, it has not yet been accepted for use in management. There are consequently no estimates of stock biomass. Estimates of recruitment and stock abundance relative to historical levels are also not available.

### *Summary of major changes*

Fishery data have been updated with the results for 2014/15: retained catch for the directed fishery and

bycatch estimates for the directed fishery, non-directed crab fisheries, and groundfish fisheries.

*Tier determination/Plan Team discussion and resulting OFL and ABC determination*

The CPT recommends that this stock be managed as a Tier 5 stock in 2016/17;  $B_{MSY}$  and MSST are not estimated for this stock. Observer data on bycatch from the directed fishery and groundfish fisheries provides the estimate of total bycatch mortality. Bycatch data from the directed fishery for years after the 1990/91 season (excluding 1993/94 and 1994/95 seasons due to insufficient data) and from the groundfish fisheries since the 1993/94 season were used. There are no directed fishery observer data prior to the 1988/89 season and observer data are lacking or confidential for four seasons in at least one management area in the Aleutian Islands during 1988/89–1994/95.

This assessment author recommended using the same approach for determining the 2016/17 total catch OFL as had been used to determine the total catch OFL since 2012/13. This approach uses data for 1985/86–1995/96 to estimate the mean retained catch in the crab fisheries, and bycatch data for 1990/91–95/96 to estimate the mean bycatch rate (0.363):

$$OFL_{2016/17} = (1 + R_{90/91-95/96}) \cdot RET_{85/86-95/96} + BM_{GF,93/94-08/09} = 5,689 \text{ t (12,542,830 lb)}$$

where,

- $R_{90/91-95/96}$  is the average of the annual ratios of bycatch mortality due to crab fisheries to retained catch in pounds over the period of the subscribed years, excluding 1993/94–1994/95 due to data confidentiality and lack of data,
- $RET_{85/86-95/96}$  is the average annual retained catch in the directed crab fishery over the period 1985/86–1995/96), and
- $BM_{GF,93/94-08/09}$  is the average of the annual estimates of bycatch mortality due to groundfish fisheries over the period 1993/94–2008/09.

A buffer of 25% between the OFL and ABC has been used since 2014/15. Therefore the CPT recommends an ABC of 4,267 t (9,407,122 lb).

*Status and catch specifications (1000 t) of Aleutian Islands golden king crab*

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2012/13	N/A	N/A	2.85	2.84	3.12	5.69	5.12
2013/14	N/A	N/A	2.85	2.89	3.19	5.69	5.12
2014/15	N/A	N/A	2.85	2.77	3.08	5.69	4.26
2015/16	N/A	N/A	2.85			5.69	4.26
2016/17	N/A	N/A				5.69	4.26

a.

*Status and catch specifications (million lb) of Aleutian Islands golden king crab*

<b>Year</b>	<b>MSST</b>	<b>Biomass (MMB)</b>	<b>TAC</b>	<b>Retained Catch</b>	<b>Total Catch</b>	<b>OFL</b>	<b>ABC</b>
2012/13	N/A	N/A	6.29	6.27	6.87	12.54	11.28
2013/14	N/A	N/A	6.29	6.38	7.04	12.54	11.28
2014/15	N/A	N/A	6.29	6.11	6.79	12.53	9.40
2015/16	N/A	N/A	6.29			12.53	9.40
2016/17	N/A	N/A				12.53	9.40

Overfishing did not occur during 2014/15 because the estimated total catch did not exceed the Tier 5 overfishing limit (OFL) of 5,685 t (12.54-million lb). The total catch did not exceed the ABC established for 2014/15 (4,267 t, or 9.40-million lb). The OFL and ABC values for 2015/16 in the table above are the values that have been recommended by the SSC since June 2014. The 2015/16 TAC was established by ADF&G on 15 July 2015. The TACs in the table above do not include landings towards a cost-recovery fishing goal to cover costs of observer deployments in the fishery; the totals for retained and total catches do include the catches from cost-recovery fisheries.

#### *Additional Plan Team recommendations*

The CPT reviewed progress on a model-based assessment for Aleutian Islands golden king crab. The preliminary model will be presented to the SSC in June 2016 and again to the CPT in September 2016. CPT recommendations on the model-based assessment are contained in the May 2016 CPT Report.

## 9 Pribilof District Golden King Crab

### *Fishery information relative to OFL setting*

The Pribilof District golden king crab fishery began in the 1981/82 season. The directed fishery mainly occurs in Pribilof Canyon of the continental slope. Peak directed harvest was 388 t (0.856-million lb) by 50 vessels during the 1983/84 season; fishery participation has since been sporadic and retained catches have varied from 0 to 155 t (0.342-million lb). The fishing season is based on a calendar year. A guideline harvest level (GHL) was first established in 1999 at 91 t (0.200-million lb). The GHL was reduced to 68 t (0.150-million lb) for 2000 – 2014 and reduced to 59 t (0.130-million lb) in 2015 to ensure that catch remains below the ABC. No directed fishery occurred during 2006–2009 nor in 2015. One vessel landed catch in 2010, two vessels landed catch in 2011, and one vessel landed catch each year from 2012 to 2014. Data from the directed fishery since 2003 cannot be reported under state confidentiality regulations; however, the GHL has not been reached. Non-retained bycatch occurs in the directed fishery and can occur in the eastern Bering Sea snow crab fishery, Bering Sea grooved Tanner crab fishery, and Bering Sea groundfish fisheries. Estimated fishing mortality from 2001 to 2014 due to directed and non-directed crab fisheries ranged from 0 to 73 t (0.160 million lb). Bycatch mortality in the groundfish fisheries ranged from < 1 t (0.001 million lb) to 8.8 t (0.019 million lb) from 1991/92 to 2014/15.

### *Data and assessment methodology*

There is no assessment model for this stock. Available data include: fish ticket and observer data, size-frequency data from samples of landed crabs and pot lifts sampled during the fishery, and bycatch estimates from the groundfish fisheries. Much of the directed fishery data are confidential due to low participation levels. Data from the NMFS slope survey is being evaluated for use in this assessment.

### *Stock biomass and recruitment trends*

There is no stock biomass data used in this Tier 5 assessment.

### *Tier determination/Plan Team discussion and resulting OFL and ABC determination*

The CPT recommends this stock be managed under Tier 5 in 2017. The CPT concurs with the author's recommended status quo OFL of 93 t (0.20 million lb) and an ABC of 70 t (0.15 million lb). The ABC was derived by applying a 25% buffer of the OFL, the same buffer used for other Tier 5 stocks with similar levels of concern. The 2017 OFL calculation is the same as recommended by the SSC for 2012–2016, though the conversion from pounds to metric tons was calculated from whole pounds (204,527 lb) rather than by first rounding to the nearest 0.01-million lb:

$$\text{OFL}_{2016} = (1 + R_{2001-2010}) * \text{RET}_{1993-1998} + \text{BM}_{\text{NC},1994-1998} + \text{BM}_{\text{GF},1992/93-1998/99}$$

where,

- $R_{2001-2010}$  is the average of the estimated annual ratio of lb of bycatch mortality to lb of retained in the directed fishery during 2001–2010.
- $\text{RET}_{1993-1998}$  is the average annual retained catch in the directed crab fishery during 1993–1998.
- $\text{BM}_{\text{NC},1994-1998}$  is the estimated average annual bycatch mortality in non-directed crab fisheries during 1994–1998.
- $\text{BM}_{\text{GF},1992/93-1998/99}$  is the estimated average annual bycatch mortality in groundfish fisheries during 1992/93–1998/99.

*Status and catch specifications (t) of Pribilof District golden king crab*

Year	MSST	Biomass (MMB)	GHL <sup>a</sup>	Retained Catch	Total Catch	OFL	ABC
2013	N/A	N/A	68	Conf. <sup>c</sup>	Conf. <sup>c</sup>	91	82
2014	N/A	N/A	68	Conf. <sup>c</sup>	Conf. <sup>c</sup>	91	82
2015	N/A	N/A	59	0		91	68
2016	N/A	N/A	59			91	68
2017	N/A	N/A	59			93	70

N/A = not available

- Guideline harvest level, established in lb and converted to t.
- Total retained catch plus estimated bycatch mortality of discarded catch during crab fisheries only. Bycatch mortality due to groundfish fisheries is not included here because available data are summarized by “crab fishery year” rather than calendar year; estimates of annual bycatch mortality during 1991/92 – 2014/15 groundfish fisheries are  $\leq 9$  t, with an average of 2 t.
- Confidential under Sec. 16.05.815 (SOA statute). GHL not attained.

*Status and catch specifications (lb) of Pribilof District golden king crab*

Year	MSST	Biomass (MMB)	GHL	Retained Catch	Total Catch	OFL	ABC
2013	N/A	N/A	150,000	Conf. <sup>c</sup>	Conf. <sup>c</sup>	0.20 <sup>d</sup>	0.18 <sup>d</sup>
2014	N/A	N/A	150,000	Conf. <sup>c</sup>	Conf. <sup>c</sup>	0.20 <sup>d</sup>	0.18 <sup>d</sup>
2015	N/A	N/A	130,000	0		0.20 <sup>d</sup>	0.15 <sup>d</sup>
2016	N/A	N/A	130,000			0.20 <sup>d</sup>	0.15 <sup>d</sup>
2017	N/A	N/A				204,527	153,395

N/A = not available

- Guideline harvest level.
- Total retained catch plus estimated bycatch mortality of discarded catch during crab fisheries only. Bycatch mortality due to groundfish fisheries is not included here because available data are summarized by “crab fishery year” rather than calendar year; estimates of annual bycatch mortality during 1991/92 – 2014/15 groundfish fisheries are  $\leq 19,480$  lb, with an average of 5,101 lb.
- Confidential under Sec. 16.05.815 (SOA statute). GHL not attained.
- Established in millions of lb to the nearest 0.01-million lb.

## 10 Western Aleutian Islands red king crab

### *Fishery information relative to OFL and ABC setting*

The domestic fishery was opened every season from 1960/61 to 1995/96. After 1995/96, the fishery was opened only in 1998/99, and from 2000/01 to 2003/04. The fishery has been closed since the end of the 2003/04 season. Peak harvest occurred during the 1964/65 season with a retained catch of 21.19 million lb. During the early years of the fishery through the late 1970s, most or all of the retained catch was harvested in the area between 172° W longitude and 179° W longitude. As the annual retained catch decreased into the mid-1970s and the early-1980s, a large portion of the retained catch came from the area west of 179° W longitude.

Retained catch from 1985/86 to 1994/95 averaged 0.94 million lb, but the retained catch during the 1995/96 season dropped to 0.04 million lb. Most of the catch since the 1990/91 season was harvested in the Petrel Bank area (between 179° W longitude and 179° E longitude) and the last two commercial fishery seasons (2002/03 and 2003/04) were opened only in the Petrel Bank area. Retained catches in those two seasons were 0.51 million lb (2002/03) and 0.48 million lb (2003/04).

Non-retained catch of red king crabs occurs in both the directed red king crab fishery, the Aleutian Islands golden king crab fishery, and in groundfish fisheries. Estimated bycatch mortality during the 1995/96 to 2013/14 seasons averaged 0.002 million lb in crab fisheries and 0.018 million lb in groundfish fisheries. Estimated annual total fishing mortality from 1995/96 to 2013/14 averaged 0.087 million lb. The average retained catch during that period was 0.066 million lb. This fishery is rationalized under the Crab Rationalization Program only for the area west of 179° W longitude.

### *Data and assessment methodology*

The 1960/61 to 2007/08 time series of retained catch (number and pounds of crabs), effort (vessels, landings and pot lifts), average weight and average carapace length of landed crabs, and catch-per-unit effort (number of crabs per pot lift) are available. Bycatch from crab fisheries from 1995/96 to 2014/15 and from groundfish fisheries from 1993/94 to 2014/15 are available. There is no assessment model for this stock. The standardized surveys of the Petrel Bank area conducted by ADF&G in 2006 and 2009 and the ADF&G-Industry Petrel Bank surveys conducted in 2001 were too limited in geographic scope and too infrequent for reliable estimation of abundance for the entire western Aleutian Islands area.

### *Stock biomass and recruitment trends*

Estimates of stock biomass are not available for this stock. Estimates of recruitment and stock abundance relative to historic levels are not available. The fishery has been closed since 2003/04 due to apparent poor recruitment. A 2009 survey conducted by ADF&G in the Petrel Bank area encountered an ageing population of legal male crab occurring in a more limited area and at lower densities than were found in a 2006 survey and provided no expectations for recruitment. A test fishery conducted by a commercial vessel during October-December 2009 in the area west of Petrel Bank yielded only one legal male red king crab.

In September 2015, industry and ADF&G worked cooperatively to perform a “reconnaissance survey” for red king crab in the vicinity of Adak during the 2015/16 Aleutian Islands golden king crab fishery. There was no retention of red king crab, but handling mortality was accounted for in the 2016/17 assessment. The reconnaissance survey found a low number of red king crab, out of a total of 730 pot pulls, 442 red king crab were found of which only 23 were legal males (Hilsinger et al., 2016).

*Tier determination/Plan Team discussion and resulting OFL and ABC determination*

The CPT recommends that this stock be managed under Tier 5 for the 2016/17 season. The CPT concurs with the assessment author's recommendation of an OFL based on the 1995/96–2007/08 average total catch following the recommendation of the SSC in June 2010 to set the time period for computing the OFL at 1995/96–2007/08. The CPT recommends an OFL for 2016/17 of 0.12 million lb.

The CPT continues to have concerns regarding the depleted condition of this stock. Groundfish bycatch in recent years has accounted for the majority of the total catch. The CPT recommends an ABC of 0.074 million lb for 2016/17, which is below the maximum permissible ABC of 0.11 million lb; equivalent to a 40% buffer.

*Status and catch specifications t of Western Aleutian Islands red king crab*

<b>Year</b>	<b>MSST</b>	<b>Biomass (MMB)</b>	<b>TAC</b>	<b>Retained Catch</b>	<b>Total Catch</b>	<b>OFL</b>	<b>ABC</b>
2012/13	N/A	N/A	Closed	0	<1	56	32
2013/14	N/A	N/A	Closed	0	<1	56	32
2014/15	N/A	N/A	Closed	0	<1	56	32
2015/16	N/A	N/A	Closed	0		56	32
2016/17						56	32

*Status and catch specifications (millions lb) of Western Aleutian Islands red king crab*

<b>Year</b>	<b>MSST</b>	<b>Biomass (MMB)</b>	<b>TAC</b>	<b>Retained Catch</b>	<b>Total Catch</b>	<b>OFL</b>	<b>ABC</b>
2012/13	N/A	N/A	Closed	0	<0.001	0.12	0.07
2013/14	N/A	N/A	Closed	0	<0.001	0.12	0.07
2014/15	N/A	N/A	Closed	0	<0.001	0.12	0.07
2015/16	N/A	N/A	Closed	0		0.12	0.07
2016/17						0.12	0.07

Overfishing did not occur during 2014/15; the estimated total catch did not exceed the Tier 5 OFL of 0.12-million lb (56 t). The total catch did not exceed the ABC established for 2014/15 (0.7-million lb, or 34 t). The OFL and ABC values for 2015/16 in the tables below are the values recommended by the SSC in June 2015. Data for computing total catch relative to the 2015/16 OFL and ABC are not yet available. No determination has yet been made for a fishery opening or harvest level, if opened, for the 2016/17 season.

Table 3 Crab Plan Team recommendations for May 2016 (stocks 8-10). Shaded areas will be filled out for the final SAFE in September 2016. Note diagonal fill indicates parameters are not applicable for that tier.

Chapter	Stock	Tier	Status (a,b,c)	F <sub>OFL</sub>	B <sub>MSY</sub> or B <sub>MSYproxy</sub>	Years <sup>1</sup> (biomass or catch)	2016/17 <sup>2</sup> MMB	2016 MMB / MMB <sub>MSY</sub>	$\gamma$	Mortality (M)	2016/17 OFL	2016/17 ABC	ABC buffer (%)
1	EBS snow crab												
2	BB red king crab												
3	EBS Tanner crab												
4	Pribilof Islands red king crab												
5	Pribilof Islands blue king crab												
6	St. Matthew Island blue king crab												
7	Norton Sound red king crab												
8	Aleutian Islands golden king crab	5				See intro chapter					5.69	4.26	25%
9	Pribilof Islands golden king crab	5				See intro chapter					0.09	0.07	25%
10	WAI red king crab	5				1995/96–2007/08					0.05	0.03	40%

<sup>1</sup> For Tiers 3 and 4 where B<sub>MSY</sub> or B<sub>MSYproxy</sub> is estimable, the years refer to the time period over which the estimate is made. For Tier 5 stocks it is the years upon which the catch average for OFL is obtained.

<sup>2</sup> MMB as projected for 2/15/2017 at time of mating.

<sup>3</sup> Model mature biomass on 7/1/2016.



Table 4 Maximum permissible ABCs for 2016/17 and Crab Plan Team recommended ABCs for those stocks where the Plan Team recommendation is below the maximum permissible ABC as defined by Amendment 38 to the Crab FMP. Note that the rationale is provided in the individual introduction chapters for recommending an ABC less than the maximum permissible for these stocks.

Stock	Tier	2016/17 <i>Max</i> ABC (1000 t)	2016/17 ABC (1000 t)
EBS Snow Crab			
Bristol Bay red king crab			
EBS Tanner Crab			
Pribilof Islands red king crab			
Pribilof Islands blue king crab			
Saint Matthew blue king crab			
Norton Sound red king crab			
Aleutian Islands golden king crab	5	5.12	4.26
Pribilof Islands golden king crab <sup>1</sup>	5	0.08	0.07
WAI red king crab	5	0.05	0.03

<sup>1</sup> for Pribilof Islands golden king crab this is for the 2017 calendar year instead of the 2016-2017 crab fishing year.

Table 5. Stock status in relation to status determination criteria 2015/16. Shaded areas to be filled in for the final September 2016 SAFE. (Note diagonal fill indicates parameters not applicable for this tier level).

Chapter	Stock	Tier	MSST	BMSY or BMSY <sub>proxy</sub>	2014/15 <sup>5</sup> MMB	2014/15 MMB / MMB <sub>BMSY</sub>	2014/15 OFL 1000 t	2014/15 Total catch	Rebuilding Status
1	EBS snow crab								
2	BB red king crab								
3	EBS Tanner crab								
4	Pribilof Islands red king crab								
5	Pribilof Islands blue king crab								
6	St. Matthew Island blue king crab								
7	Norton Sound red king crab								
8	Aleutian Islands golden king crab	5					5.69		
9	Pribilof Islands golden king crab	5					0.09	Conf.	
10	WAI red king crab	5					0.054		

<sup>5</sup> MMB as estimated during this assessment for 2015/16 as of 2/15/2016.