

## **8 Aleutian Islands Golden King Crab**

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

The directed fishery has been prosecuted annually since the 1981/82 season. Management based on a formally established GHM began with the 1996/97 season. The Alaska Board of Fisheries adopted an abundance-based harvest strategy for the stock in March 2019. This fishery has been managed under the Crab Rationalization Program since 2005. Total mortality of AI golden king crab includes retained catch in the directed fishery, mortality of discarded catch, and bycatch in fixed-gear and trawl groundfish fisheries, though bycatch in other fisheries is low compared to mortality in the directed fishery. Total mortality in the post-rationalized fishery has ranged from 2,506 t in 2006/07 to 3,693 t in 2019/20.

### ***Data and assessment methodology***

The assessment for AI golden king crab establishes a single OFL and ABC for the whole stock. However, separate models are evaluated for the EAG and the WAG owing to different abundance trends in each area. The current modeling framework was recommended by the CPT in September 2016 and approved by the SSC in October 2016.

The model-based stock assessment involves fitting male-only population dynamics models to data on catches and discards in the directed fishery, discards in the groundfish fishery, standardized indices of abundance based on observer data, fish ticket data, length-frequency data for the directed fishery (landings and total catch), and mark-recapture data. This is the only crab assessment that relies solely on fishery CPUE as an index of abundance, with the CPUE index standardization process subject to past CPT and SSC review. The data for the EAG are complete through the 2019/20 season. The fishery in the WAG was still operating when the assessment was conducted, with 96% of the TAC taken.

The assessment authors examined six model scenarios for the EAG and three model scenarios for the WAG in this assessment cycle. Model 19.1 was last year's base model. Model 20.1b was the same as Model 19.1 except that the standardization of the Fish Ticket CPUE was based on a negative binomial error model. Model 20.1b is an improvement over last year's base model because it better accounts for the noise in the base model. The CPT recommends Model 20.1b with mean recruitment based on the estimates for years 1987-2012 for OFL and ABC determination for 2020/21.

### ***Stock biomass and recruitment trends***

Estimated mature male biomass (MMB) for the EAG decreased from high levels until the 1990s after which the trend has been increasing. In contrast, the MMB for the WAG increased from a low in the 1990s until 2007/08 and then declined again, and has since recovered to the MMB levels of those in the mid-2000s. Recruitment for the EAG was variable and high during 2014-2016 while recruitment for the WAG was lower in recent years than during the 1980s. Stock trends reflected the fishery standardized CPUE trends in both areas.

### ***Summary of major changes***

The assessment model recommended by the CPT is similar to the model used in the previous assessment. There were minor changes in the CPUE standardization for the Fish Ticket data that had minor effects on assessment results.

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

The CPT recommends that this stock be managed as a Tier 3 stock in 2020/21. A single OFL and ABC is defined for AIGKC. However, separate models are available by area. The CPT recommends that stock status be determined by adding the estimates of current MMB and  $B_{MSY}$  by area. This stock status is then used to determine the ratio of  $F_{OFL}$  to  $F_{35\%}$  by area, which is then used to calculate the OFLs by area, which are then added together to calculate an OFL for the entire stock. The SSC has concurred with this approach. The stock is currently estimated to be above  $B_{MSY}$  in both areas therefore no adjustment is needed to the  $F_{OFL}$  to determine the combined OFL for both areas. As in 2019, the CPT recommends that the  $B_{MSY}$  proxy for the Tier 3 harvest control rule be based on the average recruitment from 1987-2012, years for which recruitment estimates are relatively precise.

*Status and catch specifications (1000 t) for Aleutian Islands golden king crab. Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.*

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2016/17	N/A	N/A	2.515	2.593	2.947	5.69	4.26
2017/18	6.044	14.205	2.515	2.585	2.942	6.048	4.536
2018/19	5.880	17.848	2.883	2.965	3.355	5.514	4.136
2019/20	5.909	16.323	3.257	3.275	3.693	5.249	3.937
2020/21		14.774				4.798	3.599

*Status and catch specifications (million lb) for Aleutian Islands golden king crab. Shaded values are new estimates or projections based on the current assessment. Other table entries are based on historical assessments and are not updated except for total and retained catch.*

Year	MSST	Biomass (MMB)	TAC	Retained Catch	Total Catch	OFL	ABC
2016/17	N/A	N/A	5.545	5.716	6.497	12.53	9.40
2017/18	13.325	31.315	5.545	5.699	6.487	13.333	10.000
2018/19	12.964	39.348	6.356	6.536	7.396	12.157	9.118
2019/20	13.027	35.985	7.180	7.219	8.141	11.572	8.679
2020/21		32.571				10.579	7.934

At the time of the assessment, total fishery mortality in 2019/20 was 3,693 t, less than the OFL of 5,249 t, thus overfishing has not occurred. Final determination of overfishing status will be evaluated in the 2020 SAFE in September 2020.

***Additional Plan Team recommendations***

The CPT recommended additional development of fishery CPUE standardization, including further development of how to account for year-area interactions when constructing indices of abundance and their uncertainty. Work should continue to obtain an index using the cooperative pot survey data for use in the EAG assessment model. Finally, GMACS for the AIGKC assessment should be explored.