8. Aleutian Islands Golden King Crab

Note: This SAFE document has been revised from the original version released on May 5, 2025. Minor changes were made to figures and text to comply with confidentiality rules for the 2024 fishing year. Materials presented to the SSC and on which the SSC based their decisions were different than the revised version posted here.

Fishery information relative to OFL setting

During the 2024/25 fishery, the estimated retained catch was 2,215 kt (4.9 million lb), while the estimated total catch mortality was 2.341 kt (5.2 million lb). At the time of the 2024/25 assessment, the fishery in EAG was still operating (~1 trip) remaining) and the groundfish fisheries had not been completed, so the retained and total catch mortalities are estimates. These mortalities will be updated in September 2025.

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, *inter alia,* different abundance trends in each area. A Tier 3 modeling framework for AI golden king crab based on fisheries-only data was developed over several years starting in 2011 with model assumptions and data inputs refined by reviews by the SSC and CPT. This modeling framework was recommended for the assessment by the CPT in September 2016 and approved by the SSC in October 2016. The CPT endorsed, and the SSC subsequently approved, the GMACS model for this stock in January 2023, and GMACS formed the basis for the 2023, 2024, and the current assessment.

The model-based stock assessment involves fitting a male-only population dynamics model to data on catches and discards in the directed fishery, discards in the groundfish fishery, standardized indices of abundance based on observer and fish ticket data, length-frequency data for the directed fishery (landings and total catch), and mark-recapture data. The directed pot fishery in the EAG only and the groundfish fisheries in both areas were still operating when the assessment was conducted, but the difference in total catch mortality from that in the assessment is likely to be low. A cooperative survey was conducted by the Aleutian King Crab Research Foundation (an industry group) and ADF&G during the fishery in the EAG since 2016, and in the WAG during 2018 only. Indices based on the cooperative survey continue to not be included in the assessment.

The assessment author examined two models for the EAG and WAG this assessment cycle. Model 23.1c was the 2024 assessment model with updated catch and size-composition time series and a CPUE index based on fitting GAMs. This model started in 1960 in an equilibrium state, included three catchability periods, knife-edge male maturity size at 116 mm CL, M set to 0.22 yr^{-1}, a fixed period (1987–2021; updated from 1987-2020 for the 2023/24 assessment) for reference points calculation. Model 25.0b was model 23.1a with non-equilibrium initial (1981) conditions, equal emphasis on all catch likelihood components, and bootstrap estimated stage-1 effective sample sizes.

For the EAG, the two models provided very similar results. Both models fit the retained catch, total catch, and groundfish bycatch data well. Both models fit the standardized CPUE indices similarly, but the overall fits were poor, even though an aim of model 25.0b was to allow the model more flexibility to fit the CPUE data better. The fits to the retained catch and total catch size compositions were good, with the fits to the retained catch size compositions better than to the total catch size compositions.

For the WAG, the two models fit the respective catch data and standardized CPUE indices equally well and produced similar estimates for the recruitment and MMB time series. The models followed the trends in

standardized CPUE much better than the EAG models. As for the EAG, the fits to the retained catch and total catch size compositions were good, with the fits to the retained catch size compositions better than to the total catch size compositions.

The author-preferred model was 23.1c for both areas. Model 23.1c was recommended by the assessment author because the derived quantities for model 25.0b were somewhat sensitive to data weighting, without improved model performance (i.e., reduced evidence for a retrospective pattern for the EAG). The assessment reported the time-series of historical estimates of legal male abundance, which show a pattern of decreasing projected abundance over time. The exploitation rate on legal males in the WAG has now been found to have exceeded the maximum under the state harvest strategy.

Stock biomass and recruitment trends

Estimated mature male biomass (MMB) for the EAG decreased from the 1980s to the 1990s, then increased during the 2000s, decreased marginally during the early 2010s, increased from 2014 to 2022 and declined from 2023. Estimated MMB for the WAG decreased substantially during the late 1980s and 1990s, increased somewhat during the 2000s, decreased for several years after 2008 and has since declined steadily to a low in 2021 followed by slight increase since 2022. Recruitment to the EAG has declined from a high in 2017 to low but stable recruitment since 2021. Recruitment to the WAG has declined slowly since 1985, although 2023 and 2024 recruitment are the highest since 2013, but remain uncertain as they are still relatively poorly selected by the fishery.

Summary of major changes

The assessment model recommended by the CPT, Model 23.1c, is identical to the model used in the previous assessment, except that it is based on revised (and new) catch, size-composition data, no bias correction of recruitment deviations in years preceding data, and updated standardized CPUE time series.

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 2025/26. A single OFL and ABC is defined for AIGKC. However, separate models are available by area. During its May 2017 meeting, the CPT recommended that stock status be determined by adding the area-specific estimates of current MMB and B_{MSY} to ensure that there would only be one stock status for the AIGKC stock. However, area-specific stock status is 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 summed to calculate an OFL for the entire stock. The SSC has concurred with this approach. The CPT recommends that the B_{MSY} proxy for the Tier 3 harvest control rule be based on the average recruitment from 1987-2021, years for which recruitment estimates are relatively precise.

This is the only crab assessment that relies solely on fishery CPUE as an index of abundance. The CPUE index standardization process, subject to past CPT and SSC review, is a key reason for the 25% buffer between the OFL and the ABC used in past years. Concerns raised in recent assessments are summarized in the following table:

Concern	year expressed	CPT 2025 concern?	Reason
Only crab assessment that relies entirely on fishery CPUE as an index of abundance	2020	Yes	No change.

Uncertainty in natural mortality	2020	Yes	No change.
The limited spatial coverage of the fishery with respect to the total stock distribution	2020	Yes	No change.
The small number of vessels on which CPUE is based	2020	Yes	No change.
Retrospective pattern for the EAG	2020	Yes	No change
CPUE standardization is still subject to some methodological concerns	2020	Less	The data on which the standardization is based have been checked and improved diagnostics are now available.
Catches from the WAG that were not included in the assessment	2021	Yes	Only the total catch mortality was not final at the time of the assessment
Model convergence concerns reflecting potential parameter confounding (jitter analysis resulted in multiple solutions for MMB and $B_{35\%}$ at same likelihood values)	2024	No	Most of the jitters returned to the putative MLE for the 2025 assessment model runs.
Model does not fit the trend in the index for the EAG.	2024	Yes	The fit to the standardized CPUE index for the EAG remains poor – the retrospective pattern observed for the EAG is likely related to this poor fit.
Abundance trend in the WAG	2025	Yes	CPUE continues to decline in the WAG.
Catches from the EAG that were not included in the assessment	2025	New	The directed and the total catch were not final at the time of the assessment

In 2022/23, the CPT recommended, and the SSC concurred with, a buffer of 25%. For 2023/24 to 2025/26, the CPT found that several previously expressed concerns continued to exist, the principal one being the retrospective patterns for the recommended EAG model. Thus, the CPT recommends continuing to use a 25% buffer, its value for the last three years, on the OFL for the ABC.

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
2021/22	5.859	12.592	2.690	2.699	3.056	4.817	3.372
2022/23	5.832	13.600	2.291	2.369	2.612	3.761	2.821
2023/24	5.772	12.716	2.508	2.578	2.765	4.182	3.137
2024/25	5.632	11.087	2.214	2.215	TBA[a]	3.725	2.794
2025/26		10.480				3.166	2.374

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
2021/22	12.917	27.761	5.930	5.950	6.737	10.620	7.434
2022/23	12.857	29.983	5.051	5.223	5.758	8.292	6.219
2023/24	12.725	28.034	5.530	5.684	6.096	9.220	6.916
2024/25	12.417	24.443	4.881	4.883	TBA[a]	8.212	6.159
2025/26		23.104				6.980	5.234

[a] The directed fishery in the EAG and groundfish bycatch fisheries were still being prosecuted when the 2025 assessment was conducted. At the time the assessment was conducted, the directed catch was 2.215 kt (4.9 million lb).

The total fishery mortality in 2024/25 will be updated in September 2025.