# 7    *Norton Sound red king crab*

## *Fishery information relative to OFL setting*

During the 2025 fishery, 2,657 crab (3.34 t) were harvested in the winter commercial fishery and 100,758 crab (157 t) were harvested in the summer commercial fishery. In the winter subsistence fishery, 2,239 male crab were caught, while 1,897 male crab (2.38 t) were retained. Because the total catch mortality for this stock was below the 2025 OFL of 284 t, overfishing did not occur.

## *Data and assessment methodology*

During the last three decades, information from summer trawl, summer pot, winter pot, and preseason summer pot surveys have been periodically collected for NSRKC. The summer trawl surveys provide data on annual abundance and size/shell condition compositions, while the others have contributed to life history knowledge. Time series of standardized CPUE from the summer commercial fishery provide additional indices of abundance. Tag return data provide information on growth. Retained catch data are available from fish tickets for the winter and summer commercial fisheries, as well as from subsistence catch reports. Retained catch size-composition data are generally available for the summer commercial fishery, but only limited data are available for the winter commercial fishery. Limited data on discards are available from summer commercial fishery observer data and subsistence catch reports.

The assessment has been updated to include the following new data for 2025: retained catch for the winter and summer commercial fisheries, length-shell compositions for the summer commercial fishery, total and retained catch for the winter subsistence fishery, standardized CPUE for 2025, and survey abundance and shell condition/size composition data from the 2025 National Atmospheric and Ocean Administration (NOAA) Northern Bering Sea (NBS) summer trawl survey.

The assessment is based on a length-based model of male crab abundance in the GMACS framework that combines these multiple sources of data. Logistic functions are used to describe summer commercial fishery and survey selectivities, and a dome-shaped function is used for the winter pot fishery. Selectivities for the winter commercial fishery and the subsistence fishery are mirrored to the winter pot fishery or the summer commercial fishery, depending on the model configuration. The ADF&G trawl survey is assigned a catchability of 1.0, with catchabilities estimated for other surveys and the standardized CPUE indices. Molting and growth are combined into a size-transition matrix. The model allows for length-dependent natural mortality.

The assessment author presented results from six models for consideration by the CPT for status determination and OFL/ABC calculation. The base model 24.0b was the 2024 accepted model (24.0) with GMACS updated to version 2.20.20 and corrected tier 4 $F_{OFL}$ allocation among multiple directed fleets. Model 25.0a removed shell condition and aligned natural mortality of males <= 123 mm CL with the recent estimate for BBRKC ($0.23yr^{-1}$). Models 24.0b and 25.0a each had two derivative models which dealt with the unexpectedly high $F$ values estimated for the winter commercial fishery. Models 24.0b6 and 25.0a1 set an upper bound on $F$. Models 24.0b7 and 25.0a2 set the selectivity pattern of the winter commercial fishery to that for the summer commercial fishery (i.e., logistic). Fits to size-composition data highlighted uncertainty associated with shell condition data and/or assumptions regarding transition between shell condition states. Both models addressing high $F$ values were very similar in terms of data fit, but the author and CPT agreed that mirroring selectivity of the winter commercial fishery to that of the summer commercial fishery was preferred given similarities in observed catch size distributions and gear configuration. The CPT recommended adopting model 25.0a2 for setting harvest specifications for this stock.

### *Stock biomass and recruitment trends*

Estimated mature male biomass was low in 1982 following a sharp decline from the peak biomass in 1977. MMB increased from a historic low in 1996 to a peak in 2010, after which it has fluctuated about the $B_{MSY}$ proxy. Estimated MMB increased to its highest level since the late 1980s in 2023 (3,188 t) after its lowest estimated level in 2019 (993 t). Estimated MMB has decreased over the past two years to 2,063 t for 2025. Estimated recruitment has generally been variable; recruitment in 2020 was the highest since the late 1970s, but it has since decreased. The 2024 ADF&G trawl survey showed a decrease in estimated abundance from 2023 (3.4 million males) to 2024 (1.4 million males). Standardized CPUE from the 2025 summer commercial fishery was lower than the previous three seasons). Estimated abundance during the 2025 NMFS Northern Bering Sea survey was similar to 2023.

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

The CPT recommends that this stock remain in Tier 4. Using model 25.0a2, the Tier 4 $B_{MSY}$ proxy was calculated as the average of mature male biomass on February 1 during 1980-2025 and equaled 2,000 t. The estimated 2026 mature male biomass on February 1 was 1,560 t, which is below the $B_{MSY}$ proxy, placing Norton Sound red king crab in status category 4b. The corresponding $F_{MSY}$ proxy for NSRKC was $M = 0.23$ $yr^{-1}$ (using the default gamma $=1.0$). Since the stock is in tier 4b the associated $F_{OFL}$ falls on the slope of the control rule and was computed as 0.17 $yr^{-1}$. In 2023, the CPT recommended adopting a retained catch OFL due to the lack of new information on discard mortality; the SSC rejected this recommendation and based the OFL on total catch mortality as in 2022. To maintain consistency with recent practice, the CPT recommends a total catch OFL for 2026. Consequently, the 2026 Tier 4b total catch OFL is 193 t (0.426 million lb).

The CPT recommends that the ABC for 2026 be set below the maximum permissible ABC. The SSC endorsed using a buffer of 30% for the 2025 ABC given concerns regarding the assessment. The sources of uncertainty identified when setting the 2025 ABC are still relevant. These include:

- uncertainty regarding biological characteristics:
    - $M$ and size-at-maturity are borrowed from other stocks;
    - impact of seasonal movement on survey estimates;
    - uncertainty in stock vs. survey areas;
- shortage of discard data on which to base estimates of total catch mortality;
- estimates of total catch mortality rely on *ad hoc* methods to estimate discards;
- the model consistently overestimates the proportion of large crab; and
- whether the high estimate for $M$ in the largest size class is reasonable remains unresolved

The CPT recommends using the same ABC buffer for 2026 as was endorsed by the SSC in 2025: 30%.

The resulting ABC is 135 t (0.298 million lb). Stock status is 78% of the BMSY proxy and therefore this stock is not overfished.

*Status and catch specifications (1,000 t). 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) | GHL | Retained Catch Mortality | Total Catch Mortality | OFL[1] | ABC[1] |
|------|------|---------------|-----|--------------------------|-----------------------|--------|--------|
| 2022 | 0.95 | 2.42 | 0.15 | 0.15 | 0.16 | 0.30 | 0.18 |
| 2023 | 1.20 | 2.40 | 0.18 | 0.19 | 0.20 | 0.310 | 0.220 |
| 2024 | 1.00 | 2.50 | 0.22 | 0.21 | 0.215 | 0.332 | 0.233 |
| 2025 | 0.98 | 2.15 | 0.19 | 0.16 | 0.17 | 0.284 | 0.199 |
| 2026 | 1.00 | 1.56 | | | | 0.193 | 0.135 |

*Status and catch specifications (million lb.)*

| Year | MSST | Biomass (MMB) | GHL | Retained Catch Mortality | Total Catch Mortality | OFL[1] | ABC[1] |
|------|------|---------------|-----|--------------------------|-----------------------|--------|--------|
| 2022 | 2.08 | 5.33 | 0.34 | 0.34 | 0.36 | 0.67 | 0.40 |
| 2023 | 2.65 | 5.29 | 0.39 | 0.43 | 0.44 | 0.680 | 0.480 |
| 2024 | 2.20 | 5.52 | 0.48 | 0.46 | 0.47 | 0.733 | 0.513 |
| 2025 | 2.16 | 4.72 | 0.41 | 0.36 | 0.37 | 0.628 | 0.440 |
| 2026 | 2.21 | 3.43 | | | | 0.426 | 0.298 |

Notes:
[1]OFL/ABC are total catch values in 2022-2026