7 Norton Sound Red King Crab

Fishery information relative to OFL setting

This stock supports three main fisheries: summer commercial, winter commercial, and winter subsistence. The summer commercial fishery, which accounts for the majority of the catch, reached a peak in the late 1970s at a little over 2.9 million pounds retained catch. Retained catches since 1982 have been below 0.5 million pounds, averaging 0.3 million pounds, including several low years in the 1990s. As the crab population rebounded, retained catches have increased to around 0.4 million pounds in recent years.

Data and assessment methodology

Four types of surveys have occurred periodically during the last three decades: summer trawl, summer pot, winter pot, and preseason summer pot, but none of these surveys have been conducted every year. The assessment is based on a male-only length-based model of male crab abundance that combines multiple sources of data. A maximum likelihood approach was used to estimate abundance, recruitment, and selectivity and catchability of the commercial pot gear. The model has been updated to include the following data: total catch, catch length composition, discard length composition data from the 2016 summer commercial fishery, and 2015/16 winter commercial and subsistence catch. In addition, the standardized commercial catch CPUE indices were updated to include data for 1977-2016 and the annual proportions of the commercial catch before the survey were recalculated based on fishticket data. The current model assumes a constant M=0.18yr^{-1} for all length classes except the > 134mm CL length-class, which had an estimated value of 0.590yr^{-1}. Logistic functions are used to describe fishery and survey selectivities, except for a dome-shaped function examined for the winter pot fishery.

The author summarized six model run alternatives, in conjunction with the 2016 base model (Model 0). The author recommended, and the CPT selected, Model 3 as the recommended configuration. This model estimated the molt probability for the 64-73mm CL length class. Other attributes were similar to the base model from the previous assessment. Model 3 fitted the compositional data better than the 2016 base model with one additional parameter.

Stock biomass and recruitment trends

Mature male biomass was estimated to be at an historic low in 1982 following a crash from the peak biomass in 1977. The MMB then exhibited an increase from a recent low in 1997 to a peak in 2010, before declining and then rebuilding. Estimated recruitment was weak during the late 1970s and high during the early 1980s, with a slight downward trend from 1983 to 1993. Estimated recruitment has generally been variable, with a slight increase in recent years.

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

The team recommended Tier 4, stock status a, for Norton Sound red king crab. The estimated abundance and biomass in 2016 using Model 3 are: Mature male biomass on Feb. 1: 5.14million lb (2.33 thousand t).

The $B_{MSY\ \text{proxy}}$, calculated as the average of mature male biomass on Feb. 1 during 1980-2017, was $B_{MSY\ \text{proxy}}$ = 4.62 million lb. The $F_{MSY\ \text{proxy}}$ is M =0.18 yr^{-1} and the F_{OFL}=0.18yr^{-1}, because the 2017 mature male biomass is larger than $B_{MSY\ \text{proxy}}$, with the CPT choosing the default of gamma =1.0.

The maximum permissible ABC would be 0.66 million lb, based on projected retained catch on July 1. The OFL is retained catch OFL although a total catch OFL is computed as part of the assessment. The CPT recommended an ABC less than the maximum permissible due to concerns with model specification, unresolved competing hypotheses about whether the lack of large animals in catches and surveys is due to

higher mortality or migration from the area, lack of bycatch data as well as issues noted with the *M* employed for the largest length group. The CPT recommended an ABC = 80% of the OFL (20% buffer) of 0.54 million lb.

Status and catch specifications (1000t)

Year	MSST	Biomass (MMB)	GHL	Retained Catch[1]	Total Catch[2]	Retained Catch OFL	Retain catch ABC
2013/14	0.93	2.27	0.23	0.16	0.16	0.26[A]	0.24
2014/15	0.96	1.68	0.17	0.18	0.18	0.21[B]	0.19
2015	1.09	2.33	0.18	0.18	0.24	0.33[C]	0.26
2016	1.03	2.66	0.24	0.23	0.24	0.32 [D]	0.26
2017	1.05	2.33	TBD	TBD	TBD	0.30[E]	0.24

1: Summer commercial fishery
2: Summer commercial fishery, winter commercial fishery and subsistence fishery

Status and catch specifications (million lb.)

Year	MSST	Biomass (MMB)	GHL	Retained Catch[1]	Total Catch[2]	Retained Catch OFL	Retain catch ABC
2013/14	2.06	5.00	0.50	0.35	0.35	0.58[A]	0.52
2014/15	2.11	3.71	0.38	0.39	0.39	0.46[B]	0.42
2015	2.41	5.13	0.39	0.40	0.52	0.72[C]	0.58
2016	2.26	5.87	0.52	0.51	0.52	0.71[D]	0.57
2017	2.31	5.14	TBD	TBD	TBD	0.67[E]	0.54

Total retained catch during 2016/17 did not exceed the OFL for this stock, thus overfishing is not occurring. Stock biomass is above MSST; thus, the stock is not overfished.

Additional Plan Team recommendations

The CPT has the following recommendations for the next assessment:

- Update the approach used to compute the OFL to account for length-specific natural mortality.
- Include a historical analysis as well as a retrospective analysis in the next assessment report.
- Provide the model-estimates of the discard to compare with the non-retained component of the OFL
- Compute preliminary estimates of discard (with measures of uncertainty) based on existing observer data for comparison with the model estimates of discard.