North Pacific Fishery Management Council

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Crab Plan Team

REPORT (Abbreviated)
for Final 2019 OFL/ABC Specifications for Norton Sound Red King Crab

The information below is a paraphrased version of the Crab Plan Team Report presented to the North Pacific Fishery Management Council at its February 2019 meeting and is being provided to assist in the final specification of 2019 Norton Sound red king crab (NSRKC) OFL and ABC. The Council was unable to take "final action" on this, or any, issue at the February 2019 meeting due to procedural complications related to the Dec 22, 2018 – Jan 25, 2019 government shutdown. Final action is being taken on NSRKC specifications for 2019 at a special teleconference meeting of the Council on Mar 8, 2019.

Administration

The Crab Plan Team (CPT) met in Nome, Alaska from Jan 23-25, 2019. The federal shutdown during the meeting prevented several agenda items from being addressed, however, the CPT was able to review the final Norton Sound red king crab stock assessment and recommend OFL/ABC for 2019. NSRKC was the only final crab stock assessment that required CPT review at the January 2019 meeting.

Norton Sound Red King Crab final assessment OFL/ABC

Dr. Toshihide "Hamachan" Hamazaki presented the Norton Sound red king crab assessment to the CPT. New trend data in the assessment included the estimates from the 2018 ADFG bottom trawl survey in Norton Sound, the 2018 winter commercial and subsistence fishery data, the summer commercial fishery data, the winter commercial retained catch size composition data for 2016-2018, and an update to the CPUE index. The ADFG survey results were presented and showed that the survey catch was comprised largely of females and sublegal males, with most of the catch occurring at two stations. The 2018 survey had the lowest abundance of legal male crab in the entire time series, but the highest (by a significant margin) for female and pre3 (<76 mm) males.

The assessment model includes 8 size classes. Natural mortality is fixed at $0.18yr^{-1}$ for size classes 1-6, but estimated at a higher value for the largest two size classes. The model assumes the same selectivity and catchability for new and old-shell crabs, and discard mortality is assumed at 0.2. Winter catch selectivity is assumed to be equal to winter pot survey selectivity. Maturity data do not exist for Norton Sound red king crab males and the assessment does not include a stock-recruitment function. The OFL is for legal crabs only, thus maturity does not affect the OFL calculation.

The CPT discussed moving NSRKC from Tier 4 to Tier 3. Uncertainties associated with various biological processes of the stock, including a lack of male maturity data and high estimated natural mortality of large size classes were briefly discussed by the CPT. Much of the CPT was absent, however, due to the federal shutdown, thus, a broader discussion of this topic did not occur. Hamachan provided Tier 3 calculations and evaluated the suitability of the stock for Tier 3 status. Tier 3 retained legal biomass OFL was 1.86 million lb., 7.75 times higher than the Tier 4 OFL of 0.24 million lb. The higher Tier 3 OFL is due to the high natural mortality of large crabs and the selectivity pattern. The CPT acknowledged the length-dependent OFL calculations but did not discuss at length. The CPT does not feel it is appropriate at this time to elevate NSRKC to Tier 3 given uncertainties about assumed biological processes (high *M* of large crab, lack of male maturity data) and the absence of the full CPT.

Previous CPT recommendations included quantitatively evaluating the representativeness of observer sampling and evaluating simple versus more complex selectivity curves (i.e., one-parameter versus two-parameter logistic curves) to allow the ABC and OFL to be expressed in terms of total catch rather than retained catch. Hamachan quantitatively evaluated observer sampling. Current practices do not lead to representative samples based on the number of crab per area (i.e. they are not proportional to population estimates). As such, samples could be biased if spatial differences in crabs size exist. Comparisons were not possible for some areas due to small sample numbers.

Hamachan evaluated eight model run alternatives, a base model (model 18.0) that assumes a fixed retention pattern and uses retained and discard length-composition data to estimate total catch selectivity, and several models that incorporate different stanzas (1987-1994 and 2012-2018) of size composition data from the summer and winter commercial fisheries and estimate separate retention selectivities for the summer and winter fisheries. The CPT has the following comments on the various models:

- Estimating the retention pattern does not change fit to population dynamics, but improved fits to commercial retention and tag recovery data that inform the size transition matrix and molt probability.
- Estimating separate retention patterns for the summer and winter fisheries did not improve the model fit.
- It is inappropriate to omit the 1987-1994 data without a strong justification.
- Given that summer total catch and winter retention data will be taken annually, incorporating those two datasets 8 (Model 18.2a, b) is desirable. Both model scenarios that incorporate summer total catch and winter retention data estimated identical OFLs, but it was recommended to include the 1987-1994 data set lacking a justifiable reason for omitting.

Based on these considerations, the CPT recommends that the OFL and ABC be based on model 18.2b. The CPT has the following recommendations for the next assessment:

- Continue to evaluate methods to improve ADF&G bottom trawl survey biomass estimation, including model-based approaches such as VAST.
- Conduct a sensitivity analysis to evaluate the effect of mark-recapture data by fitting the model only marks that are at liberty for one year.
- Evaluate potential differences in survey Q between NOAA and ADFG bottom trawl surveys.
- Collect more chela-carapace length data, especially at the small size range, to improve the size at maturity estimate.
- Continue to address CIE recommendations (e.g., jittering).