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New England Fishery Management Council

50 WATER STREET │ NEWBURYPORT, MASSACHUSETTS 01950 │ PHONE 978 465 0492 │ FAX 978 465 3116

Ernest F. Stockwell III, *Chairman* │ Thomas A. Nies, *Executive Director*

To: Tom Nies, Executive Director

From: Scientific and Statistical Committee

Date: November 20, 2018

Subject: Overfishing levels (OFLs) and acceptable biological catch (ABC) recommendations for Atlantic scallops.

The SSC met on October 10, 2018 in Boston, Massachusetts, to address the following terms of reference (TORs):

Terms of Reference

1. Review results from the recent scallop benchmark assessment (SARC 65) as they relate to new biological reference points, the Scallop PDT's updated projections for the scallop resource, and provide the Council with OFL and ABC recommendations for fishing years 2019 and 2020 (default).

2. Review changes to meat weights used to develop 2018 survey estimates, and growth and selectivity parameters used in the SAMS model to project biomass in portions of the Nantucket Lightship. Provide the Council with a recommendation as to whether these changes are appropriate.

To meet these TORs, the SSC considered the following documents:

Scallop Documents
1.1 Terms of Reference for Sea Scallops; October 5, 2018, SSC Meeting
1.2 SSC Final Report on OFL and ABC Recommendations for Scallop Framework 30, November 22, 2017
1.3 Scallop PDT recommendations for OFL and ABC for Framework 30 (FY2019 and FY2020 default)
1.4 Sea Scallop Assessment Summary for 2018 (SAW 65, August 2018)
1.5 Hart, D.R. Quantifying the tradeoff between precaution and yield in fishery reference points. ICES Journal of marine Science, doi.10.1093/icesjms/fss204.
1.6 Draft Framework 30 measures under consideration
1.7 Risk Policy Matrix - Atlantic Sea Scallops

Additional Background Documents
1.8 PDT recommendations for OFL and ABC for Framework 28 (FY2017 and FY2018 default) October 6, 2017
1.9 Yochum, N. and DuPaul, W.D. 2008.Size-selectivity of the Northwest Atlantic sea scallop (*Placopecten magellanicus*) dredge. Journal of Shellfish Research, 27(2): 265-271.

1.10 Hennen, D.R. and Hart, D.R. 2012. Shell height-to-weight relationships for Atlantic Sea Scallops (*Placopecten magellanicus*) in Offshore U.S. Water. Journal of Shellfish Research, 31(4):1133-1144.

1.11 Hart, D.R. and Chute, A.S. 2009. Estimating von Bertalanffy growth parameters from growth increment data using a linear mixed-effects model, with an application to the sea scallop *Placopecten magellanicus.* ICES Journal of Marine Science, 66: 2165-2175.

1.12 SARC 65 – Scallop Appendix A1 – Sea Scallop Growth (Draft report for peer review)

1.13 SARC 65 – Scallop Appendix A2 – Scallop Shell Height/Meat Weight Relationships (Draft report for review)

1.14 Scallop PDT Meeting Summaries
   a. August 28-29, 2018
   b. September 5, 2018
   c. September 28, 2018
   c. October 3, 2018

1.15 SARC 65 Full Report if available (link only)
   Correspondence

The SSC received a thorough overview of the benchmark assessment, a summary of the sea scallop survey, and the ACL/OFL recommendations for 2019 and 2020 from Dr. Dvora Hart (NEFSC). Dr. Hart described the application of the CASA model to estimate historical biomass and fishing mortality rates at a regional scale, the SYM model to estimate biological reference points based on CASA outputs, and the SAMS model to forecast future abundance, biomass, and landings at a finer spatial scale to address management needs. In 2017, the stock was not overfished and overfishing was not occurring. Of note was the high density of scallops in the Nantucket Lightship region and the observed slow growth of scallops in this region. The SSC also received a report detailing the Scallop PDT recommendations for OFL and ABC for Framework 30 from Scallop PDT Chair, Jonathan Peros (NEFMC Staff).

The SSC addressed TOR 2 first, given that the response would affect the response to TOR1.

The SSC considered the PDT recommendations for data treatments and modeling of scallops in the Nantucket Lightship to account for unique characteristics of animals in this area. These included the following:

- Shell-Height and Meat Weight (SH-MW) Relationships: Based on 2018 survey observations, the PDT was concerned that applying benchmark parameters in portions of the Nantucket Lightship area may lead to an overestimation of 2018 biomass. As with previous years, the PDT recommends using area-specific SH-MW parameter estimates from the dredge survey in these areas.
- Dredge efficiency: The PDT recommends increasing dredge estimates by 3 in high density areas (Nantucket Lightship-West).
- Growth: The PDT recommends that growth in the SAMS model be modified to account for anomalously slow growth in the Nantucket Lightship-West region, based on growth estimates using only shells from the large 2012 cohort in that area. After a year of slower than expected growth, animals in the Elephant Trunk-Flex area appear to be growing normally.

- Selectivity: This year, the PDT recommends applying the SARC 65 Georges Bank Open selectivity curve as estimated in the CASA model in the Nantucket Lightship-West and South-deep areas. The Georges Bank Closed selectivity curve reflects targeting of very large scallops; the scallops in these portions of the Nantucket Lightship area are much smaller than normal, and thus it is unlikely that the Georges Bank closed area selectivity would apply to these areas.

The SSC discussed the changes made to the stock assessment that were designed to account for slow growth of scallops within the Nantucket Lightship area. The SSC supported the changes to meat weights used to develop 2018 survey estimates, and growth and selectivity parameters used in the SAMS model to project biomass in portions of the Nantucket Lightship. The changes were deemed a reasonable approach and based on the best available science. The SSC recommended that additional research be conducted to further elucidate the drivers of slow growth in the Nantucket Lightship region.

The SSC then addressed TOR 1 through discussion of the scallop benchmark assessment results, estimated stock status based on new biological reference points, and the Scallop PDT's updated projections for the scallop resource. Despite the uncertainties regarding growth affecting the estimates underlying the catch advice, the SSC approves the ABC and OFL calculations as recommended by the PDT. The SSC recommended further research to improve understanding of slow growth in the Nantucket Lightship area and potential drivers (e.g., changes in bottom temperature, food supply, fishing effects). The SSC also recommended the continuation of work to develop an estimate of SSB based on gonad weights and related reference points. There was some concern about model consistency among assessments and with changes in during the benchmark that it would be helpful to compare new configuration with the previous to understand the impact of changes parameterization and configurations.

In response to TOR1, OFL and ABC values (expressed in metric tons) resulting from these deliberations are as follows:

Year	ABC-Land	ABC-Disc	ABC-Tot	OFL-Land	OFL-Disc	OFL-Total
2019	57,003	5,986	62,989	66,791	6,630	73,421
2020	46,028	4,915	50,943	53,994	5,453	59,447

Summary of recommendations
1. The SSC notes that these recommendations are based on the best scientific information available.
2. The SSC approves the changes to meat weights used to develop 2018 survey estimates, and growth and selectivity parameters used in the SAMS model to project biomass in portions of the Nantucket Lightship.
3. The SSC recommends an OFL for sea scallops of 73,421 mt in 2019 and 59,447 mt in 2020 (default).
4. The SSC recommends the ABC for sea scallops should not exceed 62,989 mt in 2019 and 50,943 mt in 2020 (default).

5. The SSC recommends further investigation into the: 1) different growth rates found in different scallop harvesting areas, particularly the Nantucket Lightship region, 2) further work to develop gonad-based estimates of SSB and reference points, and 3) runs of previous assessment model configurations to compare to new version of assessment.