

Stock Assessment Terms of Reference for SAW/SARC65 (June 26-29, 2018)
(to be carried out by SAW Working Groups)

(file vers. Revised10/16/2017)

A. Sea scallop

1. Estimate catch from all sources including landings, discards, and incidental mortality. Describe the spatial and temporal distribution of landings, discards, and fishing effort. Characterize the uncertainty in these sources of data.
2. a. Present the survey data being used in the assessment (e.g., regional indices of relative or absolute abundance, recruitment, size data, etc.). Characterize the uncertainty and any bias in these sources of data.

 b. Evaluate the current scallop dredge survey stratification scheme. Demonstrate methods for developing improved strata and make recommendations, as appropriate.
3. Define what data should be collected from the Gulf of Maine area to describe the condition and status of that resource.
4. Investigate the role of environmental and ecological factors in determining stock distribution and recruitment success. If possible, integrate the results into the stock assessment.
5. Estimate annual fishing mortality, recruitment and stock biomass for the time series, and estimate their uncertainty. Report these elements for both the combined resource and by sub-region. Include retrospective analyses (historical, and within-model) to allow a comparison with previous assessment results and previous projections.
6. State the existing stock status definitions for “overfished” and “overfishing”. Then update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, F_{MSY} and MSY) and provide estimates of their uncertainty. If analytic model-based estimates are unavailable, consider recommending alternative measurable proxies for BRPs. Comment on the scientific adequacy of existing BRPs and the “new” (i.e., updated, redefined, or alternative) BRPs.
7. Make a recommendation about what stock status appears to be based on the existing model (from previous peer reviewed accepted assessment) and based on a new model or model formulation developed for this peer review.
 - a. Update the existing model with new data and evaluate stock status (overfished and overfishing) with respect to the existing BRP estimates.
 - b. Then use the newly proposed model and evaluate stock status with respect to “new” BRPs and their estimates (from TOR-5).
 - c. Include descriptions of stock status based on simple indicators/metrics.
8. Develop approaches and apply them to conduct stock projections.
 - a. Provide numerical annual projections (through 2020) and the statistical distribution (i.e., probability density function) of the catch at F_{MSY} or an F_{MSY} proxy (i.e. the overfishing level, OFL) (see Appendix to the SAW TORs). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. Use a sensitivity analysis approach in which a range

of assumptions about the most important uncertainties in the assessment are considered (e.g., terminal year abundance, variability in recruitment).

- b. Comment on which projections seem most realistic. Consider the major uncertainties in the assessment as well as sensitivity of the projections to various assumptions. Identify reasonable projection parameters (recruitment, weight-at-age, retrospective adjustments, etc.) to use when setting specifications.
 - c. Describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming overfished, and how this could affect the choice of ABC.
89. Review, evaluate and report on the status of the SARC and Working Group research recommendations listed in most recent SARC reviewed assessment and review panel reports. Identify new research recommendations.

B. Atlantic herring

1. Estimate catch from all sources including landings and discards. Describe the spatial and temporal distribution of landings, discards, and fishing effort. Characterize uncertainty in these sources of data. Comment on other data sources that were considered but were not included.
2. Present the survey data being used in the assessment (e.g., regional indices of abundance, recruitment, state surveys, age-length data, food habits, etc.). Characterize the uncertainty and any bias in these sources of data.
3. Estimate consumption of herring, at various life stages. Characterize the uncertainty of the consumption estimates. Address whether herring distribution has been affected by environmental changes.
4. Estimate annual fishing mortality, recruitment and stock biomass (both total and spawning stock) for the time series, and estimate their uncertainty. Incorporate ecosystem information from TOR-3 into the assessment model, as appropriate. Include retrospective analyses (both historical and within-model) to allow a comparison with previous assessment results and projections, and to examine model fit.
5. State the existing stock status definitions for "overfished" and "overfishing". Then update or redefine biological reference points (BRPs; point estimates or proxies for B_{MSY} , $B_{THRESHOLD}$, F_{MSY} and MSY) and provide estimates of their uncertainty. If analytic model-based estimates are unavailable, consider recommending alternative measurable proxies for BRPs. Comment on the scientific adequacy of existing BRPs and the "new" (i.e., updated, redefined, or alternative) BRPs.
6. Make a recommendation about what stock status appears to be based on the existing model (from previous peer reviewed accepted assessment) and based on a new model or model formulation developed for this peer review.
 - a. Update the existing model with new data and evaluate stock status (overfished and overfishing) with respect to the existing BRP estimates.
 - b. Then use the newly proposed model and evaluate stock status with respect to "new" BRPs and their estimates (from TOR-5).
 - c. Include descriptions of stock status based on simple indicators/metrics.

7. Develop approaches and apply them to conduct stock projections.
 - a. Provide numerical annual projections (through 2021) and the statistical distribution (i.e., probability density function) of the catch at F_{MSY} or an F_{MSY} proxy (i.e. the overfishing level, OFL) (see Appendix to the SAW TORs). Each projection should estimate and report annual probabilities of exceeding threshold BRPs for F, and probabilities of falling below threshold BRPs for biomass. Use a sensitivity analysis approach in which a range of assumptions about the most important uncertainties in the assessment are considered (e.g., terminal year abundance, variability in recruitment).
 - b. Comment on which projections seem most realistic. Consider the major uncertainties in the assessment as well as sensitivity of the projections to various assumptions. Identify reasonable projection parameters (recruitment, weight-at-age, retrospective adjustments, etc.) to use when setting specifications.
 - c. Describe this stock's vulnerability (see "Appendix to the SAW TORs") to becoming overfished, and how this could affect the choice of ABC.
8. If possible, make a recommendation about whether there is a need to modify the current stock definition for future assessments.
89. For any research recommendations listed in SARC and other recent peer reviewed assessment and review panel reports, review, evaluate and report on the status of those research recommendations. Identify new research recommendations.

Appendix to the SAW Assessment TORs:

Clarification of Terms used in the SAW/SARC Terms of Reference

On “Acceptable Biological Catch” (DOC Nat. Stand. Guidel. Fed. Reg., v. 74, no. 11, 1-16-2009):

Acceptable biological catch (ABC) is a level of a stock or stock complex’s annual catch that accounts for the scientific uncertainty in the estimate of [overfishing limit] OFL and any other scientific uncertainty...” (p. 3208) [In other words, $OFL \geq ABC$.]

ABC for overfished stocks. For overfished stocks and stock complexes, a rebuilding ABC must be set to reflect the annual catch that is consistent with the schedule of fishing mortality rates in the rebuilding plan. (p. 3209)

NMFS expects that in most cases ABC will be reduced from OFL to reduce the probability that overfishing might occur in a year. (p. 3180)

ABC refers to a level of “catch” that is “acceptable” given the “biological” characteristics of the stock or stock complex. As such, [optimal yield] OY does not equate with ABC. The specification of OY is required to consider a variety of factors, including social and economic factors, and the protection of marine ecosystems, which are not part of the ABC concept. (p. 3189)

On “Vulnerability” (DOC Natl. Stand. Guidelines. Fed. Reg., v. 74, no. 11, 1-16-2009):

“Vulnerability. A stock’s vulnerability is a combination of its productivity, which depends upon its life history characteristics, and its susceptibility to the fishery. Productivity refers to the capacity of the stock to produce MSY and to recover if the population is depleted, and susceptibility is the potential for the stock to be impacted by the fishery, which includes direct captures, as well as indirect impacts to the fishery (e.g., loss of habitat quality).” (p. 3205)

Participation among members of a SAW Stock Assessment Working Group:

Anyone participating in SAW assessment working group meetings that will be running or presenting results from an assessment model is expected to supply the source code, a compiled executable, an input file with the proposed configuration, and a detailed model description in advance of the model meeting. Source code for NOAA Toolbox programs is available on request. These measures allow transparency and a fair evaluation of differences that emerge between models.

Guidance to SAW WG about “Number of Models to include in the Assessment Report”:

In general, for any TOR in which one or more models are explored by the WG, give a detailed presentation of the “best” model, including inputs, outputs, diagnostics of model adequacy, and sensitivity analyses that evaluate robustness of model results to the assumptions. In less detail, describe other models that were evaluated by the WG and explain their strengths, weaknesses and results in relation to the “best” model. If selection of a “best” model is not possible, present alternative models in detail, and summarize the relative utility each model, including a comparison of results. It should be highlighted whether any models represent a minority opinion.

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