



Atlantic States Marine Fisheries Commission

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TERMS OF REFERENCE

For the 2025 ASMFC Atlantic Menhaden

Ecological Reference Point Benchmark Stock Assessment and Peer-Review

Terms of Reference for Ecological Reference Point Assessment

1. Review and evaluate the fishery-dependent and fishery-independent data used in the Atlantic menhaden single-species assessment and the single-species assessments of the other major predator and prey species included in the ERP models, and justify inclusion, elimination, or modification of those data sets.
2. Characterize precision and accuracy of additional fishery-dependent and fishery-independent data sets, including diet data, used in the ecological reference point models.
 - a. Provide descriptions of each data source (e.g., geographic location, sampling methodology, potential explanation for outlying or anomalous data)
 - b. Describe calculation and potential standardization of abundance indices.
 - c. Discuss trends and associated estimates of uncertainty (e.g., standard errors)
 - d. Justify inclusion or elimination of available data sources.
 - e. Discuss the effects of data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, ageing accuracy, sample size) on model inputs and outputs.
3. Develop models used to estimate population parameters (e.g., F , biomass, abundance) of Atlantic menhaden that take into account Atlantic menhaden's role as a forage fish and analyze model performance.
 - a. Briefly describe history of model usage, its theory and framework, and document associated peer-reviewed literature. If using a new model, test using simulated data.
 - b. Justify choice of ecological factors (e.g., predator species, other prey species, environmental factors) as appropriate for each model
 - c. Describe stability of model (e.g., ability to find a stable solution, invert Hessian)
 - d. Justify choice of CVs, effective sample sizes, or likelihood weighting schemes as appropriate for each model.
 - e. Perform sensitivity analyses, model diagnostics, and retrospective analyses as appropriate for each model.
 - f. Clearly and thoroughly explain model strengths and limitations, including each model's capacity to account for environmental changes
4. Develop methods to determine reference points and total allowable catch for Atlantic menhaden that account for Atlantic menhaden's role as a forage fish.
5. State assumptions made for all population and reference point models and explain the likely effects of assumption violations on synthesis of input data and model outputs.
6. Characterize uncertainty of model estimates and reference points.
7. Evaluate stock status for Atlantic menhaden from recommended model(s) as related to the respective reference points (if available).
8. Compare trends in population parameters and reference points among proposed modeling

approaches, including the results of the single-species benchmark assessment. If outcomes differ, discuss potential causes of observed discrepancies.

9. If a minority report has been filed, explain majority reasoning against adopting approach suggested in that report. The minority report should explain reasoning against adopting approach suggested by the majority.
10. Develop detailed short and long-term prioritized lists of recommendations for future research, data collection, and assessment methodology. Highlight improvements to be made by next benchmark review.
11. Recommend timing of next benchmark assessment and intermediate updates, if necessary relative to biology and current management of the species.

Terms of Reference for Ecological Reference Point External Peer Review

1. Evaluate the justification for the inclusion, elimination, or modification of data from the Atlantic menhaden single-species assessment and the single-species assessments of the other major predator and prey species included in the ERP models.
2. Evaluate the thoroughness of data collection and the presentation and treatment of additional fishery-dependent and fishery-independent data sets in the assessment, including but not limited to:
 - a. Presentation of data source variance (e.g., standard errors).
 - b. Justification for inclusion or elimination of available data sources,
 - c. Consideration of data strengths and weaknesses (e.g., temporal and spatial scale, gear selectivities, aging accuracy, sample size),
 - d. Calculation and/or standardization of abundance indices.
3. Evaluate the methods and models used to estimate Atlantic menhaden population parameters (e.g., F , biomass, abundance) that take into account Atlantic menhaden's role as a forage fish, including but not limited to:
 - a. Evaluate the choice and justification of the recommended model(s). Was the most appropriate model (or model averaging approach) chosen given available data and life history of the species?
 - b. If multiple models were considered, evaluate the analysts' explanation of any differences in results.
 - c. Evaluate model parameterization and specification as appropriate for each model (e.g., choice of CVs, effective sample sizes, likelihood weighting schemes, calculation/specification of M , stock-recruitment relationship, choice of time-varying parameters, choice of ecological factors).
4. Evaluate the methods used to estimate reference points and total allowable catch.
5. Evaluate the diagnostic analyses performed as appropriate to each model, including but not limited to:
 - d. Sensitivity analyses to determine model stability and potential consequences of major model assumptions
 - e. Retrospective analysis

6. Evaluate the methods used to characterize uncertainty in estimated parameters. Ensure that the implications of uncertainty in technical conclusions are clearly stated.
7. If a minority report has been filed, review minority opinion and any associated analyses. If possible, make recommendation on current or future use of alternative assessment approach presented in minority report.
8. Recommend best estimates of stock biomass, abundance, exploitation, and stock status of Atlantic menhaden from the assessment for use in management, if possible, or specify alternative estimation methods.
9. Review the research, data collection, and assessment methodology recommendations provided by the TC and make any additional recommendations warranted. Clearly prioritize the activities needed to inform and maintain the current assessment, and provide recommendations to improve the reliability of future assessments.
10. Recommend timing of the next benchmark assessment and updates, if necessary, relative to the life history and current management of the species.
11. Prepare a peer review panel terms of reference and advisory report summarizing the panel's evaluation of the stock assessment and addressing each peer review term of reference. Develop a list of tasks to be completed following the workshop. Complete and submit the report within 4 weeks of workshop conclusion.