

## TERMS OF REFERENCE

For the 2026 ASMFC Atlantic Croaker Benchmark Stock Assessment

**Board Approved February 2023**

### ***Terms of Reference for the Atlantic Croaker Assessment***

1. Define population structure based on available data. If alternative population structures are used in the models (e.g., coast-wide or regional), justify use of each population structure. Explore possible impacts of environmental change on range shifts.
2. Evaluate new information on life history such as growth rates, size-at-maturation, natural mortality rate, and migrations and review potential impacts of environmental change on these characteristics. Explore possible impacts of environmental change on life history characteristics.
3. Characterize precision and accuracy of fishery-dependent and fishery-independent data used in the assessment, including the following but not limited to:
  - 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. Consider the consequences of environmental factors on the estimates of abundance or relative indices derived from surveys.
  - 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.
4. Develop models used to estimate population parameters (e.g.,  $F$ , biomass, abundance) and biological reference points, 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. Clearly and thoroughly explain model strengths and limitations.
  - c. Justify choice of CVs, effective sample sizes, or likelihood weighting schemes.
  - d. Describe stability of model (e.g., ability to find a stable solution, invert Hessian).

- e. Perform sensitivity analyses for starting parameter values, priors, etc. and conduct other model diagnostics as necessary.
  - f. Perform likelihood profile of key parameters (e.g., stock-recruit relationship parameters) to evaluate robustness of final parameter values.
  - g. If multiple models were considered, justify the choice of preferred model and the explanation of any differences in results among models.
- 5. State assumptions made for all models and explain the likely effects of assumption violations on synthesis of input data and model outputs. Examples of assumptions may include (but are not limited to):
  - a. Choice of stock-recruitment function.
  - b. No error in the catch-at-age or catch-at-length matrix.
  - c. Calculation of  $M$ . Choice to use (or estimate) constant or time-varying  $M$  and catchability.
  - d. Choice of equilibrium reference points or proxies for MSY-based reference points.
  - e. Choice of a plus group for age-structured species.
- 6. Characterize uncertainty of model estimates and biological or empirical reference points.
- 7. Perform retrospective analyses, assess magnitude and direction of retrospective patterns detected, and discuss model consistency due to implications of any observed retrospective pattern for uncertainty in population parameters (e.g.,  $F$ , SSB), reference points, and/or management measures.
- 8. Recommend stock status as related to reference points (if available).
- 9. Compare stock status and management advice from the assessment with the results of the traffic light analysis currently used for management. If outcomes differ, discuss potential causes of observed discrepancies and preferred method.
- 10. 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.
- 11. Develop detailed short and long-term prioritized lists of recommendations for future research, data collection, and assessment methodology. Highlight improvements that would be beneficial to the next benchmark.

12. Recommend timing of next benchmark assessment and intermediate updates, if necessary relative to biology and current management of the species.