DRAFT TERMS OF REFERENCE FOR THE
2014 ATLANTIC MENHADEN STOCK ASSESSMENT
***Changes to ToRs are highlighted**

Terms of Reference for the Stock Assessment Process

1. Review and vet all available data sources, including current and historical fishery-dependent and fishery-independent data. Justify inclusion or elimination of each data source. If possible, identify and prepare new data that could be used to inform the assessment of mortality and migration rates, commercial selectivity, and coastwide adult and/or spawning stock trends.

2. Characterize precision and accuracy of all data sources used in the assessment.
    a. Provide descriptions of each included data source (e.g., geographic location, sampling methodology, potential explanation for outlying or anomalous data).
    b. Discuss data strengths and weaknesses (e.g. temporal and spatial scale, gear selectivities, sample size) and their potential effects on the assessment.
    c. Describe calculation and potential standardization of abundance indices.
    d. Discuss trends and magnitude of uncertainty estimates (e.g., standard errors).

3. Develop population assessment models that are compatible with available data and can be used to estimate population parameters (e.g., F, biomass, abundance) and biological reference points. Analyze model performance.
    a. Clearly and thoroughly explain model strengths and limitations.
    b. Justify choice of CVs, effective sample sizes, selectivity parameterization, and/or likelihood weighting schemes.
    c. Describe stability of the model(s). Perform sensitivity analyses for starting parameter values, priors, etc. and conduct other model diagnostics as necessary.
    d. 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.
    e. State assumptions made for all models and explain the likely effects of assumption violations on model outputs.
    f. If multiple models were considered, justify the choice of preferred model and attempt to explain any differences in results among models.

4. Characterize uncertainty of model estimates and biological or empirical reference points.

5. Perform retrospective analyses, assess magnitude and direction of any pattern detected, and discuss implications of any observed retrospective pattern for uncertainty in population parameters (e.g., F, SSB), reference points, and/or management measures.

6. Recommend stock status as related to current reference points (thresholds and targets). Recommend alternative reference points, if appropriate.

7) Identify potential ecological reference points that account for Atlantic menhaden's role as a forage fish. Provide proposed methodology, a model development plan, and example results using preliminary model configurations, if time allows. *Note: finalized ERPs will not be developed in time for the 2014 Atlantic menhaden peer review or 2015 Management Board meetings. Additional technical work and peer review will be necessary before ERPs will be available for management use.*

8. Develop detailed short and long-term lists of prioritized recommendations for future research, data collection, and assessment methodology. Highlight improvements to be made by next benchmark review.

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

Terms of Reference for the External Peer Review Panel

1. Evaluate the data used in the assessment.
    a. Are data decisions made during the DW and AW justified (i.e. sound and robust)?
    b. Are input data series reliable and sufficient to support the assessment approach and findings?
    c. Are data applied properly within the assessment?
    d. Are data uncertainties acknowledged, reported, and within normal or expected levels?

2. Evaluate the methods used to assess the stock, taking into account available data.
    a. Are methods scientifically sound and robust?
    b. Are assessment models configured properly and used consistent with standard practices?
    c. Are the methods appropriate for the available data?
    d. If multiple models or model configurations were considered, evaluate the explanation of any differences in results and justification of a base model.

3. Consider how uncertainties in the assessment, and their potential consequences, are addressed.
    a. Comment on the degree to which methods used to evaluate uncertainty reflect and capture the significant sources of uncertainty in the population, data sources, and assessment methods.
    b. Are the implications of uncertainty on technical conclusions are clearly stated?

4. Evaluate the assessment findings with respect to the following:

    a. Are estimates of biomass, abundance, and exploitation rate reliable and consistent with input data and population biological characteristics? Are they useful to support inferences on stock status?

b. Is the stock overfished relative to biomass or abundance threshold reference points? Where is the stock relative to biomass or abundance management targets? What information supports this conclusion?

c. Is the stock undergoing overfishing relative to fishing mortality threshold reference points? Where is the stock relative to fishing mortality management targets? What information supports this conclusion?

d. Is there an informative stock recruitment relationship? Is the stock recruitment curve reliable and useful for evaluation of productivity and future stock conditions?

e. Are the quantitative estimates of the threshold reference points reliable for this stock? If not, are there other indicators that may be used to inform managers about stock trends and conditions?

5. 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.

6. Review the TC's recommendations on research, data collection, and assessment methodology and make any additional recommendations or prioritizations, if warranted.

7. Provide guidance on key improvements in data or modeling approaches which should be considered when scheduling the next assessment.

8) Provide feedback on the proposed ecological reference points that account for Atlantic menhaden's role as a forage fish. Evaluate the appropriateness and feasibility of the proposed approach. Provide alternative suggestions, if necessary. *Note: this TOR is aimed at obtaining preliminary feedback on a proposed reference point development approach that would inform future ecosystem-based management plans. Further technical development and peer review would be required before these reference points would be used in management.*

9. Prepare a peer review panel 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.