Atlantic States Marine Fisheries Commission
1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • www.asmfc.org

Ecological Reference Point Work Group

Check-In Summary

April 28, 2025

Members in Attendance: M. Cieri, M. Celestino, D. Chagaris, A. Buchheister, A. Schueller, A. Sharov, H. Townsend, M. Dean, G. Nesslage
Staff: K. Drew, J. Patel, J. Boyle, S. Nehemiah
Public: P. Himchak, A. Binstock, J. Higgins, J. Kaelin, A. Kornbluth, B. Foor, C. Flora, D. Rose, W. Poston

Model Updates

NWACS-MICE

135 model configurations were calibrated using various forcing functions and starting values. Most calibrations involved continuity runs or used annual or monthly primary production (PP) as forcing functions. Better fits were achieved when the initial vulnerability parameter = Bunf/B0 or V_{max}, the calibration method had a repeated search for vulnerabilities, prey switching <1, and Max Rel PB was 2 or 3. The top 10% of models—ranked by the lowest sum of squares (SS)—included nearly all model scenarios, except those using monthly forcing alone (simulation 6) and combined monthly forcing simulations (7–8). Estimated vulnerability values (N) across these high-performing models ranged from 63 to 88, with 2–4 parameters estimated per time series. Vulnerability estimates that were on parameter bounds ranged from 10 to 59, indicating potential concerns.

Biomass fits were mixed across species for the continuity, monthly vulnerability forcing, primary production annual forcing, and annual primary production monthly vulnerability forcing runs. Menhaden biomass remained consistent across all model runs, while spiny dogfish, striped bass, and Atlantic herring exhibited more variability depending on the scenario. Catch data for spiny dogfish showed higher values in later years, which may be due to model predictions extending beyond the range of observed biomass data. For menhaden, biomass was generally stable but showed more interannual variability in models with PP forcing. These models also predicted higher striped bass biomass due to increased estimated vulnerabilities for menhaden and herring. Spiny dogfish catches were frequently overestimated, driven by projected biomass increases. Atlantic herring was best fit when predation mortality from spiny dogfish and striped bass was modeled as both seasonal and increasing, though this required higher-than-observed increases in striped bass and spiny dogfish biomass to elevate M_2 on Atlantic herring. Weakfish biomass declined more in scenarios with elevated striped bass and spiny dogfish biomass, likely due to increased predation mortality. The model overall suggested a need for greater predation pressure on weakfish and Atlantic herring to reduce their biomass, but it proved challenging to simultaneously fit striped bass, spiny dogfish, and herring. Better herring fits often came at the expense of striped bass and spiny dogfish accuracy.

Equilibrium analysis was used as a diagnostic tool, similar to the 2020 model. However, initial results using the EwE F_{msy} tool produced inconsistent projections. Adjusting projections to use the terminal year instead led to more interpretable tradeoff outcomes across species. This is a methodological change from the previous assessment and may help improve understanding of model behavior under equilibrium assumptions.

In terms of future modeling direction, the group considered whether to prioritize continuity runs or explore combined forcing function scenarios. The ERP group discussed the potential value of using monthly egg production as a forcing function. While this scenario yielded strong equilibrium diagnostics, there was concern that it may only be acting as a proxy for seasonal juvenile availability to predators. If so, it might be more appropriate to pair egg production with another seasonal factor. Additionally, the high number of parameters stuck on bounds raised concerns, possibly linked to the use of PP forcing. It was noted that seasonal flexibility in the model appeared to allow more parameters to be estimated. The group also discussed pursuing scenarios with monthly vulnerability or egg production—either independently or in combination—as potential next steps.

Next steps: D. Chagaris to continue work on continuity run 6, monthly vulnerability forcing run 92, annual primary productivity run 77, and a run that combines monthly egg production and vulnerabilities combined as well as refining equilibrium diagnostics.

NWACS-Full

Eight versions of the NWACS-FULL ecosystem model were developed to assess sensitivity to three factors: the use of a primary production forcing function, constraints on vulnerability parameters (k_{ij}), and manual k_{ij} adjustments. Only two versions (Sim01 and Sim05) were fully re-fitted using iterative calibration; the others modified fitted models to test these structural choices. Including the PP forcing generally improved model fits. Although manual adjustments slightly increased the sum of squared errors (SS) by 3–4%, they improved diagnostic performance. To prevent unrealistic dynamics, caps were applied to k_{ij} values, limiting predator-induced mortality to 75% of a prey's total natural mortality. A minimum k_{ij} of 1.01 was used to reduce instability. Manual adjustments were also made for ERP species based on F_{msy} diagnostics to improve yield curves

Time series fits varied across simulations and species, with trade-offs between catch and biomass performance. Sim05 and Sim07 produced the best overall fits and were comparable to the 2020 model. Catch fits were generally stronger than biomass, especially where fishing mortality (F) time series were available. Groups without F drivers often showed flat trends. Biomass fits were good for species like bluefish, menhaden, and striped bass, while invertebrates and forage fishes showed little variation. Poor fits were noted for species like weakfish and younger striped bass, and strong recruitment events (e.g., for haddock and yellowtail flounder) were not well captured. Catch was a better fit than biomass. ERP species fits were mixed, with better performance for bluefish, menhaden, and striped bass, while species like weakfish and spiny dogfish had weaker fits for biomass.

Equilibrium C and B curves were plotted using Multisim, or manual projections. These plots showed clearer dynamics and supported model tradeoff analysis, and yellowtail flounder specifically required specific k_{ij} adjustments to reduce unrealistic oscillations, although full stabilization was not achieved. A. Buchheister hopes to do more simulations to try to balance the fits and the model dynamics between difficult species with additional manual adjustments if needed.

Next steps: A. Buchheister to try additional simulations, balance fit with stable projects by using Sim07, make additional plots for equilibrium C and B as well as decide on a base run before finalizing the results and graphs.

A question was posed to the group about how to define the biomass target for spiny dogfish since its biomass seems to exceed reproductive capability of the species as well as how to get from the terminal year to the target F and SSB for this species. K. Drew provided a document to help clarify this.

Timeline and Next Steps

J. Patel to send out scheduler for May meeting, J. McNamee's slides, task list from assessment workshop for writing responsibilities, and summary.