Atlantic States Marine Fisheries Commission

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Atlantic Menhaden ERP Workgroup Meeting Summary

October 2- 5, 2023

Committee Members in Attendance: : J. Boyle, K. Anstead, K. Drew, G. Nesslage, S. Madsen, M. Cieri, D. Chagaris, J. McNamee, M. Celestino, A. Sharov, J. Patel, A. Schueller, J. Boucher, and M. Dean

Other Participants: J. Ault, B. Watts

Guests:

Sydney Alhale
Mel Bell
Stuart Bennett
Alan Bianchi
Addie Binstock
Jeffrey Brust
Andre Buchheister
Benson Chiles
Joseph Cimino
Allison Colden
Brian Collins
Caitlin Craig
Keilin Gamboa-Salazar
Shaun Gehan
Jaclyn Higgins
Peter Himchak
Blaise Jenner
Jeff Kaelin
Raymond Kane
Robert LaFrance
Charlotte Lilly
Thomas Lilly
Jiangang Luo
Chris Moore
Dale Neal
Jean Nelson
James Rogers
Barbara Slatcher
Phil Zalesak
Steven Zalesak

Review of Current Menhaden Management

After a review of current management, the WG discussed whether the Commission had a policy on what percent risk is deemed acceptable in management. There is currently no formal policy in use, but the Commission is developing a risk and uncertainty policy and plans to incorporate it into current management strategies after further testing.

2019 Peer Review Recommendations

Peer review recommendations covered 4 Terms of Reference (TORs): (1) impact of inputting single-species model outputs into the ecosystem models vs. allowing the models to estimate quantities of interest, (2) approaches to estimating diet data and how environmental drivers can be incorporated into models, (3) how to incorporate predator-prey dynamics and food web networks into existing models, and (4) reasonable bounds on predation mortality to evaluate the effect of predation mortality on low ecotrophic efficiency.

Discussion revolved around how to incorporate these TORs into management decisions, how to address unexplained morality, and the inconsistency of available diet data. The overall goal of better incorporating spatial data should help with these issues once a spatial range is determined for each model. The use of vector autoregressive spatio-temporal models (VAST) for state survey data may be able to help with this.

Review of External Data Submissions

*Menhaden weight-at-age (*G. Nesslage*)*

While conducting the Cooperative Atlantic Menhaden Winter Survey off the coast of New Jersey, Nesslage found that the Beaufort Assessment Model (BAM) size-at-age differ from NEAMAP and the Winter Survey's size-at-age data. Differences may be due to data preparation (e.g., the time-invariant length-weight relationship, cohort-based growth curves, and bias-correction procedures used to develop the BAM inputs), or survey sampling (the spatial and temporal extent of the fishery independent sampling or the number independent samples compared to the fishery dependent samples). The larger differences were found in the weight-at-age data and differences were more apparent with otolith vs. scale ageing. If survey data are more indicative of true weight-at-age, total BAM biomass estimates are likely underestimated.

The WG agreed that there was some utility in looking at this issue more closely, including looking at the raw, uncorrected FD data, any FI weight data from other programs, influence of gear type, and spatial distribution of samples. The WG felt that the Menhaden Stock Assessment Subcommittee was a better body to explore this issue.

Next steps*:* The single-species assessment will ask for weights from fishery independent sampling as part of the data request for the update but it might not be available for all our surveys, as well as asking about weight types (e.g., fresh vs frozen or salted weights).

Reanalysis of menhaden tagging data (J. Ault)

Ault provided a reanalysis of the NMFS 1966 – 1971 menhaden mark-recovery study to evaluate previous conclusions regarding population demographic rates. Ault suggested that Liljestrand underestimated recaptures by 13% and suggested that natural mortality (*M*) should be lower than what is currently used in the BAM.

The WG discussed possible explanations for the differences in the datasets. While the digitized dataset had finer granularity, the number of tags was lower than the original Coston dataset or the Liljestrand dataset, and A. Schueller noted that the digitized dataset appeared to be missing recaptures that were present in the Coston dataset. One possible explanation of the difference between the Liljestrand and the Coston dataset is that the original Coston dataset included the tags that were part of the magnet efficiency study, not released alive, and those were removed by Liljestrand. More investigation on the causes of these differences would be helpful. The WG also noted the differences may also have been influenced by differences in the mathematical models used by Liljestrand and Ault, and the fact that Liljestrand had access to confidential, finer spatial scale effort data that Ault et al. did not. The WG felt that the Menhaden SAS was the group that should make the final call on the decision of whether to adopt these estimates of M, but noted that a sensitivity run with the lower estimate of M could be useful to help address some of the concerns about EE.

Next steps*:* The Menhaden SAS will convene to discuss this issue and make a final recommendation.

*Chesapeake Bay osprey and bird diet data sources (*B. Watts*)*

B. Watts presented on work looking at the impact of food stress on Chesapeake Bay osprey and a question of the relationship between menhaden and osprey, as well as a future project aimed at collecting data from osprey and other piscivorous bird studies along the coast into a single consistent database.

Discussion focused on looking at data in and out of the Chesapeake Bay to determine the relationship between piscivorous birds and menhaden on a larger scale. The ERP WG mentioned the difficulty of finding historic data sets and developing osprey metrics. The proportion of menhaden in the diet matters and it drives reproductive rates but need a more reliable way to determine composition. Some bird population time series goes back to

the 1970s. Dr. Watts and his team survey the birds every 5 years with current osprey populations around 10,000 pairs.

Next steps: B Watts will assemble database of datasets (metadata) by the end of 2023; timeline to obtain actual data is less clear.

Indicators (Indicator Investigators and MD work)

The WG summarized 3 approaches for indicators: (1) rubric, (2) model-free, and (3) model-feeding, followed by a presentation by A. Sharov on the traffic-light approach for model-free indicators currently in development in Maryland and a quick note on some related work going on in VA.

Discussion focused on reference periods and the usefulness of indicators for management. Additionally, a concern was brought up about the spatial extent for these indicators and the lack of resolution in places like estuaries. From a simplicity standpoint, indices are easier to understand but models are needed to tease apart factors like foraging effects so that management can be undertaken. The WG questioned whether indicators were an approach they wanted to take to the Board. Members were concerned about how to use that approach for specific species, but noted that in the context of the Risk and Uncertainty Policy, these indicators could be useful by way of helping the board understand underlying conditions in the environment. The group also discussed the possibility of using some of the indices presented to feed and validate the models or as an approach before a model is developed as the most useful approach for this type of work.

Recommendation: The most viable and useful approach is using a subset of the indices presented as "model-feeding" information, where indicators are used as direct inputs or to support modeling efforts. The WG recommends that the Maryland and Virginia model-free indicator research continues while the ERP WG focuses on model-based approaches for use by management in the shorter term.

Next Steps: Staff will give an ERP update to the Board, reminding them of past decisions regarding indicators and giving them opportunity to provide additional or updated feedback.

Diet Data

The WG reviewed diet data for tuna and from the New Jersey Ocean Trawl, predator-prey monitoring efforts by Chesapeake Bay Ecological Foundation for Striped Bass, and VIMS/NEAMAP/ChesMMAP. The group discussed diet data as a focus area for the ERP working group, there are some new techniques that may help with the paucity of data available, which impacts the robustness of these important data to the modeling efforts.

Recommendations: A sub group was formed that will look in to diet data and techniques for synthesizing that data.

Next Steps: The sub group will meet and will discuss at a minimum the work by Binion-Rock et al 2018, as well as pass around information on any relevant workshops or seminars on the topic.

Species Reviews

A subset of key predators was identified based on consumption estimates and ERP species selection was based on consumption ranking, availability of other data sources for predator and prey sources to inform assessment, and relevance to ASMFC management process. Species discussed included striped bass, bluefish, weakfish, spiny dogfish, herring (prey), piscivorous birds, marine mammals, tuna, other highly migratory species, and blue catfish.

Recommendations: Continue inclusion of striped bass, bluefish, weakfish, spiny dogfish, and Atlantic herring in the intermediate complexity models; explore inclusion of smooth dogfish or an elasmobranch super-predator group, nearshore piscivorous birds, mammals and bluefin tuna (once a spatial range has been determined) in

the EWE models if/where appropriate. Do not include blue catfish, as their distribution is currently largely limited to the generally freshwater and low salinity portions of the Chesapeake Bay and they do not appear to be a larger predator of menhaden given current diet data; this decision should be reevaluated in the future as the models become more spatially explicit and/or the blue catfish population extends beyond its current range.

VADER Model Overview

After a brief overview of the model, the group discussed focusing on the bottom-up predator-prey functionality of the model. This was a key comment from the previous peer review panel. Adding seasonality and possible VAST treatment of indices was also discussed in addition to reconfiguring the treatment of diet data that is used in the model. Of these suggestions, the diet data is the next highest priority, followed by the index treatment, with seasonality being the lowest priority. Translation to TMB was also discussed and should be a lower priority, and only done if there is ample time available and the other elements have been accomplished.

Recommendations: Start working immediately on the bottom-up feedback. Other groups will investigate index and diet data treatments, though involvement from the VADER analyst can occur within those groups to verify the work will be compatible with the VADER model.

Next Steps: Lead analyst on VADER will work with researchers at CBL on the bottom-up predator prey functionality.

NWACS and NWACS-MICE Model Overview

After a brief overview of the models, the group discussed spatial boundaries of the model (exclusion layer, EEZ or depth based) and as well the resolution of the model. D. Chagaris noted that the range of bluefin tuna extends well beyond current boundaries of the NWACS model, so including them will present challenges; additional quantitative information will be needed on the extent to which menhaden and tuna overlap in their spatial and seasonal ranges if bluefin tuna are included in the NWACS-MICE model. Much of the group supported keeping the model to the 2,000m depth contour, but J. Boucher will look at the Northeast Fishery Observer Program and Vessel Trip Report data to see how far offshore the key ERP species are encountered by the fisheries to ensure that the 2,000m boundary is not excluding habitat. The group considered splitting the reduction and bait fishery data for menhaden and using gear-based fleets instead of species-based fleets, but elected to maintain the current fleet structure. The group also discussed including additional age structure for the species in the NWACS-MICE model, and was in favor of refining some of the species further, most notably spiny dogfish. Additionally, information on movement rates is needed for the spatial version of this model, which can be obtained from tagging data.

WASPP (Wilberg Age-Structured Predator-Prey) Model Overview

The WASPP is a simulation model to test harvest control rules in an ecosystem context, and is a new model for consideration by the ERP WG. After a model overview, the WG agreed to carry this model forward as a complement to the VADER and NWACS models. The WG also discussed testing the WASPP model to see if it could recover historic assessment results and the possibility of using this model to simulate a population to test the other two models for striped bass and menhaden.

Assigned tasks

- *ERP Species Leads:* Identify VAST input data availability, monitor assessments and gather input/output files, tagging data for movement rates, seasonal relative egg production estimates
  - Menhaden, Spiny dogfish – K. Anstead
  - Striped bass, Weakfish, Bluefish – K. Drew
  - Atl. Herring – M. Cieri
  - Bay anchovy – M. Celestino, S. Madsen, K. Drew
  - Zooplankton – Indicator Investigator WG

○ Benthic invertebrates – Indicator Investigator WG, D. Chagaris

- Identify new time-series or starting biomass estimates

- *Candidate Species Leads*: Identify diet and abundance/biomass time series data sources to support modeling efforts

○ Smooth dogfish – M. Cieri

○ Bluefin tuna – M. Dean

○ Nearshore piscivorous birds – A. Sharov, J. Patel

○ Marine mammals – J. Patel, K. Drew, H. Townsend

- *Diet Data WG*: refine diet composition input, including seasonal/spatial overlap and preferred techniques to update & combine datasets

○ M. Celestino

○ K. Drew

○ S. Madsen

○ M. Dean

○ Consulting members: J. McNamee, D. Chagaris

- *VAST WG:* identify ERP species surveys that could be fed into VAST, explore using VAST to combine single-species indices and incorporate environmental data; make a recommendation on the feasibility of this approach

○ H. Townsend

○ K. Drew

○ K. Anstead

○ J. Boucher

- *Indicator Investigators WG***:** Follow up with J. McNamee and D. Chagaris on model-feeding indices
- *Menhaden SAS***:** Consider weight-at-age, a sensitivity run with *M* from external submissions
- *J. Boucher***:** query VTR and NEFOP data for ERP species data to identify furthest offshore extent of catch to refine spatial domain of the EwE models

Follow up ERP-WG call 28 November 2023 9-12pm to discuss progress towards tasks due at end of 2023.