

Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management

ATLANTIC SEA HERRING

(Full Citations: Northeast Fisheries Science Center (NEFSC). 2018. 65th Northeast Regional Stock Assessment Workshop (65th SAW) Assessment Report. US Dept. Commer. Northeast Fish Sci. Cent. Ref. Doc. 18-11; 659 p.

Atlantic States Marine Fisheries Commission. 2013. Research Priorities and Recommendations to Support Interjurisdictional Fisheries Management. Special Report # 89. ASMFC, Arlington, VA. 58pp.)

Updated with information from NEFSC. 2022. 2022 Management Track Peer Review Panel Report and Atlantic Herring 2022 Management Track Assessment Report.

Fishery-Dependent Priorities

High

- Evaluate data collected in study fleet program for informing assessment data. Develop research ideas that can be addressed within the context of the study fleet.
 - Explore fisheries selectivity in greater depth. Perhaps with study fleet and with historical perspective with industry.
 - Research on depth preferences of herring in the water column through time to inform selectivity and catchability.
- Develop (simple) methods to partition stocks in mixed stock fisheries.
- Investigate bycatch and discards in the directed herring fishery through both at sea and portside sampling.
- Continue commercial catch sampling of Atlantic herring fisheries according to ACCSP protocols.

Moderate

- Work to understand the protocols used by DFO Canada to modify their landings and develop ALKS for their fixed gear fishery.

Low

- Develop an industry-based LPUE or some other abundance index (Industry Based Survey).

Fishery-Independent Priorities

High

- Further research on the use of acoustic technology for inclusion in stock assessment, including information using industry based platforms. Specifically:
 - Investigate methods for converting herring acoustic indices to biomass.

- Investigate refinements in target strength conversion to abundance estimates in acoustic data
- Evaluate statistical design implications in acoustic data from surveys and ships of opportunity.
- Additional research to better understand species identification using acoustic signals
- Conduct more extensive stock composition sampling including all stocks (i.e., Scotian Shelf).
- Expand monitoring of spawning components¹.
- Continue the collection of direct age composition data from the summer shrimp trawl.

Modeling / Quantitative Priorities

High

- Evaluate the ability of state-space models to reliably estimate observation and process error variances under a range of scenarios, as well as their ability to estimate quantities of management interest.
- Develop statistical comparison of consumption estimates and biomass from model M.

Moderate

- Investigate use of length data, stock structure and movement within assessment models (e.g. SS3)
- Develop a list of standards for evaluating data for possible use in stock assessment. Also develop standards for evaluating model diagnostics and inclusion criteria of indices.
- Develop protocols for multi model inference to provide management advice from stock assessments based on NEFSC experience as well as other input (e.g. model averaging approaches).
- Develop simulations to evaluate diagnostics that are useful under different scenarios (e.g. use of likelihoods, retrospective patterns for diagnostics, etc.).
- Conduct simulation studies to evaluate ways in which various time series can be evaluated and folded into the assessment model.
- Develop new approaches to estimating recruitment (i.e., juvenile abundance) from fishery-independent data.
- Examine the possible effects of density dependence (e.g., reduced growth rates at high population size) on parameter estimates used in assessments.
- Explore model-based approaches to standardizing relative abundance indices.
- Evaluate the impacts of changes in phenology on the Atlantic herring stock assessment modeling
- Evaluate how the missing year 2020 survey might impact the assessment outcome and why the model performance deteriorated so much while the assessment outcome was still relatively stable
- Conduct a systematic exploration of the role of recruitment penalties in the performance of the range of species assessments that employ them

¹ Work completed at NEFSC examining extended spawning season in a subset of the mixed stock. Egg survey data analyzed for use as SSB index.

- More research needs to be done to continue developing the “dynamic reference points” approach.

Low

- Conduct a retrospective analysis of herring larval and assessment data to determine the role larval data plays in anticipating stock collapse and as a tuning index in the age structured assessment.

Life History, Biological, and Habitat Priorities

High

- Consider information on consumption from other sources (i.e., striped bass in other areas) and predators inshore of the current surveys.
- Develop a more systematic and foundational approach to modeling mortality in this key forage species.

Moderate

- Continue work related to understanding sources of variation in stomach contents, especially as this relates to the (GAMM) models used to develop an index of herring abundance.
- Continue tagging and morphometric studies to explore uncertainties in stock structure and the impacts of harvest mortality on different components of the stock. Although tagging studies may be problematic for assessing survivorship for a species like herring, they may be helpful in identifying the stock components and the proportion of these components taken in the fishery on a seasonal basis. Studies related to stock structure and movement would be also be beneficial for addressing the retrospective pattern, as this has been proposed as a possible explanation for that issue.
- Analyze diet composition of archived mammal and sea bird stomachs. Improve knowledge on prey size selectivity of mammals and sea birds.
- Further research is needed to continue development of recruitment indices based on seabird diet data. This process could benefit from more formal and streamlined sharing agreements with NMFS.
- Evaluate prey field to determine what other prey species are available to predators that could explain some of the annual trends in herring consumption.
- Investigate why small herring are not found in the stomachs of predators in the NEFSC food habits database.²
- Analyze herring condition and growth data collected by the Maine Department of Marine Resources to understand temporal changes in Atlantic herring fecundity and condition better

Management, Law Enforcement, and Socioeconomic Priorities

High

² No additional quantitative work completed, however discussions suggest a potential spatial mismatch between NEFSC survey coverage and small herring.

- Evaluate the current herring spawning closure design in terms of areas covered, closure periods, catch-at-age within (before fishing prohibition in 2007) and outside of spawning areas to determine minimal spawning regulations (Maine DMR).
- Continue to organize annual US-Canadian workshops to coordinate stock assessment activities and optimize cooperation in management approaches between the two countries.

Moderate

- Develop a strategy for assessing individual spawning components to better manage heavily exploited portion(s) of the stock complex, particularly the Gulf of Maine inshore spawning component.
- Develop socioeconomic analyses appropriate to the determination of optimum yield.

Low

- Develop economic analyses necessary to evaluate the costs and benefits associated with different segments of the industry.