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Eric Reid, *Chair* | Thomas A. Nies, *Executive Director*

MEMORANDUM

DATE: May 6, 2022

TO: Atlantic Herring Plan Development Team and Advisory Panel

FROM: Dr. Rachel Feeney, Council staff member

SUBJECT: **2022-2026 Council Research Priorities Related to Atlantic Herring**

It is time to be recommending updates to the Atlantic herring -related Council research priorities for consideration by the Herring Committee ahead of the Council decision on the *2022-2026 Council Research Priorities and Data Needs*, scheduled for the June 2022 Council meeting.

The *2021-2025 Council Research Priorities and Data Needs* included 24 related to Atlantic herring (Table 1). The full list is available online. Please review this list and prepare any recommendations for updates or revisions.

In March 2019, during the 2019-2023 research priority setting process, the Scientific and Statistical Committee (SSC) noted that it periodically makes research recommendations and that these should be considered by the Council for addition to its research priority list. The July 2020 recommendations of the SSC are included here:

- "Continuing to investigate the mechanisms that are driving the current low recruitment are important. This could involve things like researching environmental linkages to recruitment such as temperature drivers or predation effects."

Research topics #8 and 10 most closely relate to this recommendation.

- "… a dedicated acoustic survey for this schooling pelagic species may improve and supplement the existing trawl survey information as a source for abundance information for the stock."

Research topic #1 most closely relates to this recommendation.

- "… build social, cultural, and economic information out by focusing in on the potential impact of management decisions for Atlantic herring and the impacts on other fisheries and economic activities in the region, including possible distributional effects [e.g., interactions with striped bass, tuna]."

Research topics #78, 92, and 95 most closely relate to this recommendation.

Should any of these details be included? Should any priorities be removed? Any new priorities?

Table 1 –Atlantic herring related 2021-2025 Council research priorities and data needs

No.	Title	Description, rationale, potential use	Rating	Status	FMP	Broad categories	Notes
1	Continue development of hydroacoustic surveys and other resource surveys of pelagic species to provide an independent means of estimating stock sizes and/or defining localized depletion (e.g., spawning survey for herring on GB).	Priority has two parts: to help evaluate status of resource with acoustic survey and to see if that tool could be useful for defining localized depletion.	Important (near term)	Underway	Atlantic herring	Fish surveys	An RSA project looked at defining localized depletion (Stockwell et al., 2009), but the work was not completed due to issues securing research funds. It did test the utility of that survey technology. No other NEFSC efforts since. A 2013 S-K project on herring acoustic survey. See NEFMC (2019b) for details on a GB spawning survey. A survey to evaluate the success/failure of localized depletion measures would need ot be designed very carefully to provide meaningful results.
2	Investigate availability and detectability of Atlantic herring in the NEFSC spring and fall trawl survey to evaluate how well the survey detects herring.	Evaluating how well the bottom trawl survey detects herring could be useful for assessing herring biomass and if it changes over time (i.e., depth preferences).	Important (near term)	Underway	Atlantic herring	Fish surveys	2018 assessment evaluated depth preference. NEFSC compared acoustic data between bottom trawl surveys and dedicated herring surveys (Jech & Sullivan, 2014). Current assessments use estimates derived from acoustic data collected during the bottom trawl surveys. Work with the study fleet has resumed and may be considered in the 2022 assessment.
8	Investigate stock definition, stock movements, mixing, and migration through tagging studies, DNA markers, morphological characteristics, and other means for Atlantic herring.	To improve data on estimate of herring biomass and to support herring management under sub-ACL management by area.	Urgent (essential)	Underway	Atlantic herring	Population dynamics	2018 assessment explored multi-stock model but data insufficient to estimate movement or relative stock composition. NEFSC has proposed conducting otolith microchemistry, but to date that has not been funded. NEFSC generic research on consequences of ignoring stock structure. Topic is still urgent as spatial dynamics may be important for the current low recruitment situation.
9	Enhance herring fishery sampling (portside, at-sea observers and monitors) to track spawning activity on GB.	Increase number of samples and sampling for spawning condition	Urgent (essential)	Not begun	Atlantic herring	Population dynamics, Fishery performance & monitoring	Priority added in 2020. NEFMC (2019b) has details. This topic may be even more urgent if Maine sampling is no longer funded through ACCSP. Funds may expire in June 2022 unless

							extended. These data are essential for the assessment.
10	Further investigation into understanding the recent low recruitment of Atlantic herring and possible drivers.	Better understand the implications for the herring population (e.g., environmental, fertilization rates, egg condition)	Urgent (essential)	Unknown	Atlantic herring	Population dynamics	Priority added in 2020. NEFSC is funding a CINAR project that plans to explore this topic in some detail (2021).
11	Understand the impacts of fishing gear on herring egg mats.	Better understand the implications for the herring population.	Strategic (future needs)	Unknown	Atlantic herring, Multiple	Population dynamics, Conservation engineering, Bycatch	Priority added in 2020.
12	Calculate and/or improve river herring and shad life stage-specific estimates of range-wide natural and human mortality rates, including fishing.	Would improve RH/S stock assessment.	Important (near term)	Unknown	Atlantic herring	Population dynamics	A TEWG synthesis is being prepared. NEFSC staff involved in shad assessment.
13	Collect information on the marine phases of river herring and shad specific to migrations at sea.	Improve RH/S stock assessment for: 1) river origin of individual catch in coastal/ocean (independent surveys, tagging) & in non-targeted ocean fisheries; & 2) marine survival.	Important (near term)	Underway	Atlantic herring	Population dynamics	Turner et al and Lynch et al published several papers on at-sea distributions.
24	Investigate fine-scale spawning dynamics and the appropriate size and timing of spawning area closures.	Potential to adjust time-area closures for groundfish species or impact small-mesh multispecies exemption areas.	Important (near term)	Underway	Multiple	Population dynamics	Two S-K projects and Council-funded projects on cod and winter flounder spawning. NEFSC has supported a GMRI study.

25	Explore the sources of uncertainties in Atlantic herring and silver and red hake stock assessments, including retrospective patterns, and identify appropriate adjustments (e.g., data or modeling revisions) to resolve those patterns.	To improve data on estimate of herring and silver and red hake biomass.	Strategic (future needs)	Underway	Atlantic herring, Small-mesh multispecies	Stock assessment	Very large topic for all assessments, challenging to resolve. This could be explored during the Atlantic herring management track assessment.
26	Improve and standardize data collection methods for river herring and shad stocks.	Needed for management & assessment of RH/S (e.g., for catch caps). Useful beyond Herring FMP.	Urgent (essential)	Underway	Atlantic herring	Stock assessment	No NEFSC scientists working on this but are involved in ASMFC assessment.
27	Develop biological benchmarks used in RH/S assessment modeling and management.	Needed for management & assessment of RH/S (e.g., for catch caps). Useful beyond Herring FMP.	Urgent (essential)	Underway	Atlantic herring	Stock assessment	NEFSC scientists involved in ASMFC assessment.
35	Incorporate other surveys into stock assessments as appropriate.	Would improve stock assessments. Including industry-based surveys, state surveys, NEAMAP, collaborative surveys with industry and scientists.	Important (near term)	Underway	Multiple	Stock assessment	Used recently for GOM cod, witch flounder, and GB yellowtail flounder assessments. NEFSC plans to evaluate in management track process. Probably needed for small-mesh multispecies stocks.
42	Analysis of previous actions implemented in the Herring FMP to determine if they have been effective and are meeting intended goals.	An MSE-like study may be appropriate.	Important (near term)	Not begun	Atlantic herring	Fisheries management	Priority added in 2019.
54	Identify spawning components on a spatial and temporal scale for Atlantic herring including an evaluation of spawning success and define whether localized	Progress on acoustics and stock mixing herring research priories would help with this priority. A focus on early life history is important.	Important (near term)	Unknown	Atlantic herring	Fishery performance & monitoring	NEFSC contributed data to related GMRI study. A very specific directed study would be needed to address this adequately.

	depletion has negative impacts on spawning capacity.						
55	Investigate Atlantic herring fishery fleet behavior and decision-making with respect to their relationship to population dynamics, closed areas, catch rates, etc.		Strategic (future needs)	Not begun	Atlantic herring	Fishery performance & monitoring	Generally lower priority, not very clear what main objective is here. Could help evaluate current and future management measures. No NEFSC work to date.
62	Collect data on discards of other clupeids in the A. herring and other fisheries; develop improvements to river herring/shad catch estimation methods in the A. herring fishery.	Improve monitoring and reduce bycatch.	Important (near term)	Underway	Atlantic herring	Bycatch, Fishery performance & monitoring	The PS program collects catch and discard data in the A. herring fishery. This could be expanded to other fisheries, but that is outside the scope of the current herring PS program. The process was peer reviewed and deemed sufficient for catch cap monitoring with no changes recommended. NEFSC using EM to look at slippage issues.
63	Continue River Herring Bycatch Avoidance Program in the Atlantic herring fishery and develop or evaluate innovative approaches for avoidance or monitoring river herring/shad catch in small mesh fisheries.	Approaches include: bycatch avoidance, environmental cues, electronic monitoring, portside sampling.	Important (near term)	Underway	Atlantic herring	Bycatch	Council maintained this as a research priority for 2019-2021 RSA. Ongoing research by Turner et al.

64	Identify gears and/or methods that would reduce bycatch and/or improve discard survival, that may change the ratio of component catch species or improve size and species selectivity of gear for groundfish, monkfish, herring, and skates.	Minimize bycatch	Urgent (essential)	Underway	Northeast multispecies, Monkfish, Atlantic herring, Skates	Bycatch, Gear	Many projects, e.g., BREP 2018 award creating bycatch avoidance model for rec fishery; small-mesh belly panel to reduce flatfish. Four S-K projects on lobster trap bycatch & haddock trawls. 2013 S-K project on reducing sturgeon bycatch in monkfish gillnet. Outside of NEFSC expertise.
76	Data collection efforts for improved social and economic impact analyses, as well as cost-benefit analysis, for all fisheries, but particularly groundfish and Atlantic herring.	Some of this is done; fixed cost data is a particular need. The data is needed in user-friendly formats.	Urgent (essential)	Underway	Northeast multispecies, Atlantic herring, Multiple	Human dimensions	2013 and 2017 S-K projects on groundfish communities. For herring, some work was done for the IFM amendment. NEFSC SSB data collection continues (e.g., crew survey, income survey). Topic came up in the 2019 interviews of Council members (Williams et al 2020).
78	All fisheries: (1) the vessels, firms, organizations, and communities involved; (2) capacity use and fixed costs; (3) stakeholders besides directed fishery participants; (4) dealers and processors (e.g., dependence on fishery, location, costs, earnings, employment); and (5) market dynamics (e.g., relationships between fishermen, buyers, and processors; and end users).	For use in Council actions: describing the potentially impacted human communities and potential impacts.	Urgent (essential)	Underway	Multiple	Human dimensions	Priority added in 2019. See also the needs identified in the Groundfish Catch Share Program Review (Swasey et al., 2020). Topic came up in the 2019 interviews of Council members (Williams et al 2020). Some work underway by NEFSC.
79	Improve quantification of economic impacts from restricted fishing in closed areas and small-mesh	Could develop a spatially explicit fleet behavior model. An MSE-like study may be appropriate.	Important (near term)	Unknown	Multiple	Human dimensions	

	exemption areas (lack of access to other areas).						
92	Synthesize predator/prey information on A. herring, silver hake & other forage fish, fill data gaps; investigate role of forage fish in the Northwest Atlantic ecosystem & their importance for other managed species; assess the relative importance of herring vs. other forage as prey & predator in the ecosystem (e.g., competition with right whales & juvenile cod for *C. finmarchicus*).	Information is needed to develop ecosystem management tools and approaches. Silver hake plays a central role in the ecosystem as predators as adults and prey as juveniles. Predation by haddock on herring egg mats.	Important (near term)	Underway	Atlantic herring, Small-mesh multispecies	Ecosystems	Amendment 8 MSE and 2018 herring assessment looked at some of this but not all. For example, the food web model explored in MSE. Deroba et al (2019). NEFSC working on long-term ecosystem research. Richardson et al (2011) on haddock predation. Suca et al (2021) on sand lance and shifting prey. Deroba (2018) on stomach contents of predators. Silva et al (2021) on collocation of sand lance and top predators.
95	Improve herring, ecosystem, and economic models.	For future herring MSE work.	Important (near term)	Underway	Atlantic herring	Human dimensions, Population dynamics, Ecosystems	Priority added in 2020. NEFMC (2019a) has details. This primarily requires NEFSC time, or contract.