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MEMORANDUM

DATE: November 9, 2017

TO: Herring AP and Committee

FROM: Herring PDT

SUBJECT: **Herring Research Set-Aside (RSA) program**

This memo includes background information and Herring PDT input (p.6) for the agenda item related to research priority recommendations for the next Herring RSA federal funding announcement. The Council is scheduled to approve research priorities at the December 2017 meeting and the announcement would likely be published in the *Federal Register* before spring 2018. The next solicitation will include fishing years 2019-2021.

Research Set-Aside programs are unique to Federal fisheries in the Greater Atlantic Region. No Federal funds are provided to support the research. Instead, research funds are generated through the sale of set-aside allocations for quota managed or days-at-sea (DAS) managed fisheries. The New England and Mid-Atlantic Fishery Management Councils (Councils) set aside quota or DAS, which is awarded through a competitive grant process managed by the Northeast Fisheries Science Center. Money generated by the sale of the awarded RSA quota or DAS fund the proposed research.

RSA priorities are established by the Councils. Solicitations for RSA proposals are posted at www.grants.gov, and distributed widely through Councils' and other NMFS public relations channels. Incoming proposals are reviewed and ranked based on both technical merit and management relevance. With competitive grants awarded through this process, different entities will apply. Projects funded under an RSA allocation must enhance understanding of the fishery resource and/or contribute to the body of information which management decisions are made.

The Herring RSA program was established in 2007 under Amendment 1 to the Herring FMP (See Section 4.8 for more details). That action authorizes the Council, in consultation with the ASMFC, to allocate 0-3 percent of the Herring ACL from each management area to pay for research. Set-aside amounts are specified by area and tracked/monitored separately, but they may be used to support herring-related research in any management area(s) consistent with the research priorities identified by the Council.

GARFO issues an Experimental Fishing Permit to participants that includes two exemptions from herring regulations: 1) participating vessels are exempt from the Area 1A seasonal closure that extends from Jan 1 through May 31; and 2) participating vessels are exempt from the 2,000 lb possession limit that takes effect when/if a herring management area closes due to harvest of the sub-ACL. Participating vessels are subject to all other herring fishery regulations.

The first Herring RSA award was allocated in 2008, and the program has been active each year since being established, except 2010-2012 when no RSA was allocated, and 2013, which was a transition year to the 2013-2015 specifications. The 2013-2015 Atlantic herring fishery specifications deducted a 3% RSA from the ACL for all management areas and identified river herring bycatch avoidance and portside sampling as top priorities for cooperative research to be funded by herring RSA in 2014 and 2015. For the 2016-2018 Atlantic herring fishery specifications, the Council recommended maintaining the specification of 3% RSA from each management area in each fishing year. The Council will need to specify the total RSA amount, including herring management area, in the upcoming specification document for FY2019-2021.

Top Priorities for Cooperative Research 2016-2018

In January 2015, the Council recommended the following four research priorities under any RSAs that may be allocated in the 2016-2018 Atlantic herring fishery specifications (without ranking, i.e., equally-important):

1. Portside sampling
2. River herring bycatch avoidance
3. Electronic monitoring
4. Research to support/enhance Atlantic herring stock assessments

In addition, the Council unanimously passed a motion to request input from the NEFSC regarding the fourth cooperative research priority. The NEFSC identified four research projects that would support or enhance the Atlantic herring assessment, while at the same time being appropriate for Atlantic herring RSA. These topics include: stock structure/spatial management; availability and detectability; fishery acoustic indices; and volume-to-weight conversion. The NEFSC provided some additional information to the Council regarding the applicability of these research topics to the Atlantic herring RSA program.

Previously funded Herring RSA Projects

Table 1 summarizes the RSA awards to date under the Herring RSA program. Several of the programs have been multi-year focused on bycatch issues. Only one final report has been approved and is available, and a second final report has been submitted and is under review.

Table 1 – Summary of Herring RSA awards

Year	Project Category	Title	Funding Level	State	Organization	Final Report Due Date	*Used in mngt?*
2016	Bycatch Reduction	Sustaining, improving, and evaluating portside sampling and river herring incidental catch reduction in the Atlantic herring mid-water trawl fishery	$408,004	MA	University of Massachusetts - Dartmouth	3/31/2019	
2016	Tagging-Other	Coastwide Stock Structure of Atlantic Herring using DNA Analyses to determine the degree of mixing between stocks and spawning aggregations	$257,554	NY	Cornell Cooperative Extension	7/29/2019	
2014	Conservation Engineering-Trawl	Characterizing and Reducing River Herring Incidental Catch in the Atlantic Herring Mid-Water Trawl	$1,046,160	MA	University of Massachusetts - Dartmouth	3/31/17 (1 year extension) IN REVIEW	*Paper recently published?*
2008	Resource Dynamics	Effects of fishing on herring aggregations	$666,600	ME	Gulf of Maine Research Institute	Final Report Available Online *	*No?*

*Final report: https://www.nefsc.noaa.gov/coopresearch/pdfs/FR-08-0429_Herring.pdf

When Amendment 1 considered establishing an RSA program a table was generated identifying the research that was currently being conducted, and which ones needed longer term funding. A TAC set-aside for research in the herring fishery was intended to help to eliminate the constant pursuit of soft money to fund industry-based research programs (i.e. herring tagging and inshore hydroacoustic survey). **Table *2*** below has been extracted from Amendment 1.

Table 2 – Atlantic herring research projects and funding sources

Current Research Projects	Project Coordinator	Current Funding source	Need to seek long-term funding?
Herring migration and movement	Maine DMR	Industry	Needed
Commercial catch sampling	Maine DMR	Maine DMR/ ACCSP	Needed
Inshore acoustic survey	Gulf of Maine Research Institute	Industry/Northeast Consortium	Needed
NMFS offshore acoustic survey	NEFSC	Federal	Not needed at current funding levels
Morphometric study	NEFSC	Federal	Unlikely

Research priorities from the last herring benchmark assessment (2012)

In the last benchmark assessment, fifteen new research priorities were identified. A subset of these were highlighted in the last RSA funding announcement under priority #4 - research to support/enhance Atlantic herring stock assessments.

1. More extensive stock composition sampling including all stocks (i.e. Scotian Shelf).
2. Develop (simple) methods to partition stocks in mixed stock fisheries.
3. More extensive monitoring of spawning components.
4. Analyze diet composition of archived mammal stomachs. Improve size selectivity of mammal prey. Also sea birds.
5. Consider alternative sampling methods such as HabCam (video survey used in federal scallop survey).
6. Research depth preferences of herring.
7. Simulation study to evaluate ways in which various time series can be evaluated and folded into model.
8. Evaluate use of Length-based models (Stock Synthesis and Chen model).
9. Develop indices at age from shrimp survey samples.
10. Evaluate prey field to determine what other prey species are available to the predators that could explain some of the annual trends in consumption.
11. Develop statistical comparison of consumption estimates and biomass from model M.
12. Consider information on consumption from other sources (i.e. striped bass in other areas) and predators inshore of the survey.
13. Investigate why small herring are not found in the stomachs of predators in the NEFSC food habits database.
14. Develop an industry-based LPUE or some other abundance index (Industry Based Survey).
15. Develop objective criteria for inclusion of novel data streams (consumption, acoustic, larval, etc.) and how can this be applied.

Five-year research priorities approved by the Council

The Council approved its five-year research priorities for 2017-2021 in June 2017. Priorities related to Atlantic herring include:

Fish Surveys

1. Investigate availability and detectability of **Atlantic herring** in the NEFSC spring and fall trawl survey. Develop fishery acoustic indices for **herring**, and develop a volume-to-weight conversion factor for **herring**.

Population Dynamics

1. Further investigations into stock definition, stock movements, mixing, and migration through tagging studies, DNA markers, morphological characteristics and other means for **groundfish** (Atlantic cod and Atlantic halibut), **Atlantic herring**, silver hake, and red hake.
2. Calculate and/or improve **river herring and shad** life stage-specific estimates of range-wide natural and human mortality rates, including fishing.
3. Collect information on the marine phases of **river herring and shad** specific to: migrations at sea (e.g., determination of river origin of individual catch in coastal/ocean

independent surveys, tagging); determination of river origin of incidental catch in non-targeted ocean fisheries; and marine survival.

Stock Assessments

1. Continue to explore the sources of uncertainties in groundfish and **Atlantic herring** stock assessments, including retrospective patterns, and identify appropriate adjustments **(**e.g., data or modeling revisions) to resolve those patterns.
2. Improve and standardize data collection methods for **river herring** and **shad** stocks, and develop biological benchmarks used in assessment modeling and management (e.g., for setting catch caps).

Fishery Performance and Monitoring

1. Improve sampling of commercial catch at age data, such as through cooperative NMFS/industry programs to supplement port agent activities for **Atlantic herring** and groundfish, with an emphasis on bycatch (including incidental catch).
2. Define localized depletion of spawning components on a spatial and temporal scale for **Atlantic herring**.
3. Investigate fleet behavior and decision-making with respect to their relationship to population dynamics, closed areas, catch rates, etc. in the **Atlantic herring** fishery.

Bycatch

1. Identify gears and/or methods that would reduce bycatch and/or improve discard survival of unwanted catch:
    a. Research fishing practices or gear modifications that may change the ratio of component catch species or improve size and species selectivity of gear for groundfish, monkfish**, herring** and skates.
2. Investigate portside sampling and electronic monitoring as tools to monitor the **Atlantic herring** fishery.
3. Collect data on discards of other clupeids in the sea herring and other fisheries, and develop improvements to river herring/shad catch estimation methods in the **Atlantic herring** fishery.
4. 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 (e.g., environmental cues and bycatch avoidance, electronic monitoring and portside sampling).

Ecosystems

1. Synthesize predator/prey information on **Atlantic herring** and other forage fish and fill data gaps; investigate the role of forage fish in the Northwest Atlantic ecosystem and their importance for other managed species; assess the relative importance of herring vs. other forage species as both prey and predator in the ecosystem (e.g., competition with right whales and juvenile cod for *C. finmarchicus*).

Endangered, Threatened and Protected Species

1. Investigate protected species bycatch/discards in the **Atlantic herring fishery**.

Socioeconomics

1. Continue to support 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**.
2. For the **Atlantic herring** fishery: (1) Characterize the individuals, families, firms, organizations, and communities involved in the Atlantic herring fishery; (2) Identify capacity use and fixed costs of Atlantic herring vessels; (3) Characterize Atlantic herring

stakeholders besides those of the commercial herring fishery (e.g., whale watching, tuna, groundfish, lobster fisheries); (4) Characterize Atlantic herring dealers and processors (e.g., dependence on herring, location, costs, earnings, employment); and (5) Characterize market dynamics (e.g., relationships between fishermen, buyers, and processors; and end users in bait and fresh markets).

Herring PDT input

The Herring PDT met on October 24, 2017 to discuss RSA research priorities. The PDT reviewed the priority list from the last specification document, research themes from Amendment 1 when the RSA program was established, research priorities listed in the last benchmark assessment (2012), as well as the Council's five year research priorities related to herring.

First, the PDT recommends that the portside topic be removed from the list used in the last specifications document because it has been funded in the past in part to see if was comparable to at-sea observers, and it has recently been accepted that it is. Furthermore, the IFM Amendment may be approved which would implement a federal portside system, reducing the need for another program.

Second, the PDT recommends that bycatch avoidance stay on the list, and it be expanded to clarify that it is not just focused on river herring bycatch. The PDT recommends that haddock specifically be listed as well.

Next the PDT discussed electronic monitoring and since there is currently a large scale pilot program underway, it was discussed that it could be removed until results are available on the feasibility of the program to date. Some PDT members voiced that there could be additional ways to enhance the EM pilot, and it is currently limited to MWT vessels only. However, in the end the PDT recommends removing electronic monitoring for now and replacing it with other topics.

The PDT also discussed the fourth and final item on the list of research priorities from the last specifications document, research to support the stock assessment. In a nutshell the PDT reviewed the longer list of items from the last benchmark and identified two specific items that would improve our understanding of the resource that also have management relevance: stock structure/spatial management, and spawning dynamics.

Finally, the PDT discussed an item that was not on previous lists, but a topic the Council has spent a lot of time over the years, localized depletion. It has been challenging for the PDT to evaluate the potential impacts of localized depletion due to many data limitations. It was discussed that if more direct research was available about the potential impacts on predators in this region it would be very useful for the management of herring as forage. The PDT recommends adding evaluation of localized depletion to the list of research priorities.

Final PDT Recommendation (not in priority order):

1. **Bycatch avoidance** (e.g. river herring/shad, and haddock).
2. **Stock structure / spatial management**
   In particular, continued work on distinguishing among stocks (e.g. morphometrics) and identifying stock of origin from mixed catches, identifying the relative size of

stock components, movements and mixing rates, and degree of homing. This information could help development of a spatially explicit stock assessment model and inform appropriate apportionment of sub-ACLs and management uncertainty.

3. **Research spawning dynamics**
   Including life history, gear interactions, spatial patterns, etc. Information about whether gear interactions disrupt spawning and negatively affect recruitment (i.e. egg disposition and survival) success would be particularly beneficial.
4. **Localized depletion**
   Studies to evaluate the influence of localized depletion of herring on their predators. For example, projects that directly measure the potential influences of depleting herring on predator distributions, such as a before-after control impact study (BACI experiment), or other related research.