STATE OF MAINE
DEPARTMENT OF
MARINE RESOURCES
MARINE RESOURCES LABORATORY
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Atlantic Coastal Cooperative Statistics Program
Operation and Advisory Committee
1050 N. Highland Street, Suite 200A-N
Arlington, VA 22201

August 17, 2020

We are pleased to submit the revised proposal entitled **"Portside commercial catch sampling and comparative bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries"**

This is a maintenance proposal which has not changed its scope from the previously funded project in 2020. The top priority is the biological sampling of the Atlantic herring commercial fishery because the information derived has critical value that shows the health of the east coast herring metapopulation.

We have addressed all the general comments (below). Changes from the original proposal are highlighted in yellow as directed. In addition, specific comments were made (below). Our responses to these comments are also included.

Dr. Matthew Cieri and Erin Summers

Proposal for Funding made to:
Atlantic Coastal Cooperative Statistics Program
1050 N. Highland Street, Suite 200A-N
Arlington, VA 22201

Portside commercial catch sampling and bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries

Total Cost: $25.896.00

Submitted by:

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Portside Commercial Catch Sampling and Comparative Bycatch Sampling for Atlantic Herring, Atlantic Mackerel and Atlantic Menhaden fisheries

General Comments:

- Please review the Funding Decision Document to make certain that all guidelines have been followed. Key items like data delivery plan, budget, etc. should have headings so that reviewers do not have to search for items embedded in a narrative.
- Highlight all changes made to your initial proposal.
- Indicate (bold, underline, within text, etc.) where your proposal hits various ranking criteria. This is especially important for new projects.
- Explicitly label the percentage amount the project covers for each module [e.g., *This project aims to cover the catch and effort (45%), biological (30%) and bycatch (25%) modules*].
- Carefully label in-kind vs. match. Ask if you have questions about definitions.
- Maintenance proposals should
    - make note if this is the last year of the proposal for reviewers,
    - include previous data delivery and achieved goals as well as future plan, and
    - include full and condensed ranking summaries.

All general comments have been addressed in the proposal

Specific Comments:

- Do you foresee issues getting samples?
    - *It has been difficult with COVID-19 and low quotas. Appearance of menhaden likely means more menhaden sampling and less herring sampling*

The response for this was already located in the proposal shown below. See page 9 (highlighted section)

- Is there other funding for this project, because herring is only adequately sampled because of this project?
    - *There are no funding sources inline to take over this project. ME will likely to sample within the state, but not in other states*

The response for this was already located in the proposal. A brief summary was included in the cover letter (see below)

"This is the last year this project is eligible to be funded through ACCSP. Maine DMR will work with other states and our federal partners to secure funding by the completion of FY 21. Should a solution

not be found, herring and menhaden biological sampling will continue in Maine, but activities out of state will cease."

Reference can also be found on pages 5, 7 and 14.

- Pg. 8 "Main" should be "Maine"

Completed

Applicant Name: Maine Department of Marine Resources (MEDMR)

Principal Investigator: Matthew Cieri, Marine Resource Scientist

Project Title: Portside commercial catch sampling and bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries

Project Type: Maintenance Project

Requested Award Period: One year after receipt of funds

Change in Scope/Cost from Previous Year Project:
This is a maintenance proposal which has not changed its scope from the previously funded project in 2020 The overall cost is slightly less than the FY20 final award amount after adjustment to a slight lower overhead rate.

Objectives:

To maintain and expand the biological sampling of primarily the Atlantic herring commercial fishery including Atlantic menhaden and mackerel and other incidentally retained species of interest.

A secondary objective is to continue the portside bycatch sampling for trips targeting Atlantic herring.

Need:
Each of the species involved in this study has been declared not overfished and not subject to overfishing, as of May 2020, except for mackerel. However, a recent benchmark for Atlantic herring found declining stock size and resulted in much lower quotas through 2020. Also, each of these principle pelagic fisheries has recently become the focus of management action because of their status as forage species and because of potential bycatch problems associated with the directed fishery. In particular, Atlantic herring and Atlantic menhaden have been the focus of the emerging trend towards ecosystem management. Additionally, the commercial catch sampling portion of this project covers four important species River herring (*Alosa sp.*), Atlantic menhaden (*Brevoortia tyrannus*), Spiny dogfish (*Squalus acanthias*), and Shad (*Alosa sapidissima*)

Atlantic herring *(Clupea harengus)*, Atlantic menhaden (*Brevoortia tyrannus*), and Atlantic mackerel (*Scomber scombrus*) are three of the most ecologically and economically important fish species in the western Atlantic. All three are high volume, low-value species utilized for bait, reduction, or human consumption. The three species are oceanic plankton-feeding fish that occur in large schools, inhabiting coastal and continental shelf waters from Labrador to Florida. These species provide a significant forage base for other fish species, marine mammals, and birds. Atlantic herring landings in 2019 (the last year that NMFS data was available) were reported at approximately 12,712 mt with an estimated value above $3 million; the result of drastically reduced quotas. In addition to the direct economic contribution of herring landings, this fishery supports a domestic value-added industry worth approximately $15 million, and the North Atlantic lobster fishery estimated at over $500 million. Atlantic mackerel landings in 2019 were reported at approximately 5,190 mt with an estimated value above $7 million.

The domestic value-added industry (frozen whole fish) for mackerel, based in Cape May, NJ, and Fall River, New Bedford, and Gloucester, MA, is estimated at $12 million. The Atlantic menhaden 2019 catch was ~180,000 mt valued at ~$80 million. Generally, 35-40% of all menhaden are landed for bait.

This study will continue the biological commercial catch sampling of Atlantic herring, Atlantic mackerel, and Atlantic menhaden. Additionally, other species of interest, such as dogfish, both river herring species, and shad will be sampled as they are routinely encountered in this study.

This proposal will also continue to survey bycatch during trips targeting Atlantic herring using the protocols developed over the last decade of sampling.

Approximately seventy percent (70%) of project resources are needed to carry out the first and prime objective (or module) of the concurrent sampling portion of the project while thirty percent (30%) of resources are needed for the bycatch module.

Commercial catch sampling of Atlantic herring, Atlantic mackerel, and Atlantic menhaden

MEDMR has collected and processed Atlantic herring commercial catch samples since 1960. A significant focus of this proposal is a continuation of the commercial catch sampling program for Atlantic herring along the east coast. MEDMR maintains primary responsibility for fishery dependent sampling of the east coast Atlantic herring fishery. Duties include processing biological samples, compiling catch data, and constructing the catch at age matrix for the age-structured model. Currently, staffing and financial limitations prevent MEDMR from providing adequate commercial catch sampling coverage without ACCSP support. Furthermore, NMFS has reduced port agents and other staff, such that biological sampling of herring has become a lower priority. To improve the commercial catch sampling program, MEDMR has supported a dedicated northeast herring sampler who covers fishery landings from NJ through Maine.

The Atlantic herring fishery has recently undergone significant management changes as a result of federal action through Amendment 8. Also, a large reduction in both quotas and stock status was implemented in 2019. A recent update to the Atlantic herring benchmark assessment has also revealed a potential re-emergence of a retrospective pattern. Such a pattern for Atlantic herring tends to overestimate spawning stock biomass and underestimate fishing mortality in the terminal year. While changes to selectivity and natural mortality may be the cause of this pattern, age discrepancies between fishery dependent and commercial catch sampling may also play a role. As such, continued commercial catch sampling will be vital in potential resolution of this issue

Without ACCSP support, samples would not be collected or aged, resulting in no catch-at-age information for the assessment. Atlantic herring would move from an age-structured stock assessment to one developed for data-poor species and would be categorized as a data-poor species in need of sampling. Because ACCSP has funded this project, however, Atlantic herring are currently adequately sampled and are not scored by ACCSP. Given the most recent management changes, changes in the most recent stock assessment, ongoing litigation, and the importance to both state and federal partners, Atlantic herring would have scored very high in the process had it been part of the scoring.

Although ACCSP has not identified Atlantic mackerel as a priority, commercial catch sampling should be important given recent changes to the Squid, Mackerel, and Butterfish Plan as implemented by the

Mid-Atlantic Council. Further mackerel has transitioned to an age-structured assessment, further increasing the importance of fishery dependent sampling for this stock. Like Atlantic herring, fleet behavior may change markedly, as a result of bycatch quotas recently implemented for River herring and ongoing discussions between Mid-Atlantic and New England Councils on incidental catch limits of Atlantic herring. Traditionally the commercial mackerel catch was sampled by NMFS; however, due to the closure of port offices and limited personnel, current mackerel sampling is limited. With the existing and predicted growth in the domestic mackerel harvest, additional sampling is necessary to adequately cover the fishery.

Since 2016 Atlantic menhaden have been increasing in numbers in Maine state waters. As a result of this, and a lack of herring being landed from all areas, Maine landings have increased for this important baitfish. Because of this, Maine has increased its biological sampling program for this species to both fulfill ASMFC sampling objectives and to provide valuable fishery dependent data for the stock assessment.

Continued commercial catch sampling has been put forth as imperative research need in the most recent menhaden assessment. Further importance has been placed on increased commercial catch sampling in the northern portions of the stock's range and the bait fishery in general. This is particularly important as the menhaden assessment team analyzes changes in selectivity resulting from changes in state-by-state allocation of the resource.

As the Atlantic herring, Mackerel, and Menhaden fisheries encounter bycatch, this project also samples all species encountered during either the bycatch or commercial catch sampling modules. Four species River herring (*Alosa sp.*), Atlantic menhaden (*Brevoortia tyrannus*), Spiny dogfish (*Squalus acanthias*), and Shad (*Alosa sapidissima*), are routinely encountered and samples for length, weight, and otolith/scales are forwarded to other institutions for age analysis.

Continued bycatch sampling

During at-sea operations NMFS observers use basket sampling to document the occurrence of other species during targeted Atlantic herring and mackerel trips. These non-target species are then included in the data as retained or "Kept" (http://www.nefsc.noaa.gov/fsb/manuals/2013/NEFSC_Observer_Program_Manual.pdf). Normally, ten 50 lb. basket sub-samples are taken at regular intervals during the pumping process from the net to hold. These samples are then checked for bycatch and the results expanded. Because the Atlantic herring fishery is a high volume fishery much of the bycatch is retained during the pumping process, particularly for co-occurring pelagic species such as river herring.

Until the spring of 2011 MEDMR port sampling procedure measured bycatch using a "lot" (~40,000 lbs.) approach. Lot sampling involves looking intensively at a portion of a vessel's landings and then extrapolating those results to the entire offload. This sort of sampling contrasts that done by NMFS and MADMF, which takes regularly spaced basket subsamples during pumping.

Analysis of more than ten years (2005-2014) of both portside and at sea bycatch data and results from the DMR, DMF, and NMFS databases revealed that "lot" sampling, as MEDMR had been conducting it, was not useful when comparing the portside and at-sea programs. The reasoning behind this stems from the variability of catch composition in vessels with multiple fish holds. Fish being partitioned into separate holds may be from the same, different, or a mixture of multiple tows or sets. While lot sampling has provided valuable spatial and temporal insights to bycatch distribution and frequency, it is unable to resolve variability between vessel holds. Sampling entire vessel offloads allows that variability to be reflected in the data.

In an attempt to more closely align our data with both the at-sea observer data and DMF portside data, we (DMR) have moved away from the practice of "lot" sampling in 2011 and instead now use a protocol similar to DMF and NMFS.

In 2012 MEDMR, with ACCSP funding, implemented concurrent sampling of Atlantic herring trips portside that had also been sampled by at-sea observers. After 4 years, MEDMR had the required number of trips, by gear, area season, and year, to analyze the data and statistically determine if portside and at-sea sampling give similar results. Further analysis was provided upon request during the FY 2019 proposal process as a result of a request by the reviewers and will be included in the 5-year report During Sept 2019. That said the summary of the findings suggests results between portside and at-sea sampling are statistically similar for small-bodied species in high volume fisheries.

Given the results, MEDMR is now using this newly revamped protocol and during routine portside bycatch monitoring of the Atlantic herring fishery. DMR's efforts, coupled with ongoing work by MA DMF and the NEFOPS program will help to increase sample sizes for determining bycatch amounts in the Atlantic herring fishery. While neither MEDMR or MA DMF portside programs are used to monitor bycatch quotas for haddock or River herring, data from both programs were used to set the River herring quotas by gear type (http://s3.amazonaws.com/nefmc.org/160301-2016-2018-Herring-Specs-Formal-Submission.pdf)

Results and Benefits:

Commercial catch sampling

This program collects all the Atlantic herring directed samples from the U.S East coast fishery and a portion of all the collected mackerel and menhaden samples use in assessments of the stocks and management of the fisheries. Regarding the need for the work as stated above, if this project was not funded there are currently no other resources that would or could be shifted to collect samples of Atlantic herring, Atlantic mackerel, or Atlantic menhaden. There are also limited resources to perform Atlantic herring, Atlantic mackerel, or Atlantic menhaden bycatch studies. The catch at age analysis for all three species would lack coverage for the full range of the fishery without this project.

Annually collected samples of Atlantic herring from the commercial fishery provide the cohort catch at age data for the SARC's periodic assessment of the herring population and are used to predict and define the ASMFC's (Atlantic States Marine Fisheries Commission) rolling spawning area closures and give evidence of overall health of the Coastal Stock Complex. All Atlantic herring sample data is uploaded to the ACCSP data warehouse. Commercial catch sampling can also provide insight into the biological

and management processes that drive the stock and fishery. Recently an analysis was performed to examine changes in length at spawning for Atlantic herring. Results were presented to the ASMFC Atlantic Herring Section that is in the process of finalizing spawning relationship changes to account for a decrease in herring length at full maturation.

Maine DMR processes all commercial catch herring samples for the east coast fishery. DMR maintains a lab facility with the equipment and staffing necessary for processing more than 200 commercial herring samples a year. Also, DMR provides staff oversight of the field sampling program and scientific analysis of the data generated from the program which is then fed directly into the assessment. Without the ACCSP funded program, samples would not be collected or aged, resulting in no catch-at-age information to inform the assessment. As such, Atlantic herring would move from an age-structured stock assessment to one developed for data-poor species and would be categorized as a data-poor species in need of sampling. Because ACCSP has funded this project, however, Atlantic herring are current adequately sampled and are not scored by ACCSP. This may change, however, as this is the last year this project is eligible for funding through ACCSP.

In addition to sampling Atlantic herring and mackerel to develop catch-at-age matrices, this program has provided biological samples for multiple research projects. Herring have been collected for the Gulf of Maine Research Institute acoustics project, the NEFSC's (North East Fishery Science Center) morphometrics study, genetics studies, and most recently stomach and fat content samples have been provided to various organizations to examine the role of climate change in the nutritional content of herring. The commercial catch samples also provide the basis for determining the start date for the three Atlantic States Marine Fisheries Commission herring spawning closure areas (two along the Maine coast and one along the NH/MA coast).

Atlantic menhaden were added as a sample species in 2010. Menhaden can be collected as bycatch during herring operations as well as from a growing purse seine directed fishery for lobster bait in the Northeast. While the bulk of this fishery occurs in the Mid-Atlantic, there is a growing interest in menhaden as a result of recent management changes in the Atlantic herring fishery. Bait landings of menhaden in Southern New England and the Mid-Atlantic have tripled in the past two years. Even more recently, Maine landings have risen sharply as the stock has entered the state of Maine waters. Because menhaden stratify in latitude by age, a more complete sampling of the menhaden catch in the northern parts of its range may improve our understanding of the population dynamics of this important forage species.

The commercial catch sampling program funded historically by ACCSP has proven extremely successful and has provided important information to the fishery managers. The biological information on size, age, and maturation of herring feeds directly into the stock assessments for Atlantic herring, Atlantic mackerel, and Atlantic menhaden. ASMFC has routinely used the data collected from this project to implement management changes to herring spawning regulations, as well as to make other decisions with regards to the allocation of quota among management areas.

Bycatch sampling

The data collected through the bycatch survey supplements the federal at-sea observer coverage program, as well as the MA DMF River Herring Avoidance Program, which has vastly increased the amount of information available on bycatch in the herring fishery. This project will maintain and expand

an effective and scalable method for the long-term monitoring of bycatch in the Atlantic herring fishery. A portside bycatch sampling methodology has been developed and tested and has demonstrated the ability to observe high volumes of landed herring catch. Portside efforts will complement but not replace the NMFS at-sea observer coverage. This proposed bycatch survey represents a unique opportunity to collect data in an inexpensive but efficient and accurate way. Given this, in 2018 NMFS started the process of incorporating Maine DMR and MA DMF portside sampling into the quota monitoring system for Haddock and river herring bycatch quotas. This effort is now fully implemented with data from Maine DMR and MA DMF being incorporated fully into the process of quota monitoring

Beyond the immediate benefit to the NMFS, MA DMF, and MEDMR bycatch sampling in this fishery, the proposed project may guide other bycatch sampling programs in other fisheries. More importantly, DMR's proposed portside sampling will augment the MA DMF and NEFOP efforts allowing for better estimation of River herring, haddock, and potentially other species caught as bycatch in the directed Atlantic herring fishery

Review of Previous Results:
This proposal is a continuation of an ACCSP funded herring sampling and combined portside bycatch survey. The project has evolved over the past several years to maximize the use of funds. Project history is shown in Attachment 2 and explains the evolution of the project, including the transition to an emphasis on portside bycatch sampling in conjunction with biological sampling along with a review of project costs. The Project for FY 2020 has just ended so full analysis has yet to be completed, but the most recent semi-annual report is in Attachment 3. This report concluded that the data collected from both the and Commercial Catch Sampling Program were useful for the Atlantic herring stock assessment as well as for mackerel. Additionally, Portside Bycatch Program quantified incidental catch particularly River herring; and that these dates are starting to be used to monitor the River herring/Shad bycatch quotas for the Atlantic herring fishery.

Approach:

It should be noted that for both bycatch and biological sampling, ME DMR expects the continuation of full sampling effort despite lower Atlantic herring quotas. While herring quotas have and will continue to decline, the number of trips should be only slightly less. This in part, due to ASMFC imposed effort controls, as well as the sampling frame. The sampling frame is designed on a trip basis, rather than by volume landed. Thus, it is anticipated that the number of trips is likely to remain similar to 2019 levels, but that the volume of each trip might decline. Additionally, any reduction in herring bycatch and biological sampling is expected to be off-set by increased sampling effort in menhaden and mackerel. In particular menhaden landings have increased dramatically in the state of Maine over the past few years, requiring more effort to sample effectively.

As of June 2020, this project is being completed under the Spring 2020 social distancing guidelines as per the Governor's Office for the State of Maine. Should social distancing measures remain in effect in FY 2021, no impact on this project is anticipated.

Commercial catch sampling of Atlantic herring, Atlantic mackerel, and Atlantic menhaden

Commercial catch sampling will be conducted at herring and mackerel pumping and processing sites along the east coast. As a general rule commercial catch sampling occurs such that there is at least one sample per statistical area, per week, per gear type and generally meets NMFS protocols of one sample per 500 mt.

The samplers will follow the existing protocol developed for commercial catch sampling of Atlantic herring (Attachment 4). This protocol complies with the guidelines laid out by ACCSP. Samples will be processed and aged by in-house staff, primarily Lisa Pinkham. Samples are processed for length; weight, maturity, and aged per NMFS protocols (please see www.nefsc.noaa.gov/publications/crd/crd0406/crd0406.pdf Page 22). This information is uploaded to the ACCSP warehouse and is used for the assessment of Atlantic herring.

The same vessels that harvest Atlantic herring primarily pursue Atlantic mackerel on the east coast. Traditionally, when markets are available the pelagic fishing fleet transfers some of their effort from herring to mackerel in the winter and early spring. The samplers funded by this grant can easily collect mackerel by keeping in touch with the herring vessels that enter the mackerel fishery. Most of the ports where significant mackerel landings occur overlap with major herring ports; this is largely because herring processing facilities are also capable of freezing mackerel. Sampling will follow the existing NMFS protocol for mackerel and the guidelines established by ACCSP (Attachment 4).

Atlantic menhaden sampling

Support for port sampling for Atlantic menhaden (*Brevoortia tyrannus*) is also requested. Currently, there have been increased menhaden catches in the New England Area, particularly Maine, when compared to previous years. This trend is expected to continue for the next several years. National Marine Fisheries Service in Beaufort, North Carolina has requested commercial samples from the northern extent of this stock's range (north of Cape Cod). Such sampling of the "snapper rig bait fishery" (Northeast purse seine) is also listed as a priority research initiative in the most recent menhaden assessment. Such samples are critical to the assessment process for Atlantic menhaden and inaccurately estimating the catch at age. During our normal sampling of the Atlantic herring bait fishery, we will collect Atlantic menhaden samples primarily from purse seines using the protocols outlined by NMFS, Beaufort (Attachment 4), and forward scales and measurements for use in the next assessment.

ASMFC sample requirements state "One 10-fish sample (age and length) per 300 metric tons landed for bait purposes for ME, NH, MA, RI, CT, NY, NJ, and DE. While minimums have been met, a more rigorous sampling design by gear, time, area have not been conducted as only 1 year (2017) of sample/landings information has been officially released as the large-scale fishery is quite new to the state.

Bycatch sampling

The herring industry has changed tremendously in the last five years resulting in a much more centralized distribution structure. Generally, the herring used for bait goes through a wholesale dealer to smaller dealers and lobster wharves along the coast. The wholesale dealers have facilities where they sort, barrel, freeze, and store bait for redistribution. It is at these sites where effective bycatch surveys can also be done, thereby including the bait sector in this study. Herring is also landed at larger

centralized processing plants which may process for a food-grade market for export or direct sale into the regional bait market.

The sampling takes place at centralized processing plants and bait dealers. A goal of observing 2 trips per month from January through May and one or two trips per week during the June-Oct period (when the fishery is most active) is proposed. Trip selection will be haphazard, with an overall goal of sampling multiple gears and management areas each month and to scale bycatch sampled trips with the activity of the fishery.

The samplers will quantify bycatch from individual off-loadings that enter the processing and bait plants according to a NMFS specified protocol. The total weight of any observed bycatch will be recorded along with species identification, total species weight, individual lengths, and weights of all fish or a representative sub-sample. The total estimated bycatch weight by species will then be compared to census sampling by MA DMF and/or at sea basket sampling conducted by NEFOP as appropriate.

Using existing MEDMR protocols (Attachment 5) and in close concert with NMFS observers and MA DMF portside samplers, staff will directly target trips that have been observed by either of those two programs. Where possible, and as practicable, staff will also conduct a full census of landed bycatch from full offloading events (trips) which have also been sampled at-sea; thereby allowing a direct analysis and validation of current at-sea bycatch monitoring methods. Particular emphasis will be placed on sampling those trips, using current MEDMR methods that had both NMFS and MA DMF bycatch sampling.

Once the data are collected, they will be housed and archived in a MEDMR relational database. Data requests and queries will be performed to assist in monitoring quotas, as well as to provide bycatch information to the NEFMC Plan Development Team, NMFS, and other interested parties. Data on River herring/Shad as well as Haddock are routinely provided to the Regional Office at NOAA for use in quota monitoring activities.

Geographic Location and Temporal Distribution of Effort:
Sampling will occur in ports from Prospect Harbor, ME to Cape May, NJ, and reflect landings and effort from NC, through ME. Efforts will be coordinated with the NMFS NEFSC in Woods Hole, NMFS, Beaufort, NC, NJ, MA, MA DMF, NH F&G, and RI, DEM, and other state agencies throughout the range of the herring and mackerel fisheries. Staff will be based out of the MEDMR Boothbay Harbor lab facility. Because of herring and mackerel availability to the fishery, market conditions, and other factors, it is difficult to pinpoint where the fleet maybe landing at any given time. Sampling will thus occur after direct contact with vessel captains and plant managers to identify were sampling should take place.

In general herring, biological and bycatch sampling is primarily conducted spring, summer, and fall, with some effort during winter months. Mackerel sampling occurs primarily in the winter months, and it's anticipated that menhaden sampling will occur in the late summer to early fall. Bycatch sampling and commercial sampling become more infrequent in the winter months, while travel to get to the landing sites increases. Report writing and data analysis occur between regular commercial and bycatch sampling.

Data Management:

Data collected through this study are regularly entered into the MARVIN biological database housed at MEDMR. Data are first entered into MARVIN and run through Quality Assurance/ Quality Control (QA/QC) routines to ensure accurate reporting. Data can then be utilized for running an analysis comparing Portside and at sea observers (see Attachement 7) and/or stored until needed for the assessment or use by managers.

Metadata will be created with ArcCatalog to conform to the (Federal Geographic Data Committee (FGDC) standards and specifications. Created metadata will be available in text and XML formats.

Milestone Schedule:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Catch Sampling-HERR	x	x	x	x	x	x	x	x	x	x	x	x
Catch Sampling-MACK	x	x	x	x	x							x
Bycatch Sampling-co-occurring NMFS	x	x	x	x	x	x	x	x	x	x	x	x
Analysis	x	x	x	x	x	x	x	x	x	x	x	x

***** - Upon request, MEDMR will provide bycatch sampling data on a state by state basis three times a year.

Project Accomplishment Measurement

Commercial Catch Sampling	
Atlantic herring	At Least 10% sampled trips by gear type and month
Atlantic mackerel	At Least 10% sampled trips by gear type and month
Bycatch Sampling	
Atlantic herring	At least 40 trips sampled by area, gear type and quarter

FY 2021 Budget & Narrative

FY2021 Budget (State FY22)
7/1/21 - 6/30/22

Cost Summary: Portside bycatch sampling

Personnel Services	**Description**	**ACCSP**
None		
All Other		
Travel Expenses		
PROJECT VEHICLE 12 months	$295/mo	$ 3,540.00
Mileage fee	31000 @ $.21/mi	$ 6,510.00
Toll allowance		$ 150.00
35 Overnight stays	$102/night	$ 3,570.00
Per diem (includes extended days)	$50/day	$ 2,750.00
		$ 16,520.00
Office Supplies & Minor Equipment		
2 Cell Phones	2 @ $50/month	$ 1,200.00
1 air card	1 @ $75/month	$ 900.00
Sampling Gear		$ 500.00
Lab Supplies		$ 800.00
		$ 3,400.00
Total Direct Costs		**$ 19,920.00**
Indirect Costs (30%)		**$ 5,976.00**
Award to DMR		**$ 25,896.00**

Partner Contribution – For ACCSP Purposes

Scientist IV (10% time)	$10,000
Scientist III (25% time)	$15,000
Scientist I (100% time)	$90,000
Specialist I (25%)	$12,000
Total	$127,000

Future Project Needs:

This project is designed to benefit all states from Maine to New Jersey, ASMFC, and federal management agencies including the NEFMC, NMFS, and the Mid-Atlantic Fishery Management Council (MAFMC). While accessory funding is available for FY 21 to cover all personnel costs, MEDMR continues to pursue long-term and permanent funding for this project through a commitment made by the participating states and the federal government. Given that this is the last year of ACSP funding for this project and should a funding solution not be found, this project will terminate at the end of FY 2021.

Budget Narrative:

Personnel and Fringe Benefits: Because of state funding resources, we are not requesting to fund either the Scientist I (Chris Uraneck) or the Specialist I (Lisa Pinkham). Since the last proposal, the Specialist II position occupied by James Becker has been occupied by Chris Uraneck and upgraded to a Scientist I. This change to State funding of personnel is a shift in the project which reduces overall costs to ACCSP.

Travel and vehicles
Travel is requested for 35 overnight trips and 20 extended days. The exact number and length of trips will depend on the fleet activity and port of landing. A small utility 4x4 truck is proposed for safety reasons during winter sampling in remote locations, as well as to haul equipment from time to time. Central fleet for the State of Maine stipulates rates, and private rentals are prohibited by state policies. The current request reflects a recent policy change by Central Fleet to charging less per month but increasing the mileage rate for trucks.

Office Supplies & Minor Equipment
Two cell phones and an "Air Card" are requested. One cell phone is for the sampler to contact vessels and to coordinate with NEFOP and MA DMF personnel. A second phone is requested for the supervisor to provide direction if needed and to allow for communication in case of an emergency. An air card is also requested which allows the user to connect to the State network from any location with cell phone coverage. Air cards allow for the efficient entry of data while waiting for vessels to land, along with allowing access to the VMS system to better pinpoint landing events.

Other Lab and Sampling supplies include baskets for sampling, scale calibration, rain gear, waterproof paper, sample boxes, safety equipment, and other items

Indirect costs: The Department of Marine Resources has an indirect cost rate of 30%. See Attachment 6 for the Negotiated Indirect Cost Agreement.

Attachment 1: FY 2020 Budget & Narrative

FY 2020 Budget & Narrative

FY2020 Budget (State FY21)
7/1/20 - 6/30/21

Cost Summary: Portside bycatch sampling

Personnel Services	**Description**	**ACCSP**
None		
All Other		
Travel Expenses		
PROJECT VEHICLE 12 months	$295/mo	$ 3,600.00
Mileage fee	31000 @ $.21/mi	$ 6,510.00
Toll allowance		$ 150.00
35 Overnight stays	$102/night	$ 3,570.00
Per diem (includes extended days)	$50/day	$ 2,750.00
		$ 16,580.00
Office Supplies & Minor Equipment		
2 Cell Phones	2 @ $50/month	$ 1,200.00
1 air card	1 @ $75/month	$ 900.00
Sampling Gear		$ 500.00
Lab Supplies		$ 800.00
		$ 3,400.00
Total Direct Costs		**$ 19,980.00**
Indirect Costs (30.7%)		**$ 6,135.86**
Award to DMR		**$ 26,115.86**

Partner Contribution – For ACCSP Purposes

Scientist IV (10% time)	$10,000
Scientist III (25% time)	$15,000
Specialist II 100% time)	$84,000
Specialist I (25%)	$12,000
Total	$121,000

Budget Narrative: 2020

Personnel and Fringe Benefits: Because of state funding resources, we are not requesting to fund either the Specialist II (James Becker) or the Specialist I (Lisa Pinkham) as we have in past years. This represents a shift in the project from mostly ACCSP funded, to mostly State funded.

Travel and vehicles

Travel is requested for 35 overnight trips and extended days. The exact number and length of trips will depend on the fleet activity and port of landing. A small utility 4x4 truck is proposed for safety reasons during winter sampling in remote locations, as well as to haul equipment from time to time. Central fleet for the State of Maine stipulates rates, and private rentals are prohibited by state policies. The current request reflects a recent policy change by Central Fleet to charging less per month but increasing the mileage rate for trucks.

Office Supplies & Minor Equipment
Two cell phones and an "Air Card" are requested. One cell phone is for the sampler to contact vessels and to coordinate with NEFOP and MA DMF personnel. A second phone is requested for the supervisor to provide direction if needed and to allow for communication in case of an emergency. An air card is also requested which allows the user to connect to the State network from any location with cell phone coverage. Air cards allow for the efficient entry of data while waiting for vessels to land, along with allowing access to the VMS system to better pinpoint landing events.

Other Lab and Sampling supplies include baskets for sampling, scale calibration, rain gear, waterproof paper, sample boxes, safety equipment, and other items

Indirect costs: The Department of Marine Resources has an indirect cost rate of 30%. See Attachment 6 for the Negotiated Indirect Cost Agreement.

Attachment 2: Project history

YEAR	TITLE	COST	Rational/Emphasis	RESULTS
2001	Commercial catch sampling of Atlantic herring	$52,299	catch sampling, herring	expanded sampling of herring
2002	Commercial catch sampling of Atlantic herring	$67,168	catch sampling, herring	herring and mackerel sampling
2003	Commercial catch sampling of Atlantic herring and other northeast fisheries	$67,168	catch sampling, herring	herring, mackerel, and halibut
2004	Commercial catch sampling and bycatch survey of the northeast Atlantic herring fishery	$70,441	catch sampling, herring and mackerel	herring, halibut, mackerel and pilot portside bycatch sampling
2005	Commercial catch sampling and bycatch survey of two pelagic fisheries	$69,949	catch sampling, herring and mackerel	herring, halibut, mackerel and pilot portside bycatch sampling
2006	Portside bycatch sampling and commercial catch sampling of the Atlantic herring and Atlantic mackerel fisheries	$104,633	portside bycatch survey herring and mackerel catch sampling	herring and mackerel portside bycatch at 5% level and catch sampling
2007	Portside bycatch sampling and commercial catch sampling of the Atlantic herring and Atlantic mackerel fisheries	$108,891	portside bycatch survey herring and mackerel catch sampling	herring and mackerel portside bycatch at 5% level
2008	Portside bycatch sampling and commercial catch sampling of the Atlantic herring and Atlantic mackerel fisheries	$116,300	portside bycatch survey herring and mackerel catch sampling	herring and mackerel portside bycatch at 5% level
2009	Portside bycatch sampling and commercial catch sampling of the Atlantic herring, Atlantic mackerel, and Atlantic menhaden fisheries	$105,985	portside bycatch survey herring menhaden and mackerel catch sampling	herring and mackerel portside bycatch and commercial catch sampling and bycatch at 5% level
2010	Portside bycatch sampling and commercial catch sampling of the Atlantic herring, Atlantic mackerel, and Atlantic menhaden fisheries	$84,451	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at 5% level
2011	Portside bycatch sampling and commercial catch sampling of the Atlantic herring, Atlantic mackerel, and Atlantic menhaden fisheries	$174,778	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at 5% level
2012	Portside commercial catch sampling and comparative bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$0	portside bycatch survey herring menhaden and mackerel catch sampling	Funds were not requested because of previous cost-saving measures; allowing for the continuation of the previous work with no added costs.
2013	Portside commercial catch sampling and comparative bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$113,774	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at 5% level
2014	Portside commercial catch sampling and comparative bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and	$130,599	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at 5% level

	Atlantic Menhaden (*Brevoortia tyrannus*) fisheries			
2015	Portside commercial catch sampling and comparative bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$136,306	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at a 5% level.
2016	Portside commercial catch sampling and comparative bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$23,606	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at a 5% level.
2017	Portside commercial catch sampling and bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$24,975	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at a 5% level.
2018	Portside commercial catch sampling and bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$25,974	portside bycatch survey herring menhaden and mackerel catch sampling	herring menhaden and mackerel portside bycatch and commercial catch sampling and bycatch at a 5% level. Final analysis Ongoing
2019	Portside commercial catch sampling and bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$25,974	portside bycatch survey herring menhaden and mackerel catch sampling	ongoing
2020	Portside commercial catch sampling and bycatch sampling for Atlantic herring (*Clupea harengus*), Atlantic mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries	$26,116	portside bycatch survey herring menhaden and mackerel catch sampling	Not yet started

Proposed ACCSP Ranking

Proposal Type: Maintenance

Primary Program Priority and Percentage of Effort to ACCSP modules:

Biological Sampling (8 Points): Although Atlantic herring is missing from the top quartile of the Biological Matrix, a correct scoring would certainly adjust it to that level. The score would rise to the top of the matrix with the elimination of biological sampling. Additionally, River herring and shad, caught as bycatch in the Atlantic herring and menhaden fisheries are near the top of the Biological Matrix.

Bycatch/Species Interaction (6 Points): Mid-Water trawl gear targeting Atlantic herring and mackerel is currently the most scrutinized for bycatch of river herring and groundfish. Amendment 7 of the Atlantic herring FMP is calling for an added increase in bycatch monitoring via portside sampling for the Mid-water trawl fleet. It is ranked 9th out of 18 on the "Quartile of Bycatch Matrix".

Metadata (2 Points): will be created with ESRI ArcCatalog 10 to conform to the FGDC standards and specifications. Created metadata will be submitted to ACCSP in text and XML formats.

Project Quality Factors:

Regional Impact (5 Points): all partners will benefit, as all data collected will be uploaded to ACCSP. Regional management organizations, such as ASMFC, will benefit from the biological and bycatch information from the proposed project.

Funding transition plan (4 Points): MEDMR will continue to seek alternative sources of funding to further transition from ACCSP grant money.

In-kind Contribution (4 Points): the partner contribution is listed below the budget.

Improvement in Data Quality/Timeliness (4 Points): Data collected through this study are regularly entered into the MARVIN biological database housed at MEDMR. Data are first entered into MARVIN and run through QA/QC routines to ensure accurate reporting. The biological sampling data is uploaded to the ACCSP data warehouse regularly.

Potential secondary model (4 Points) Data collected through this proposed project is used in the assessment and management of river herring, Atlantic herring, Mackerel, and menhaden as outlined to the expected benefits section

Impact on Stock Assessment (3 Points): Regional management organizations that carry out stock assessments would benefit from the detailed biological sampling and bycatch data. This information could be used in stock assessments for many species that are managed by regional agencies.

Properly Prepared (5 Points): MEDMR followed ACCSP guidelines and pertinent documents when preparing this proposal.

Attachment 3: FY2019 semi Report

Maine Department of Marine Resources
Bureau of Resource Management
West Boothbay Harbor, Maine

Atlantic Coastal Cooperative Statistics Program
Grant No. NA14NMF4740360
(DMR#4077)

Portside Bycatch Sampling and Comparative Sampling for Atlantic Herring (*Clupea harengus*), Atlantic Atlantic Mackerel (*Scomber scombrus*), and Atlantic Menhaden (*Brevoortia tyrannus*) fisheries

Research Performance Progress Report (RPPR)

Grant Period: July 1, 2019 – December 31, 2019

Final Report? No

Submitted by:

James Becker, Maine Department of Marine Resources
P.O. Box 8, 194 McKown Point Road
West Boothbay Harbor, ME 04575
james.becker@maine.gov
(207)-633-9545

1/8/2020

ACCOMPLISHMENTS:

What were the major Goals and Objectives?

1. Continuation of the portside bycatch survey
   a. Expand the coverage of landed herring and menhaden monitored for bycatch.
   b. Increase the percentage of unobserved at-sea sampling offloads.

2. Continuation of commercial catch sampling and species collection upon request.

Methods

All bycatch sampling events were arranged with the participating sites along with a request of their processing schedule. A sampling event started when the fish were delivered either by boat, or on occasion truck, to the dewatering tower and or facility. As the fish were sorted, the bycatch was removed and set aside. Each boatload was processed separately, with the collection of catch amount, gear type, NMFS Statistical Area, date of capture, presence/absence of an observer, and the VTR number.

Portside bycatch sampling requires the collection of a bushel basket from the offload delivery system (dewatering box or pre-graded assembly line) every 5 minutes until the entire trip has been pumped from the vessel. Bycatch species were sorted and weighed from each basket, and the total amount of each species from the basket sample is expanded to the entire hold using the captain's estimate of the trip size.

$$w_s = \frac{N}{n}\sum w_{s,i}$$

$$V(w_s) = N^2\left(\frac{N-n}{N}\right)\left(\frac{s^2}{n}\right)$$

Where, w_s = weight of species *s* in the hold, $w_{s,i}$ = weight of species *s* from basket *i*, *N* = number of possible baskets from hold, *n* = number of baskets sampled from hold, s^2 = sample variance of species *s* from baskets.

All individuals (of the entire sample or sub-sample) were measured and recorded on a length frequency log. A random sub-sample (n=50) was taken if necessary.

It is important to note that for the purpose of this progress report all non-targeted species (i.e. anything but the target species) were referred to as bycatch. This includes species such as Atlantic mackerel and squid that are classified as incidental catch in the herring fishery.

Herring commercial catch samples that were collected during either portside bycatch surveys or directly from the fishing vessel's hold were transported to DMR where they were processed for length, weight, age (using otoliths), gender, gonad stage/maturity, and stomach contents/weight. Data are then entered into a database and are available for statistical analysis as part of an ongoing NOAA interstate fisheries grant.

What was accomplished under these goals?

1) Major activities

Portside bycatch studies were performed on herring trips in Portlland, ME (Figure 1). Herring and menhaden commercial catch samples were collected off trips from Davisville, RI, Gloucester, MA, Seabrook, NH, Portland, South Portland, Harpswell, Sebasco, Pine Point and Rockland, ME.

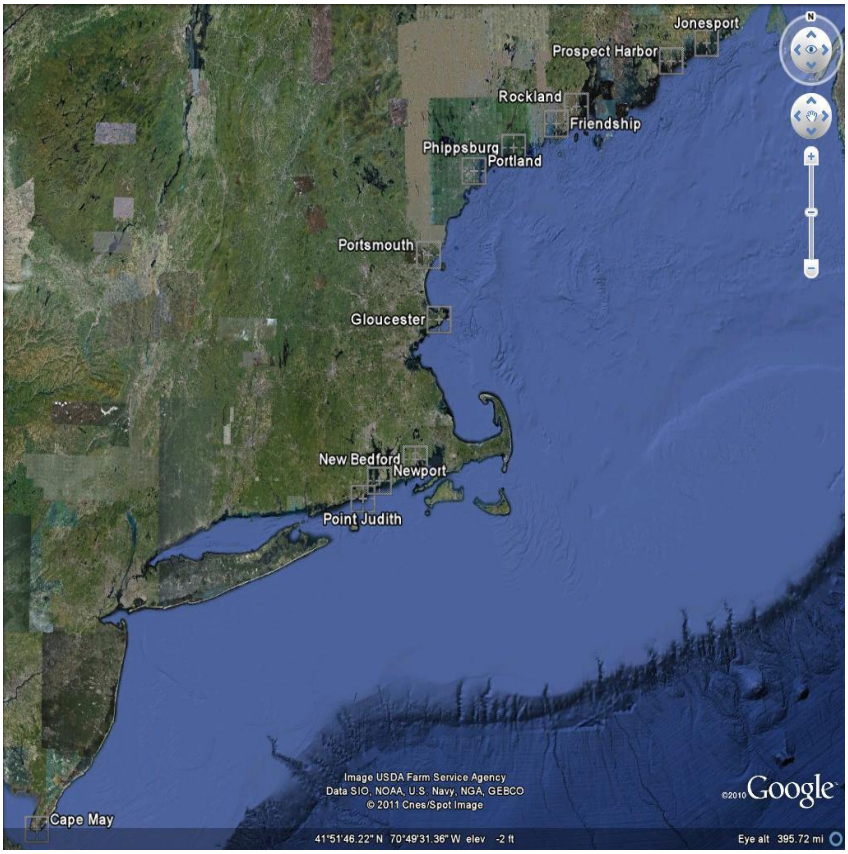


Figure 1: Range and locations of sampling and portside bycatch studies.

2) Specific Objectives

Objective 1a: Portside Bycatch sampling of Atlantic Herring and Menhaden

Conduct portside bycatch studies on Atlantic herring trips, from ME to NJ, and Atlantic menhaden in ME, and increase the percent coverage from this time in 2018.

3) Significant Results

Objective 1a: Portside Bycatch sampling of Atlantic Herring and Menhaden

Herring

Three portside bycatch studies were conducted on US herring landings from July 1, 2019– December 31, 2019. All three were conducted on purse seiners (PS). For this specific period, the US herring fishery landings were approximately 4,837 MT, down from 29,000 MT for this time in 2018 (NOAA Quota Monitoring Website 2020) and a total of 218 MT of herring was sampled for bycatch, down from 678 MT, equating to 4.50% sampling coverage, up from 2.23% this time last year (Table 1a). The total weight of documented bycatch was 9.64 MT. The total percent of documented bycatch was 4.43%, up from 4.07% for this time in 2018. The overall mean percentage of bycatch per individual study was 4.43%, with a standard deviation of 4.47%, a minimum of 0.62% and a maximum of 9.35% (Table 1b). Three species of bycatch were documented (Table 2).

Herring bycatch studies were conducted on landings from NMFS Statistical Area 514 for this particular time frame (Figure 2).

Atlantic mackerel (***S****comber scombrus*) made up the bulk of the documented bycatch, about 95.93%, up from 75% this time in 2018, and about 4.25% of the sampled herring landings, up from 1.16% (Table 2).

Silver hake (*Merluccius bilinearis*) accounted for roughly 2.93% of the overall bycatch, down from 6.70% and around 0.13% of the lot of herring sampled, slightly up from 0.10% of the bycatch for this time in 2018 (Table 2).

River herring (a category of anadromous fish, containing both Alewife (*Alosa pseudoharengus*) and Blueback herring (*A. aestivalis*) comprised about 0.55% of the bycatch and about 0.02% of the sampled herring, down from 3.02% and 0.03%, respectively (Table 2).

Squids, a combination of longfin and Northern shortfin (*Doryteuthis pealeii, Illex illecebrosus)*, held around 0.30% of the overall bycatch, up from 1.69%, and about 0.01% of the sampled herring, no change since this time in 2018 (Table 2).

Atlantic needlefish (*Strongylura marina*) were documented as bycatch for the first time in this project history. They made up 0.3% of the overall bycatch and .01% of the herring lot (Table 2).

Note that spatial information and all length frequencies for all species other than squids will be provided in the next annual report due in 2020.

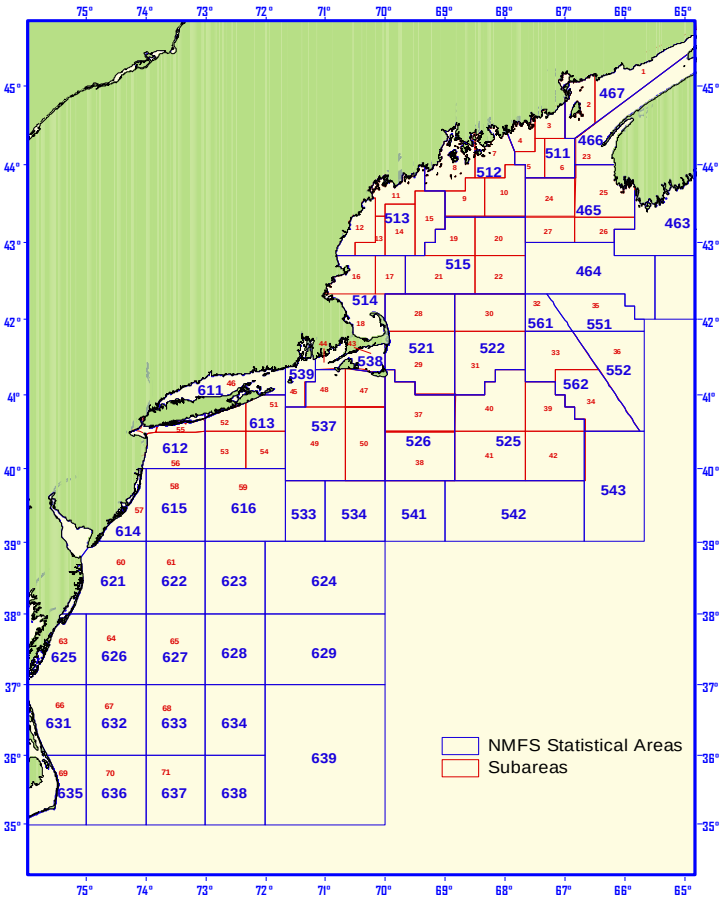


Figure 2. NMFS Statistical Areas.

Table 1. Herring bycatch data, July 1, 2019–December 31, 2019.

a. Bycatch Data by Total Landings and Total sampled	
Total Landings MT	4,837
Total Sampled MT	217.74
% of Total Landings Studied	4.50
Total Bycatch MT	9.64
% Bycatch in Total Sample	4.43
b. Bycatch Data per Sampling Event	
Mean % Bycatch	4.43
Maximum % Bycatch	9.35
Minimum % Bycatch	0.62
Standard Deviation	4.47

Table 2. Documented herring bycatch including incidental species, January 1, 2019–June 30, 2019

Species	Total Weight Kg	% Total Bycatch	% Bycatch in Herring
Atlantic mackerel	9,249.952	95.929	4.248
Silver hake	282.181	2.926	0.130
River herring	52.911	0.549	0.024
Squids	28.762	0.298	0.013
Atlantic needlefish	28.713	0.298	0.013
Total	9,642.518	100.000	4.428

Atlantic menhaden

No menhaden bycatch studies were conducted from July 1, 2019 – December 31, 2019, as that the only dewatering box equipped for portside bycatch sampling for this fishery had pressure problems specific to menhaden from the Transvac, preventing access to the overhead bulkhead for basket interval sampling. The bulkhead needed to remain closed to compensate the additional water pressure needed to pump the larger size menhaden versus herring from the fish hold into the bait trucks.

Objective 1b*:* Increase the number of unobserved at-sea sampling offloads.

None of the herring portside bycatch studies during this time frame had an onboard observer, giving 100% unobserved portside bycatch studies for this time frame, meeting this objective.

Objective 2: Commercial catch sampling of herring, mackerel and menhaden

Herring Sampling

Thirty six herring samples were collected from July 1, 2019–December 31, 2019, down from forty three for this time period in 2018. Samples came from catches in the GoM, off Cape Cod and on Georges Bank. Approximately seventy eight percent of the herring samples were collected from Maine, 16.67% from MA, 2.78% from NH, and 2.78% from RI (Figure 3). These samples were transported to DMR where they were processed for length, weight, age (using otoliths), gender, gonad maturity and spawn condition, fecundity, and stomach fullness.

Note that length, weight, and age structures will be provided in the next annual report.

Sampling for the herring fishery occurs routinely during bycatch sampling at many of the same locations, in addition at sites specific for the collection of commercial catch samples only. Data are then entered into a database and are available for statistical analysis as part of this ongoing NOAA interstate fisheries grant.

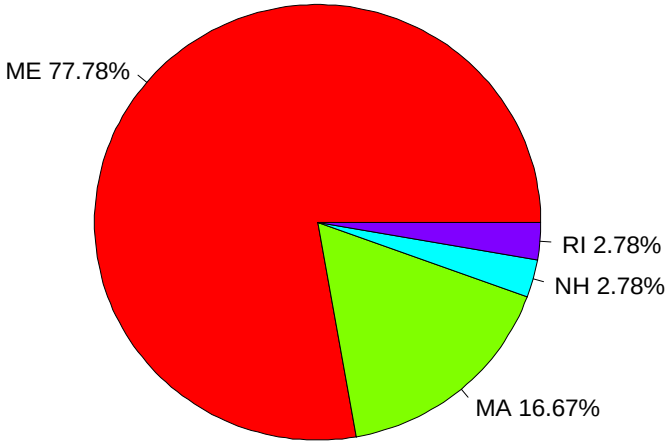
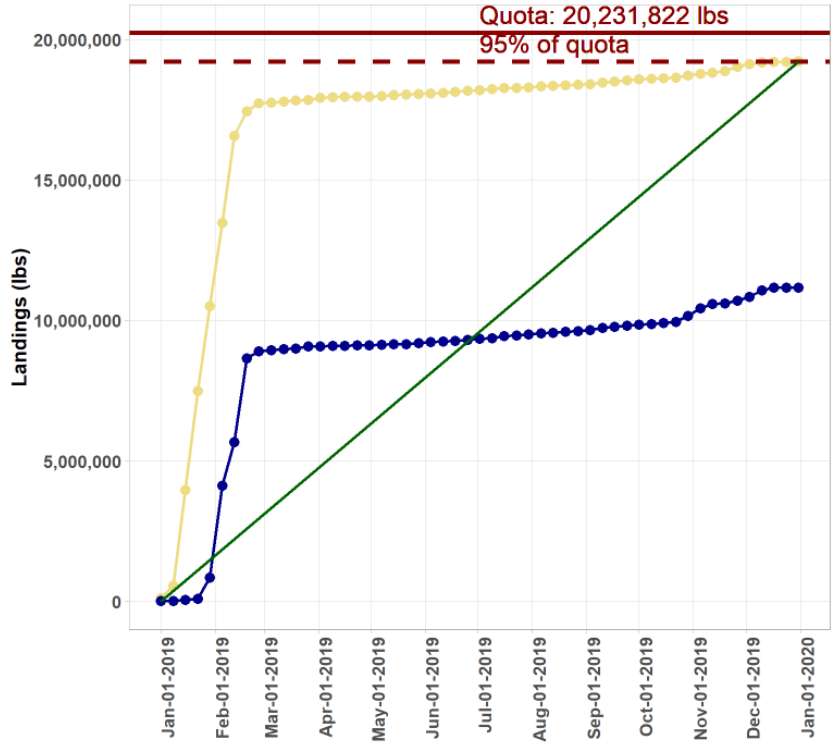


Figure 3. Percentage of herring samples collected by state, July 1, 2019–December 31, 2019.

Atlantic Mackerel Sampling

The Atlantic mackerel season is a winter fishery that typically starts in December and ends in the spring. The bulk of the 2019 mackerel landings were between January and March, thus opportunity to conduct sampling on this species was minimal, and zero samples were collected during the timeframe of this report (Figure 4).



Atlantic mackerel landings for the 2019 fishery (NOAA Fisheries, 2020).

Atlantic Menhaden Sampling

Twenty two menhaden biological samples were collected, up from eight this time in 2018, eighteen by PS and four by gill net (GN). All were caught in Area 513 (Figure 2) and landed in ME, nine were collected in Harpswell, six were in Portland, three in Sebasco, two in Pinepoint, one in South Portland and one in Boothbay Harbor. Samples were delivered to DMR were they were processed for length, weight, and age (via scale patches). Data were entered into a DMR database, and scale patches were mailed to Beaufort, NC, for aging.

What opportunities for training and professional development has the project provided?

Nothing to report

How were the results disseminated to communities of interest?

The herring spawn data gathered from the commercial catch samples were shared with the Atlantic States Marine Fishery Commission (ASMFC) for spawn monitoring for Maine, NH, and MA http://www.massmarinefisheries.net/herring/. The herring and menhaden data are used for each of their stock assessments http://www.asmfc.org/species/atlantic-herring. The herring bycatch data were used for bycatch quota monitoring for ASMFC and NMFS https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/reports_frame.htm.

What do you plan to do during the next reporting period to accomplish the goals and objectives?

The project will continue with the same objectives; collecting bycatch data and biological samples from the herring, mackerel and menhaden fisheries. An increase in the frequency of bycatch studies, in particular with herring should occur in 2020 with the upgrade and outfitting of at least three more sampling dewatering boxes in Maine with OSHA approved scaffolding, handrails and ladders or stairs, allowing for more safe access to offloads for data collection.

PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS:

What individuals have worked on this project?

PIs/PDs: James Becker, Matthew Cieri, Amy Dumeny, Christopher George, Christie Labbe, Rochelle Nutting, Erin Summers, and Carl Wilson.

Name:	James Becker
Total Number of Months:	No Change
Project Role:	
Contribution to Project:	
Name:	Matt Cieri
Total Number of Months:	No Change
Project Role:	
Contribution to Project:	No Change
Name:	Erin Summers
Total Number of Months:	No Change
Project Role:	
Contribution to Project:	
Name:	Carl Wilson
Total Number of Months:	No Change
Project Role:	
Contribution to Project:	
Name:	Amy Dumeny
Total Number of Months:	No Change

Project Role:

Contribution to Project:

Name: Christopher George
Total Number of Months: No Change
Project Role:

Contribution to Project:

Name: Christie Labbe
Total Number of Months: No Change
Project Role:

Contribution to Project:

Name: Rochelle Nutting
Total Number of Months: No Change
Project Role:

Contribution to Project:

Has there been a change in the active other support of the PD/PI(s) or senior/key personnel since the last reporting period.

James Becker from DMR has been the field coordinator and lead PI since the last reporting period of July 1, 2014 – June 30, 2019. The remaining personnel (listed above) and their duties have remained unchanged.

What other organizations have been involved as partners?

MA DMF has successfully continued to combine their own portside bycatch sampling program with DMR to collectively achieve larger sampling coverage of both the herring and mackerel fisheries.

NMFS combines our portside bycatch data with their at-sea observer program to estimate bycatch and discards for both the herring and mackerel quota monitoring systems. Plus, data are compiled for both stock assessments.

The Atlantic Coastal Cooperative Statistics Program (ACCSP) use our herring spawn data, gathered from the commercial catch samples to overlook, monitor and administer the spawn forecast model used for the corresponding closures within the GoM.

Have other collaborators or contracts been involved?

Herring commercial catch data are shared with the Gulf of Maine Research Institute (GMRI) to be applied for spawn monitoring and future regulation.

IMPACT:

What was the impact on the development of the principal discipline(s) of the project?

The bycatch program for herring and mackerel plays a significant role in not only establishing a monitoring system to protect bycatch and incidental species, but influences herring and mackerel fishing landings throughout the year. For example, when a certain amount of river herring (Alewife and Blueback herring) are landed via herring or mackerel trips and reach a set quota, portions of theses directed fisheries are closed until the quota resets in the following year. This protects these nontargeted species from overharvesting, but impacts the revenues generated for these directed fisheries.

The spawn information gathered from the herring commercial catch samples during the summer and fall are used to monitor closures necessary to protect the spawning aggregates. For example, when 25% of the female herring collected from herring vessels fishing Areas 511 – 514 (Figure 3.) reach a certain threshold and ratio of the ovary weights to body weights, portions of the inshore fishery are closed for at least 30 days to ensure a healthy successful spawn and fertilization of the benthic eggs, necessary to protect the future recruitment of the herring fishery.

Furthermore, the biological data collected via the commercial catch sampling program of herring, mackerel, and menhaden are directly used for their stock assessments and catch-at-age matrices. These data are used to estimate the size and age structure, 2019-2021 fishing quotas, recruitment, and ultimately the health of their population.

What was the impact on other disciplines?

Nothing to report

What was the impact on the development of human resources?

Nothing to report

What was the impact on teaching and educational experiences?

Nothing to report

What was the impact on physical, institutional, and information resources that form infrastructure?

Nothing to report

What was the impact on technology transfer?

Nothing to report

What was the impact on society beyond science and technology?

Bycatch data collection and biological sampling have influenced fishing behaviors. With catch cap monitoring of river herring, shad and haddock in two directed fisheries, implemented partly by our sampling program, fishing locations can be chosen accordingly. To prevent closing areas of these fisheries due to choke species, the fishing spatial activity can shift to areas where the cumulative bycatch is lower and less likely to shut down landings. For example, if it is known that portside sampling is to occur on a certain herring or mackerel offload, the captain may decide to fish an area that typically contains less haddock, to prevent closing the fishery.

A similar spatial shift occurs during the rolling spawn closures within the GoM. As that herring typically spawn from north to south, harvesters move out of the areas that are approaching peak spawning as to not land significant amounts of ripening females, to halt samples that may trigger a closure. Harvesters may also fish a certain spawn closure, providing DMR with spawn samples and a real-time look at the status of the ovaries in an effort to close the area as soon as possible. This could allow it to open that much earlier for harvest in the fall, to align with better markets and demand for bait.

Bycatch quotas and spawn closures can close large areas of these fisheries for harvest and directly impact the revenues and economies associated from the income the crew and captains generate up the chain to the dealers and other related businesses. As such, a both direct and indirect impacts are created on the relevant stakeholders.

What percentage of the award's budget was spent in foreign country(ies)?

Nothing to report

CHANGES/PROBLEMS:

Nothing to report

SPECIAL REPORTING REQUIREMENTS:

Nothing to report

BUDGETARY INFORMATION:

Will be provided in next final report

PROJECT OUTCOMES

All objectives and goals were met for this report period. The portside bycatch survey has continued to prove very successful since its inception in August of 2003. The results of this survey have revealed extremely small levels of bycatch in the directed herring fishery, and minor levels of bycatch in the mackerel and menhaden fisheries for all gear types sampled. The results of this project are useful in quantifying and understanding the extent of retained bycatch in the herring, mackerel, and menhaden fisheries. However, the species encountered as bycatch varied spatially by NMFS Statistical Area, and conclusions drawn regarding the spatial nature of the bycatch encountered should be interpreted cautiously due to the small sample sizes. It is important to remember that bycatch in these fisheries can be episodic and can be isolated to one fishing event in one specific spatial location during only handful of trips.

Herring, mackerel, and menhaden are harvested as large volume fisheries, which results in mass handling techniques like pumping the catch from the nets into the vessel holds and again into the processing facilities. Because of the nature of these fisheries, there are limited opportunities to observe and/or sample bycatch at-sea. However, vessels can discard some or all of the catch at-sea and there are some methods of sorting out large bycatch i.e. mammals before or during the pumping process. For these reasons the portside component is not designed to quantify all bycatch in these fisheries, but only retained and landed bycatch.

Since the spring of 2011, the portside bycatch sampling protocol shifted towards analyzing entire boatloads only and eliminating partial boat or lot sampling. This change in approach and the results of the co-occurring trip analyses have revealed that aligning portside data between DMR, MA DMF, and the NEFOP at-sea program offer more statistically sound estimates of bycatch and allows for the increase of sampling coverage across these fisheries. These efforts will complement and supplement, but not replace the NEFOP at-sea observer program. This bycatch survey represents a unique opportunity to collect data in an inexpensive but efficient and accurate way.

The data collected from both the Portside Bycatch Program and Commercial Catch Sampling Program were useful for the herring stock assessment for 2018 and the upcoming assessment update in 2020. In-particular the herring samples used for the catch-at-age matrix helped to determine spawning stock biomass, the 2019 - 2021 area fishing quotas and specifications, and spawn closure regulations. In addition, portside bycatch data from this project was used in conjunction with the at-sea data to calculate the river herring and haddock bycatch quotas for the 2019/2020 herring and mackerel fisheries.

Attachment 4

Instructions for Sampling Atlantic Menhaden from the Maine Bait Fisheries

Acquiring the 'Sample'

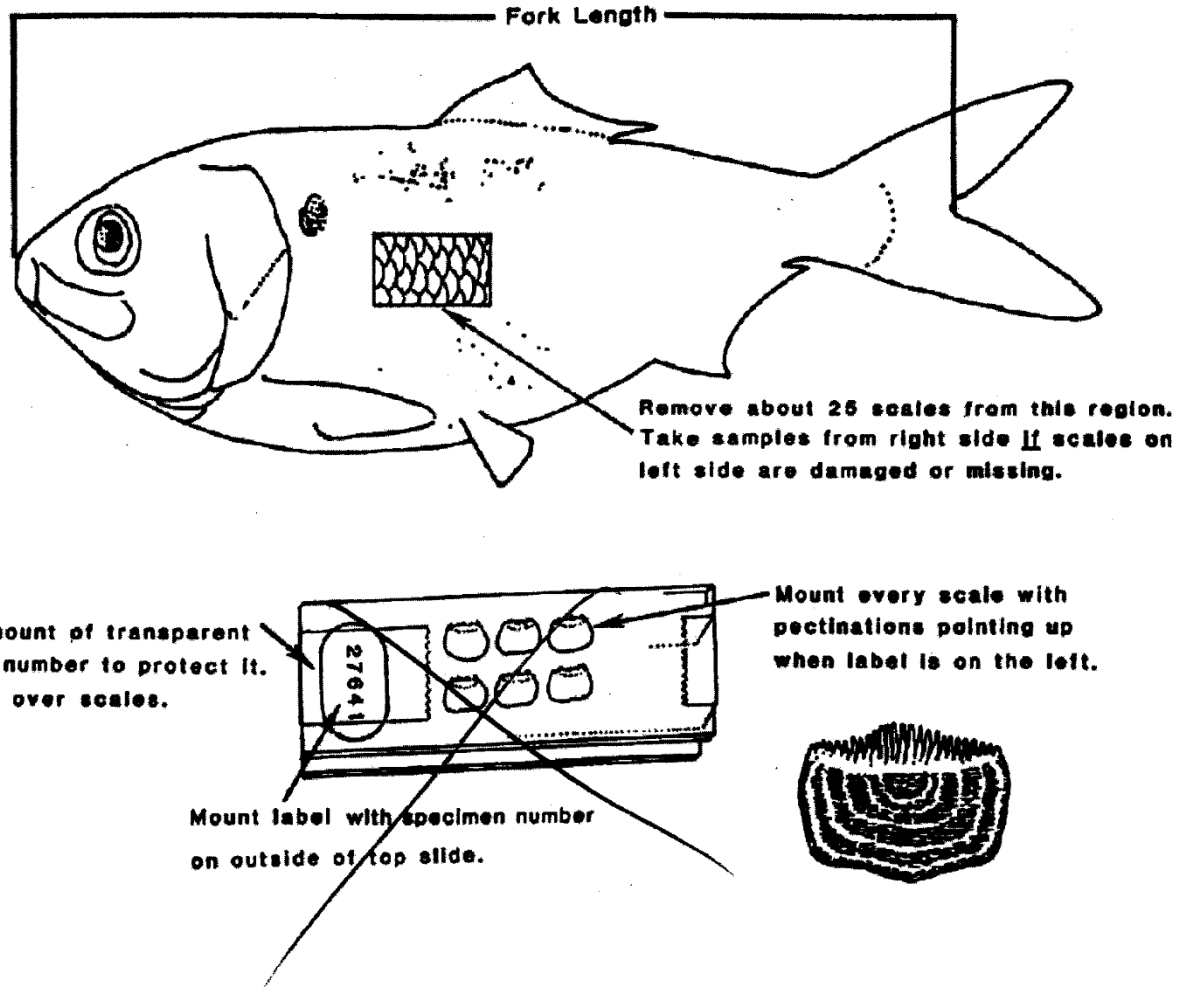
- Ideally, scoop a bucket of menhaden at random from the top of the fish hold.
- If the menhaden have already been packed out in flats or fish boxes, take 15-20 fish at random from the container.
- If available, record date of capture, location of capture, and vessel name. Usually we write this info on a waterproof tag and toss it in with the bagged menhaden sample.

Processing the 'Sample'

- Select a data sheet from the top of the pile. Write-in pertinent sample info on left half of data sheet:
  - Year Caught - last two digits
  - Vessel Name - just a name; we'll assign a vessel number at Beaufort
  - Location Caught - write location above the boxes; we'll assign a location code at Beaufort
  - Month and Day
  - LEAVE BLANK - Species and Scale Reader
  - Initial the data sheet (bottom right), and write any miscellaneous comments in the 'Remarks' box of the data sheet, eg, gear type, port of landing.
- Before you begin to handle the fish for lengths and weights, lay out ten coin envelopes on the counter-top and label each on the back with the unique 5-digit 'Specimen Number' found on the right side of the data sheet.
- From the plastic bag, bucket, etc. holding the menhaden sample, randomly draw out 10 fish. Process each of these 10 fish for fork length (in mm), weight (to the nearest whole gram), and remove a scale patch. Write fork lengths and weights for each of the 10 sample fish in the appropriate boxes on the right side of the data sheet.
- Scale patches are removed from mid-body, just below the start of the dorsal fin. See illustration in sampling manual.
  - Place scale patches in the appropriately labeled coin envelope, ie, scale patch from the first fish in the sample goes in the coin envelope labeled with the specimen number ending in '1'; scales from second fish go in coin envelope ending with specimen number ending in '2, etc.
- Re-bind ten coin envelopes with a rubber band. Paper-clip the coin envelopes to the top of the data sheet.
- Mail data sheets and coin envelopes to Beaufort via Dr. Matt Cieri.

Questions?? - Call Joseph W. Smith, NMFS Beaufort, 252-728-8765

FIGURE 2


Fork Length
Remove about 25 scales from this region.
Take samples from right side If scales on
left side are damaged or missing.
Use minimum amount of transparent
tape, but cover number to protect it.
Do not lap tape over scales.
27641
Mount every scale with
pectinations pointing up
when label is on the left.
Mount label with specimen number
on outside of top slide.

Attachment 5

COMMERCIAL PORTSIDE BYCATCH SURVEY PROTOCOL

EXPLANATION:

The bycatch survey represents a unique opportunity to collect data in an inexpensive but efficient and accurate way. The program takes advantage of normal processing plant operations by quantifying bycatch that enters the facilities. Processing plants have to manually remove other species from the production line before the fish are sorted and cut or frozen. In normal operations, bycatch removed from the product is segregated into xactix bins or totes and removed from the processing floor at the end of each lot. Plants process one lot (fish caught by one vessel on a particular trip, delivered by truck or boat) at a time and then reset the plant in preparation for the next lot. Therefore, the bycatch removed from each lot can be documented and assigned to a catch location, gear type, date and a total lot amount. Additionally, the plants generally buy herring from vessels throughout the fishery and therefore cover multiple gear types, vessel sizes and individual fishing practices.

The bait industry has changed tremendously in the last five years resulting in a much more centralized distribution structure. Generally the herring used for bait goes through a large wholesale dealer to smaller dealers and lobster wharfs along the coast. The wholesale dealers generally have facilities where they sort, barrel, freeze and store bait for redistribution. It is at these sites where effective bycatch surveys can also be done, thereby including the bait sector in this study.

The sampling takes place at processing plants and bait dealers in Maine, New Hampshire, Massachusetts, Rhode Island and New Jersey. Sampling sites are selected by targeting Tier 1 locations first and then relying on Tier 2 locations to meet weekly goals. A sampling level of five percent of the entire herring fishery is targeted (Table 1). The mackerel fishery will be sampled if the target levels for the herring fishery are being reached or when herring samples are not available. This scenario is most likely to occur in the winter months when many of the herring vessels switch to the mackerel fishery. The samplers quantify bycatch from individual lots that enter the processing and bait plants according to a NMFS specified protocol. The total weight of any observed bycatch are recorded along with species identification, total species weight, individual lengths and weights of all fish or a representative sub-sample.

From 2004 thru 2008 the average annual herring landings were 91,803 metric tons. Over this five year period, April averaged the lowest landings of 2,033 metric tons, yielding about 2% of the annual landings (Figure 1). August averaged the highest landings of 13,438 metric tons, and yielded about 15% of the annual landings.

Table 1: Target sampling levels for herring

Month	5% Herring landings
January	319.82
February	270.91
March	144.92
April	101.63
May	346.8
June	355.3
July	544.18
August	671.9
September	502.18
October	646.28
November	386.65
December	299.61
Totals MT	4590.18

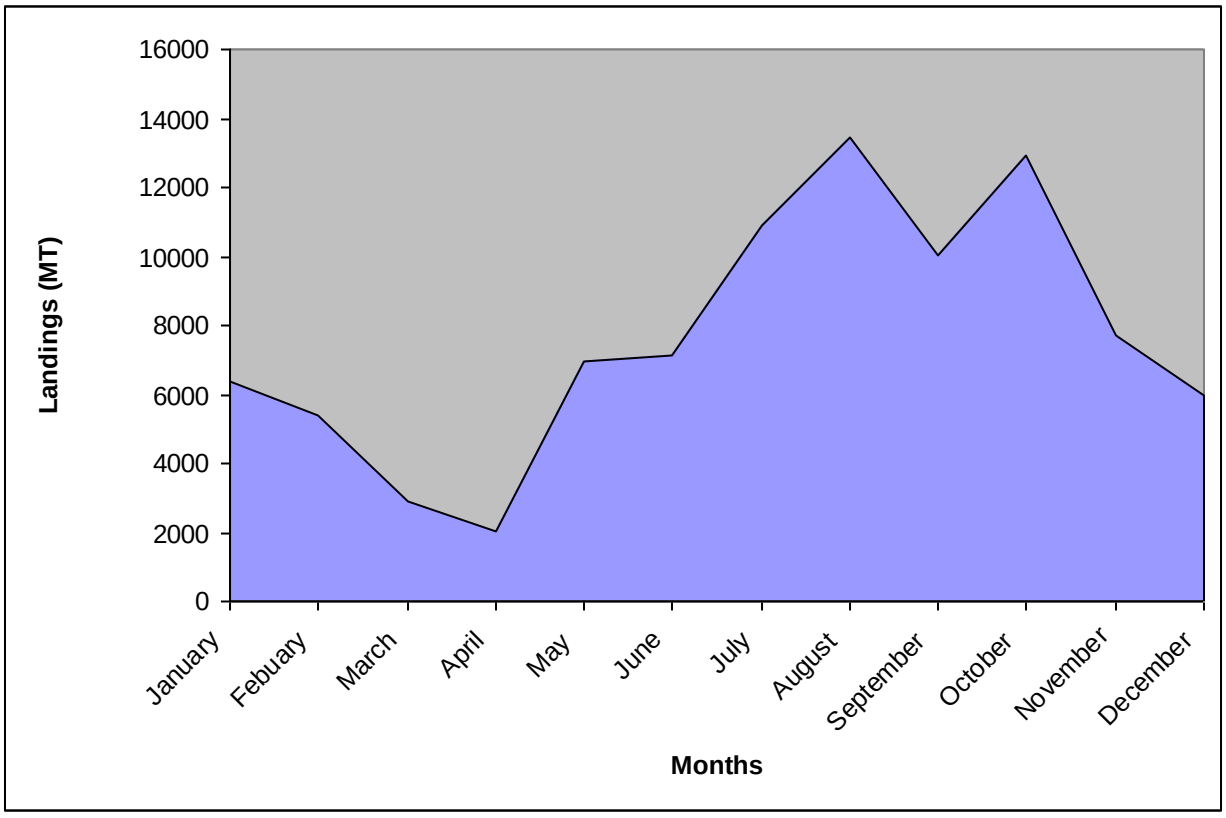


Figure 1: Five year average (2004-2008) of monthly herring landings

COMPLETE SAMPLING PROTOCOL:

The samplers collect and quantify all bycatch from individual lots of fish (transported by trucks or vessels) that enter the processing facilities. Samplers position themselves at the point of entry into the facility along an assembly line or at the base of the hoppers where the fish are unloaded. Sampling is conducted before grading or sorting of the catch occurs. All bycatch is removed from the assembly line or hopper and placed in bushel baskets or buckets specific to each species. Species identification is accomplished by examination and the use of identification keys when appropriate as outlined in NMFS and NEFOP protocols. The total weight of any observed bycatch is recorded along with species identification, total species weight, individual lengths and weights of all fish according to a NMFS and ACCSP specified protocol. If there is a large amount of one species, the total weight is recorded and then length frequencies and weight are gathered from a sub sample of n=50. The information collected for each bycatch study is recorded on the data sheets (see "Data Sheets" section of packet) and entered into the MEDMR biological database.

SUB-SAMPLING PROTOCOL:

A sub-sampling protocol is utilized when sampling a large volume of catch, determined as greater than 80,000 lbs. (~40 mt). Instances where this is likely to occur include sampling sites where vessels land an entire catch (as much as one million pounds) to a single facility. Sub-sampling is also appropriate in instances when there is an overwhelming amount of bycatch and/or non-targeted species mixed in with the lot of fish. In these cases it can be impossible to use the complete sampling protocol regardless of the amount inspected (< 80,000 lbs.). These situations are likely to occur when vessels are fishing mixed groups of herring and mackerel, some of which have a 50-50 composition.

Sub-samples are to be collected using bushel baskets at timed intervals during the pumping or unloading process following the NMFS at-sea observer sampling protocol. To accomplish this type of sub-sampling one needs to know the total lot weight and the duration of time it will take to unload the catch. After sampling the bushel basket of fish should be sorted by species, and total weight of each species and length frequencies should be recorded (sub sample n=50, for length frequencies if more than fifty of any species occurs).

Example:

Lot size = 120,000 lbs. (3 Trucks)
Pumping or unloading time = 3 hours (180 minutes)

If a sample basket is to be collected for every 10,000 lbs. of fish, then **12 sample baskets** need to be collected over the entire pumping or unloading process.

120,000 lbs./10,000 lbs. = 12

If the entire pumping or unloading process takes an estimated 180 minutes, than **a basket sample needs to be taken every 15 mins.**

If the catch composition from the bushel baskets is 99% Atlantic herring, than one can extrapolate that out of the 120,000 lbs. unloaded, then 118,800lbs is Atlantic herring.

99% Atlantic herring = 120,000 lbs. x 0.99 = 118,800lbs of Atlantic herring

If the remaining 1% of the catch composition is Atlantic mackerel, then one can extrapolate that out of the 120,000 lbs. unloaded, 1,200lbs is Atlantic mackerel

1% Atlantic mackerel = 120,000lbs x 0.01 = 1,200lbs of Atlantic mackerel

Attachment 6: Negotiated Indirect Cost Agreement

U.S. Department of Commerce
Office of Acquisition Management – Grants Management Division
1401 Constitution Ave., NW, HCHB Rm 6412
Washington, DC 20230, Attn: Indirect Cost Program

CERTIFICATE OF INDIRECT COSTS

This is to certify that I have reviewed the indirect cost rate proposal prepared and maintained herewith and to the best of my knowledge and belief:

(1) All costs included in this proposal dated 3/18/20 to establish indirect cost billing rates for July 1, 2019 through June 30, 2020 are allowable in accordance with the requirements of the federal awards to which they apply and 2 CFR Part 200 , "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards". This proposal does not include any costs which are unallowable as identified in the applicable federal cost principles. For example, advertising contributions and donations, bad debts, entertainment costs or fines and penalties.

(2) All costs included in this proposal are properly allocable to federal awards on the basis of a beneficial or causal relationship between the expenses incurred and the agreements to which they are allocated in accordance with applicable requirements. Further, the same costs that have been treated as indirect costs have not been claimed as direct costs. Similar types of costs have been accounted for consistently and the Federal Government will be notified of any accounting changes that could affect the rate.

(3) The indirect cost rate calculated within the proposal is 34.30%, which was calculated using an indirect cost rate base type of Modified Total Direct Costs. The calculations were based on actual costs from fiscal year July 1, 2018 thru June 30, 2019 to obtain a federal indirect cost billing rate for fiscal year beginning July 1, 2019.

Subject to the provisions of the Program Fraud Civil Remedies Act of 1986, (31 USC 3801 et seq.), the False Claims Act (18 USC 287 and 31 USC 3729); and the False Statement Act (18 USC 1001), I declare to the best of my knowledge that the foregoing is true and correct.

Organization Name: State of Maine, Department of Marine Resources

CFO Signature: Gilbert Bilodeau Date: 3/18/2020

Name/Title Authorized Official: Gilbert M. Bilodeau, Director, Natural Res Ser Ctr

Dept Head Signature: Date: 03/18/2020

Name/Title Authorized Official: Patrick Keliher, Commissioner

Attachment 7:

Atlantic Coastal Cooperative Statistics Program
Grant No. NA13NMF4740203
(DMR#4077)

Comparative Analysis of Two Bycatch Programs within the U.S. Atlantic Herring (*Clupea harengus*) Fishery

Supplementary Report

Submitted by:

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2/10/2017

Introduction

Bycatch estimates in the U.S. Atlantic herring fishery are primarily calculated by an at-sea sampling program conducted within the National Marine Fisheries Service (NMFS) by the Northeast Fisheries Observer Program (NEFOP). However, in recent years due to high costs and lack of appropriate funds, NEFOP decreased its overall coverage, leaving a larger portion of herring trips unobserved (NMFS, 2015). Moreover, in 2005 the Maine Department of Marine Resources (ME DMR) began a portside bycatch program of the herring fishery that offered the ability to estimate bycatch at a safer and cheaper cost, allowing access to high volume offloads without placing observers at-sea. However, unlike NEFOP, the portside program has yet to be used for bycatch quota estimation. This report attempts to validate the bycatch estimates derived between the at-sea and portside bycatch programs from co-occurring trips (trips that were sampled both at-sea and portside). If the methodologies and bycatch estimates are compatible, combined, both programs could offer increased sampled trips, and decrease the variability associated with the current low coverage.

To date, there are five species with bycatch caps within the U.S. Atlantic herring fishery. Bycatch caps for haddock (*Melanogrammus aeglefinus*) were mandated in 2006, and in 2014 for river herring and shad (RHS), a combination of alewife and blueback herring *(Alosa pseudoharengus* and *A. aestivalis*), and American and hickory shad (*Alosa sapidissima* and *A. mediocris*), respectively (NMFS, 2016). The bulk of the focus of this report is on river herring, but looks at other bycatch species as well. The past decade has shown an increasing concern for river herring bycatch within the U.S. Atlantic herring fishery, thus, minimizing and grasping the extent of this bycatch and assessing the status of the population have become paramount (NMFS, 2012).

Prior to the implementation of these bycatch quotas, NOAA conducted a series of workshops to gather more information on the status of river herring in the northwest Atlantic. In May of 2012, NOAA worked closely with the Atlantic States Marine Fisheries Commission (ASMFC) to use information contained in their river herring stock assessment and the best available information to determine whether these two species should be listed under the Endangered Species Act (ESA). Several areas where additional information was needed included stock structure, extinction risk, and the impact of climate change on these species (NOAA Fisheries Northeast Regional Office: Protected Resource Division, 2013).

Due to the growing concern of the health of the river herring population and its interactions with the Atlantic herring fishery, facilitation of bycatch quotas, and the potential for an ESA listing, lead to an analysis and comparison of co-occurring trips between at-sea observed and portside observed, looking for, but not limited to, the significance of bycatch estimates of river herring. These tests and comparisons were also useful for examining other bycatch species estimates, methodologies, and for addressing which methods could be tweaked to better estimate bycatch landings.

The objective of this report is to access whether the portside and at-sea observer programs are compatible, and can estimate statistically sound and similar bycatch estimates within the US Atlantic herring fishery.

Methods

For the analysis and comparison of the co-occurring trips three methods were initially used, (for more detail, see the 2016 proposal for ACCSP Grant No. NA13NMF4740203). However, after accessing the data and the sampling protocol for the at-sea program, it became evident that Method 3 was the most statistically sound approach for determining significance between programs of bycatch estimates.

Typically at-sea sampling requires10 bushel baskets to be systematically collected per haul (tow) per trip. Bycatch species are removed and weighed, and then the proportions of each species are multiplied by the estimate of each haul weight. The overall bycatch estimate per trip is the sum of each bycatch estimate per haul. Due to the variance associated with each individual haul, Method 3 offered the most viable approach for comparing bycatch estimates between co-occurring trips.

Portside sampling requires the collection of a bushel basket from the offload delivery system (dewatering box or pre-graded assembly line) every 5 minutes until the entire herring trip has been pumped from the vessel. Bycatch species are sorted and weighed from each basket, and the overall proportion is multiplied by the total hail weight of the catch.

Method 3, (Dean, 2011), involved calculation of composition and variance of bycatch species per haul, per at-sea trip, combining the individual variances into a single array representing the entire catch, then conducting a modified two sample two tailed t-test to look for significance between both programs ($P<0.05$). Since this particular method needed a customized significance test to compensate for the individual haul compositions at-sea per trip, the sample means and variances were replaced with the total estimated bycatch per trip (w), and the variance of those estimates ($V(w)$) written as:

$$t = \frac{w_1 - w_2}{\sqrt{V(w_1) + V(w_2)}}$$

With

$$H_0 : w_1 - w_2 = 0$$
$$H_A : w_1 - w_2 \neq 0$$

Calculations for the pooled degrees of freedom for each at-sea trip were written as:

$$Pooled\ At\text{-}sea\ DF = (N_1\text{-}1) + (N_2\text{-}1) + (N_3\text{-}1) = (N_1+N_2+N_3) - g$$

Where N_i is the total haul weight divided by the average basket weight per haul, and g is the number of hauls per trip, in this case 3 (https://www.isixsigma.com/topic/degree-of-freedompooled-estimate-of-variance/).

Calculations for the degrees of freedom for each portside trip were written as:

$$Portside\ DF = N\text{-}1$$

Where *N* is the total trip hail weight divided by the average basket weight.

In both cases, *N* is estimated and scaled up to establish the number of possible baskets that could be taken from the entire catch.

For this analysis of co-occurring trips three universal criteria were used. The first was used if a specific bycatch species was absent in the sample baskets between both programs for the same trip. For example, if a certain trip lacked alewife in the sample baskets for the portside data and the at-sea data, then the results would state there was no significant difference between the two trips, noted as (-,-) or denoted a "zero" trip. The second was if a bycatch species was found only in one of the programs, noted as (+,-) for presence at-sea only, and (-,+) for portside only, deeming that specific trip significantly different. Lastly, on occasion a scenario arose where the at-sea program was unable to identify what type of river herring species was landed (either an alewife or blueback herring), therefore nullifying the possibility of a comparison, noted as (NK,+) NK standing for "not known".

Results

To meet the necessary criteria for this type of analyses, i.e., a co-occurring trip that contained the presence of the same species both at-sea and portside, the filtering process mentioned above was implemented which limited and reduced the useable data. Thus, sixty one co-occurring trips were conducted, of which 38 were accessed for significance testing (Table 1 and 2). Currently seven trips were used for statistical comparisons, and within three of those specific trips analyses were conducted on more than one species. This resulted in 13 individual statistical analyses conducted to date. Eight out of the 13, or 62% of the analyses revealed that bycatch estimations between programs were not statistically different (Table 2).

Refer to Table 2 for the following results: Trip 16, a small mesh bottom trawler (SMBT) fishing in Block Island Sound (BIS), in Area 539, showed no significant difference between estimated Alewife (Ale) bycatch, yet showed significance between both blueback herring (BB) and the combination of the two, river herring (RH). Trip 17, a SMBT fishing in BIS, showed no significant difference between Alewife. Trip 18, a single mid-water trawler (SMWT) fishing on Georges Bank (GB) in Area 522, revealed a significant difference in haddock (Had) estimations. Trip 19, a SMWT on GB, did not show a significant difference in Had. Trip 20, a SMBT, showed no significant difference among Ale, BB, or combined as RH. Trip 21, a paired mid-water trawler (PMWT) fishing on GB, showed a significant difference with Had, and Ale, but not with mackerel (Macks). Trip 22, a PMWT fishing on GB, showed no significant difference with Had.

The scaled up bycatch estimates for *w* and *V(w)* varied substantially. The highest *w and V(w)* were found in trip 19, with the portside Had estimates around 25, 928 lbs. and 10,063,307, and the at-sea about 28,582lbs and 22,714,397, respectively. The lowest *w and V(w)* portside were documented in trip 16, with the BB estimates about 98lbs and1,920 respectively. However, the lowest *w and V(w)* at-

sea were found within trip 21, with the Ale estimates around 59lbs and 3,184, respectively. Note that trip 21 contained zero Ale portside, or in this case a null value.

Table 1. Co-occurring trips that were not analyzed via a statistical test, including zero trips.

Trip	Year	Gear	Area	Spe	Signf	Criteria	Comments
1	2016	PS	513	Zero	No	(-,-)	
2	2014	PS	512	Zero	No	(-,-)	
3	2014	PS	513	Zero	No	(-,-)	
4	2013	PS	513	Zero	No	(-,-)	
5	2012	PMWT	521	Zero	No	(-,-)	
6	2012	PMWT	522	Had	Yes	(+,-)	At-sea observed Haddock outside of baskets
7	2012	PMWT	522	Had	No	(-,-)	
8	2012	PS	513	Ale	Yes	(-,+)	Alewife were present in one At-sea basket, 0.2Lbs
9	2012	PS	513	Ale	Yes	(-,+)	
10	2012	PMWT	522	Ale	Yes	(+,-)	Alewife were present in one Portside basket, 0.2lbs
11	2012	PMWT	539	BB	NA	(+,NK)	
12	2011	PS	511	Zero	No	(-,-)	
13	2011	PMWT	522	Zero	No	(-,-)	
14	2011	PS	513	Zero	No	(-,-)	
15	2010	PMWT	515	Zero	No	(-,-)	

Table 2. Co-occurring trips with statistical analyses of bycatch species estimations.

Trip	Year	Gear	Area	Hail Lbs	Spe	Prtsd Ws lbs	At-Sea Ws lbs	Prtsd Bskts	At-Sea Bskts	All hauls smpld	Prtsd V(Ws)	At-Sea V(Ws)	Signf	Tval	Tcrit
16	2016	SMBT	539	44,127	Ale	738	1,128	6	12	Yes	41,251	28,193	No	1.481	1.964
					BB	98	405				1,920	4,195	Yes	3.933	1.964
					RH	836	1,533				51,267	20,878	Yes	2.598	1.964
17	2013	SMBT	539	34,998	Ale	795	560	5	16	Yes	33,340	8,443	No	-1.147	1.964
18	2013	SMWT	522	79,996	Had	5,637	2,149	10	15	Yes	1,805,154	576,741	Yes	-2.260	1.962
19	2013	SMWT	561	520,011	Had	25,928	28,582	37	58	No	10,063,307	22,714,397	No	0.464	1.960
20	2013	SMBT	539	21,773	Ale	1,332	1,617	5	10	Yes	17,006	491,560	No	0.040	1.966
					BB	348	310				10,017	9,648	No	-0.275	1.966
					RH	1,681	1,927						No		1.966
21	2012	PMWT	522	469,908	Had	2,881	1,151	36	18	No	472,957	219,789	Yes	-2.078	1.960
					Ale	0	59				NA	3,484	Yes	NA	NA
					Mack	7,003	9,474				532,343	1,651,887	No	1.695	1.960
22	2011	PMWT	522	520,528	Had	110	246	26	22	Yes	11,972	590,226	No	0.176	1.960

Conclusion

Results suggest it is important to note the following when comparing co-occurring trips for significance among estimated bycatch: 1.) Achieving the established sampling protocol for both programs; sampling every haul at-sea, collecting ten baskets per haul, and maintaining sampling of the offload stream every 5 minutes for the entire offload for the portside program. 2.) The number of baskets collected per haul at-sea. For example, if fifty baskets were collected port side, and only twenty total at-sea for the same trip, a significantly different bycatch estimation between trips may result. 3.) Due to the small sample size, i.e. total weight of all baskets collected for either study compared to the overall trip hail weight, the estimated variance *V(Ws)* can be extremely large.

4.) Discrepancies in identifying alewives versus blueback herring (river herring). 5.) Culling of large species at-sea, i.e. haddock may reveal a significant difference in estimated weight compared to portside data. 6.) At-sea observers putting their documented bycatch back in the hold versus overboard. 7.) Within-trip speciation, varying distributions per species, and multiple zeros of species per basket.

One co-occurring trip in particular brought to light some of the issues mentioned above (Table 2, Trip 21). A PMWT fishing on GB showed a significant difference in alewife estimations with only 0.2lbs documented at-sea (one individual fish) and zero reported portside. Once scaled up to the total catch, 59.03lbs was estimated at-sea, and 0.00lbs portside, deeming a significant difference (if following the methods of this analysis). Interestingly, the haddock estimations were smaller at-sea than portside, even though culling and removal of the larger fish at-sea after collecting the 10 required baskets for bycatch estimation could have revealed a larger amount of haddock. However, this may be due to the fact that not all the hauls were sampled at-sea, which potentially could underestimate the overall bycatch. Lastly, the estimations of mackerel were not significantly different. This within-trip speciation may be revealing varying distributions per species within the catch composition. Mackerel, one of the most common bycatch species (incidental catch) found in the Atlantic herring fishery (NEFOP, 2016), may sometimes be distributed normally within the catch, whereas other species of the catch composition may be in a delta-lognormal distribution and may be solely responsible for the many zeros documented per basket sample (Fletcher, 2008). Overall this trip represented an example of the limits of precision and detection of small amounts of bycatch, the difference in methodologies between programs, lack of achieving sampling protocol, and that significance can be species specific.

An important note to consider was the decision not to use any of the "zero" trips. Once these trips were removed from our analysis, the percent of trips that were significantly different increased to about 38%. This seemed the appropriate approach as that zero trips prevented the use of our customized t-test, and therefore couldn't be pooled with the trips that contained the relevant bycatch. If in the future the use of zero trips is incorporated, another approach could be some type of randomization test (Hooton, 1991).

Overall this study revealed that the bulk of the co-occurring trips analyzed were not statistically different, reinforced the legitimacy of portside sampling, and combined will help for both management and this industry. Incorporating the portside bycatch program will increase coverage, and should reduce the variance within bycatch quota monitoring found within large volume fisheries, especially if the areas of concern mentioned above are addressed. Overall this would reduce the cost to both the US Atlantic herring fishery and NEFOP, and increase bycatch monitoring for both the RHS and haddock bycatch caps and overall statistical power and effectiveness of bycatch estimation.

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M.S.	Biology (Marine Ecology), Rutgers University	1995
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Graduate Research Assistant, School of Marine Science, University of Maine 5/95-9/99
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Graduate Research Assistant, Institute of Marine Sciences, Rutgers University 10/93-4/94
Animal Laboratory Technician, Department of Natural Sciences, Stockton College 10/92-9/93

CURRENT DUTIES

Atlantic Herring: New England Fishery Management Council (NEFMC) and Atlantic States Marine Fisheries Commission (ASMFC)

- Oversee catch and landings reporting. Use of VTR (Vessel Trip Reports), Dealer Reports, & IVR (Interactive Voice Reports) to analyze and report landings and catch data to NMFS (National Marine Fisheries Service) regional office, NEFMC, and ASMFC
- Monitor IVR system: Query IVR database and report landing weekly to interested parties. Design and execution of a catch and effort model to predict appropriate "Days Out" needed to extend the fishery in some areas
- Commercial and Bycatch Sampling: Oversee the collection, inventorying, processing, and ageing of herring samples, also verify data entry. Make data available to interested parties. Supervise two full-time and one part-time technician. Produce compliance reports for ASMFC
- Monitor Herring spawning condition: Analyze biological sample data to determine spawning activity status. Indicate when areas should be closed to fishing to protect spawning herring
- Herring PDT (Plan Development Team) & Stock Assessment Subcommittee member (NEFMC & ASMFC): Participate in Stock assessments and analysis of catch and landings statistics for the Herring SAFE report. Develop the catch at age matrix for use in Virtual Population Analysis (VPA) and Age Structure Assessment Program (ASAP) models. Provide technical advice to management; Current Technical Committee Chair (ASMFC)

Whiting and Small mesh Multispecies (NEFMC):

- PDT & Stock Assessment Subcommittee member (NEFMC): Participated in stock assessment activities; Revision of overfishing and biomass reference points; Analysis of catch and landings statistics; Provide technical advice to management.

Spiny Dogfish (ASMFC):

- Participated in stock assessment activities and management analysis; Revision of overfishing and biomass reference points; Analysis of catch and landings statistics; Provide technical advice to management.

Assessment Science Committee (ASMFC):

- Provide stock assessment and technical advice to ASMFC Policy board including; Sampling targets for fishery independent and dependent sampling; Workload and scheduling for ASMFC stock assessment and participating scientists; coordinate Advanced Stock assessment training workshops

Multispecies Technical Committee Chair (ASMFC):

- Provide stock assessment and technical advice to ASMFC Policy on predator/prey relationships; Update and Expand MS-VPA (Multispecies Virtual Population Analysis) model as appropriate; Assist in incorporating Predator/prey and natural mortality estimates in the Atlantic Menhaden Assessment. Current Chair

Atlantic Menhaden (ASMFC)

- **Stock Assessment Subcommittee:** Provide estimates of natural mortality and participate in general assessment activities.

Biological Review Panel (ACCSP):

- Provide recommendations of priority and scope of fishery dependent and independent sampling for East Coast Fisheries

PREVIOUS DUTIES

Monkfish

- **PDT & Stock Assessment Subcommittee member (NEFMC):** Participated in stock assessment activities; Revision of overfishing and biomass reference points; Analysis of catch and landings statistics; Provide technical advice to management.

Atlantic Menhaden (ASMFC)

- **Technical Committee Chair:** Writing consensus documentation from technical meetings; Provide analysis of catch and landings data; Analyze current assessment methods; Present findings to the Menhaden Management Board. Produced compliance reports for the state of Maine
- **Multispecies Subcommittee Chair:** Provide technical guidance on conceptualization and implementation of the Menhaden Multispecies ecosystem model; Report progress to the Menhaden Management Board.

American Eel (ASMFC)

- **Stock Assessment Subcommittee Chair:** Organized and lead meetings with both scientific and stakeholder participants. Writing consensus documentation from technical meetings. Provided analysis of catch and landings data. Analyzed assessment methods for use in the stock assessment. Presented results during ASMFC external peer review and Eel Management Board.

Erin L. Summers
Maine Department of Marine Resources
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Profile:

- Work collaboratively with state, federal, academic, conservation, and industry partners to reduce whale entanglements
  and mortality in marine mammals and sea turtles through bodies such as the Atlantic Large Whale Take Reduction team and Atlantic Large Whale Disentanglement Network.
- Build research programs to provide baseline data on large whale life history, ecology, and habitat use in Maine's coastal rocky bottom habitats. Design new and emerging methodologies to inform management decisions.
- Oversee research and monitoring programs within the Division of Biological Monitoring at DMR, including the lobster programs, surveys for scallops, sea urchin, shrimp, and herring, recreational fisheries program, inshore trawl survey, and the landings and reporting group.
- Represent the Department of Marine Resources in stakeholder meetings, including those for wind energy permitting, Natural Resource Damage Assessments, department wide research and priority setting, etc.
- Member of the Atlantic Scientific Review Group advising NOAA Fisheries on marine mammal stock assessments

Education:

MA Biology: Boston University Marine Program	Woods Hole, Ma.	5/02
BA Biology, Spanish minor: Truman State University	Kirksville, Mo.	5/00

Employment:

Jan 2017 – present: Marine Resource Scientist IV
Maine Department of Marine Resources
West Boothbay Harbor, Me

- Oversee Division of Biological Monitoring, including Commercial Landings Program, Benthic group (lobster, scallops, urchins), and Pelagics group (herring, groundfish, shrimp, and recreational fishing)
- Lead Scientist for DMR's Large Whale Conservation Program
- Member of the Atlantic Large Whale Take Reduction Team

Feb 2006 – Jan 2017: Marine Resource Scientist II
Maine Department of Marine Resources

- Lead scientist for DMR's Large Whale Conservation Program
- Secured grant funding, wrote reports, tracked budgets to support research projects
- Completed projects to support management decisions for the Atlantic Large Whale Take Reduction Plan, including tagging humpback whales, right whale habitat surveys, passive acoustic surveys, gear density surveys, testing alternative fishing gear, characterizing fishing practices, etc.
- Oil Spill Response Coordinator
- Assist with GIS coordination

Jan 2010 – May 2010: **Adjunct Faculty**
Unity College
Unity, Me

- Taught upper level course in the biology of Marine Mammals

Feb 2004 – Feb 2006: **Marine Mammal Research Specialist**
University of New England
Biddeford, Me

- Lead Research technician on project to track and predict right whale habitat use and distribution
- Analysis of remotely sensed data and right whale sightings in the Bay of Fundy Critical Habitat
- Assisted with report writing and budget tracking
- Completed project and published paper analyzing right baleen using stable isotope analysis
- Completed project and published papers satellite tagging and tracking baskings sharks off the coast of New England

Sept 2002 – Feb 2004: **Research Technician**
Cetacean and Sea Turtle Team, NOAA Fisheries Service
Beaufort, NC

- Lead technician tracking and analyzing movements of satellite tagged dolphins
- Perform field work including fishing gear and dolphin aerial surveys, boat based dolphin biopsy and photo-identification surveys, satellite tagging dolphins, responding to strandings, etc.
- Participate in necropsies as needed

Oct 2000 – June 2002: **Laboratory Technician**
Marine Biological Laboratories
Woods Hole, Ma

- Manage daily operations of the laboratory of marine veterinarian, Roxanna Smolowitz
- Run experiments and document methodologies and results
- Prepare media, samples, histology slides, and other lab bench work